



GOVERNMENT MODULE

Advocacy, Awareness, Capacity Building and Public Participatory Platforms (AACB)





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WATER SECTOR TRANSFORMATION 2040

WATER SECTOR TRANSFORMATION 2040 (WST2040)
GOVERNMENT MODULE: ADVOCACY, AWARENESS, CAPACITY BUILDING AND PUBLIC PARTICIPATORY PLATFORMS (AACB)

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Integrated Water Resources Management (IWRM) Training Module for Government Sector

By

Advocacy, Awareness, Capacity Building and Public Participatory Platforms (AACB) Task Force; National Water Sector Transform 2040 (WST2040)

Professor Dato' ChM. Dr. Mazlin Bin Mokhtar, FASc, FMIC

Chairperson, AACB Task Force &

Director, Institute for Environment and Development (LESTARI),

Universiti Kebangsaan Malaysia (UKM)

Dr. Minhaz Farid Ahmed

Module Cluster Leader (Government Sector), AACB Task Force &

Fellow, Institute for Environment and Development (LESTARI),

Universiti Kebangsaan Malaysia (UKM)

Ms. Nurul Ain Sazalli

Analyst, AACB Task Force

Foreword

The Government is very keen and focused to incorporate water resources in the national development agenda. Therefore, the Economic Planning Unit (EPU) via Academy of Sciences Malaysia (ASM) has embarked on the Water Sector Transformation 2040 (WST2040) study with aspirations to contribute from the water sector to the national GDP (Gross Domestic Product), especially when considering water as one of the important components of KEGA (i.e., Key Economic Growth Activities) in the fiveyear Malaysia Plans. Therefore, the government, as one of the four clusters of the Advocacy, Awareness, Capacity Building and Public Participatory Platform (AACB) Task Force/ Sub-sector within the WST2040 study, has mainstreamed awareness-raising, advocacy and capacity building of government officials for IWRM via a special training programme by using an unusual business training module. The training module, strategy and road map for WST2040 were produced by reviewing relevant existing policies, comparing IWRM capacity-building practices between Malaysia and several other developing as well as developed nations, conducting several national and international webinars;, arranging several interviews, focus group discussion (FGD) sessions, and national level workshops. It also includes an online questionnaire survey. Moreover, field visits to several existing training centres throughout Malaysia have been done not only to propose a suitable on-site for IWRM training in 13 states and three federal territories, but also to institutionalise and link the existing public participatory platforms (PPPs), such as Rakan Alam Sekitar (RAS), River of Life (RoL), Friends of Rivers (FoR) with the proposed training centres/ water hubs of AACB WST2040. Therefore, the capacity building for government officials via training is aimed to encourage their proactive leadership roles to accelerate the IWRM implementation via collaboration and partnership with multi-stakeholders.

The IWRM AACB WST2040 Training Module for government officials was designed from the perspectives of disaster risk reduction (DRR), considering both natural and manmade water-related disasters. The DRR perspective was included in the training module to prepare government officials for the worst situation and tackle the water-related disasters so that they can act promptly to reduce the frequency and intensity of future disasters. Moreover, the strategies and road maps in the AACB government cluster are also aligned with the aspirations of 12th to 15th Malaysia Plans, whereby the capacity building of 154 local authorities and 171 district officials are keys for the sector transformation. The strategies of AACB government cluster in the five focus areas are people, governance, information and RDIC (Research, Development, Innovation and Commercialisation), finance, and infrastructure and technology of the 12th Malaysia Plan are also meant to fulfil the objective to accelerate the IWRM implementation. The strategies have also focused on listing the IWRM resource persons/ experts from the government sector to train future water leaders by using the already prepared AACB training module of the government cluster. Therefore, capacity building of local authorities, district officials as well as enforcement officials from other agencies are real keys to drive the IWRM implementation and contribute to the sustainable development goals (SDGs).

Dr. Minhaz Farid Ahmed

Module Cluster Leader (Government Sector), AACB Task Force & Fellow, Institute for Environment and Development (LESTARI), Universiti Kebangsaan Malaysia (UKM)

Acknowledgement

First and foremost, praise be to Almighty Allah for all his blessings to produce this business training module to accelerate the implementation of integrated water resources management (IWRM) by the government sector.

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I am also grateful to my fellow module cluster leaders (Associate Professor Dr. Goh Choo Ta - Academic Cluster; Associate Professor Dr. Lee Khai Ern - Business Cluster; and Associate Professor Dr. Rasyikah Md. Khalid) as well as AACB communication expert Ms Siti Nurbaiyah Nadzmi for their support to produce this training module.

This training module for government sector would not have been accomplished without the assistance and support from the analysts (Dr. Zuritah A. Kadir; Ms Nurul Ain Sazalli; Ms Nurul Iman Abu Hanifah; Ms Siti Nurfazreen Abdul Rahman; and Mr Muhammad Irfan bin Masri) of AACB WST2040 Task Force. I sincerely acknowledge their support to prepare this module as well as to organise several events in order to come out with the training module.

I am also indebted to the management team members of AACB Task Force (Dato' Ir Hj Hanapi bin Mohamad Noor, FASc; Datuk Prof Dr Azizan Baharuddin; and Ir. Hj. Ismail Abdul Rahman) as well as SMEs (Subject Matter Experts) of AACB WST2040 Task Force for their contribution in this training module preparation.

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Last but not least, I highly acknowledge the support from Institute for Environment and Development (LESTARI), Universiti Kebangsaan Malaysia (UKM) for accomplishment of this training module preparation for the government sector.

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List of Abbreviations

AACB	Awareness Raising, Advocacy and Capacity Building
ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
ASM	Academy of Sciences Malaysia
BAKAJ	Badan Kawalselia Air Negeri Johor
BOD	Biochemical Oxygen Demand
BKSA	Badan Kawal Selia Air (Water Regulatory Body)
BMP	Best Management Practices
CEPA	Communication, Education and Public Awareness
CEO	Chief Executive Officer
СВО	Community-based Organisation
CC	Climate Change
CCIW	Climate Change Impacts on Water
CDD	Community Development Department (Jabatan Kemajuan Masyarakat- KEMAS)
CIDB	Construction Industry Development Berhad
CSO	Civil Society Organisations
CSR	Corporate Social Responsibilty
CTP	Community Transformation Programme
CWP	Country Water Partnerships Department of Irrigation and Drainage
DAN	Dasar Agromakanan Negara (National Agrofood Policy of Malaysia – NAPM)
DG	Director General
DID	Department of Irrigation and Drainage (Jabatan Pengaliran dan Saliran – JPS)
DMG	Department of Minerals and Geoscience
DO	District Office
DOA	Department of Agriculture
DOE	Department of Environment
DOF	Department of Fisheries
DSAN	Dasar Sumber Air Negara (National Water Services Policy)
DSS	Decision Support Systems
EDC	Endocrine Disrupting Chemicals
EIA	Environmental Impact Assessments
EPU	Economic Planning Unit
ERP	Enterprise Resource Planning
FAO	Food and Agriculture Organisation
FGD	Focus Group Discussions
FOR	Friends of River
GEC	Global Environment Centre

GEF5	Global Environment Facility 5	
GNI	Gross National Income	
GWA	Ground Water Assessment	
GWP	Global Water Partnership	
HAZMAT	Hazardous Material Unit Team	
HAZOPS	Hazard and Operational Analysis	
HEART	Humanistic Existential Approach to Relationship Therapy	
ICZM	Integrated Coastal Zone Management	
IDM	Integrated Drought Management	
ILBM	Integrated Lake Basin Management	
ILEC	International Lake Environment Committee	
LKIM	Lembaga Kemajuan Ikan Malaysia	
IMT-GT	Indonesia-Malaysia-Thailand Growth Triangle	
IKAT	Indeks Kualiti Air Tanah	
INDCs	Intended Nationally Determined Contributions	
IPCC	Intergovernmental Panel on Climate Change	
IRBM	Integrated River Basin Management	
IUWM	Integrated Urban Water Management	
IWA	International Water Association	
IWK	Indah Water Konsortium	
IWMI	International Water Management Institute	
IWRM	Integrated Water Resources Management	
IR 4.0	IR4.0 in the various Water Sub-sector Task Force (IR 4.0WS)	
JBA	Jabatan Bekalan Air (Water Supply Department – WSD)	
JKKK	Jawatankuasa Kemajuan dan Keselamatan Kampung	
JKR	Jabatan Kerja Raya (Public Works Department – PWD)	
JKT	Jabatan Kerajaan Tempatan (Local Government Department)	
JMG	Jabatan Mineral dan Geosains (Department of Minerals and Geoscience – DMG)	
JPBD	Jabatan Perancangan Bandar dan Desa (Town And Country Planning Department – TCPD)	
KADA	Kemubu Agriculture Development Authority	
KeTTHA	Kementerian Tenaga, Teknologi Hijau dan Air (Ministry of Energy, Green Technology and Water – MEGTW)	
KKLW	Kementerian Kemajuan Luar Bandar dan Wilayah (Ministry of Rural and Regional Development – MRRD)	
LAUT	Lembaga Sumber Air Terengganu	
LESTARI	Institute for Environment and Development	
LPP	Lembaga Pertubuhan Peladang (Farmers' Organisation Authority – FOA)	
LSANK	Lembaga Sumber Air Negeri Kedah (Kedah State Water Resources Board)	
LUAS	Lembaga Urus Air Selangor (Selangor Water Management Authority – SWMA)	
MADA	Muda Agriculture Development Authority	
MARA	Majlis Amanah Rakyat	

MENGO	Malaysian Environmental NGO
MET	Meteorological Department
MEWC	Ministry of Energy, Water and Communications
MFT	Malaysia Federal Territories
MHLG	Ministry of Housing and Local Government
MLD	Millions of Litres per Day
MMWQI	Malaysian Marine Water Quality Index
MNRE	Ministry of Natural Resources and Energy
MOA	Ministry of Agriculture and Agro-based Industry
МОН	Ministry of Health
МОНЕ	Ministry of Higher Education
MOE	Ministry of Education
MOSTI	Ministry of Science, Technology and Innovation
MOT	Ministry of Transport
MPIC	Ministry of Primary Industry and Commodities
MRC	Mekong River Basin Commission
MSAN	Majlis Sumber Air Negara (National Water Resources Council – NWRC)
MSANg	Majlis Sumber Air Negeri (State Water Resources Council – SWRC)
MSMA	Manual Saliran Mesra Alam (Urban Storm-water Management Manual)
MUWHLG	Ministry of Urban Wellbeing, Housing and Local Government
MWA	Malaysian Water Association
MWIG	Malaysian Water Industry Guide
MyCapNet	Malaysian Capacity Building Network
MyCDNet	Malaysian Capacity Development Network
MyWP	Malaysian Water Partnership
NAHRIM	National Hydraulics Research Institute of Malaysia
NGO	Non-governmental Organisation
NIWR	National Integrated Water Research
NKEA	National Key Economic Area
NKPA	National Key Priority Area
NPP	National Physical Plan
NPO	Non-Profit Organization
NRE	Ministry of Natural Resources and Environment
NRW	Non-revenue Water
NTP	National Transformation Programme
NWRP	National Water Resources Policy
NWRS	National Water Resources Study

O&M	Operations and Maintenance
OA	Orang Asli
OPP3	Third Outline Perspective Plan
PAAB	Pengurusan Aset Air Berhad (Water Asset Management Company – WAMCO)
PES	Payment for Ecosystem Services
PNK	Persatuan Nelayan Kebangsaan
PPj	Perbadanan Putrajaya (Putrajaya Corporation)
PBT	Pihak Berkuasa Tempatan
PPP	Public Participatory Platform
PUB	Public Utilities Board
PWSA	Penang Water Services Academy
QA	Quality Assurance
QC	Quality Control
R&D	Research and Development
RBIMS	River Basins Information Management System
RBMC	River Basin Management Committees
RBMU	River Basin Management Unit
RMK12	Rancangan Malaysia Ke-12
RNA	Research Needs Assessment
RoL	River of Life
RUU	Rang Undang-Undang
RWP	Regional Water Partnerships
RSAJ	Ranhill SAJ
RTM	Radio Televisyen Malaysia
SATU	Syarikat Air Terengganu
SAINS	Syarikat Air Negeri Sembilan
SDG	Sustainable Development Goal
SEASSA	Environment and Natural Resource Economic Division
SME	Small- and Medium-enterprises
SOM	Service-oriented Management
SOP	Standard Operating Procedures
SPAN	Suruhanjaya Perkhidmatan Air Negara (National Water Services Industry Commission)
SSL	Self-sufficiency Levels
STI	Science, Technology and Innovation
SSH	Social Science and Humanity
SWCorp	Solid Waste Management and Public Cleansing Corporation
SWMA	Selangor Waters Management Authority

SWRA	State Water Resources Agencies
SWRE	Sabah Water Resources Enactment
STEM	Science, Technology, Engineering and Mathematics
TGM	Transboundary Groundwater Management
TMDL	Total Maximum Daily Load
TNB	Tenaga National Berhad
TOT	Training of Trainers
UKM	Universiti Kebangsaan Malaysia
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCSD	United Nations Conference on Sustainable Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WEF	Water, Energy, Food
WASH	Water, Sanitation and Hygiene
WEM	Water Engineering and Management
WF	Water Footprint
WFD	Water Framework Directive
WFN	Water Footprint Network
WHO	World Health Organization
WMA	Water Management Authority
WMO	World Meteorological Organization
WQI	Water Quality Index
WRC	Water Research Consortium
WRD	Water Resource Department
WRDC	Water Research and Development Centre
WRM	Water Resources Management
WSIA	Water Services Industry Act
WSM	Water Supply Management
WST 2040	National Water Sector Transformation 2040
WSWWM	Water Supply and Wastewater Management
WTP	Water Treatment Plant
WUGs	Water User Groups

Purposes of AACB WST2040 Training Module

Objective

To enhance leadership skills of local government in order to accelerate the IWRM implementation .

Scope

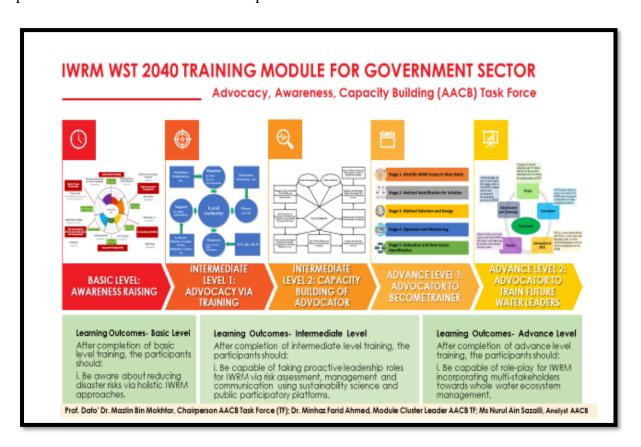
- Civil Servants & Parliamentarian
- Existing Public Participatory Platforms

Expected Output

Local authorities (154) and district officials (171) as well as other enforcement officials from government agencies are trained on IWRM.

Expected Outcome

Proactive and effective leadership roles of civil servants for the participatory decision-making processes to accelerate the IWRM implementation



IWRM WST 2040 TRAINING MODULE FOR GOVERNMENT SECTOR

Advocacy, Awareness, Capacity Building (AACB) Task Force

1 Basic Level-Awareness-raising

1.1 Disaster Risks and Problem Solving Approaches via IWRM

1.2 IWRM and Holistic

Approaches
1.2.1 integrated RiverBosin
Monagement (RBM)
1.2.2 integrated Later Bosin
Monagement (IBM)
1.2.3 integrated Coartol Zone
Monagement (IBM)
1.2.4 integrated Coartol Zone

1.3 IWRM Practices between Malaysia and other Countries

2 Intermediate Level 1-Advocacy via Training

2.1 Proactive Leadership Roles for

2.2 Risk Assessment

2.3 Risk Management 2.4 Risk Management

Communication 2.5 Training Methods of IWRM

2.5.1 National RiverTrail

2.5.2 River of Life 2.5.3 River Care Program 2.5.4 Wakaf Air 2.5.5 Friends of River (FoR)

2.6 Communication, Education and Public Awareness (CEPA)

3 Intermediate Level 2- 4 Advance Level 1-Capacity Building of IWRM Advocator

3.1 Policy Support for IWRM Implementation 3.2 Stakeholders'

Mapping for IWRM 3.3 Data & Information Mapping for IWRM

3.4 Public

Participatory Platform (PPP) & Stakeholders Engagement

3.4.1 PPPs of Government Sector 3.4.2 Roles of Media for IWRM 3.4.3 Steps to Participate Effectively in PPP

Advocator to Become Trainer

4.1 Stakeholders' Engagement in Entire Steps of IWRM

4.1.1 Identifying IWRM Issues 4.1.2 Method Identification for

4.1.3 Method Selection & Design 4.1.4 Operation and Monitoring 4.1.5 Evaluation and New Issues

4.2 Planetary and Human Health

4.3 Sustainable Development Goals 4.4 12th to 15th Malaysia Plan

5 Advance Level 2-Advocator to Train Future Water Leader

5.1 Accelerating IWRM and Crosscutting Issues 5.1.1 People-Netw Collaboration

5.1.2 Governance-Water romework Directives & Capacity

ulding 5.1.3 Information-8 i Model for Water Ecosystem Management 5.1.4 Infrastructure-Training

Centers 5.1.5 Finance-Water as Resource

5.2 8i Model for whole Water Ecosystem Management 5.3 Role-play for IWRM

STAGE 01

STAGE 02

STAGE 03

STAGE 04

STAGE 05

Basic Level Training Duration: On-site half a day training.

Intermediate Level Training Duration: On-site one full day training. Advance Level Training Duration: On-site one full day training along with field visit for role-

Prof. Dato' Dr. Mazlin Bin Mokhtar, Chairperson AACB Task Force (TF); Dr. Minhaz Farid Ahmed, Module Cluster Leader AACB TF; Ms Nurul Ain Sazalli, Analyst AACB

1. Basic Level- Awareness-raising

1.1. Disaster Risks and Problem Solving Approaches via IWRM

1.1.1. Chemical Disaster in Sungai Kim Kim and Health Impact

Sungai Kim Kim Incident (March 2019)

The first deadly toxic gas poisoning incident occurred in three waves. In the first wave that began on 7 March 2019, there were 71 reported cases, mostly schoolchildren at two schools, Sekolah Kebangsaan (SK) and Sekolah Menengah Kebangsaan (SMK) Taman Pasir Putih. Most victims were reported to feel nausea, dizziness and shortness of breath. A few children also experienced eye irritation, chest pain, sore throat, coughing, fever and vomiting. This was followed by a second wave that began on 11 March 2019, right after a heavy rainfall. On 13 March 2019, a third wave affected more than a thousand victims, who were mostly schoolchildren. Most affected schoolchildren were in classrooms on the third and fourth floors. A total of 5,039 individual cases in 12 schools were reported.

By tracing the source of odour and using MultiRAE Detector to detect the gas, HAZMAT Johor discovered a massive illegal chemical waste dumping under a bridge at Sungai Kim Kim, which was 1km upstream from SK Taman Pasir Putih on 7 March 2019. On further measurements through the use of Gasmet DX4030 by HAZMAT Melaka, the presence of acrylonitrile, acrolein, benzene, hydrogen chloride, toluene, xylene, ethylbenzene and D-limonene were detected (Scientific Committee on Chemical Dumping in Pasir Gudang, 2019). The authorities immediately concluded that the illegal dumping of the chemical wastes in Sungai Kim Kim had triggered the first and second waves. The third wave was because of the massive cleaning and removal of toxic chemical wastes and contaminated soils.

MPPG, JAS dan *Jabatan Pengairan dan Saliran* (JPS) personnel jointly removed 2.5 tonnes of chemical wastes from the river by pumping while chemical wastes from the contaminated soils were removed by excavation at the dumping site. They also controlled the chemical wastes from spreading downstream by deploying a boom across the river. Syarikat 5E Resources Sdn Bhd (5ERSB) was employed to remove the chemical wastes and contaminated soils and clean the river.

To prevent further occurrence of toxic gas poisoning and facilitate investigations on the source of the gases, JBP Johor ordered the evacuation and closure of all 111 schools in Pasir Gudang on 13 March 2019 until further notice. Investigations into the chemical wastes dumping at Sungai Kim Kim resulted in the charging of two directors and an employee of a tyre-processing company by the Johor Bahru Sessions Court on 11 March for the illegal disposal of chemicals into Sungai Kim Kim (BERNAMA, 2019). The first toxic chemical poisoning incident was declared over on 4 April 2019. However, another incident recurred in June 2019.

Source: (ASM, 2019)



Figure 1. The top view of Sungai Kim Kim after toxic chemical were dumped into it, on 5 April 2019, causing thousands of people who inhaled the noxious fumes to become sick (ASM, 2019)

Pasir Gudang Incident (June 2019)

The second toxic gas poisoning incident apparently also occurred in three waves. The first wave began on 20 June 2019 at Sekolah Agama Taman Mawar and SK Pasir Gudang 4, which affected 29 schoolchildren. The schools reported that the schoolchildren were having breathing difficulties and vomiting. This was followed by a second wave that began on 22 June 2019 and a third wave on 30 June 2019, affecting more than a thousand victims, who were mostly schoolchildren. Most affected schoolchildren were in classrooms on the third and fourth floors. They experienced vomiting, nausea, dizziness and shortness of breath. A few also experienced eye irritation, chest pain, sore throat, coughing and fever. A total of 1,178 individual cases in 22 schools were reported.

There were more badly affected schools in the second incident than in the first incident. The 20 affected schools were SMK Tanjung Puteri Resort, SK Kopok, SK Tanjung Puteri Resort, SK Taman Pasir Putih, SMK Pasir Putih, SK Pasir Gudang, SK Pasir Gudang 4, SMK Taman Nusa Damai, SK Pasir Gudang 3, SK Taman Bukit Dahlia, SK Kota Masai, SMK Bandar Seri Alam, SK Taman Scientex, SMK Taman Megah Ria, SK Taman Nusa Damai, SK Taman Rinting 3, SK Taman Cendana, SMK Kota Masai, SK Desa Cemerlang and SK Taman Rinting.

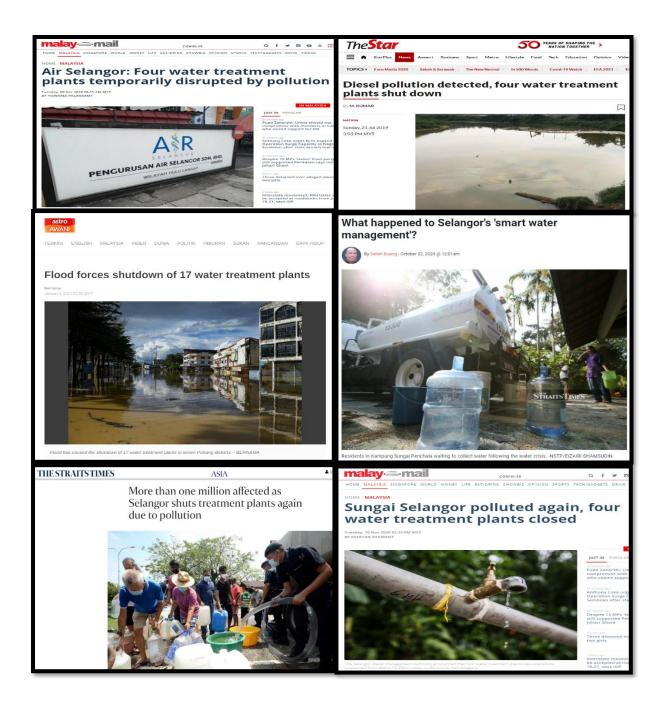
JAS personnel and the schools detected four toxic gases that comprised acrolein, acrylonitrile, methyl mercaptan and benzene by using Gasmet DX4030 . The source of toxic gases could not be determined from the chaotic distributions of concentration data. However, chemical waste dumped into Sungai Kim Kim could be ruled out because it had been disposed of and Sungai Kim Kim was clean during the incident. No other new chemical waste dumping site was discovered.

Source: (ASM, 2019)

1.1.2. Disasters and Shutdown Incidents of Water Treatment Plants

Table 1. River basins in Malaysia

Category	Number of river basin	Size (km2)
River basin within a state	2,958	263, 498.756
River basin shared with several states	22	56,840.494
River basin shared with neighbouring country	6	7,557.762
TOTAL	2,986	327,897.012



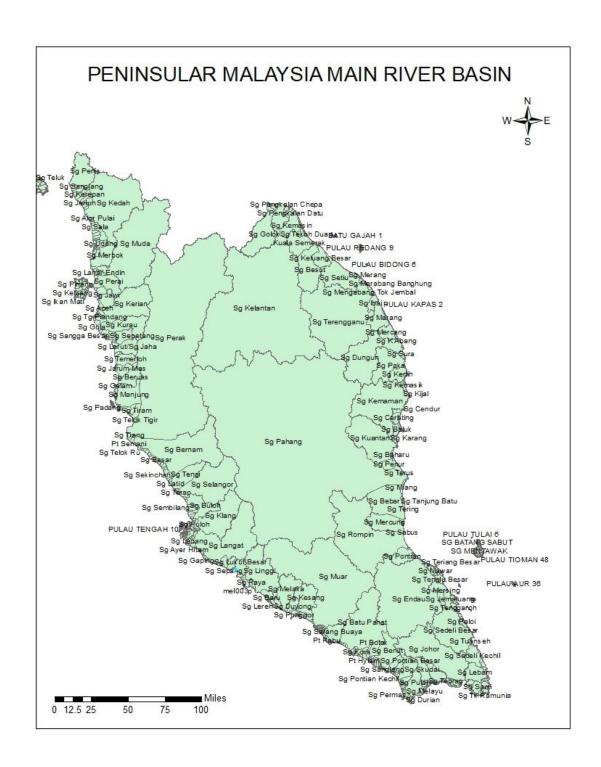


Figure 2. Main river basins in Peninsuslar Malaysia

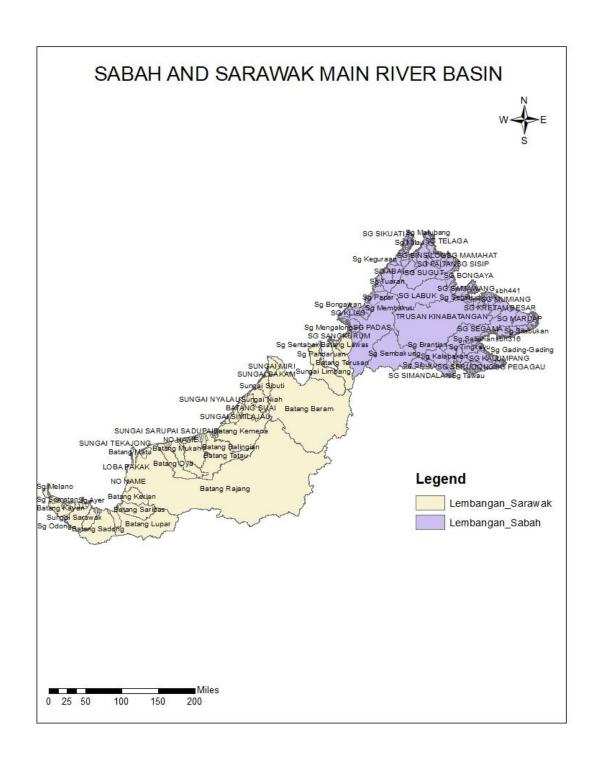


Figure 3. Main river basins in Sabah and Sarawak, Malaysia

1.1.2.1. Water Pollution in Malaysia

Critical issue on water resource in Malaysia is pollution. Pollution occurs as a result of nature and human actions. Lately, human greed to explore nature has led to environmental pollution and destruction. Pollution from human and industrial waste products has caused many water resource pollutions which in turn led to the closure of water treatment plants; hence, adversely affected human health. Daily waste production amongst people in country recorded an increase of 100.75 % to 38,142 tonnes in 2018, as compared to 19,000 tonnes in 2005.

Table 2. Worst water resource pollution in Malaysia

	Description Ongoing dumping of waste from a pig abattoir
	resulted in bad odour, rendered the river black, and
	killed aquatic life (CAP, 2010).
2016: Sungai Mas, Penang	Illegal commercial units dumped sewages and
	rendered Sungai Mas black and smelly, irked
	holiday makers, hoteliers, and fishermen near Batu
	Ferringhi (Today Online, 2016).
er 2016: Sungai Semenyih,	Sungai Semenyih water treatment plant had to be
	shut down due to pollution from the Lalang River
	near Semenyih Hitech area (BERNAMA, 2016).
	Illegal poultry farm released ammonia pollution into
	Sungai Johor that caused three water treatment
	plants to shut down (Othman & Said, 2017).
·	Residents near the river, including schoolchildren
	suffered breathing difficulties, nausea and fainting
	due to the pollution. 111 schools in the area were
	ordered to close (Noh, 2021a).
	Air Selangor stopped the operations at its Sungai
	Selangor Water Treatment Plant (WTP) Phase 1,
	Phase 2, and Phase 3 and the Rantau Panjang WTP
	due to industrial effluent pollution. A total of 1.2
	million users were affected (Arumugam, 2020).
	Solvent caused odour pollution in Sungai Selangor
	which resulted in water supply disruption to 1.2
	million account holders (BERNAMA, 2020). Waste and organic compounds in Nilai polluted
	Sungai Semenyih upstream and affected operations
	at two water treatment plants, which disrupted water
	supply to 300,000 users (FMT, 2020).
	After two years, Sungai Kim-Kim was again
	polluted and fishermen complained that the fish had
	disappeared (Noh, 2021a).
	Pollution caused by industrial effluents and sewage
	affected the Sultan Ismail Water Treatment Plant
	(LRA) and disrupted water supply to residents in
	Johor Bharu (BERNAMA, 2021).

Based on figures released by Solid Waste Management and Public Cleansing Corporation (SWCorp), a citizen was estimated to produce 1.17 kg of waste per day in 2018, as compared to 0.8kg in 2005. In the same report, plastic waste was recorded to increase by 20 % in 2018 as compared to food waste (44.5 %), plastic waste (13.2 %) and disposable diapers (12.1 %) in 2005. Table 2 shows the worst water resource pollutions in Malaysia faced by the Malaysian community thus far.

Tracing Non-point Source Sediment by Using Environmental Forensic Approach: Case Study in Kelantan River Basin, Malaysia

Over the past few decades Southeast Asia has been actively undergoing land conversion into agricultural land. This created challenges to the nation in dealing with the non-point source pollutants in many fluvial systems, and thus an effective approach in sediment source apportionment for an appropriate target mitigation procedure was required. The trace element property from different source points was used for catchment classification of Galas River. Sediment sample collection was carried out at sources and sink areas of the catchment system. Fine sediment was analysed by using X-ray fluorescence to obtain the elemental composition, followed by a statistical test and numerical model. Out of 83 elements, 12 elements (Mn, Ca, Cr, Ga, Dy Hf, Y, V, Th, Pb, Zn and Sr) were selected as the best tracer signatures. The solver model indicated Pergau River as the major sediment contributor to this large catchment system. The model output could directly be proportional with the land-use practice, indicating excessive terrestrial alteration had taken place within the sites for agricultural plantation purposes. Therefore, this highly recommends the use of targeted areas to overcome serious sedimentation issues caused by the tillage operation in affected stream points and improve the watershed quality (Sugumaran et al., 2021).



Source: BERNAMA, 2020a

In view of the recent spate of water contamination incidents that led to unscheduled disruptions in water supply in the Klang Valley, it is high time for the Ministry of Environment and Water to step up collaboration with environmental forensic experts from local universities and look into the matter (BERNAMA, 2020a).

Mohd Yusoff Ishak, a senior lecturer from the Faculty of Forestry and Environment, Universiti Putra Malaysia stated that the university had established an Environmental Forensics Research Centre for pioneering studies on pollution and identifying the cycle of contaminants.

The senior lecturer told BERNAMA that via collaboration and sharing of resources, their experts can help to analyse the contaminants at the source of pollution itself through the use of scientific technics certified by international standards.

He said that the experts can also carry out the process of matching contaminant samples with data listed in the authorities' inventory to enable more effective enforcement of relevant environmental laws. He also added that this will speed up the prosecution process and when swift action is taken against polluters, the message will come across loud and clear that no environmental criminal can escape legal action.

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Mohd Yusoff said that Malaysia's hot and humid weather posed a challenge when ensuring the integrity of samples taken for analysis in the event of a pollution incident. He added that it was necessary for the authorities to collaborate with universities data and analyses, as well as the latest techniques used by their experts can be shared to identify pollutants.

Regarding the four high technology drones that Selangor will use from next month to monitor rivers in the state and collect water samples, Mohd Yusoff said while the move is a good one, but how the water samples taken by the drones could be used as evidence to charge the polluters in court still remains a question.

Still far behind

On Monday, Phase 1, Phase 2 and Phase 3 of the Sungai Selangor Water Treatment Plant (WTP) and Rantau Panjang WTP were shut down temporarily due to odour pollution, which was believed to have been caused by oil residues in one of the rivers that supply raw water to the treatment plants.

The ensuing water cuts which lasted for two to four days had affected over a million Air Selangor account holders in the Klang Valley.

The latest disruption was the third major water cut that occurred for a month. On Wednesday, Selangor Mentri Besar Datuk, Seri Amirudin Shari was quoted to say that this year alone there were eight incidents of water pollution in Selangor.

In line with current technology developments, Mohd Yusoff also called for more sophisticated labouratories and expertise at government agencies to deal more effectively with matters related to the contamination of water resources and to nab environmental criminals who are cunning enough to cover their tracks.

"Malaysia is still far behind in the field of environmental forensics," he said, adding that the government has to upgrade its labouratory facilities and equipment to detect elements of substances that cause contamination in view of the presence of various types of new-generation chemicals.

Claim compensation

Meanwhile, Association of Water and Energy Research Malaysia (AWER) President, S. Piarapakaran said that his organisation had proposed that a new clause be added in the Environmental Quality Act 1974 to allow all affected parties to claim compensation for water supply disruptions due to raw water contamination from the wrongdoers concerned.

"The government has a limit in imposing penalties. This is why we are proposing that the wrongdoer pays the full cost of pollution which will cover penalty, cost of cleaning up the contamination and compensation that we have proposed," he said.

He said that the total cost may run into millions of ringgit which will serve as a deterrent to companies and individuals.

Under the Environmental Quality Act, penalty for non-toxic and toxic contaminations is a maximum fine of RM100,000 and RM500,000, respectively, including imprisonment.

Piarapakaran also urged the government to create special reserve areas in the catchment areas of rivers as they are a part of the nation's drainage system.

"Even drains end up (emptying their contents) in the river and sea. When irresponsible individuals dump effluents into the drain or river, it can lead to contamination like what we are seeing now," he added.

On the actions taken by the authorities concerned, the Bukit Bandaraya Residents Association Advisor, Datuk M Ali said that Selangor water operators should submit a full report to people who have to put up with frequent disruptions in water supply.

"What exactly has happened to the water supply system in our country, especially in Selangor?" he asked, adding that the National Water Services Commission and Ministry of Environment and Water should prepare the report.

He said the people need to know how many times unscheduled water cuts have occurred over the past five or 10 years, their causes, people responsible for the disruptions and measures taken or to be taken to prevent such incidents.

He opined that a Royal Commission of Inquiry should be set up to look into this matter as he understood that there were 18 unscheduled water cuts in the Klang Valley since early this year.

1.1.2.2. River Water Quality Status

In 2019, out of the 672 rivers monitored by the Dept of Envirnment Malaysia, 408 (61%) showed clean water quality, 205 (30%) were slightly polluted, while 59 (9%) were polluted (Figure 4). The monitored rivers and their overall quality status are available at (https://www.doe.gov.my/portalv1/wp-content/uploads/2019/05/Standard-Kualiti-Air-Kebangsaan.pdf). As in previous years, the biochemical oxygen demand (BOD), ammoniacal nitrogen (NH₃-N) and suspended solids (SS) remained significant in terms of river pollution. High BOD can be attributed to inefficient treatment of sewage or effluent from agro-based and manufacturing industries. The main sources of NH₃-N maybe attributed from animal farming and domestic sewage, while the sources for SS were mainly due to improper earthworks and land clearing activities (DOE, 2019).

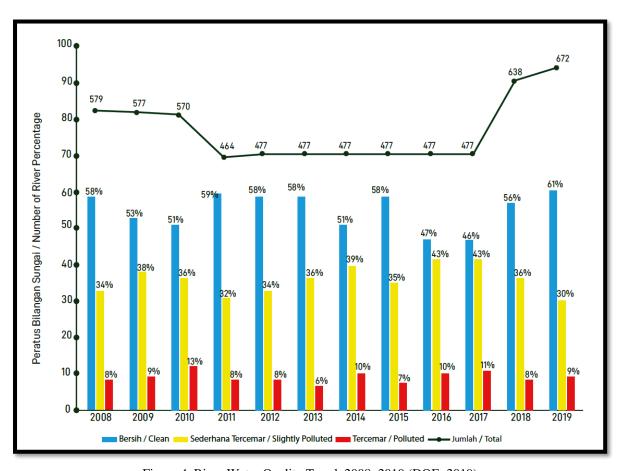


Figure 4. River Water Quality Trend, 2008–2019 (DOE, 2019)

In 2019, there were five types of water pollution load source that were emphasised in the Environmental Quality Report by the Dept of Environment Malaysia (DOE, 2019), which were manufacturing industries, agricultural-based industries, sewage treatment plant, piggery and wet market. Calculation on pollution load was mainly focused on three main parameters that showed obvious effect on the river water quality which consisted of biochemical oxygen demand (BOD), suspended solids (SS) and ammoniacal nitrogen (NH₃-N).

Biochemical Oxygen Demand (BOD)

In 2019, a total estimation of 627.09-tonnes/day pollution loads for BOD was generated (DOE, 2019). Sewage treatment plants remained as the largest BOD load contributor with a total load of 320.53 tonnes/day (51%), followed by piggery activities which contributed 223.70 tonnes/day (36%), agriculture-based industries 47.39 tonnes/day (7%), manufacturing industries 30.30 tonnes/day (5%) and wet markets 5.17 tonnes/ day (1%) (Figure 5).

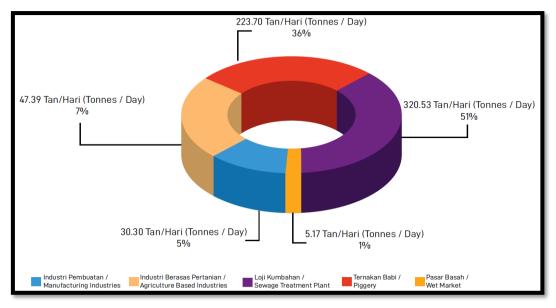


Figure 5. Estimation of BOD load (tonnes/day) by sources of water pollution, 2019 (DOE, 2019)

Suspended Solids (SS) Load

In 2019, the overall estimation for the SS loads was 1,368.64tonnes/day (DOE, 2019). Total pollution load from agriculture-based industries and piggery activities topped the list with 34% each at 465.05 tonnes/day and 464.60 tonnes/day, respectively. This was followed by sewage treatment plant at 399.68 tonnes/day (29%), manufacturing industries at 32.63 tonnes/day (2%), and wet market at 6.68 tonnes/day (1 %) (Figure 6).

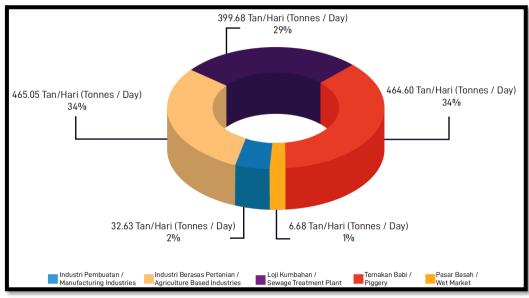


Figure 6. Estimation of SS load (tonnes/day) by sources of water pollution, 2019 (DOE, 2019)

Ammoniacal Nitrogen Load (NH3-N)

In 2019, the NH₃-N load was estimated at 270.31 tonnes/day (DOE, 2019). The sewage treatment plant remained as the largest contributor of NH₃-N with a total load of 216.97 tonnes/day (80%), followed by piggery activity at 27.53 tonnes/day (10%), agriculture-based industries at 22.03 tonnes/day (8%), manufacturing industries at 3.49 tonnes/day (2%) and wet market at 0.29 tonnes/day (0.1%) (Figure 7) .

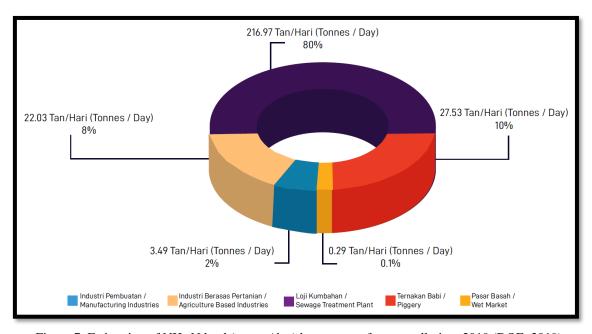


Figure 7. Estimation of NH₃-N load (tonnes/day) by sources of water pollution, 2019 (DOE, 2019)

Biochemical Oxygen Demand Load (BOD) By States

The estimation for BOD loads generated in Johor was recorded as the highest with a value of 178.50 tonnes/day, followed by Perak (108.87 tonnes/day), Selangor (85.40 tonnes/day), Penang (71.83 tonnes/day), Sabah (34.01 tonnes/day) and Sarawak (27.50 tonnes/day). BOD load for the rest of the states, including Federal Territory of Labuan and Putrajaya, was less than 22.75 tonnes/day. BOD pollution load based on states is shown in Figure 8 (DOE, 2019).

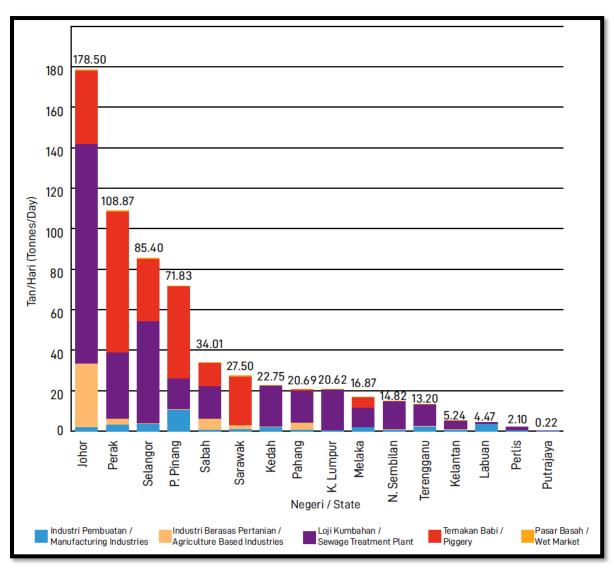


Figure 8. Dispersions of BOD (tonnes/day) load estimation and sources of water pollution by states, 2019 (DOE, 2019)

Suspended Solids Load by State

The estimation of SS loads generated in Johor was recorded as the highest with a value of 627.78 tonnes/day, followed by Perak (187.85 tonnes/day), Selangor (171.14 tonnes/day), Penang (139.82 tonnes/day), Sarawak (55.67 tonnes/day) and Sabah (54.37 tonnes/day). SS load for the rest of the states, including Federal Territory of Labuan and Putrajaya, was generated at less than 28.90 tonnes/day. SS pollution load based on states is shown in Figure 9 (DOE, 2019).

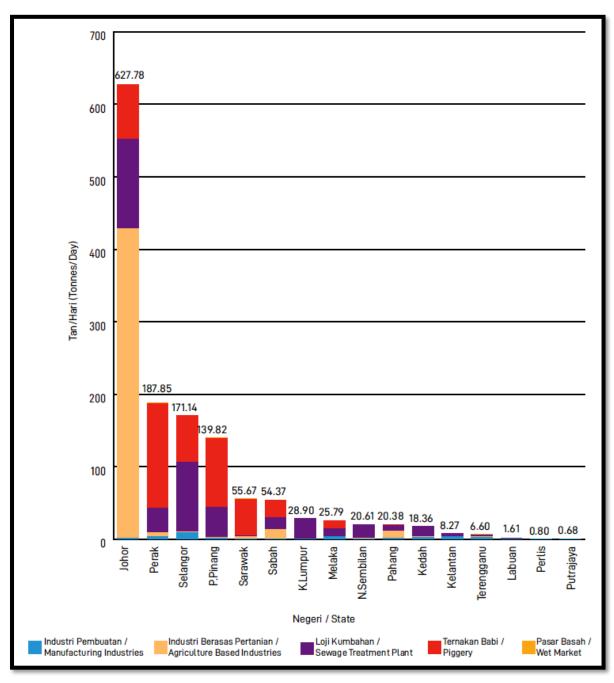


Figure 9. Dispersions of SS load (tonnes/day) estimation and sources of water pollution by states, 2019 (DOE, 2019)

Ammoniacal Nitrogen Load by State

The estimation of NH₃-N loads generated in Johor was recorded as the highest (67.00 tonnes/day), followed by Selangor (42.20 tonnes/day), Sabah (37.90 tonnes/day) and Perak (29.58 tonnes/day). NH₃-N load for the rest of the states, including Federal Territory of Labuan and Putrajaya, was generated in less than 16.20 tonnes/day. NH₃-N pollution load based on states is shown in Figure 10 (DOE, 2019).

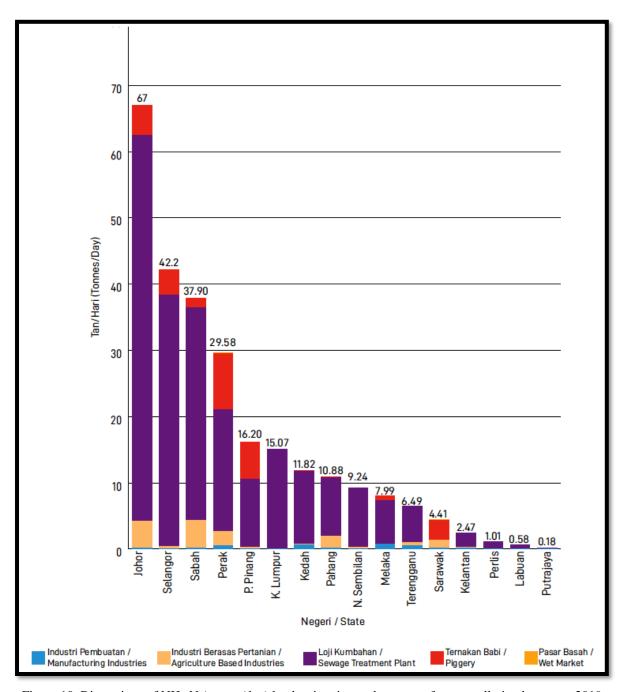


Figure 10. Dispersions of NH₃-N (tonnes/day) load estimation and sources of water pollution by states, 2019 (DOE, 2019)

Contaminated land can be described as "land containing substances that when present in sufficient concentrations, may cause harm to humans, animals and the environment". Although a difference of opinion exists as to the exact nature of contaminated land, generally contaminants are classified as hazardous materials that do not naturally occur on a particular site. Contaminants present in soils are therefore the result of pollution from previous land usage. However, some areas may become affected from neighbouring properties by the movement of ground water.

We have not yet inherited a frightening legacy of contaminated land as in other developed countries. This can be attributed to the relatively recent industrialisation in Malaysia. Moreover, abandoned industrial sites are not many. However, contamination of land will become an increasingly serious concern unless positive efforts are directed at addressing this issue now. Moreover, we run the risk of being burdened with pockets of unsafe and unproductive contaminated land. Experience in other parts of the world has shown that acquiring, cleaning, and redeveloping contaminated industrial sites can be very expensive and time consuming.

Many contaminated sites remain obscure including abandoned municipal open dump sites. Industrial activities may also lead to disposal of waste by tipping it onto the land thus contamination may arise from unintentional leaks and spills too. Contaminants can range from solvents, oil, petrol, heavy metals to radioactive substances. Contaminants are not just restricted to industrial processes; other sources may include agricultural activities, inadequate waste disposal measures, deposition from the atmosphere and every day activities such as petrol distribution and dry cleaning.

Legislation

Specific legislations governing contaminated land are non-existent in most countries. In fact, many of the developed countries are beginning to promulgate legislations to govern contaminated land. Similarly there is no specific legislation addressing soil and groundwater contamination in Malaysia; neither are there any soil or groundwater quality standards. However section 24 of the Environmental Quality Act 1974, states that:

- No person shall, unless licensed, pollute or cause or permit to be polluted any soil or surface of any land in contravention of the acceptable conditions specified under section 21.
- Notwithstanding the generality of subsection (1), a person shall be deemed to pollute any soil or surface of any land if -
 - (a) he places in or on any soil or in any place where it may gain access to any soil any matter whether liquid, solid, or gaseous;
 or
 - (b) he establishes on any land a refuse dump, garbage pit, soil and rock disposal site, sludge deposit site, waste injection well or otherwise uses land for the disposal of or a repository for solid or liquid wastes so as to be obnoxious or offensive to human beings or interfere with underground water or detrimental to any beneficial use of the soil or the surface of the land.
- 3. Any person who contravenes subsection (1) shall be guitly of an offence and shall be liable to a fine not exceeding one hundred thousand ringgit or to imprisonment for a period not exceeding five years or both and to a further fine not exceeding one thousand ringgit a day for every day that the offence is continued after a notice by the Director General requiring him to cease the act specified therein has been served upon him.

Several other sections of the Environmental Quality Act address soil contamination indirectly. Section 31 gives the Director General the power to require the owner or occupier of a premise to install pollution control equipment, conduct a study on environmental risk, and maintain a monitoring programme. Section 33A allows the Director General to request for an environmental audit for premises perceived to be polluting. Section 34B prohibits the placing of any waste on land or surface waters. The Environmental Quality (Scheduled Wastes) Regulations 2005 list contaminated soil as a scheduled waste requiring specific ways to adequately treat and dispose off the waste.

Identification of Contaminated Sites in Malaysia

Very little work has been carried out in identifying contaminated sites in Malaysia. In October 1997, the Department of Environment (DOE) commissioned Universiti Putra Malaysia to investigate and assess existing and closed municipal landfill sites in the Federal Territory of Kuala Lumpur and to propose appropriate remedial action by relevant authorities. The study was carried out on six closed and one existing municipal landfill sites. These included Paka 1, Sri Petaling, Jinjang Utara, Paka 2, Brickfields and Sungei Besi. The only active landfill site serving Kuala Lumpur City was the Taman Beringin Landfill. The investigations included characteristics of the landfill sites, surrounding land use, social aspects, topography, geological and hydro-geological component, groundwater flow pattern, hydrological component, water quality, gas measurement, vegetation, fauna diversity and toxicity tests.

The most polluted sites were identified based on three criteria, that is, water quality, landfill gas emissions and environmental pollutants in soils, leachate and groundwater. Taman Beringin was identified as the most polluted site followed by Jinjang Utara, Paka 1, Brickfields, Paka 2, Sri Petaling, and Sungei Besi. However, no remediation action was taken mainly because it was not in use then

Other than the above study, contaminated sites that have been identified by the DOE are those sites contaminated by illegal dumping of toxic and hazardous waste where clean up was subsequently undertaken.



Future Plans

Under the Ninth Malaysia Plan, the DOE will undertake a study on the criteria and standards for managing and restoring contaminated land in Malaysia. The purpose of the study is to provide a framework for the proper assessment and management of contaminated sites. This would ensure a consistent standard for site assessment and subsequent clean-up and restoration. It would also provide guidance to those responsible for management as well provide

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Contaminated Sites

At the end of this study, technical guidelines for remediation of contaminated sites will also be developed. These guidelines essentially will consist of the following information:

Guidelines for Remediation of

- Establishing remediation goals/targets;
- Appropriate remediation methods to be used. depending on the type and severity of contamination and site conditions;
- 3. Extent of remediation required, including areas off-site which have been affected:
- 4. Extent (if any) of public consultation and any local nuisance abatement required before and during remediation;
- 5. Plans to protect health and the environment during remediation, including safety consid-
- 6. Outline of a site management plan if partial remediation is proposed; and
- 7. Sampling and analysis to be conducted to determine if remediation has reduced the level of contamination or risk to tolerable

Guidelines for Planning and Management of Contaminated Land

There is a clear need for guidelines for better management and planning and to enable contaminated sites to be utilised for economic activities in the future. The study will therefore include the formulation of guidelines that will take into consideration the output of the study of the selected sites representing the various categories of contaminated land and identifying suitable land use for these contaminated sites. The guidelines shall also include the determination of the status of quality of the identified sites and the clean-up method re-

Pilot Study for Selected Sites

Pilot studies for selected sites representing the various categories of contaminated land will be conducted. Such studies will use the various guidelines that will be developed as stated above, namely the Guidelines for Assessing and Reporting Contaminated Sites and Guidelines for the Remediation of Contaminated Sites.

Inventory of Contaminated Sites

Identification of selected sites representing the various categories of contaminated land in the country shall be carried out. The identified sites along with relevant information and its profile shall be recorded. A database on an inventory of contaminated sites and its profiles will also be developed in a manner that enables easy retrieval of information, references and undating to be made.

Subsequent to the study, the DOE would continue its efforts to identify all contaminated sites throughout the country. The contaminated land information system envisaged to be one of the outcomes of the study would be continuously improved and upgraded where necessary.

Awareness and Capacity Building

The DOE would continue to play its role in promoting awareness to the public, decision makers and the professionals on the importance of protecting the environment including issues related to contaminated sites. It is expected that some basic training and awareness programmes on contaminated sites would be conducted during the study. A more specific training needs and capacity building programme amongst managers and professionals in relation to contaminated sites would be identified for implementation in the future.

Research Needs

Areas of research on contaminated sites ranked in terms of priority to be carried out as recommended in the study would be examined and the DOE would continue to support and collaborate with research institutes in enabling such research to be undertaken in the country. The DOE is also open to collaboration with international organisations for the management of contaminated land.

Conclusion

The environmental implications of contaminated land is a potential problem and the DOE is now taking the initiative to deal with it. An increasing population especially in urbanised areas has put heavy pressure on scarce land resources and the necessity to utilise or redevelop contaminated sites will be inevitable. The absence of legislation coupled with a low level of awareness has, in the past, diverted attention away from the contaminated site problem. There are no standards and protocols developed in Malaysia yet. In the absence of agreed standards or guidelines, an ad hoc approach was adopted resulting in variable standards being applied. There is a need for Malaysia to develop its own criteria and standards as a means for the protection and enhancement of contaminated land as well as developing technologies to meet local needs. General awareness amongst the public needs to be heightened and overall capacity amongst professionals needs to be raised.

In conclusion, the DOE looks forward to playing an important role, in partnership with others, in supporting, encouraging and promoting the importance of identifying contaminated land, managing and restoring these sites for beneficial use so as to eventually contribute to the overall betterment of our environment.

> Hanili Ghazali Email: nili@doe.gov.m Ir Lee Heng Keng Email: lee@doe.gov.my

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assurance to the community that public health and environmental concerns on contaminated sites are being addressed.

The proposed criteria and standards from the study will be used as an input to the DOE in formulating the appropriate regulations, if so required, for the control of land pollution. The outcome of the study should also provide useful information to the Government in formulating policy and guidelines for future development on contaminated sites.

Definition, Criteria and Standards

A definition of contaminated land will be part of the proposed study. Criteria for determining contaminated land including various types of contamination and use shall be developed. The severity of contamination and associated health and environmental risks shall be considered in developing the criteria. The study will include the development of standards for a wide variety of potential soil and groundwater contaminants and other substances and media that may be present.

Guidelines for Assessing and Reporting Contaminated Sites

Guidelines and protocols for assessing contaminated sites will be developed and guidelines for preparing reports of such assessment will also be included. The main objective of these guidelines is to ensure that reports prepared by consultants and others on the investigation, assessment, remediation and any subsequent monitoring of contaminated land contain sufficient and appropriate information to enable efficient review and appropriate action by regulators, site auditors, members of the public and other interested parties.

Technical guidelines on how to carry out investigations to enable contaminated sites to be assessed thoroughly and in the most economical manner shall also be developed. These guidelines will include some of this information:

- 1. Preliminary site investigation to determine the probability that a site is contaminated;
- 2. Detailed site investigation to provide additional information needed to confirm or refute potential for site contamination, primarily by sampling and chemical analysis of environmental media (air, surface water, groundwater, soil, flora, fauna);
- 3. Sampling strategy to obtain an accurate picture of distribution of contaminants on site, sampling preparations, sampling techniques, appropriate standard operating procedures and QA/QC protocols;
- 4. Health and environmental assessment to determine the potential human exposure and environmental impact of the contaminants on the current and proposed land use of the contaminated sites; and
- Use of relevant models for exposure and risk assessment of contaminated lands and estimation of soil to groundwater contaminant release

Untreated Sullage:

A Challenge to the Rehabilitation of Rivers in Malaysia

According to media reports, the nation is likely to face a water supply shortage in the years to come. Besides the problem of an impending water shortage, we also have to grapple with increasing pollution of our waters. The quality of our rivers is being degraded by increasing pollution from point sources (residential, industrial and commercial premises) and non point sources (storm runoff from urban and rural land use). Data from (Eriksson et al., 2002) show that of the rivers monitored in the country, only 45 percent are clean. The rest need to be rehabilitated to regain a clean status.

It is generally believed that sewage is the main source of river pollution in the country. However, some studies reveal that untreated sullage(DDE, 2004) and urban runoff (DDE,



2003) are also responsible for the poor quality of water in our rivers. There are guidelines to treat sewage, industrial effluents and runoff (DID, 2000) but none have been established for the treatment of sullage. Consequentially, sullage remains one of the main pollution sources. It is time that proper attention is given to this source of pollution.

What is Sullage

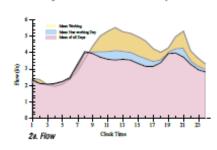
Sullage is defined as wastewater without any input from toilets (excreta). It is termed as grey-water that mainly originates from kitchen sinks, washing machines, bathrooms (Figure 1), restaurants, wet markets, car washing centres, etc. Although the quantity and quality of

sullage vary from source to source, the pollutant concentration could be high and should not be allowed to enter into the river system without any treatment (Eriksson et al., 2002). Sullage quantity and quality also vary with time and day (Figure 2).

Many studies in the US and other developed countries reveal that sullage has a great potential to cause serious damage to the river ecology because it contains untreated organic material, household chemicals and pathogens similar to sewage water.

How Much Sullage Do We Generate?

A significant portion of the water in urban streams is discharged from the residential and commercial activities as sullage. A few studies (DDE, 2004; 2003) reveal that sullage is very polluting in nature and must be treated properly before being allowed to enter the water body.



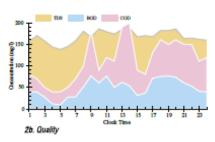


Figure 2: Variation of suitage flow and quality with time and day

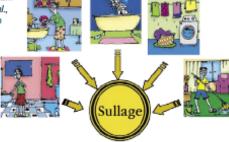


Figure 1: Sullage from household activities

An important point for us to note is to the extent sullage poses a threat to our rivers. The answer lies in getting the flowdata - how much sullage is discharged per household per day. A research conducted at UPM (Azni Idris et al., 2004) revealed that generally there are three peaks in sullage flow during the working days (Figure 2a). The sullage flow from the 6.14

ha study area was between 2 to 6 Vs. The population within the study area was 1448 people from a total of 283 houses. However, in many new residential areas, all sullage conveying plumbing is connected to the sewer, which goes for treatment at sewage treatment plants.

As the sullage flow varies, the pollution load also fluctuates for different times and days (Figure It generally follows the trends. of sullage flow patterns, that is, pollutant concentration is high during peak sullage flows. The maximum and minimum organic content, measured as Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) values on working days, can be 77 & 9 mg/l and 200 & 40 mg/l. respectively. Based on the NWQS, the quality of the sullage from residential areas is equivalent to Class V (Table 1) Sullane from

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A high concentration of nutrients in sullage is another critical issue which causes algal problems in the waterbodies. Although the concentrations of AN, Total Kjeldal Nitrogen (TKN) and ortho phosphate in the sullage is less than that in the typical sewage, they are excessively high, and can degrade the aquatic status of the urban stream where the assimilative capacity of the streams is low. It is known that excessive levels of AN in rivers would be toxic to most of the aquatic fauna; the threshold level should be less than 5 mg/l for AN.

Impact of Sullage on Urban Streams

Based on the UPM study, it was found that about 81 percent of the total water consumed in the study area was released as sullage while the remaining 19 percent water used in toilets went into the sewage treatment plant. This proportion may be different in other urban sub-catchments. However, the areas where all domestic wastewater is not connected to the sewage treatment plants may have a similar proportion between sewage and sullage. There is sufficient evidence to show that for an urbanised residential area, a significant amount of domestic wastewater is discharged into the municipal drain as badly polluted sullage or grey-water. Besides other pollution sources. sullage is also responsible for degrading water quality in urban streams. The situation is severe in the areas that were developed before 1990s and in small development lots which are not subject to the EQA, 1974 (DOE, 1974).



Generally, urban streams do not have enough assimilative capacity to absorb the pollution loads released from various point sources. For a river, the quantity and quality of sullage release pose a challenge for the rehabilitation and conservation of urban streams. Discharge of untreated sullage adds coygen demanding substances, nutrients and toxic elements such as AN into the water, which in turn make the streams unsuitable for aquatic flora and fauna. As such, like any other pollution source, sullage should also be treated effectively before being discharged into the streams.

The Way Forward

Sullage is one of the main pollution sources, which has yet to receive the attention it deserves. It is being released from many urban (residential and commercial) areas without any treatment. High BOD, COD, AN, TKN, ortho phosphate and low DO are the main polluting characteristics of sullage from residential areas. Considering that about 81 percent of the water used in a typical urban area is released as sullage without any treatment, the impact on

pollution load is significant. Management of sullage water can be done in two ways; first, prevention of discharge of sullage into municipal drains by having wastewater connection to the sewer. Second, provision of suitable on-site treatment systems (such as septic tank or mechanical sewage plant), which are able to degrade the BOD down to allowable discharge limits. As such, increased public awareness and upgrading of the laws are necessary to control discharge in order to protect the river systems from further degradation and exploitation.

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Source Prof. Dr Azni Idris Email: azni@eng.upm.edu.my Dr Abdullah-Al-Mamun Email: mamun@iu.edu.my

Table 1: Quality of sullage compared to the Malaysian National River Water Quality Standards (NWQS)

Parameter	Value for Sullage [5]	Malaysi	an National Riv	er Water Quality	Standards (NV	MQS)
		Class I	Class II)	Class III	Class IV	Class V
		Excellent for water supply	Conventional treatment needed for water supply	Extensive treatment needed for water supply	Suitable for irrigation	Not suitable for any use
AN(mg/l)	4.9	< 0.1	0.1-0.3	0.3 - 0.9	0.9 - 2.7	> 2.7
BOD(mg/l)	49.6	<1	1-3	3-6	6-12	> 12
COD(mg/l)	115.6	< 10	10 - 25	25 - 50	50 - 100	> 100
DO(mg/l)	1.6	>7	5-7	3-5	1-3	<1
pH	5.7	> 7.0	6.0 - 7.0	5.0 - 6.0	< 5.0	< 5.0
TSS(mg/l)	43.2	< 2.5	25 - 50	50-150	50 - 300	> 300
WQI	28.8	> 92.7	76.5 - 92.7	51.9 - 76.5	31.0 - 51.9	< 31.0

AN - Ammoniacal Nitrogen, 800 - Biochemical Oxygen Demand, COD - Chemical Oxygen Demand, DO - Dissolved Oxygen, pH - Phosphorus, TSS - Total Suspended Solids, WQI - Water Quality Indicators

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NEWS	BUSINESS	LIFE & TIMES	SPOR	TS WORLD	NST TV	OPINION	VOUCHERS	GALLERY	OLYMPIC 2020
EXCLUSIN	E CRIME	& COURTS	NATION	GOVERNMENT	PUBLIC PO	OLICY POL	ITICS		

Pahang MB should cancel mining near Tasik Chini to preserve lake, urges environmental group

By New Straits Times - June 8, 2021 @ 6:15pm



Source: (New Straits Time, 2021)

An environmental group urged the Pahang Menteri Besar to revoke the approval given for mining activities in the vicinity of Tasik Chini, the country's second-largest freshwater lake, in Pekan. In a letter to the Menteri Besar, Datuk Seri Wan Rosdy Wan Ismail, the Malaysian Natural Heritage Protection Organisation (Peka), said that they were against the decision for mining works to be done near Tasik Chini, which has been categorised as an environmentally sensitive area under the National Physical Plan. Its president Puan Sri Shariffa Sabrina Syed Akil stated that area near the lake has been continuously plagued by logging and mining activities, resulting in the buffer zone to become smaller. "The lake is not well managed to meet existing standards and this has resulted in some disadvantages to Tasik Chini and its surrounding areas. Problems related to environmental issues include worsening lake water quality, declining marine life, extinction of local biodiversity and the lake losing its aesthetic values.

"The current pollution and ecological disturbances could lead to natural disasters. For example, pollution at high areas around the lake can result in floods during heavy rainfall, as reported in the past. Once the hilly areas are cleared for logging and subsequently mining works, then landslides can occur," she said. "In case a disaster occurs during the monsoon season, the State government will face losses and have to spend more to repair their damaged infrastructure, and provide assistance to those affected, including some who may lose their homes or lives.

1.1.4. Climate Change and Water Security



Projected Average Mean Annual Flow (cubic metre per second) for the Major River Basins in Malaysia											
River Basin	Historical	2030	%	2050	%	River Basin	Historical	2030	%	2050	%
Kiver Dasin	Historical	2030	70	2030	70	Sabah					
Peninsular						Kadamaian	149	151	1.4	141	-5.6
Malaysia						Tuaran	62	59	-4.2	60	-3
Muda	96	96	-2.8	97	1.4	Padas	343	345	0.6	325	-5.2
viuua	90	90	-2.0	91	1.4	Kinabatangan 596	596	614	3	556	-6.7
Perak	716	730	1.9	763	6.6	Tawau	4	4	0	4	0
Kelang	32	32	2.7	33	5	Sarawak					
Selangor	63	72	15	74	17	Sg. Sarawak	141	148	4.5	152	7.2
Linggi	24	26	9.2	27	15	Sadong	215	226	5.1	232	7.8
Batu Pahat	25	27	6.9	28	9.8	Saribas	129	136	5.2	145	12
Muar	55	69	25	70	27	Lupar	547	572	4.5	595	8.7
Johor	68	69	1.3	68	1.1	Rajang	3,275	3,296	0.6	3,293	0.5
Pahang	468	487	4	487	4.1	Kemena	273	283	3.6	277	1.4
Dungun	55	55	0.6	56	2.5	Baram	2,110	2,121	0.5	2,063	-2.2
Kelantan	534	558	4.6	559	4.8	Limbang	266	277	4.3	271	2
	Source: (MESTECC 2018)										

State/Territory	No. of	WTPs' Design	Production	Reserve Margin in	WTPs' Design	Production	Reserve Margin in
State, retritory	WTPs	Capacity (MLD)	(MLD)	2015 (%)	Capacity (MLD)	(MLD)	2016 (%)
Johor	44	1986	1619	18.50	1986	1661	16.40
Kedah	36	1308	1315	0.00	1308	1361	0.00
Kelantan	35	500	453	9.20	500	471	5.80
F.T. Labuan	6	101	73	27.60	101	72	29.20
Melaka	9	639	519	18.80	639	510	20.10
Negeri Sembilan	23	994	752	24.40	1000	779	22.10
Penang	9	1479	1014	31.40	1599	1054	34.10
Pahang	76	1414	1129	20.10	1414	1111	21.40
Perak	46	1816	1289	29.00	1846	1317	28.70
Parlis	4	233	220	5.60	233	230	1.00
Sabah	73	1304	1229	5.80	1304	1221	6.40
Sarawak	93	1609	1268	21.10	1675	1328	20.70
Selangor	34	4606	4675	0.00	4606	4807	0.00
Terengganu	12	846	603	28.70	845	616	27.20
Malaysia	500	18835	16159	14.20	19056	16536	13.20

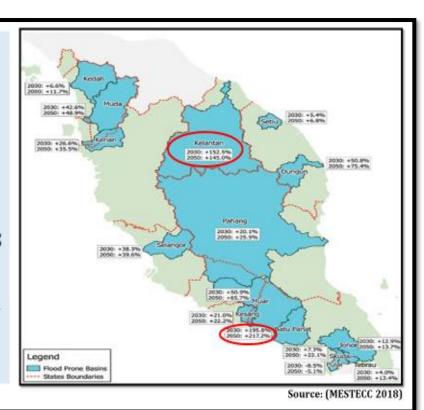
Flood and dry spell prone dams in Peninsular Malaysia



Source: (MESTECC, 2018)

Bukit Kwong Dam faced extended periods of as long as eight consecutive months. In 2014–2015, the Sungai Langat Dam, Sungai Selangor Dam and Sungai Tinggi Dam experienced three or more consecutive months of storage levels at below 50% capacity. Future dry spell projections indicate that these dams may face significant dry spells with return period of more than 10 years by 2040.

Projected
Changes in
Flood Areal
Extent for
the Selected
15 Flood
Prone Basins
in Peninsular
Malaysia both
in 2030 and
2050.



Basin Current Flood Projected Flood Prone Area Projected Flood Prone Area Flood Prone Area Prone Area (2030) (2050)						
Basins	km²	km²	km²	Changes (%)	km²	Changes (%)
Kedah	2,800	127.6	136.1	+6.6	142.5	+11.7
Kerian	1,418	138.2	175.0	+26.6	187.3	+35.5
Kesang	696	89.1	107.8	+21.0	108.8	+22.2
Muar	6,149	302.2	456.0	+50.9	500.6	+65.7

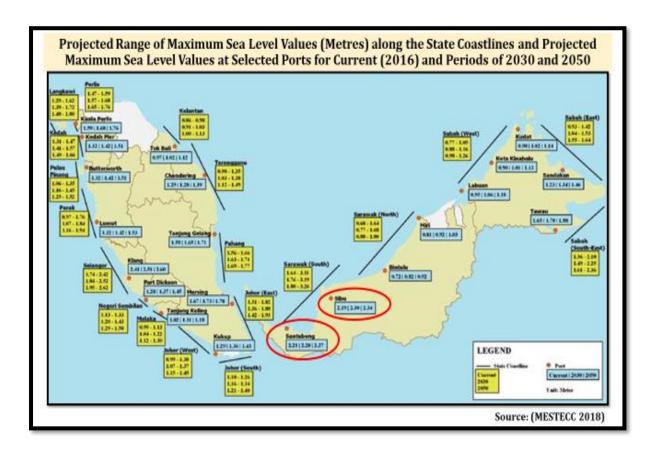
Pulai 280 16.9 -8.5 16.0 347 9.0 9.7 +7.3 11.0 32 +13.4 Tehrau 261 33 +40 3.6 Pahang 28,549 1,403.8 1,686.4 +201 1762.3 123.4 Setiu 1035 1300 +5.4 131.8 +6.8 366.0 522.0 2.086 224.9 311.1 +38.3 314.0 +39.6 Selango 2,233 209.8 620.6 +12.9 +13.7 Johan 2,252 238.5 269.3 2711 1,714 114.5 11,901 551.0 1,3915 13501 +145.0 +152.5 Kelantar 65,906 3,918 6,210

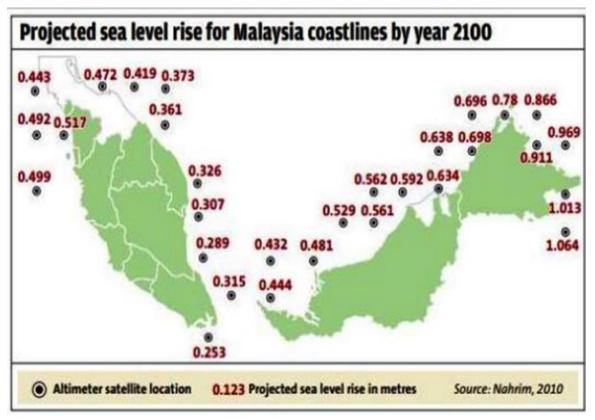
Source: (MESTECC 2018)

Observed and Projected Sea Level Rise in Malaysia

Parameter	Observed Rate (1993-2010)	Projected for 2030	Projected for 2050
Sea Level Rise			
		0.03 - 0.10 m	0.11 - 0.21 m
Peninsular Malaysia	2.73 - 6.45 mm/year	0.05 - 0.10 m (West Coast)	0.11 - 0.21 m (West Coast)
		0.03 - 0.07 m (East Coast)	0.11 - 0.15 m (East Coast)
Sabah	5.06 - 7.00 mm/year	0.11 – 0.15 m	0.21 – 0.62 m
Sarawak	3.82 – 5.11 mm/year	0.04 – 0.12m	0.15 - 0.22 m

Source: (MESTECC 2018)



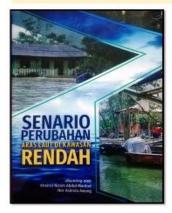


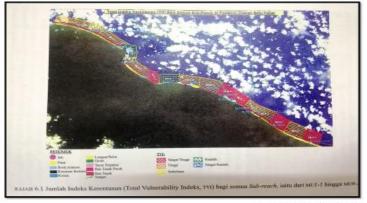
Source: (Lee, 2015; Ghazali et al., 2018)

National Hydraulic Research Institute (NAHRIM) reported that the Malaysian coastlines were being affected by rising sea levels, with many parts of the country expected to be underwater by end of the century. NAHRIM reported that since 2010 the sea levels have been rising yearly between 0.2mm and 4.4mm due to climate change in Malaysia.

	Eroded		tegory 1: al Erosion		tegory 2: cant Erosion	Category 3: Acceptable Erosion	
State	Coastline (km)	No. of Areas	Aggregate Length (km)	No. of Areas	Aggregate Length (km)	No. of Areas	Aggregate Length (km
Johor	64.7	0	0.0	30	38.1	42	26.8
Kedah	26.8	4	1.9	28	13.6	90	11.3
Kelantan	19.8	2	2.0	2	2.5	43	15.3
Melaka	3.7	1	0.2	6	1.7	3	1.8
Negeri Sembilan	9.8	6	5.5	9	4.1	2	0.2
Pahang	61.8	2	1.5	14	16.9	58	43.4
Pulau Pinang	16.3	7	4.7	13	5.0	31	6.6
Perak	95.1	1	0.3	21	33.8	105	61.2
Perlis	0.1	0	0.0	0	0.0	2	0.1
Selangor	76.4	2	4.8	16	18.6	156	51.2
Terengganu	48.7	8 /	12.3	20	15.4	115	21.0
Sarawak	492.5	7	18.6	78 (144.8	566	329.1
Sabah	429.3	3	3.0	63	79.1	1120	347.2
Labuan	4.4	1	0.6	9	2.5	11	13
TOTAL	1,349.3	44	55.4	309	376.1	2,344	916.5

Sea Level Rise and Coastal Erosion in Batu Pahat, Johor





Source: (Maulud & Awang 2015)

Sea Level Rise and Coastal Erosion in Batu Pahat, Johor





Source: (Maulud & Awang 2015)

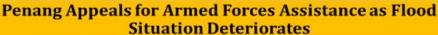
Protecting Coastlines in Malaysia

- Malaysia has about 5267km of coastline and 29% of these faces erosion problems.
- As part of the solution towards coastal erosion, both hard and soft engineering approaches had been implemented.
- For the longer term, Integrate Shoreline Management Plans (ISMPs) have been developed and implemented for specific areas.
- In addition, a National Coastal Vulnerability Index to sea-level rise is being developed.
- Detailed sea level rise studies had also been conducted at some of the vulnerable coastal areas to project future vulnerabilities in a 20year sequence from 2020 to 2100 (GoM 2015).

Tsunami

- The tsunami in 2004 originated in Indian Ocean impacted the islands of Langkawi and Penang, mainland Kedah, Perak and reached north of Selangor.
- Maximum tsunami wave heights observed on the shore ranged from 2 to 5 m.
- Post-tsunami observations revealed that inland inundation reached as far as 400 m.
- The tsunami caused damage to coastal villages and fishing harbours and resulted in 68 fatalities.
- The most severe damage was to wooden houses and fishing boats located in coastal inlets (Ghazali et al. 2018).







Source: (Dermawan, 2017

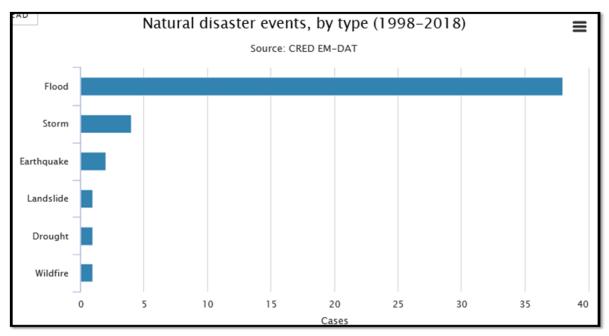
- □ The flooding situation worsened as the water level raised about 10 to 12 feet above the roof of houses and the wind was very strong.
- Due to worsening flood situation, the Penang government has requested the help of armed forces form Federal government to rescue the inhabitants.
 - electricity supply at flood relief centres have been cut off.
 - floods have forced Rapid Penang to temporarily cease its stage bus operations.
 - Flood waters were reported to have inundated major roads and disrupted electricity supply to key areas.
 - Commuters have been advised to refer to the Rapid Penang Facebook at *rapidpgfans* for updates.

Floods in Penang, Malaysia (4-5 November 2017)



Source: (Alagesh, 2017)

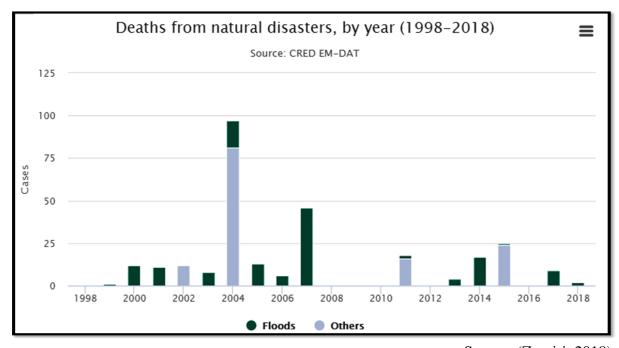
- ☐ A total 1,968 flood victims (Mok, 2017) have been evacuated due to the massive floods-
 - ☐ 1,125 victims from Central Seberang Perai.
 - ☐ 615 from North Seberang Perai,
 - ☐ 70 from the Northeast district
 - ☐ 158 from the Southwest district
- Penang govt says its drainage system unable to cope with intense 15-hour rainfall e.g. 372mm (Basyir, 2017).
- Several senior citizens living in a nursing home along Jalan P. Ramlee trapped by rising floodwaters (Alagesh, 2017).



Source: (Zurairi, 2018)

Figure 11. Natural disaster events by type (1998–2018) in Malaysia

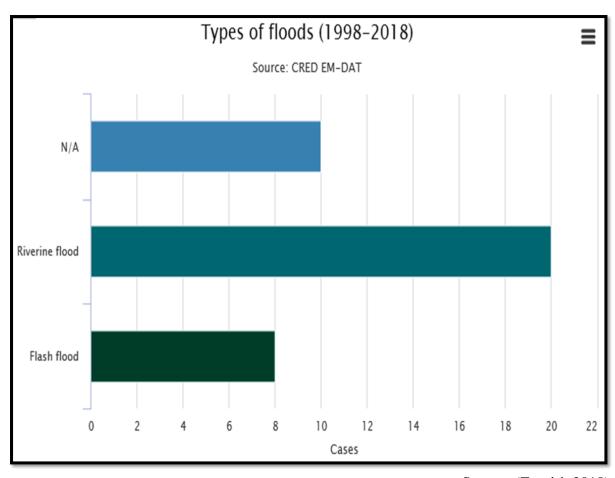
In the two-decade period, between 1998 and August 2018, Malaysia experienced 51 natural disaster events — with two floods recorded in 2018 alone. During that period, over 3 million people were affected and 281 people died.



Source: (Zurairi, 2018)

Figure 12. Deaths from natural disaster by year (1998-2018) in Malaysia

Most of the carnage in Malaysia was caused by floods, making up 38 out of 51 natural disasters during that period, or roughly three-quarters — considerably more than the global average of over 43 %. In the last two decades, floods had affected over 770,000 people, killing 148 people, and caused US\$1.4 billion or roughly RM5.82 billion in damages.



Source: (Zurairi, 2018)

Figure 13. Types of flood (1998–2018) in Malaysia

When compared to the total damage over the period, floods contributed about 70 % of the damage to Malaysia. It caused over half of the total deaths from natural disasters over that period. Out of the 38 occurrences of flood during that period, 20 happened at rivers as compared to just eight cases of flash floods. The biggest flood in recent memory was also the worst, which affected 2.3 million people.

1.1.5. Water Safety Plans

Water Safety Plans (WSPs) are a comprehensive and preventive approaches to risk assessment and management (WHO & IWA, 2009). They represent a holistic framework that considers the entire water supply chain (from the source-water catchment through to the point of human consumption) for identifying and prioritising water quality risks and further control measures required to mitigate risk.

Typically, the process of developing a WSP builds on documentation and control measures already established (e.g., existing maps of catchment, information on activities within the catchment and management measures for controlling those activities). WSP development involves asking and answering the following questions:

- What are the hazards, hazardous events and resulting risks to public health in my water supply system?
- How important are they?
- How do I fix them?
- How do I know they are fixed?

In this context, hazards are biological, chemical, physical or radiological agents that can cause harm to public health, and hazardous events that introduce hazards to the system, or fail to remove them from it. The resulting risks are described by a combination of identifying the likelihood that hazardous events will occur, and evaluating the severity of consequences if those events occurred. The approach advocates for the implementation of additional control measures (i.e., the activities and processes applied to reduce or mitigate risks) if the assessment reveals that the risks are insufficiently controlled. It also requires management and communication plans to be established, implemented and be periodically revised to result in incremental improvements.

1.1.6. Sanitation Safety Plan (SSP)

Sanitation Safety Plan (SSP) is a risk-based management tool for sanitation systems (WHO, 2015). It assists in:

- systematically identifying and managing health risks in the sanitation chain. Such risks include those from generation of wastes, conveyance of wastes (in sewerage systems), treatment of wastes, use of sanitation by-products (in agriculture) and discharge into the environment
- guiding investment based on actual risks, to promote health benefits and minimise adverse health impacts
- assuring authorities and the public on safety of sanitation-related products and services.

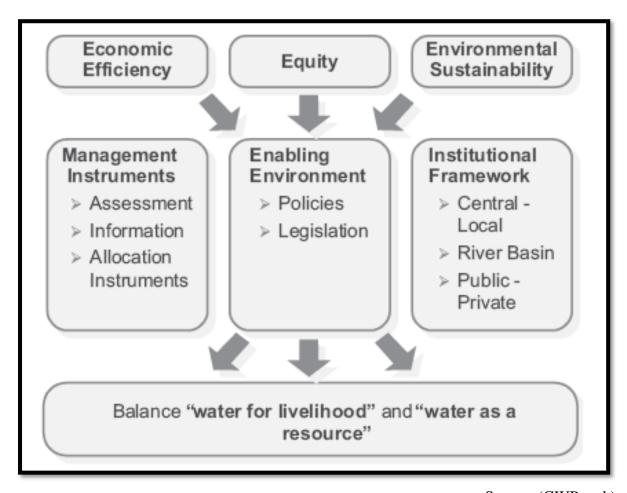
The hazards, hazardous events and associated management plans developed in the SSP process can, and should inform catchment risks in water safety planning. These can be at a macro catchment scale (with diffuse or point-source releases) or at the small community level.

SSPs are sometimes linked to or included in WSPs, to pay due attention to the whole watersupply cycle, including wastewater production and discharge. Such approaches consider the influence of sanitation on drinking water quality and application of wastewater in agriculture and aquaculture.

1.2. IWRM and Holistic Approaches

The concept of IWRM, as defined by the Global Water Partnership (GWP, n.d.) is:

"...a process which promotes the coordinated development and management of water, land and related resources in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems."



Source: (GWP, n.d.)

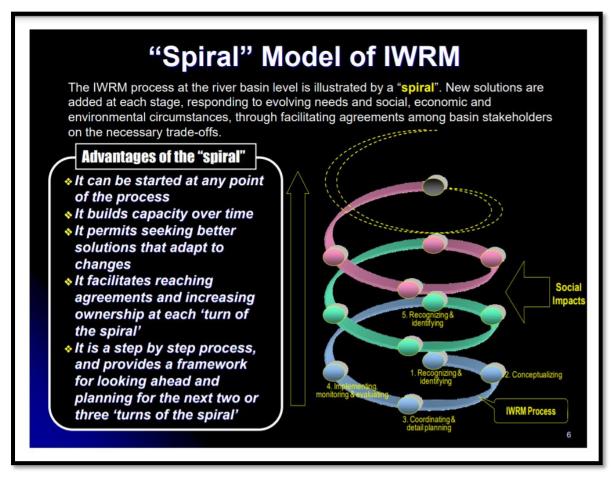
Figure 14. General framework of the IWRM approach to water management

To implement this vision, there is a need to ensure coherence and appropriate linkages between the main national and local development objectives with respect to:

- economic development objectives relating to monetary resources, such as economic growth, management of monetary assets, and economic sector development
- social development objectives relating to human resources, such as poverty alleviation, health, education, and job creation
- environmental development objectives relating to natural resources, such as water policies, pollution control policies, nature conservation policies, agricultural land policies, forest policies, and fisheries policies.

The "Three Es" in the general IWRM definition – Economic efficiency, social Equity and Ecological sustainability have to be achieved through a comprehensive development of the "Three Pillars" in water management:

- 1. Enabling environment in the form of policies, strategies, legislation, etc.
- 2. Institutional roles of various stakeholders in the water sector
- **3.** Managing instruments such planning tools, monitoring, regulation and economic incentives



Source: (Stakhiv, 2009)

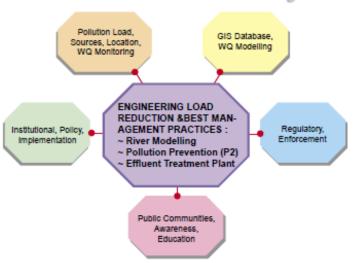
Figure 15. Spiral model of IWRM

Integrated Water Resource Management: Perspectives and Initiatives in Malaysia

Natural water is a finite resource that is vital to human development. It needs to be properly managed in a sustainable manner, particularly during the dry season when water reserves in many dams drop to a critical level. In many developing countries, maintaining adequate water resources is a problem because of lack of integration and an holistic approach to its management Population increases lead to an increase in water demand or water supply requiring an efficient and effective water treatment system in place to achieve the standard set for drinking water. Usually there is little participation of the general public and other stakeholders apart from the government. In addition, not only systems are poorly designed and underfinanced, regulatory and management aspects remain weak. Collaborative Decision Making (CDM) mechanism has been promoted as a better management approach to managing water resources in a river basin, including the use of indicators in performance measurements (Mazlin et al. 2004a:h)



Water resource management often focuses on meeting demands by the population without taking into consideration the requirement to protect the natural water resource from pollution. Generally, the numerous consumer complaints revolve around poor water quality rather than health related aspects of water. Changes in government policy play an important role in increasing the complexity of managing natural water resources. In addition, the transformation of our economy from an agriculture-intensive to industry-intensive one has resulted in massive changes in land use activities. Changes in land use such as deforestation, agriculture, industrial and residential development do have a large impact on water quality in many river systems. Rapid



igure 1: Schematic representation of a holistic approach to managing water quality of the Langet River

development within cities or township areas, industrial estates, industries, and the increasing use of chemicals in agriculture have resulted in poor water quality of many of our rivers. River systems have been subjected to tremendous increases in pollution sources as a result of these activities. Maintaining good water quality has become a major concern in water resources management not only in Malaysia but around the world as well



Concepts of TWRM and TRBM
The concepts of Integrated Water Resource
Management (IWRM) and Integrated River
Basin Management (IRBM) aim to provide
the best approach on how to treat the natural
water resources economically. IRBM which
deals with issues of water allocation, pollution

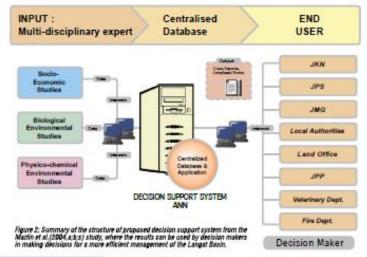
control and flood control is a subset of WRM which addresses the broader issues of food self sufficiency, tariffs, cross subsidies, institutional roles, etc. Water governance should be the focal point of a participatory approach involving all levels of stakeholders. Mearwhile, integrated in this context refers to the integration within and between natural and human systems.

Integrated management of water quality appears to be a superior approach to gathering all data involving environmental systems. IWRM and IRBM when applied to water systems result in integration between freshwater and coastal zones; land and water; surface water and groundwater; quantity and quality; as well as upstream and downstream. The principles to be adopted are economic efficiency, equity and environmental sustainability. There is also a need to develop a structural framework comprising management instruments.

The role of the Global Water Partnership of which the Malaysian Water Partnership (MyWP) is a chapter, promotes and facilitates IWRM / IRBM. The global mission's message calls for the involvement of all stakeholders, moving towards full-cost pricing of water

services, increasing public funding for research and innovation while promoting cooperation in the management of international basins and increasing investments in water projects (Hiew, 2001). Water as an important resource in the coastal zone should also be managed sustainably within the context of Integrated Coastal Zone Management (ICZM) as discussed by Mazlin and Sarah (2003).

Environmental modeling has become an important tool for environmental management. This can be observed in increasing interest among scientists and engineers to develop environmental models. Of late, studies on the application of models, either as predictive tools or as a numerical representation of the real environment, have been published in many journals and books.





Integrated Water Resource Management in Malaysia (IRWM)

Malaysia has recently adopted fWRM as an innovative approach to managing its water resources. Clear pronouncements to this effect are found in the Third Outline Perspective Plan (OPP3) and the 8th Malaysia Plan (MP8) documents. The adoption provides the necessary impetus to break away from traditional practices characterised by multiple individualist sector-centred approaches. In line with the current international trend, the new approach promises to overcome deficiencies in cross-sector co-ordination, reduce conflicts and inefficiency, and engender equity.

However, countrywide adoption and implementation of WRM principles and practices have been hampered due to the following factors:

- General lack of awareness of IWRM, countrywide:
- Lack of capacity in implementing agencies (public, private and NGOs);
- Absence of Best Management
 Practices (BMPs) in IWRM in the
 Malaysian context.

Under the Malaysian Constitution, water is a state matter. Nevertheless when it comes to water resource development, utilisation and management, both the federal and state governments are involved. This is because the responsibility for water resource administration is fragmented and is shared among a number of federal and state agencies, with each having its own specific involvement in water related

issues. Their interest in water related matters could be viewed from any of the following aspects:

- Planning, development and management of water resource aspects:
- Protection and conservation of water aspects:
- Land use control and watershed management aspects.

IWRM includes actions necessary to develop an effective framework of policies, legislations, financing structures, capable institutions with clearly defined roles, and a set of management instruments (GWP-ToolBox, 2003). The purpose of such a framework is to effectively regulate the use, conservation and protection of the water resources, balancing requirements for broad economic development and the need to sustain ecosystems. The emphasis here is on the process of establishing priorities and actions for integrated management of water resources. Priorities include ecosystem protection and conservation in the basin. As only modest progress has been made in creating public awareness in IWRM, its realisation is still minimal.

WRM/IRBM of the Langat River

The Langat Basin is an area drained by the Langat River in the state of Selangor, Malaysia. The Basin is currently one of the fastest developing areas in the country. A number of large scale socio-economic projects are either currently taking shape or are already completed in the Basin. These include the new

Continued on page 12

Rapid urbanisation in the Basin has led to a large influx of people into the region. A sudden increase in population has exerted a number of stresses on the Langat River. One of the main problems is river pollution from sewage and suspended solids resulting from land clearing and discharge of untreated or incompletely treated sewage. The problem is of concern to many including government, non-governmental organisations and the public as the Langat River is the main potable water resource for the whole Langat Basin and the Klang Valley (Kuala Lumpur) nearby where almost a million people depend on this river for drinking water. Many attempts have been made to arrest the deterioration of the Langat River water quality but with limited success. The root of the problem is the absence of a truly integrated management system of water resources in the Basin.

Integrated management has been applied in several water quality improvement programmes funded by the government for the Langat River Basin. The Consultancy Unit of Universiti Malaya (UPUM, 2002) has conducted a Pollution Prevention and Sungai Langat Water Quality Improvement Programme funded by the then Ministry of Science, Technology and Environment. The objectives of the study were:

- i. To improve, upgrade and maintain raw water quality of Sungai Langat from medium polluted to clean category (Class III to Class II), so that it is suitable for water treatment purposes using conventional methods
- ii. To evaluate various control instruments such as engineering, scientific, legal, economic and institutional at meeting the objectives of reducing pollution load into the Sungai Langat and the maintenance of a suitable environment for repair and self restoration.
- iii. To restore and maintain Sungai Langat at Class II after the implementation of the river improvement project.

In this study the holistic approach to watershed management was applied (Figure 1). A watershed management plan (WMP) is needed to address several issues: (i) pollution

load estimation, sources and geographical information system (GIS), (ii) pollution load reduction strategies and best management practices (BMPs), and (iii) community, institutional and regulatory aspects.

The IRBM concept was taken into consideration as well in the study by Mazlin et al. (2004a: b: c). This study started at the end of year 2000 and was completed in December 2003 under the IRPA Grant mechanism. The objectives of the study were:

- i. To understand inter and multidisciplinary approaches monitoring and assessing the health of the Langat Basin ecosystem and suggest a framework for integration.
- ii. To identify strategies and tools that allow integration of conservation and development, maintenance of ecological integrity, protection of ecosystem resilience and satisfaction of basic human needs.
- iii. To gather scientists and technical experts to monitor, analyse, evaluate and make recommendations on the sustainable management of ecosystem health at the national level hased on the Langat Rasin as a case
- iv. To suggest a list of environmental health indicators which will assist planners, policy and decision makers in planning and environmental management.
- v. To develop an information directory related to Langat Basin Ecosystems to facilitate finding of information and references.
- vi To develop a decision support system inclusive of databases, good management systems, modeling and friendly user interface.

This study advocated the concept of IWRM-IRBM and introduced a general framework for structuring IWRM-IRBM planning and implementation. It also involved the development of a simulation model using Artificial Neural Networks (ANN)





Conclusions

The concepts of IWRM and IRBM promote a holistic approach to managing the natural water resources of Sungai Langat within the Langat Basin community area. They need to be adopted as a matter of urgency as they aim for pollutant-free water discharge into the Langat river or water courses. By applying this approach the current quality of water will not only be enhanced, but environmental protection is assurred as well which directly provides for healthy living. The realisation of benefits by applying this approach has been proven in many instances in recent years worldwide. In fact, this approach offers greater integration via participation amongst the government agencies, non-government sectors and stakeholders, on reducing or alleviating pollution levels and increasing environmental awareness amongst the general public. The resolution to treat available natural water resource within the context of environmental conservation and best water resources management practices is an imperative.

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Hafizan Juahir Email: hafizan@env.upm.edu.my Azimah Ismail Email: azimah@iwk.com.my Mazlin Mokhtar Email: mazlin@pkrisc.ukm.edu.my

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1.2.1. Statute for IWRM in Malaysia

The National Policies related to **Advocacy, Awareness and Capacity Building (AACB)** and **Public Participatory Platforms (PPPs)** for WST2040 in Malaysia are:

No.	Related Policies/ Strategic Plan Reviewed	A	A	СВ	PPPs	Previous Ministry	Current Ministry
1	National Resources Water Policy 2002					NRE	KASA
2	National IWRM Strategic Plan					NRE	MOSTI
3	National Policy on the Environment 2002					КеТТНа	KASA
4	Solid Waste Management Policy (2016)					-	KPKT
5	National Policy on Climate Change, 2009					-	KETSA
6	National Policy on Science, Technology and Innovation 2013–2020					-	MOSTI
7	National Cleanliness Policy 2019					-	KPKT
8	National Policy on Biological Diversity 2016–2025					KeTSA	NRE
9	Green Technology master plan Malaysia 2013–2030					КЕТТНА	NRE
10	National Agrofood Policy 2011–2020					MOA	MAFI
11	National Environmental Health Action Plan (NEHAP) Malaysia					-	МОН
12	National Urbanisation Policy 2 (2016–2025)					-	KPKT
13	National Policy on Rural Development (2030)					-	MRRD
14	National Transport Policy 2019–2030					-	МОТ

No.	Related Policies/ Strategic Plan Reviewed	A	A	СВ	PPPs	Previous Ministry	Current Ministry
15	Shared Prosperity Vision 2030					PMO (EPU)	PMO (EPU)
16	National Community Policy					-	KPKT
17	National Energy Efficiency Action Plan, 2015					KeTTHa	NRE
18	National Forestry Policy (1978; Revised 1992)					NRE	NRE
19	Shared Prosperity Vision 2030					Ministry of Economic Affairs	Ministry of Economic Affairs
20	National Consumer Policy (2002)					-	KPDNKK
21	Education Blueprint (2006–2010)					-	KPM
22	National Physical Plan 3 (2016)					-	KPKT
23	Malaysia Smart City Framework (2018)					-	KPKT
24	Environmental Sustainability 2020–2030					-	KASA
25	Ministry of Water, Land and Natural Resources Strategic Plan 2019 –2023					KATS	NRE
26	Malaysia Road map Towards Zero Single Use Plastics (2018–2030)					KPKT	КРКТ
	Indicator : Present Not present						

Integrated River Basin Management related Statute and Agency in Malaysia

Management	Statute	Agency
Pollution control	Environmental Quality Act 1974	D. of Environment (F)
Ponution control	Drinking Water Quality Standard	D. of Health (F)
	Street, Drainage & Building Act 1974	Local government (S)
	Local Government Act 1976	Local government (S)
	LUAS Enactment 1999	LUAS (S)
	Water Services Industry Act 2006	Water Commissioner (F)
Catchment area	National Forestry Act 1984	D. of Forestry (S)
	LUAS Enactment 1999	LUAS (S)
	Local Government Act 1976	Local government (S)
Land Use Drainage	Land Conservation Act 1960	Land Office (S)
	Town & Country Planning Act 1976	Local government (S)
	Local Government Act 1976	Local Government (S)
	Drainage Works Act 1954	DID (F)
Flood Control	Ministerial Function Act 2008	DID (F)
	LUAS Enactment 1999	LUAS (S)
Water services	Water Services Industry Act 2006	Water Commissioner (F)

Note: F = Federal Level, S = State Level.

Source: (Khalid et al., 2018).

1.2.2. Conventional and Nature-based Approaches for Disaster Risks Adaptation

Natural hazard	Conventional approaches	Natural or nature-based approaches	Examples
Inland flooding and erosion	Dams, dikes, levees, stream channelization, stormwater sewers, combined sewers, pumps	Floodplain and watershed restoration Green stormwater management Protecting floodplains from development	Levee setbacks Wetland, forest and watershed restorations Rain gardens and natural infiltration systems Minimizing stream alterations Permeable pavement Voluntary buyouts Avoiding new development in floodplains Open space acquisition and protection
Coastal flooding and erosion	Seawalls, bulkheads, dikes, breakwaters, levees	Coastal habitat protection and restoration Living shorelines Protecting sensitive coastal areas from development	Intact or restored shoreline systems (e.g., wetlands, mangroves, beaches, dunes, and barrier islands) Coral and oyster reefs Restored/constructed marsh with sills or breakwater structures Constructed oyster reefs Voluntary buyouts Coastal land acquisition and easements
Extreme heat and drought	Dams and reservoirs, air conditioning	Watershed protection and restoration Urban green infrastructure Water conservation	Forest and watershed restoration Beaver restoration Urban trees and other vegetation Green roofs and cool pavement Rain barrels Xeriscaping
Wildfire	Wholesale suppression of wildfires, clearing firebreaks	Ecological forest management Helping communities live with fire Managing wildfires (when possible) to benefit ecosystems	Combined fuel reduction treatments Prescribed fire Post-fire restoration Fire-adapted communities, such as through Firewise USA® neighborhood mitigation Collaborative risk management Avoiding new development in high-fire-risk areas

Source: (Glick et al., 2020)

The protective value of nature- A 2019 study from the Federal Emergency Management Agency found that an abandoned golf course in Clear Lake, Texas, helped to protect 300 residents and 150 homes from flooding during the Hurricane Harvey storm. Before the storm, the course was converted into a 178-acre park and wetland by the local water authority. Massachusetts Department of Fish and Game determined that by removing three old dams and restoring natural floodplains it would reduce flood risk to surrounding areas and prevent the chance of dam failure. Dam removal was also 60% less expensive than repairing and maintaining the structures over the next 30 years.

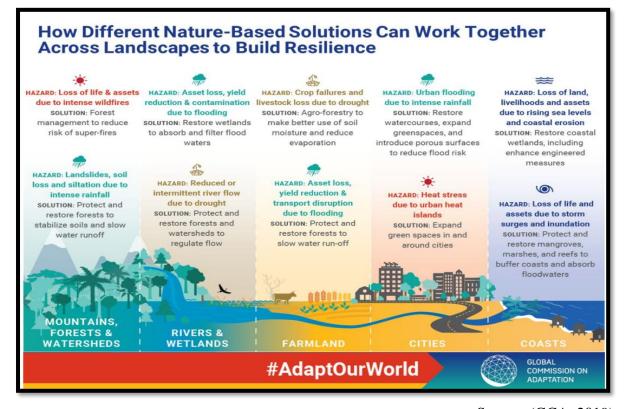


Green Infrastructure Can Be Cheaper, More Effective than Dams

- Hundreds of studies on nature-based solutions to extreme events show that "green infrastructure" is often cheaper and more effective than engineered projects like dams, levees and sea walls, according to a new analysis.
- The science is clear- both model-based studies and empirical evidence from around the world show that natural infrastructure can provide significant, quantifiable levels of protection for communities from natural hazards, and is often more cost-effective than structural infrastructure

National Wildlife Federation and Allied World advocates for governments to increase funding for projects like floodplain restoration.

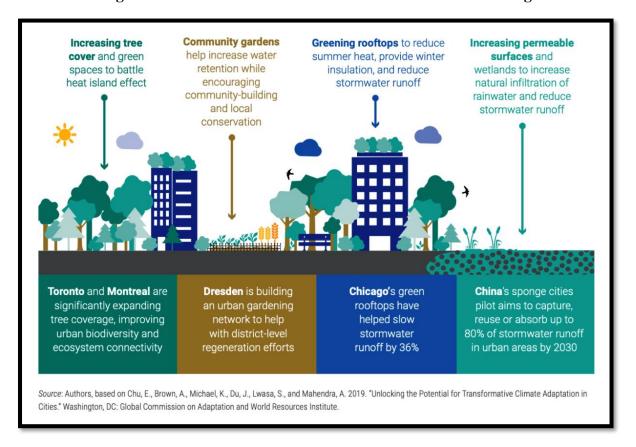
Source: Cusick 2020



Source: (GCA, 2019)

Figure 16. Nature-based solutions approach across landscapes

Urban Planning with Nature-based Solutions for Stormwater/ Flood Management



Source: (GCA, 2019)

Early-warning systems

Climate risk and early warning systems (CREWS) is a partnership of several international organisations (the World Bank, World Meteorological Organisation, and United Nations Office for Disaster Risk Reduction) and countries (Australia, France, Germany, Luxembourg, the Netherlands, Switzerland, and Canada) that aim to save lives, assets, and livelihoods in least developed countries (LDCs) and small island developing states (SIDS) by increasing the capacity to generate and communicate effective, impact-based, multi-hazard, gender-informed early warnings (GCA, 2019).

Responding before disaster strikes

Forecast-based financing (FbF) turns the standard disaster response – act after disaster strikes – on its head. By using advanced weather forecasts and a dedicated funding mechanism, FbF funnels resources to communities before extreme events hit.

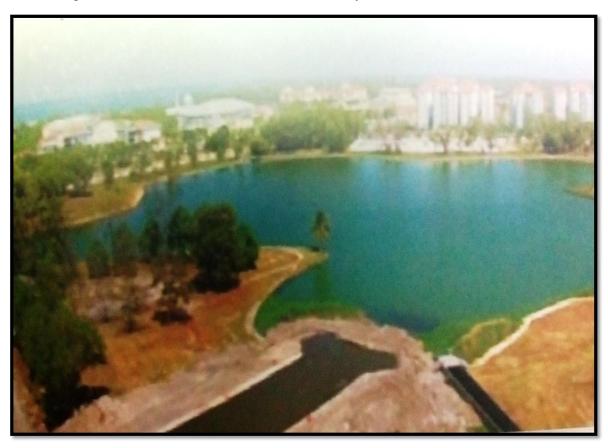
"With such a timely disbursal, we hope to avoid potential catastrophe before it even happens, supporting people to continue working and going to school," said Robert Kwesiga, Secretary General of the Uganda Red Cross Society (URC).

Uganda is one of 16 Red Cross Red Crescent societies around the world piloting FbF. Uganda has seen more frequent flooding and more severe droughts due to climate change. In the

Kapelebyong Region, FbF helped more than 2,000 people to protect themselves against flooding-induced waterborne diseases, and enabled URC to proactively warn residents of potential flooding in two districts (GCA, 2019).

Constructed Wetlands for Flood Mitigation in Malaysia

Universiti Sultan Zainal Abidin, Gong Badak campus is the only university campus in the east coast that applied the concept of environment friendly floodwater reservoirs after the devastating flood in 2014 in almost the whole of Malaysia (Toriman, 2017).



Source: (Toriman, 2017).

Integrated Flood Management in Malaysia

Flood Management - Programme and Activities

Definition of Flood

Flood can be defined as a body of water, rising, swelling and overflowing land not usually thus covered. Also, overflowing of the bank of a stream, lake or drainage system of water onto adjacent land as a result of storm, ice melt, tidal action and channel obstruction.

Types and Nature of Flood

There are no formal categorizations of floods in Malaysia but is often broadly categorised as monsoonal, flash or tidal floods. In addition, floods are also described based on its location, characteristics, the cause, the timing as to when it occurs and its duration.

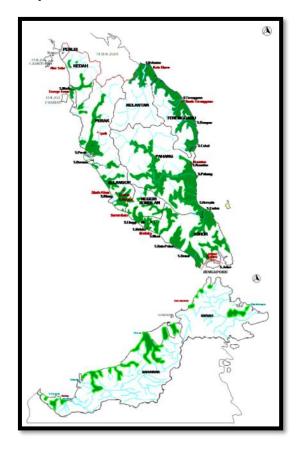


Causes of flood

- Natural Causes of flood: Short, high intensity leads to flash flood, heavy widespread rain leads to land inundation
- Human Induced floods: Disposal of solid wastes into rivers, sediments from land clearance and construction areas, increase in impervious areas and Obstruction and constriction in the rivers

Source: (DID, 2017)

Flood Prone Areas in Malaysia



Source: (DID, 2017)

Impacts of flood

Positive: Sustaining, enriching and rejuvenating certain sector of biodiversity in the floodplains, replenishes the land with nutrient rich soils, and thus good for agriculture and natural vegetation, clear debris as well as remove sediments from the flooded area, recharges groundwater storage (DID, 2017).

Negative: Threaten lives, disrupt social and economic activities and destroy properties, causing distress and recovery can be costly both to individuals and the government, and deterred new investments in the flood prone area (DID, 2017).



Source: (DID, 2017)

Flood Management Approaches

Initially, flood management focused on the urgent need to provide immediate flood relief works as well as to implement major flood mitigation projects to "catch-up" with the continuous and intense urban development.

New non-structural measures were introduced and the most significant being that was required under Manual Saliran Mesra Alam. Since 2001, compliance to this manual is now a mandatory requirement for all new urban development projects.

Since the new millennium, the DID has adopted the Integrated River Basin Development and the Integrated Flood Management approaches for its flood management programmes. These will provide a balanced approach between structural and non-structural measures as well as higher levels of public participation (DID, 2017).

Flood Relief Machinery and Organisation

Government has established the Natural Disaster Relief Committee in 1972 with the task of coordinating flood relief operations at national, state and district levels with a view to prevent loss of human lives and to reduce flood damage.

DID is one of the committee members and the organisation of flood relief and its operation is based on the Operation Procedure No.29 published by the National Security Council. Besides, DID has published Circular No.2/2003-"Guidelines for Management of Flood Disaster during the Monsoon Season and Flash Floods", which is to coordinate the preparation of flood operations at federal, state and district levels (DID, 2017).



Non Structural Measures



Source: (DID, 2017)

Master Plan

- Studies: Study on River Basin and Flood Mitigation
- Drainage Master Plan Study

Catchment Management

- Development Control
- Land Preservation
- High land use management

Water related legislation

No	Legislation
1	Water Act, 1920
2	Geological Survey Act, 1974
3	irrigation Areas Act, 1953
4	Streets, Drainage and Buildings Act, 1974
5	The Forest act, 1984
6	The National Code, 1985
7	The Incorporation (State Legislature Company) Act, 1962
8	The Drainage Works Act, 1985
9	The Fisheries Act, 1985
10	Environmental Quality Act, 1974
11	Land Conservation Act, 1960
12	Town and Conutry Planning Act, 1976
13	Local government Act, 1976
14	The Merchant Shipping Ordinance, 1952
15	The Port Authorities Act, 1963
16	The Emergency (Essential Powers) Ordinance No.7, 1969
17	Selangor Water Supply Enactment, 1997
18	The Mining Enactment, 1929
19	Selangor Waters Management Authority Enactment, 1999

Integrated Flood Management Flood Hazard Map **IFM Principles** · A risk assessment tool Water · To reduce the adverse impacts of flood Resources Management disasters · A basic step in the formulation and effective implementation of either structural or nonstructural flood mitigation measures **Definition of Integrated Flood Management (IFM)** · An integrated approach for an effective and efficient flood mitigation management Integrated Flood Management · Maximise the efficient use of flood plain · Minimise damage to properties and loss of life Land Use Management **Elements of Integrated Flood Management (IFM)** · Maximise the positive aspects of water cycle · Integrate land and water management Coastal · Adopts best mix of strategies Zone Madagement · Ensure participatory approach Management · Adopts integrated hazards management

Source: DID 2017

The IFM concept of 'Living with flood' is based on the following principles:

- Employ a basin approach
- Treat floods as part of the water cycle
- Integrate land and water management
- Adopt a mix of strategies based on risk management approaches
- Enable cooperation between different agencies
- Ensure a participatory approach

National Flood Forecasting and Warning Centre in Malaysia

Objectives

To provide accurate and reliable forecast and warning of impending floods for public safetyand reduction in risks and property damages.

Functions

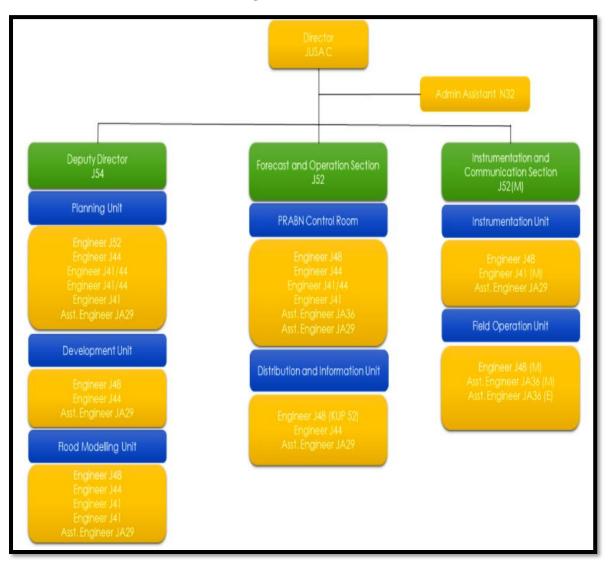
- To develop, maintain and operate flood forecasting and warning system comprising hydrodynamic and hydrological data collection and telemetry systems and ICT infrastuctures.
- To provide timely dissemination of flood forecasts and early warning to flood disaster response agencies and the public.
- Enhance disaster resilient communities which can absorb the shocks of flood, respond, react and able to recover quickly after the flood is over.

Client Charter

Implementing flood forecast and warning dissemination monsoon two days earlier to flood disaster related agencies and flood victims in Kelantan, Terengganu and Pahang River Basin.

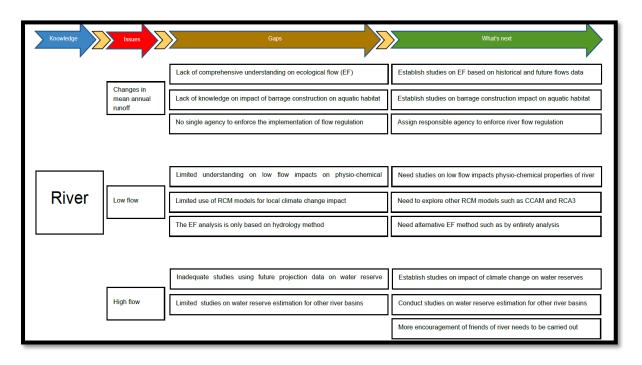
To provide flood report within 24 hours after flood event (DID, 2018).

Organisational Chart



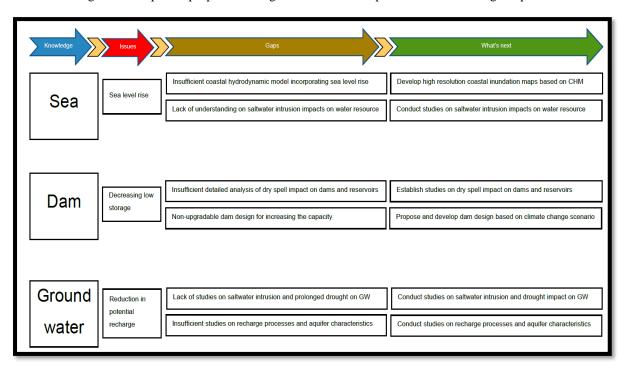
Source: (DID, 2018)

1.2.3. Strategies for Water Management under Possible Climate Change Impact



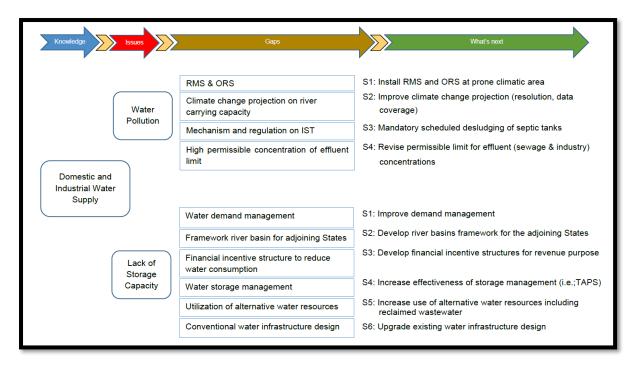
Source: (National Water Research Institute of Malaysia, 2021)

Figure 17. Gaps and proposed strategies for river under possible climate change impact



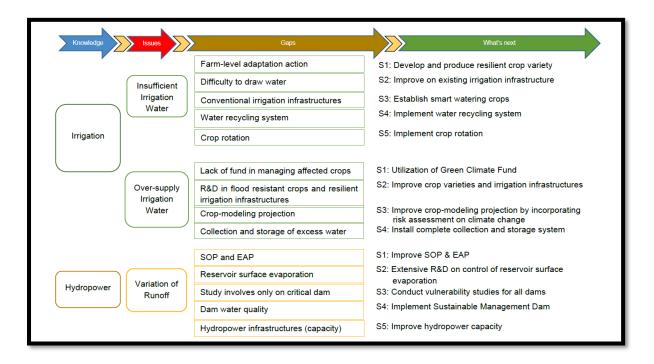
Source: (National Water Research Institute of Malaysia, 2021)

Figure 18. Gaps and proposed strategies for sea, dam, and groundwater under possible climate change impact



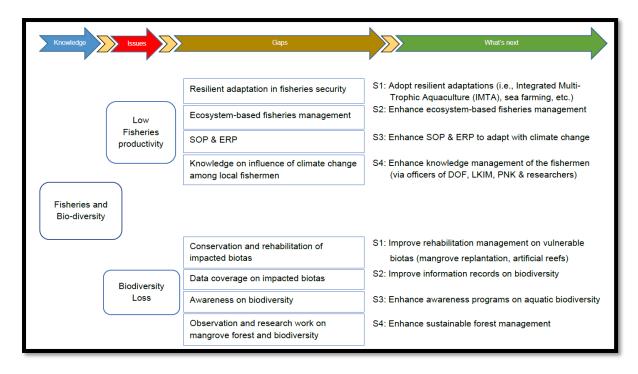
Source: (National Water Research Institute of Malaysia, 2021)

Figure 19. Gaps and their corresponding strategies for sector water utilisation under possible climate change impact



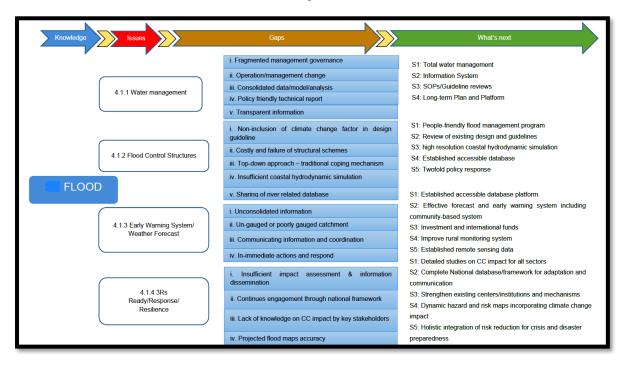
Source: (National Water Research Institute of Malaysia, 2021)

Figure 20. Gaps and their corresponding strategies for sector water utilisation under possible climate change impact



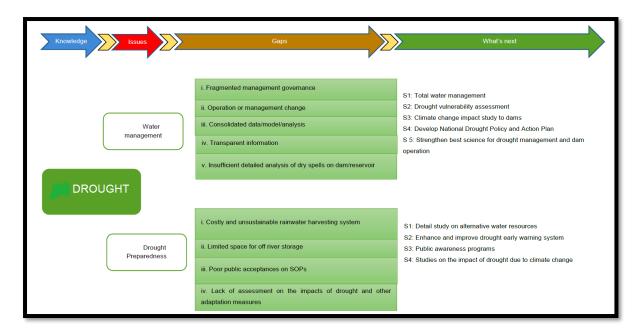
Source: (National Water Research Institute of Malaysia, 2021)

Figure 21. Gaps and their corresponding strategies for sector water utilisation under possible climate change impact



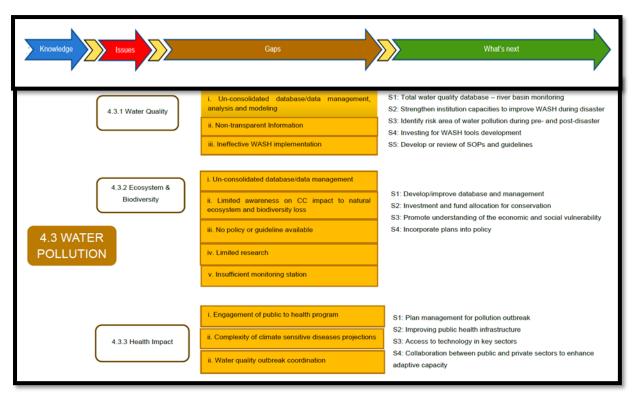
Source: (National Water Research Institute of Malaysia, 2021)

Figure 22. Gaps and their corresponding strategies for water-related disasters – flood under possible climate change impact



Source: (National Water Research Institute of Malaysia, 2021)

Figure 23. Gaps and their corresponding strategies for water-related disasters – drought under possible climate change impact



Source: (National Water Research Institute of Malaysia, 2021)

Figure 24. Gaps and their corresponding strategies for water-related disasters – water pollution under possible climate change impact

1.2.4. Environment-friendly Mining

Environment friendly mining which involve the government both in and out of Malaysia

By

Ts. ChM. Dr. Abdul Hafidz Yusoff, Universiti Malaysia Kelantan (UMK)

A recent United Nations' (UN) report found that 26 % of the world's carbon emissions stem from extraction and early processing of metals and other minerals. Reducing the environmental impacts of mining activities is recognised as a key component of low-carbon economic development. Cornish Lithium, a company set up in 2016 to explore English county's lithium reserves, which are comparatively abundant in geothermal water, uses integration of satellite imagery, drones and 3D subsurface mapping and previous historical mapped data of more than 200 years to locate the highest potential of large lithium deposits. The firm's collaboration with local communities, government and academia had greatly reduced trial-error exploration amount of forests and overburden stripping. Water boreholes were drilled into the permeable geological structures to intercept the fluids at approximately 1km deep at targeted site and the water was pumped into a processing plant to extract lithium before being injected back into the underground. This method has far less impact than the traditional large open-air evaporation basins (IET).

Other than the current regulations under Malaysia Environmental Quality Act 1974 and State Mineral Enactments, plan for improving efficiency and decreasing the environmental impact of mining also involves shutting down illegal and unregulated mines, choosing environmentally friendly general mining processes, implementing recently discovered green mining technologies, cleaning up the sites of shutdown mines, reevaluating cut-off grades, and research and development of green mining technology (MIT Mission, 2016).

Biomining by using non-pathogenic bacteria as initiatives becomes an important industrial application in South Africa, Brazil and Australia, with 20% of global copper production comes from bioleaching (BBC News Technology 17406375). Mine-site zero emission vehicles which can generate electricity directly from hydrogen or natural gas, which only produces water vapours as waste or battery driven, have been produced by Finland company Epiroc (Epiroc). Rio Tinto, an Australian company is running a pilot mine with methane capturing technologies in New South Wales and carbon dioxide storage in Victoria Australia, with over 60,000 tonnes stored in 2020. Dundee Sustainable Technologies, a Canadian company has developed a new hydrometallurgical process of chlorination to replace the use of extremely toxic cyanide and eliminate the need tailing ponds and containment collapse risk. Phytostabalisation is by Chile research studies to retain contaminants by using plant growth to reduce soil heavy metal Aeolian mobility, as an initiative to **treat mine waste**. Operator training by using a **simulator** can greatly reduce cost and fuel usage, and thus less carbon emission. Scrap mining uses ever-reusable resources for other mining initiatives as recycled metal are cheaper and sustainable. Ecosphere Technologies in Australia uses Ozonix to treat bacteria, soluble organics in mining residual water by using chemical. eMalahleni Local Municipality in South Africa implements a desalination plant, contributing near-zero waste facility. Barrick Gold mining company in Australia currently receives 19% of its power from renewable energy. Surface miner 2200 SM is used to reduce noise and air pollution by preventing the conventional drilling and blasting activities.

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1.2.5. Integrated River Basin Management (IRBM)

River Rehabilitation and Restoration through SMART Partnership: Government Role

Dr. Kalithasan Kailasam, Global Environment Centre (GEC)

Integrated River Basin Management (IRBM) approach seeks to integrate water resources management with ecosystem management and enable the incorporation of upstream and downstream considerations into decision-making and subsequently the management of water resources (Keizrul Abdullah, 1999). IRBM approach will lead to cleaner and healthier rivers through better protection, restoration and rehabilitation of riverine ecosystems and thereafter improves the status of biodiversity (Kailasam, 2005).

In recent years, there has been an increased recognition of the need for increased involvement of stakeholders in the management of rivers (Chan, 2005). It has now been widely recognised that unless a broad range of stakeholders, including many government agencies, service providers, politicians, general public, private sector, local communities and NGOs become actively involved – efforts towards river management with be neither successful nor sustainable (Bent Lauge Madsen, 1995a, 1995b). This paper shares the different engagement processes on how the government can play a significant role in river management.

Government agencies play significant roles not only on the policy level, but also to translate it into action and ensure the health of the river, especially on-ground conservation of river basin, especially through watershed protection, restoration and rehabilitation. Previously, the agencies focused mainly on "hard approach", especially engineering solution to deal with watershed management and issues. As highlighted by IWRM/ IRBM as well as GEC's more than 20 years of experience on river care, the root to effective river basin management is mainly on 'human factor' (human behaviour and practices). Civic Science Approach which emphasises the HEART approach, whereby Awareness, Knowledge and Skill will enable Actions to be taken by relevant target groups is equally required and still lacking. Therefore, to address and solve the issues at their root causes, localised engagement, i.e. amongst all the stakeholders, especially the local communities is vital and has been promoted by GEC for the past 15 years. It is important to factor in the humanistic approach, such as the power of community in alleviating issues such as river pollution as well as basin monitoring.

Balancing "top down" and "bottom up", as well as 'Hard & Heart' approaches are the key aspects in ensuring project ownership and sustainability. Therefore, the key of this approach is building relation and trust of all stakeholders, especially community with the government. One of the success models is public, private partnership (PPP) which emphasises collaboration of the stakeholders and beneficiaries: government (cross agencies), private sector, NGOs, and public.



Figure 25. River basin smart partnership model

In ensuring the above, a SMART Partnership mechanism was established and promoted as the focal platform to increase engagement and ownership of river. The SMART partnership help to strengthen the relation and engagement of governmental agencies and other relevant stakeholders with NGOs, local communities, the public and media in protection, restoration, rehabilitation and monitoring of river basin activities.

There are a few exemplary models of SMART Partnership as in the above diagram, by on their own or forming smart partnership with others (agencies, private sector, foundation, international funding agencies, NGOs, community/public and universities/research institutions). Below are some of the good examples of river basin management by using the SMART Partnership model by GEC with government agencies and private sectors.

One of the good examples of SMART engagement project is the Malaysian Government's biggest River Restoration and Beautification project; *River of Life Public Outreach Programme* (ROL POP) (http://www.klriver.org) which involves multi-level of engagement with all relevant stakeholders. At the local government level, the Local Agenda 21 platform is another successful smart partnership model on sustainable stakeholder engagement. Besides that, the private sector and foundation also contribute significantly on sustainable river basin management in Malaysia. A good example that shows significant impact is SPARK Foundation's *W.A.T.E.R Project* (Working Actively through Education and Rehabilitation): Sg Penchala River Restoration Project through the SMART partnership from 2004 until now with continuous progress and expansion of initiatives that benefits not only the environmental aspect of river, but also social and economic of nearby communities

(http://www.waterproject.net.my). Another good example of foundation-based engagement is by Yayasan Hasanah: *Management of Kinta River Basin for Community and Ecosystem Services* through active community and stakeholder participation. It emphasises the multi – agencies' roles on upstream of Sg Kinta catchment management together with other beneficiaries, including the Orang Asli communities. Besides, the Mainstreaming of Biodiversity Conservation Into River Management in Malaysia (Upper Kinta and Klang River Basin) is also a great example to show how government agencies (DID, Malaysia) can work with the international agencies (GEF and UNDP) and NGO (GEC) as the implementing partners. In addition, the Empowering Targeted Orang Asli Communities in Natural Resource Conservation and Sustainable Livelihoods project with UNDP-MOF Malaysia; Sustainable Water Resource Management for Community via Drinking Water Supply with HSBC Bank Berhad; and GEC's National River Care Fund are some of the successful case models.

On partnership with the local community and public, a good example can be seen through the network of *Friends of Klang River Basin* (FOKRB) and other Friends of River Groups. The key outcomes of this partnership include the establishment of partnership between various local proactive community groups and government agencies for joint adoption, monitoring, collaboration, information sharing, as well as networking amongst stakeholders as information exchange mechanism to share experience and related lessons learned. All relevant project information on the stakeholders involved, the government agencies' roles and their contributions to the achievement of the project/programme highlighted above are available on the website www.riverranger.my.

The SMART Partnership **opens up significant notions to embark**, such as an advisory role, which is an important part in contributing ideas, approval and resources (in kind) to the project implementation. The model also complements their technical expertise with other agencies, with knowledge and skills required to manage watershed in a more natural way. Besides, the agencies can understand better about what is required to manage rivers sustainably and provide ideas on how to initiate and participate effectively in regard to community participation in watershed management, allow/expose the government officers to issues faced by the communities and provide opportunities for them to develop solutions through available means. It is also an opportunity for the government officers to form network with the community members. Therefore, the public will have direct access/contact with related government officers from relevant agencies. The public need to be acknowledged and given the recognition and ownership to protect their environment and surroundings while blending well with urbanisation and development together with the goals of government/agencies.

Government agencies can also extend their support and acknowledge the ongoing programmes or activities as well as work in hand with NGOs and CBOs by providing technical support as well as collaborating partners. Examples of supporting programmes developed and run by NGOs are GEC's RIVER Ranger, SMART Ranger and DRH2O. Another role that the government agencies can play is by recognising the partnership initiative by other stakeholders, especially the public, local communities and volunteers. Platforms like ROLPOP Award, Sekolah Lestari, SGDs Awards, World Water Day Award

and River Care Award are some well-established platforms to recognise the target groups (drivers). In addition, financial support volunteerism and network amongst stakeholders and communities is equally important, whereby platforms such as National River Care Fund (NRCF) by GEC, LA21 Community Initiatives by the local Authorities, Urban Community Garden Technical Support by the Department of Agriculture (DoA), Friends of Rivers (FoR) are some of the best available case studies that showed the different roles of government agencies in supporting various undertaken initiatives.

To summarise, the shared SMART Partnership above highlights the benefits of multi-governmental agencies' engagement as below:

- (a) Establish focused sustainability mechanisms (financial, human resource, institutional) which are cost effective and time saving. However, implementing one programme for the whole catchment will be more cost effective as integrating the programmes will avoid delays associated with separate contracting, initiating and managing different phases or small-scaled projects.
- (b) Optimise resources which enable economies of scale and production of common materials and joint activities across all sub-catchments rather than separate initiatives,
- (c) Avoid duplication of work, especially in design, duplication of materials and activities as well as approvals across separate sub-catchment phases and contractors,
- (d) Enhance consistency in key messages and principles, whereby common and integrated messaging on common issues across sub-catchments can be standardised,
- (e) Ease of management and administration, whereby an integrated contract to manage under the guidance of one established steering committee, rather that six to eight separate contracts and coordination mechanisms.

Overall, it leads to better and more lasting results. The integrated approach will enhance the quality of results and improve sustainability by enabling the development of long-term multi-stakeholder partnerships. The governmental involvement and engagement are important and must work in hand with other main stakeholders, such as NGOs, communities/the public, private sectors, education and research institutions through the smart partnership in any project, which will eventually lead to long-term partnership, ownership, win-win approaches that lead to sustainability.

Water Catchment and Integrated Water Resources Management- A Water Cycle in a Large River Basin



1.2.6. Integrated Lake Basin Management (ILBM)

Against this background of the unique resource value of lakes, negative impacts of excessive human use of these resources, and resultant difficulties of managing lakes and their basins for sustainable use, the International Lake Environment Committee (ILEC) examines lake basin management experiences in many countries around the world. The goal was to develop an effective, scientifically-sound integrated approach to lake-basin management. This approach, designated integrated lake basin management (ILBM), is a way of thinking that assists managers and stakeholders of lake basin to manage lakes and their basins for sustainable use, and particularly to sustain ecosystem regulating services. Based on a previous Lake Basin Management Initiative undertaken in cooperation with the World Bank and the Global Environment Facility, ILBM considers that lakes have many resource values that require special management considerations because of their lentic water properties (ILEC, 2005). Recognising that lakes and their basins are a single mutually-interacting management units, ILEC has determined that a good lake basin management can only be realised through ILBM. In addition, since the biophysical features are associated with lentic water systems such as lakes, this management framework promotes continuous improvement in lake basin governance by integrating six management elements that are essential for an effective lake basin management. These lake governance pillars include institutions, policy, stakeholder participation, science, technology and funding, and they are fundamental to effectively address impairments to ecosystem services, especially those involving regulating services.

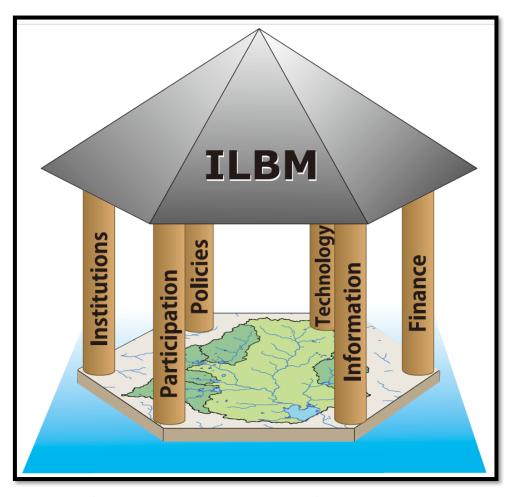
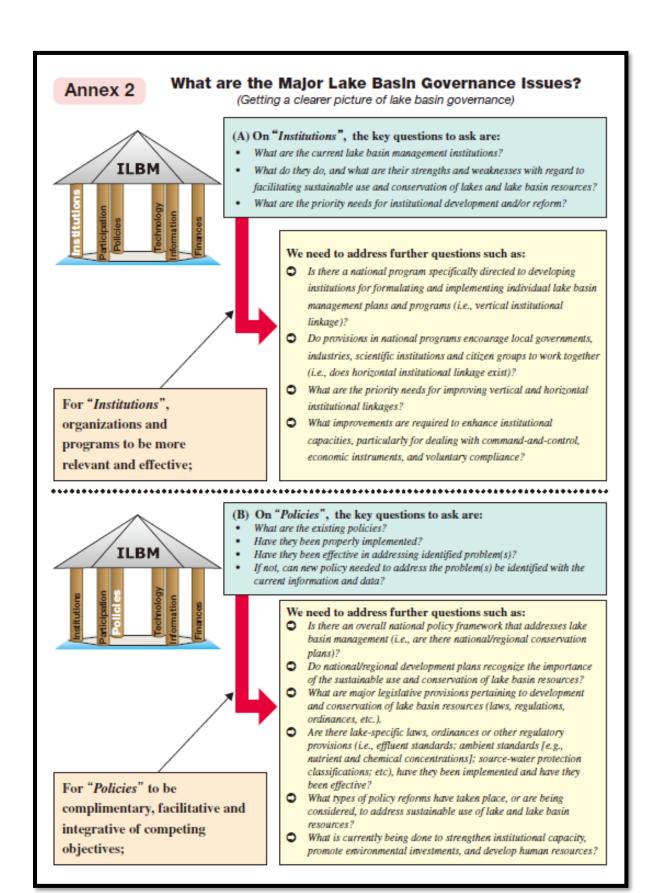
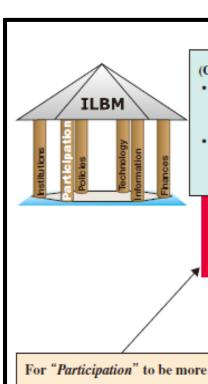


Figure 26. ILBM governance elements (Nakamura & Rast, 2012)



Source: (Nakamura and Rast, 2012)



(C) On "Participation", the key questions to ask are:

- What are the major lake basin management stakeholder groups (i.e., government agencies and/or sectors; institutions; organizations; interest groups; private sector; lakeshore residents, downstream water users, etc.)?
- What mechanisms exist for stakeholder involvement, and how well are they
 functioning (e.g., how well have non-governmental organizations conveyed their
 concerns within the context of government plans and programs)?

We need to address further questions such as:

- How can existing stakeholder involvement in designing and implementing lake management program(s) be improved?
- How can the involvement of voluntary associations, village organizations, CBOs, NGOs, etc., be better promoted?
- How can the involvement of women, the disadvantaged, and affected members of community be promoted/assured?
- What are the relevant roles and involvement of international/external NGOs? What are the benefits and disbenefits

For "Participation" to be more instrumental in obtaining public opinions and inputs;

(D) On "Information", the key questions to ask are:

 What information and data are available for lake basin management decisionmaking?

- Are the existing information and data sufficient to inform stakeholders? Are they used for lake basin management decision-making?
- Do they include sources of information from non-traditional sources, and from local sources?
- Are there regular monitoring programs, and have they produced useful research results?

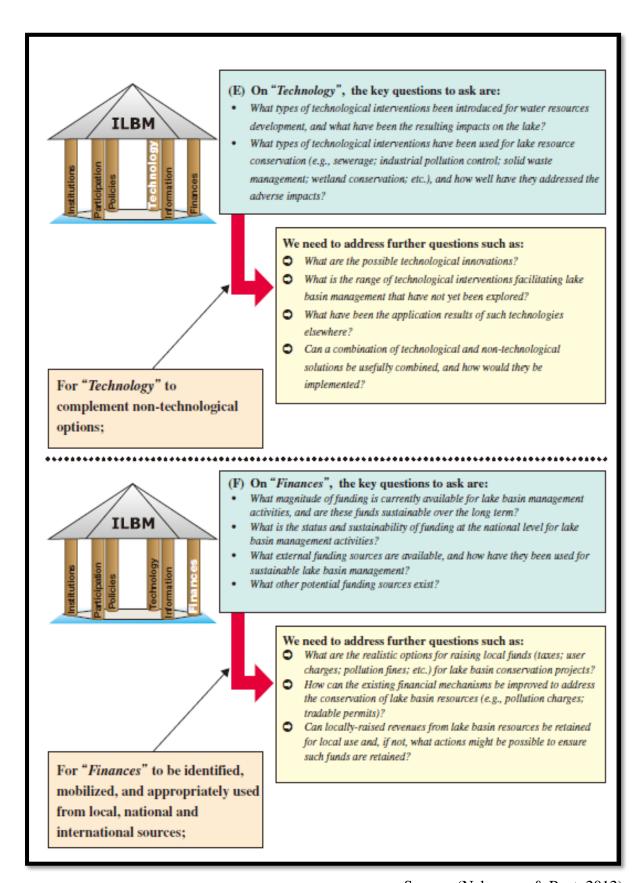


We need to address further questions such as:

- What scientific information and data are available to improve lake basin management?
- If the knowledge base is inadequate, how can the needed information and data be obtained?
- How can collaboration among scientific institutions working on a given lake basin be enhanced (including universities, governmental/ non-governmental research institutes, private sector laboratories, etc.)?
- How can such institutions collaboratively facilitate lake basin management decision-making?
- How can information dissemination and sharing be improved?
- How can transparency and access to data and information be improved?

For "Information" to be more relevant to both the immediate and long-term needs of decision-making;

Source: (Nakamura & Rast, 2012)



Source: (Nakamura & Rast, 2012)

1.2.7. Integrated Coastal Zone Management (ILBM)

Status of Marine Water Quality Stations

In 2019, DOE reported that out of the 368 local marine water quality monitoring stations at coastal, estuary and islands, 74 stations were excellent, 113 stations were good, while 166 stations were moderate (DOE, 2019). The remaining 15 stations were categorised as poor. A total of 11 poor water quality stations were located at the estuary, three were at coastal area while the remaining one was located on the island.

Johor and Selangor recorded five poor stations, respectively, while Pulau Pinang recorded two poor stations and one poor station located in Perak, Malacca and Kelantan. Faecal coliform, dissolved oxygen, nitrate and phosphate were the key parameters that deteriorated the marine water quality. The new version of MMWQI for marine water quality index calculation in 2019 demarcated a new benchmarking to monitor, which is more sensitive and stringent towards changes in marine water quality.

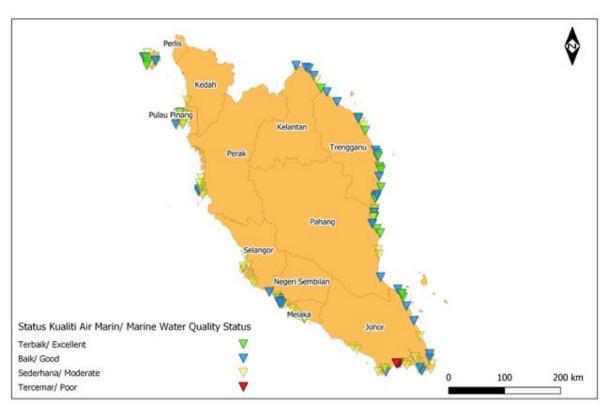


Figure 27. Location of coastal stations and its index in Peninsular Malaysia (DOE, 2019)

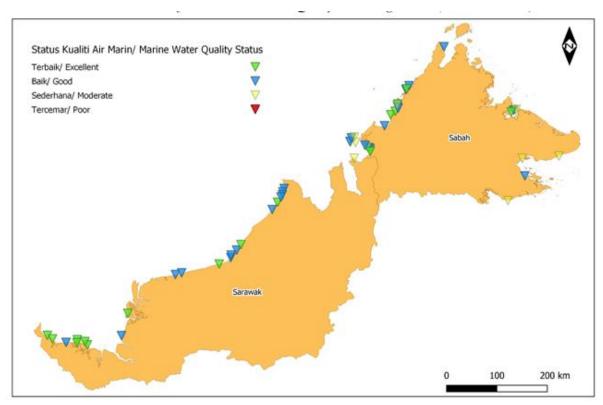


Figure 28. Location of coastal stations and its index in Sabah and Sarawak (DOE, 2019)

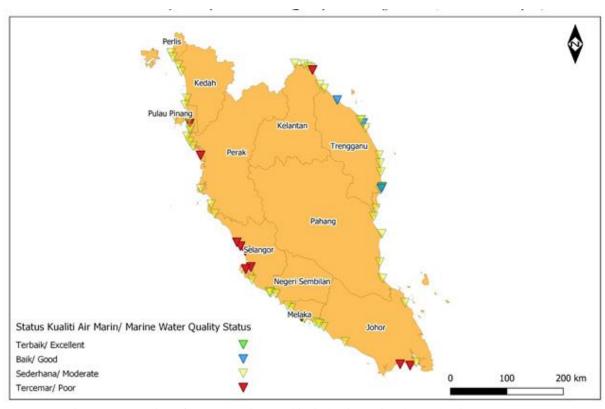


Figure 29. Location of estuary stations and its index in Peninsular Malaysia (DOE, 2019)

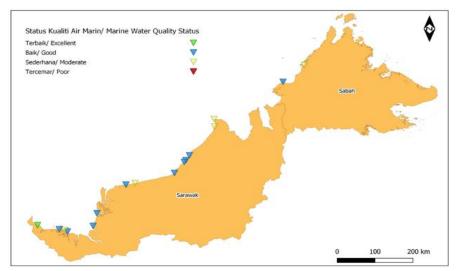


Figure 30. Location of estuary stations and its index in Sabah and Sarawak (DOE, 2019)

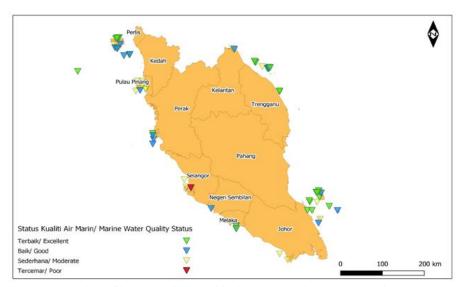


Figure 31. Location of island stations and its index in Peninsular Malaysia (DOE, 2019)

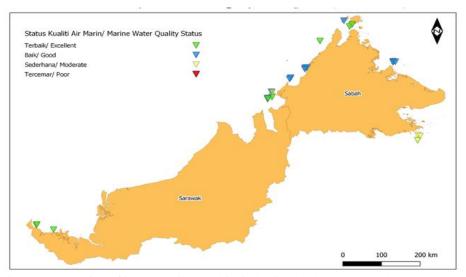


Figure 32. Location of island stations and its index in Sabah and Sarawak (DOE, 2019)

Sustainable coastal environmental management requires integration of social, cultural, ecological and economic activities that are consistent with the goals of sustainable development (Stocker et al., 2012). University of Wollongong in Australia defined the coastal management theory proposed by Harvey and Caton (2003) as "the management of human activities and sustainable use of Australia's coastal resources in order to minimise adverse impacts on coastal environments now and in the future" (Stocker et al., 2012). Meanwhile, adaptive and collaborative approaches of coastal management have integrated with shared governance and the focus has been on public participation, ecological awareness, improved integration between various sectors, less engineered solutions, and in essence, to the concept of sustainable development (Stocker et al., 2012).

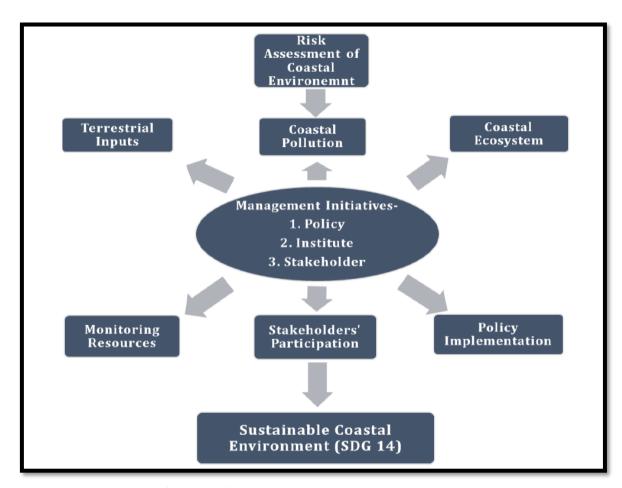


Figure 33. Conceptual framework for achieving sustainable coastal environment (Mokhtar et al., 2017)

Coastal zones are the link between land and the sea, and are unique areas characterised by high marine biodiversity. They are environmentally sensitive and economically valuable resources. Coastal zones provide vital important ecosystem services such as seafood, protection from natural hazards, ecotourism and climate change mitigation. They are also of great aesthetic value and a part of our cultural heritage. Activities such as aquaculture and tourism are beneficial to the economy and human well-being, but if not managed effectively they can also place significant pressures on coastal zones through biodiversity loss, contamination by hazardous substances, introduction of non-indigenous species and marine litter (EU, 2014). It has been highlighted by the United Nations (2017) that the adverse impacts of climate change (ocean acidification), overfishing and marine pollution are jeopardising the recent gains in

protecting the world's oceans, as required under the Sustainable Development Goal (SDG) 14. The target 14.1 clearly states that by 2025 countries must take measures to prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.

Coastal environment- challenges and management frameworks

Malaysia's main agricultural economy started to diversify significantly with the rapid expansion of manufacturing infrastructure (Mokhtar et al., 2010). Various policies, such as the New Economic Policy (1971–1990), Vision 2020 (1991–2020), National Development Policy (1991–2000) and National Vision Policy (2001–2010), supported these amongst others. According to the Economic Report 2014/2015 published by MOF, the manufacturing sector was projected to contribute 5.5% of the total gross domestic product (GDP) in 2015, while the agricultural sector to contribute 3.1% of the total GDP in the same year (MOF, 2014).

With the manufacturing sector intensified for economic benefits, the government introduced the Environmental Quality Act 1974 (EQA 1974) for environmental protection through regulations aimed at reducing and eliminating the negative impact of industrialisation. This Act covers different aspects of environmental protection, including pollution and contamination caused by hazardous substances. Due to industrialisation and GDP contribution by the manufacturing sector, Malaysia allows the use of different types of material and processes by the industry. However, DOE regulates the emissions, discharges and deposit of environmentally hazardous substances, pollutants and wastes. In this regard, EQA 1974 gives DOE the mandate to apply measures necessary for monitoring environmental impacts and controlling environmental degradation.

Accordingly, the Fisheries Act 1985 is responsible for sustainable management of marine resources besides helping with the enforcement of marine reserves. Ecosystem Approach to Fisheries Management is one of the latest measures taken to rationally manage the fisheries resources. Fisheries Department depends on DOE for pollution control of coastal waters through the EQA 1974. For water resources management in Malaysia, the Federal Government works closely with State Governments. Better coordination is required amongst the federal, state and local authorities for the coastal pollution management through better implementation of policies. The engagement and participation of public, private and civil society are essential for the integrated and holistic approach towards coastal pollution management (Mokhtar et al., 2017).

1.2.8. Transboundary Groundwater Management (TGM)

GROUNDWATER QUALITY MONITORING

Groundwater water quality monitoring was established in 1997 (DOE, 2019). The sites were selected based on specific land use. Groundwater monitoring programme was carried out at 120 groundwater quality monitoring stations (wells) throughout the country (Figure 34). However, groundwater sampling was conducted at only 115 stations. This was for the reason of no groundwater discharge due to development factors and rocks cracking in the groundwater quality monitoring stations. Figure 34 shows the distribution of groundwater quality monitoring stations (wells) in Malaysia by land use category. In 2019, 459 samples were analysed for volatile organic compounds (VOCs), pesticides, heavy metals, anions, bacteria (coliform), phenolic compounds, total hardness, total dissolved solids (TDS), pH, temperature, conductivity and dissolved oxygen (DO).

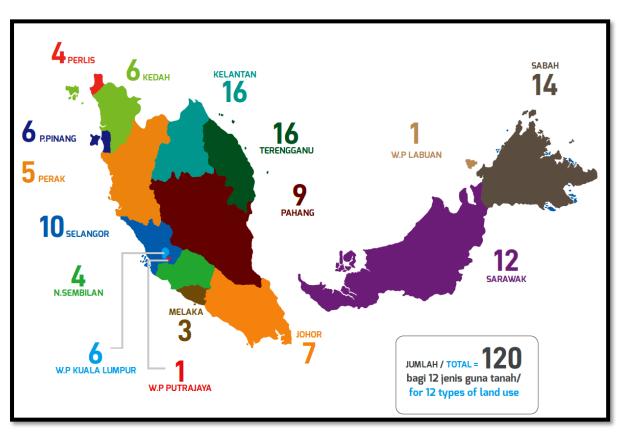


Figure 34. Monitoring well for each Malaysia state, 2019 (DOE, 2019)

The Malaysia Groundwater Quality Index (MGQI) is used to determine the groundwater quality status and its category. MGQI was developed based on main parameters, such as pH, iron, total dissolved solids, nitrate, E-Coli, phenol and sulphate. MGQI with a scale quality that ranged from 0 to 100 will identify the quality of the groundwater from excellent to very poor (Figure 35).

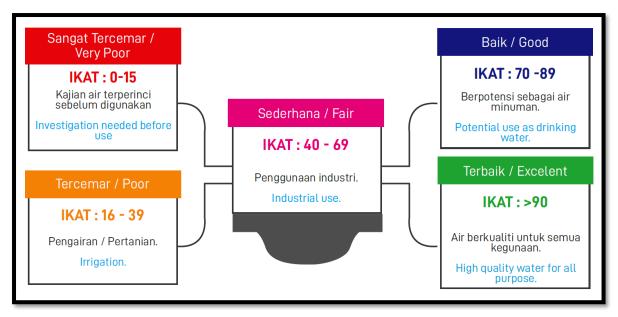


Figure 35. Groundwater Quality Index Classification (DOE, 2019)

Governance of Groundwater Resources

Former United Nations Secretary General, Boutros Boutros-Ghali once said that "the best way to deal with bureaucrats is with stealth and sudden violence." It seems Boutros-Ghali held a rather glum view of bureaucracies, yet he would probably agree that we should first do an institutional analysis ('stealth'), so that we know how to use 'sudden violence' to implement a sound groundwater policy, in doing so answering the research question: What is the current institutional setting with respect to groundwater resource management and how can it be changed to enable groundwater extraction? An understanding of the institutional setting is important, especially in the field of integrated water, management, whereby problems are often complex and poorly defined because knowledge is incomplete and policy actors can have different problem-perceptions and competing interests. By ignoring the institutional feasibility, one risks developing an irrelevant (technical) solution that simply will not be implemented (Stek, 2008).

Having established the purpose and necessity of an institutional analysis, this brings us to selecting a framework for performing the institutional analysis. But which analytical framework is suitable for evaluating the institutional setting? And, more importantly, how can this framework lead to useful conclusions and recommendations? Given that governance has strong local characteristics, the framework must be able to perform under different water management regimes in different countries.

Bressers et al. have developed an institutional analysis framework for comparing water resource management regimes in different countries and identified policy coherence as the key criterion for successful and sustainable water management based on an extensive review of European and American literature on natural resource governance. Furthermore, Bressers et al. successfully applied their method in six European countries, including France, Spain, the Netherlands and Switzerland, all of which have very different histories and systems of governance (Bressers, et al., 2003). Although the policy coherence framework was developed

for and applied in six continental European countries, the ideas on which it was based find wide application elsewhere, including in the United States and the United Kingdom. Given that the Malaysian government and legal system are modelled on that of the United Kingdom, it is reasonable to assume that the policy coherence framework can also be applied to groundwater management in Kuala Lumpur.

Analytical Framework

Bressers maintains that policy coherence between all relevant policy actors is necessary to manage water sustainably. This is because it entails policy actors in adapting each other, stabilising the water management regime and ensuring the commitment and cooperation necessary to carry out sustainable water policies. Policy coherence cannot be imposed because there is no policy actor who has full control. Even a powerful government agency will need to respect property rights, legal jurisdictions and prevailing interests (Bressers et al., 2003).

Bressers also observes that there are several key barriers to make a groundwater policy that leads to a win-win situation or profitable trade-offs between policy actors. Uncertainty, along with the complexity of problem, the long-term time-scale of groundwater changes and pluralism (i.e. the presence of multiple policy actors) can prevent effective decision-making (Bressers et al., 2003). While the previous chapter attempts to reduce uncertainty through modelling, this chapter focuses on how cooperation between multiple policy actors can be stimulated.

The other plank of Bressers' research concerns water use rights. However, this topic is not very relevant to this specific study because the property and use rights of groundwater are very simple. In Kuala Lumpur groundwater use rights are regulated by a single agency and current groundwater use is insignificant.

In analysing policy coherence, Bressers also stresses the need to identify, taking into account that decision-making happens at many levels, and that these decisions influence each other. The institutional analysis is conducted by answering a list of questions that cover all policy coherence framework elements: levels of governance, policy actors, perceptions and objectives, policy instruments and resources. The conditions for policy coherence identified by Bressers et al. were a tradition of cooperation, joint problems, joint opportunities, the presence of a credible alternative threat and institutional interfaces (Bressers et al., 2003).

Institutional Analysis

The institutional analysis is structured along the elements of Bressers' governance model (policy instruments and resources are combined under a single heading).

Levels and Scales of Governance

Malaysia is a federation in which the State Governments have significant autonomy. *Under article 73 of the federal constitution, state governments have jurisdiction over water and land resources, whereas the Federal Government can legislate on interstate issues such as pollution control, mining and public health* (Perunding Zaaba, 1999). A complete listing of organisations involved in Kuala Lumpur's groundwater management is given in Table 3.

Selangor has created a single agency, the Selangor Waters Management Authority, to manage its key responsibilities in the fields of water resource and water supply. In Selangor and Kuala Lumpur the water supply system is operated by the Selangor Water Supply Corporation, a private company which has a concession granted by the Selangor State Government and which is part-owned by the Selangor State Investment Company: Kumpulan Darul Ehsan Berhad.

The Selangor Waters Management Authority relies on expertise from the Federal Government's Department of Minerals and Geoscience and the Department of Environment to carry out its duties. At the state level, the Selangor Waters Management Authority interacts with the Department of Irrigation and Drainage and Public Works Department. These two agencies are involved in the design and construction of physical infrastructure. The Town and Country Planning Department is responsible for land use planning at the national and state levels, which includes gazetting sensitive riparian areas and groundwater recharge zones.

Table 3. Overview of organisations dealing with groundwater in Kuala Lumpur

	Ministry of Natural Resources and Environment
	Department of Environment
	Department of Minerals and Geoscience
	National Hydraulic Research Institute Malaysia
	Ministry of Federal Territories
Federal Agencies	Kuala Lumpur City Hall
	Ministry of Energy, Water and Communications
	National Water Services Commission
	<u>Treasury (Ministry of Finance)</u>
	Water Asset Holding Company
	Ministry of Health
	Ministry of Natural Resources and Environment
	Department of Irrigation and Drainage
Federal and State	Ministry of Housing and Local Government
Agencies	Town and Country Planning Department
	Ministry of Public Works
	Department of Public Works
	Selangor Waters Management Authority
Selangor State Agencies	Kumpulan Darul Ehsan Berhad (Selangor State Investment Company)
Scialigor State Agencies	Local Authorities of Selangor State such as Ampang Jaya Municipal
	Council, Petaling Jaya City Council, etc.
Private Companies	Selangor Water Supply Corporation

Source: (Stek, 2008).

The Selangor Water Supply Corporation, being a private water utility, is regulated by the Federal Government's National Water Services Commission. The Commission regulates water prices, piped water quality and water delivery. The Selangor Water Supply Corporation buys water from water treatment plants which are operated by other companies. Some of these plants are privately owned, others are owned by the State Government or the Federal Government's Water Asset Holding Company. Because the Selangor Water Supply Corporation supplies drinking water, it is also supervised by the Ministry of Health, which operates small-scale water supply projects in some rural areas, but not in Kuala Lumpur.

The Department of Irrigation and Drainage, the Department of Public Works and the Department of Town and Country Planning are Federal departments but the State Governments hold significant powers over their state-level operations. The Department of Environment and the Department of Minerals and Geoscience are pure Federal agencies who assist State Governments but are not controlled by them.

Local authorities such as Kuala Lumpur City Hall are required to monitor development in environmentally sensitive areas and withhold building permits if it is deemed prudent to do so (LESTARI, 1997). Local authorities fall under the control of the State Government (there are no local elections), and in the case of Kuala Lumpur, which is a Federal territory, under the Ministry of Federal Territories. It is important to note that the Selangor Waters Management Authority faces several 'holes' in its jurisdiction, notably Kuala Lumpur. In Kuala Lumpur, the Selangor State Government is required to supply water (a duty carried out by the Selangor Waters Supply Corporation) but it has no jurisdiction over the city's water resources.

Research on water management issues is conducted by the National Hydraulic Research Institute Malaysia, an institute of the Ministry of Natural Resources and Environment. An overview of the abovementioned agencies is given in Table 4.

The Malaysian Government is legalistic and hierarchical. This can prevent cooperation between different levels of government. This legalistic nature of the government is evident from the following example about groundwater monitoring activities. The Department of Environment monitors groundwater quality as part of its tasks to control pollution under the Environmental Quality Act (1974). The Department of Minerals and Geoscience monitors groundwater levels because it has to study hydrogeology, as instructed by the Geological Survey Act (1974). This leads to the peculiar situation, whereby both departments operate completely separate groundwater monitoring networks. At Department of Environment wells only groundwater quality is measured. At Department of Minerals and Geoscience wells only groundwater levels are measured. However, both departments fall under the Ministry of Natural Resources and Environment.

In terms of hierarchy, Federal Ministers and State Chief Ministers have roughly the same level of authority. So for a comprehensive groundwater policy to be initiated in Kuala Lumpur, the Chief Minister of Selangor and eight Federal ministers must reach agreement. This fragmentation of authority makes regulation of water resources in Malaysia ineffective (Zakaria, 2001; Madsen et al., 2003; Mutadir, 2006; BERNAMA, 2007). Only the Prime Minister, backed by the Federal Parliament and the Treasury, has a higher standing than the Federal ministers and Chief Ministers. The Economic Planning Unit of the Prime Minister's department establishes five-year plans that direct policy for all ministries and State Governments. The current five-year plan (2006–2010) is the 9th Malaysia Plan.

Historically, politicians from the National Front coalition have controlled the federal government and the state governments. However, following the 2008 general elections the National Front lost power in Selangor to the People's Front coalition. Therefore, the position of the Prime Minister in relation to the Chief Ministers is likely to change in future.

1.3. IWRM Practices between Malaysia and other Countries

AACB sub-sector has compiled the success stories of AACB & Public Participatory Platform for Water Resources Management by other countries as benchmarking exercise. The success stories were analysed via content analysis. The information will be tabulated categorically while making comparison with the strategies of Malaysia. Water management programmes and activities of the following countries seem to be suitable with regard to Malaysian condition, and also relevant to AACB. The countries studied were the United Kingdom, Australia, Sweden, Finland, Singapore, South Korea and Mekong River. Each of the country's water management programme has its own niche and it has to be observed and embedded into Malaysian condition. Almost all water management programmes show the relation between the communities and government entities. The programs also highlight the empowerment of communities, and the people have experienced noticeably good results (ADB, 2012; SIWI, 2015; Josefsson, 2007).

1.3.1. Comparison on IWRM Awareness between Malaysia and the United Kingdom

In comparison with the United Kingdom, AACB sub-sector examined water awareness campaigns in Malaysia that intend to shape water users' habits and perspectives on water, to create responsible water citizens. Example of campaigns in Malaysia and the United Kingdom that intend to create responsible water citizens are tabulated below.

Table 4. Comparison on IWRM awareness between Malaysia and the United Kingdom

Malaysia	United Kingdom
 22 April - World Earth Day. 5 June - World Environment Day Public. 16 September - World Ozone Day Public. 21 October - National Environment Day Public. Environmental Awareness Camps for School & IPT Students. Environmental Partner Programmes; National River Trail Friend of River Mutual aid activities in the river area River Rangers with NGOs Public River Scientist Fellow, School & IPT Students. Sustainable School Award Environmental Award Module of management / importance of water resources for Primary & Secondary School Students Environmentally themed public exhibitions. Environmental Speeches of School & IPT Students. Langkawi Awards Environmental Sustainability Government Agencies, Public, Corporate Bodies, private and nongovernment organisations. 	The Our Rivers campaign was an unofficial public comment process, initiated by green non-government organisations in parallel to the Environment Agency's consultations, aimed at, including local knowledge and more ambitious measures into the final River Basin Management plan (RBMPs)

3 Minute Thesis Competition Environment Malay Students IPT	

1.3.2. Comparison on IWRM Advocacy between Malaysia and the Philippines

AACB sub-sector examined initiatives that promote grassroots advocacy with the goal of creating a network of trained water advocates in country, states and/or districts between Malaysia and the Philippines.

In terms of advocacy, the Philippines adopted:

- 1. "Adopt an Estero Program" in 2012 was one of the programmes under the Environmental Management Bureau (DENR-EMB). In this programme, 430 Memoranda of Agreements (MOAs) were signed with 232 water bodies nationwide. This programme involved participation of the community in collecting and managing water quality data of the adopted water bodies.
- 2. Watershed Management Youth Council (WMYC).
- **3.** Watershed Code was drafted and adopted in 2007 to integrate the various initiatives in the basin (Hearne, 2010).
- **4.** Promote watershed management advocacy amongst the Davao City student leaders and advocates.
- **5.** Participation of women in terms of provision, management, and safeguard water resources. Decision-making in water resources management is no longer considered as strategic-level issues.
- **6.** Flood Mitigation and Management Programme: FMMP transmitted warnings of possible flooding by two-way radio or mobile phone to village volunteers in the project areas. Red Cross volunteers in the villages then wrote up the forecasts on notice boards at prominent village locations and passed on through word-of-mouth.

Management phases and institutional strengthening (top-down but bottom-up enablement) – the Philippines had successfully conducted a river basin management or coordination amongst multi helix stakeholders.

- Citywide Watershed Management Council (WMC) to author the Watershed Management Code.
- Eight river basins; management is integrated under the Watershed Management Ordinance.
- In 1998, Talomo-Lipadas Rivers, the initiative on Philippines-Canadian Environmental and Economic Management Committee to increase the health of the river.
- Davao River Conservation Coordinating Committee (DRCCC).
- Local NGOs coordinate the role in effective participation, collaborating with Catholic Relief and Services (CRS).
- 1974: the National Water Resources Board (NWRB) established to coordinate the use of water for different purposes.
- 1999: Davao River Conservation Coordinating Committee (DRCCC).
- 2007: The City Council approved the Watershed Management Code.

Performance and accountability - Who takes the lead?

- HELP (Hydrology for the Environment, Life and Policy) Davao; management of city's water and environment.
- HELP Davao Network and International training on water management (Khan, 2011).
- Twinning programme with Murrumbridgee 'HELP Demonstrational' River Basin in Australia has expanded the network of technical cooperation and exposure of the city government.
- The framework under local government, a Local Executive Order was issued in the formation of citywide Watershed Management Council (WMC).

Table 5. Comparison on IWRM Advocacy between Malaysia and the Philippines

Advocacy	Malaysia	Philippines
Local Authorities/Government	Medium	High
Women empowerment	Medium	High
School empowerment	Medium	High
Youth empowerment	Medium	High
Leadership empowerment	Medium	High
Community empowerment	Low	High

1.3.3. Comparison on IWRM Capacity Building between Malaysia and other Countries

AACB TF undertook a comprehensive review of literature on capacity building and training for IWRM for WST, with the aspirations of providing suggestions and recommendations for multiple stakeholder groups at the scales of Federal Governments, State Governments, local authorities, individual utilities, and intermediate units of governance while comparing between Malaysia and Mekong River and Singapore.

Table 6. Comparison on IWRM capacity building between Malaysia and other countries

	e 6. Comparison on IWRM capacity building between Malaysia and other countries		
Countries	Details		
Malaysia	There is limited water training centres which lead to poor training rate in water management. Therefore, it will be difficult to ensure effective implementation of AACB WST2040 schemes and programmes to incorporate all the relevant stakeholders of water sector in Malaysia. Existing water academies in Malaysia Indah Water Training Centre, Indah Water Konsortium (IWK) Institut Pembangunan Modal Insan (IPMI), Department of Irrigation and Drainage Environment Institute of Malaysia (EiMAS) Malaysia Water Academy (Malaysia Water Association) Penang Water Services Academy (PWSA) Water Academy, Rahnill SAJ		
Singapore	The Singapore Water Academy (SgWA)		
	The Public Utility Board (PUB), Singapore's national water agency, has set up the Singapore Water Academy (SgWA), a leading training institution offering specialised programmes for water professionals both internationally and locally.		
	The Academy develops competency-based curricula to build on current engineering competencies and develop future capabilities to enhance the engineering skills of the industry for the next phase of growth.		
Mekong	 Mekong Region Futures Institute (MERFI) activities include: The analysis of development investment options by applying complex system tools and by improved cross-sectoral coordination. The implementation of participatory processes to facilitate learning amongst decision making agencies by eliciting, analysing and explaining cross-sector tradeoffs of development investments amongst government agencies, universities and research institutions, and civil society. The facilitation of cross-sector dialogue to share experiences about development investments and minimise cross-sector trade-offs. The development of license free data and analytical tools provided to government agencies, including comprehensive training. The training of government agency staff in the Greater Mekong Subregion (GMS) to assess sustainability related outcomes of development decisions, promoting improved national efficiencies in: sustainable national and regional development maintenance and improvement of ecosystem services community capacity to adapt to climate change poverty reduction well-being and more resilient livelihoods ability to compete in the world market 		
Finland	Finnish Environment Institute SYKE Finnish Environment Institute SYKE offers expertise on vast management measures for rivers, streams and brooks that range from small forestry brooks to large hydropower streams and offers deep ecological understanding with profound hydrological modelling capacity. The special areas of the expertise include improving water status and using scientific knowledge in restoration.		

A multi-criteria assessment method helps in the comparison of cost-effective options and ensures stakeholder participation in the planning phase. Water quality and biological monitoring before and after restoration gives information on how the goals of the restoration were attained.

1.3.4. Comparison between Malaysia and Finland on IWRM

Comparison between Malaysia and Finland in terms of water management at the River Basin level (Water is our DNA), Water Framework Directives.

Finland is a country located in northern Europe, symbolising the northern border between western and Eastern Europe. The strategies used for enabling environment in Finland are laid down in the Act on the Organisation of River Basin Management and Marine Strategy, Government Decree on Water Resources Management and Government Decree on Water Resources Management Regions. The Ministry of Environment and the Ministry of Agriculture and Forestry lead the water resource management in Finland. A national programme is adopted, such as Programme of Measures (PoM) to implement River Basin Management Plan (RBMP). To make this programme successful, management instruments were used to define responsibilities and cooperation amongst all stakeholders to make sure the measures and instruments are concrete and well known. Besides, a monitoring system was also adopted.

Other additional instruments that have been used are rehabilitation of water bodies, education and research (Keto & Gustafsson, 2020). However, due to the transboundary river issues between countries, Finland had to institutionalise the transboundary cooperation between Finland and its neighbours, but this cooperation is considered not necessary in adapting the river agreement because of implementation of the convention, whereby Finland involves in the process of ratifying it. To overcome this problem, a clear definition in basin cooperation and participation of all basin countries is needed to address the IWRM, especially on issues related to sustainable development, management, use and protection of transboundary water (Honkonen & Lipponen, 2018).

Finland's AACB and Public Participatory Platform Initiatives

i. Finnish Watercourse Restoration Network

A platform open for all that provide information and experience in improving the status of water, which comprise campaigns, information sharing via websites, newsletters and social media. Good practices for water protection and restoration, success stories, challenges and failures, use of aquatic ecosystem services.

ii. Lake Vesijärvi Foundation

- Secure funding for research, maintenance, and management efforts.
- Improve the awareness of Lake Vesijärvi by many kinds of communication.
- Promote efforts to improve the water quality of Lake Vesijärvi.
- Prepare a plan for lake management.

iii. Finnish Environment Institute SYKE

Finnish Environment Institute SYKE offers expertise on vast management measures for rivers, streams, and brooks that range from small forestry brooks to large hydropower streams and

offers deep ecological understanding with profound hydrological modelling capacity. The special areas of the expertise include improving water status and using scientific knowledge in restoration.

Preparation of a restoration project includes the choice of physical, chemical, and biological measures and catchment area management techniques to be applied in the target. Ecological flow implementation and a range of ecological compensation options are used for hydropower mitigation. A multi-criteria assessment method helps in the comparison of cost-effective options and ensures stakeholder participation in the planning phase. Water quality and biological monitoring before and after restoration give information on how the goals of the restoration were attained.

Table 7. Comparison between Malaysia and Finland on IWRM

Categories	Malaysia	Finland
Information and data	Sectorised	Finnish Watercourse Restoration Network
Fund and finance	Sectorised	Government
Citizen science	Low exposure	High involvement

Lesson Learned

- 1. Top-down approach is balanced with the bottom-up initiatives.
- 2. Finnish Watercourse Restoration Network as an open platform for all that provides information and experiences in improving the status of water.

1.3.5. Comparison on IWRM between Malaysia and Germany

Table 8. Comparison between Malaysia and Germany in terms of The RhineNet programme (Democracy is giving back to the community)

Theme	Malaysia	Rhine Net Program
Public Participation Framework and guideline	No framework has yet established or guidelines	Harmonising Collaborating Planning (HarmoniCop) was designed to improve public participation. This derived from new European Water Framework Directive incorporates the approach of River Basin Management Planning. Fifteen partners from Belgium, France, Germany, U.K., Hungary, Italy, Netherlands, Spain and Switzerland are involved in the project that each represents a unique network of water-related expertise. The project objective aims to generate useful information on public participation in River Basin Management Plan (RBMP) will be supported by external advisers, constituting a stakeholder platform. Representatives from NGOs, local government, policy-making, water industry and farming served as external advisers during project implementation. Since the beginning of the project in November 2002, the project partners have already received a lot of interest from the public. The project ends in October 2005.
Decision-	Trough water forum	Through river basin organisation
making platform	(Occasional)	
Governance	State level	State level
Fund & Finance	Based on yearly budget (State/Federal)-based on requirement only Mainly supported by non-governmental organisation/ community- based organisation (N), private business (P), consultant/contractor (C)	Government must allocate fund and finance as per community demand
Capacity	Lack of research and	More research and training in developing water plans and
development	training in developing water plans and capacity building amongst water planners.	capacity building amongst water planners.
Authority	Some state in Malaysia under Enactment established water board/authority such as LUAS, LSANK, LAUT, BAKAJ and Kuching water Board. The limitation of this arrangement is the authorisation of river	Rhine Net Basin Authority

basin crossing more than	
1 state.	

1.3.6. Comparison on IWRM between Malaysia and Mekong River Commission

Table 9. Comparison between Malaysia and Mekong River Basin Commission

Theme	Malaysia	Mekong River basin Commission
Public	No framework has yet established or	Structure River basin governance Mekong
Participation	guidelines	River basin Commission
Framework and		
guideline		
Decision-making	Through water forum (Occasional)	MRC acts as the primary forum for
platform		cooperation and the only one established
		by treaty (the 1995 Mekong Agreement) of
		four sovereign states. While the
		responsibility for planning, design and
		implementation of development projects
		and water resources management lies with
		each Member Country, the MRC is
		mandated to promote sustainable
		development and coordinate management
		from a basin-wide perspective. In seeking
		to fulfil its mandate to foster cooperation
		and contribute to regional integration in its
		mandated water and related sectors, the
		MRC and its Member Countries have
		sought to build cooperation with
Governance State level		strategically important partners. Country level
Fund & Finance	Based on yearly budget (State/Federal)-	Through commission
rund & rmance		Through commission
	based on requirement only	
	Mainly supported by non-governmental	
	organisation/ community-based	
	organisation (N), private business (P),	
consultant/contractor (C)		
Capacity Lack of research and training in		More research and training in developing
development developing water plans and capacity		water plans and capacity building amongst
building amongst water planners.		water planners.
Authority	Some state in Malaysia under Enactment	Mekong River basin Commission
	established water board/ authority such as	-
	LUAS, LSANK, LAUT, BAKAJ and	
	Kuching water Board. The limitation of	
	this arrangement is the authorisation of	
	river basin crossing more than 1 state.	

Lesson Learned

- 1. Germany collaborates with other countries to jointly manage Rhine Basin. The management programme for Rhine River Basin is cared by a committee that is represented by a few states within the river basin.
- 2. The Rhine Net River approach is to create an enabling environment which attracts people to get close to the river and take care of their river basin.
- 3. Comparison between Malaysia and Singapore in terms of active, beauty, clean (ABC) programmes

1.3.7. Comparison on IWRM between Malaysia and Singapore

Singapore implemented integrated urban water resource management through Active, Beautiful, Clean (ABC) Waters Programme. Active, Beautiful, Clean (ABC) Waters Programme was launched in April 2006 as part of PUB's larger strategic objective to bring people closer to water so that Singaporean can better appreciate and cherish this precious resource. Before Singapore role for implementation of ABC programmes, the buy in process has not been so easy as expected. The Active, Beautiful, Clean Waters Programme started with getting the buy in from political leaders, building rapport with the public by intensive awareness campaign until the first demonstration site was launched, starting with Kolam Ayer, followed by projects in Bedok Reservoir and MacRitchie Reservoir (Public Utilities Board, 2019).

Under the Active, Beautiful, Clean Waters (ABC) Programme, Singapore has optimised reservoirs, rivers, and canals beyond their traditional functions of channelling water and water storage. Pockets of community spaces now offer a host of recreational options for people to enjoy, transforming Singapore into a vibrant City of gardens and water. More than 100 potential locations were identified for the implementation of this programme by 2030. The process of the ABC programme is shown in Figure 36 below.

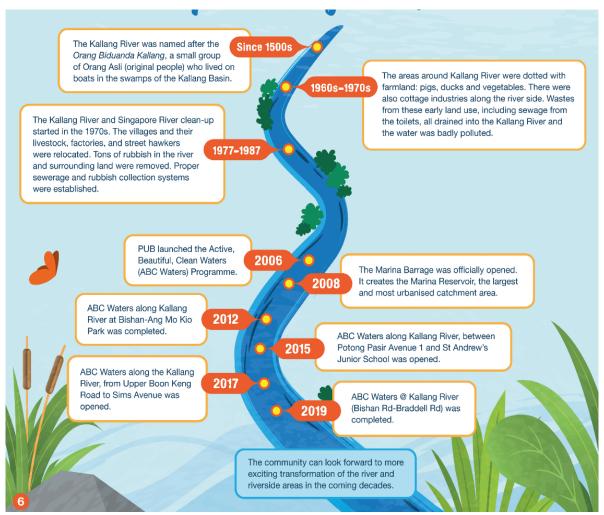


Figure 36. ABC initiatives at Kallang River, Singapore ((Public Utilities Board, 2019)

To deal with multi stakeholders, Singapore adopts 3P (people, private, public) Network to engage people and the private and public sectors holistically to give life to PUB's water management projects. The 3P Network would later form the pillar of the ABC Waters Programme, which is based on a tri-sector approach to bring together and work with multiple stakeholders. The inter-agency exchanges have supported the implementation of Active, Beautiful, Clean Waters Programme.

Some initiative to recognise and boost volunteerism the involvement, PUB introduced(Centre for Liveable Cities, 2017):

- 1. Watermark Awards that recognise individuals and organisations for their outstanding contributions towards the water cause.
- 2. Recognition to organisations and members of the public who are keen in raising awareness on water conservation and organising water related activities are welcome as Friends of Water.

PUB recognised that there was a need to build capacities through certification and professional programmes towards ensuring liveable cities, (Centre for Liveable Cities, 2017), including:

- 1. ABC Waters Certification Scheme
- 2. Green Mark Scheme
- 3. ABC Waters Professional Programme

Lesson Learned

- 1. The concept of Integrated Urban Water Resource Management can be one of the options for AACB and PPP programmes in Malaysia.
- 2. However, strategic, and comprehensive planning must be made as the project might be costly and sustainability of the project must also be considered.
- 3. The collaboration amongst stakeholders is vital and crucial to ensure the project is successful and sustainable.

1.3.8. Comparison between Malaysia and South Korea on Capacity Building

Comparison between Malaysia and South Korea in terms of Saemaul-Undong 'Community Driven Development' village programmes.

The concept South Korea in terms of Saemaul-Undong 'Community Driven Development' village programs are (Asian Development Bank, 2012):

- 1. Improving Quality of Life and Competitive Power in the local community.
- 2. Quantitative Regional Growth and Changing Economic Structure, Participation, Growing Enjoyment.
- 3. Increasing Regional Wealth and Job Creation

The major aim of the SU movement is to overcome what at the time appeared to be endemic rural poverty in the Republic of Korea. In the early 1970s, 33,267 mauls (traditional villages) participated in the SU movement. In each maul, male and female Saemaul leaders were democratically elected at a village general meeting. The outward achievements of the movement included rehabilitation of village infrastructure, improvement in the overall rural living environment, and a significant increase in household income. Implementation of the SU movement took place in three successive stages that focused on basic infrastructure (Stage I); development (Stage II); and dissemination (Stage III), by which is meant to broaden of the populace who embraced the principles that led to the movement's success in both medium-term and the long-term.

Saemaul Undong's AACB and Public Participatory Platform Initiatives

- 1. Training Programme 1-week isolated training camp / 11-week training camp
- 2. Saemul Leadership Training
- 3. Training Institute for Saemul Leaders

Table 103. Comparison between Malaysia and South Korea on Capacity Building

Criteria	Malaysia	South Korea		
Capacity development	Low and not specific	High and structured by using		
for community	structured now	role play		
Public-private	Low Public-Private	High Public-Private		
partnership	Partnership Gearing up for	Partnership Gearing up for		
	Local & Regional	Local & Regional		
	Development	Development		

Lesson Learned

- 1. Isolated training camp for capacity development.
- 2. Emphasis on political influence and strong leadership is important.
- 3. Bottom to top approach in the public participatory platform.

1.3.9. Comparison on IRBM Governance between Malaysia and Australia

In Australia, State Government rather than Federal Government govern water. Water governance responsibilities are divided into five categories, namely policy, service, provision, economic regulation, environmental regulation, and health regulation. South Australia has over 20 years of experience with integrated approaches to water and natural resources management. Three different approaches were executed from 1970 to 2014. The first approach was the Water Advisory Committee formed to see the water allocation and its engagements. The Water Advisory Committee was formed from Water Resources Act 1976.

For the community approach, the neighbours could be involved as committee in making decisions on water allocations and on water license application. In this approach, the main challenge was that the government could not fund the demands recommended by the community. The second approach was in mid-1990, in which the Legislation in 1995 of the Water Management Act and Water Resources Act 1997 that enabled the establishment of catchment water management boards. The third approach was the Natural Resources Management Act in 2004, which re-appealed the Water Resources Act (1997), as well as Soil Conservation and Land Care Act (1989). The main objective was to draw together organisations and individual across a diversity sectors, linking the natural systems and interaction of economic, social and environment factors in decision-making.

The main challenge was that the key managers are not familiar enough with the legislation process. To have proper holistic in the scales of implementation, coordination of all water resources such as surface water, groundwater, water quantity, flooding, desalinisation, upstream and downstream issues were highlighted. The South Aussie government has always been consistent in its integrated approach, for example on the Natural Resources Management (NRM) 2004 bill (Mitchell et al., 2014). In Melbourne Australia, Integrated Urban Water Management (IUWM) and Water Sensitive Urban Design (WSUD) is a long-term planning to include community outcomes in involving all stakeholders, service operator, and water sources (Furlong et al., 2016). The comparison is as discussed in Table 11 below:

Table 11. Comparison between Malaysia and Australia in terms of IRBM

Criteria	Malaysia	Australia			
Governance	State level	State level			
Public Participation	Lack of community participation in decision	Strong community participation			
Decision Making	making process trough non-government in decision-making proce				
(policies/law, legal	organisation and community-based	trough committee river basin			
etc.)	organisation	establishment			
Legal instruments	State water resources enactments.	Legislation in 1995 of the Water			
		Management Act and Water			
		Resources Act 1997			
Fund & Finance	Based on yearly budget (State/Federal)-based	Government must allocate fund			
	on requirement only	and finance as per community			
	private business (P), consultant/contractor (C)	demand			
Capacity development	Lack of research and training in developing	More research and training in			
	water plans and capacity building amongst	developing water plans and			
	water planners.	capacity building amongst water			
		planners.			

Authority	State established their water resources	The authority was developed			
	authority. The limitation of this arrangement	based on river basin such as			
	is the authorisation of river basin crossing	Murray-Darling Basin Authority			
	more than 1 state.	(MDBA).			
River basin	Monitored by sector	The Sustainable Rivers Audit			
monitoring		(SRA)			
		Integrated Basin Reporting			
		framework			

Lessons Learned

- 1. The Basin Community Committee (BCC) is the Public Participatory Platform that has helped the Commission successfully in obtaining and maintaining community interest, as well as their involvement and supports.
- 2. Resource condition outcomes are more likely to be achieved, whereby formal targets have been identified, and the accountability to achieve these targets are clearly identified and agreed by governments.
- 3. The strategies for action, programmes and frameworks have benefited from intergovernmental (top-down) approaches coupled with bottom-up actions, although determining how an equitable cost-sharing arrangement can be set up, implemented and maintained, has been a challenge.
- 4. To promote sustainability, the monitoring mechanism is required.

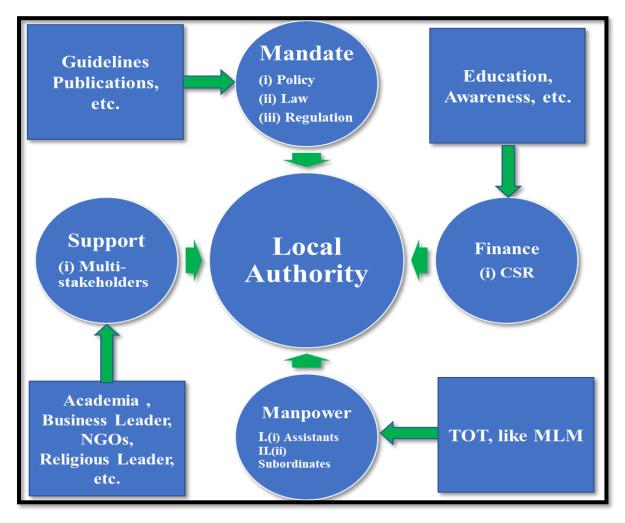
2. Intermediate Level 1- Advocacy via Training

2.1. Proactive Leadership Roles for IWRM

The leadership roles of government sector for integrated water resources management (IWRM), especially at the developing countries are very important because of their better institutional and legal support than other stakeholders. However, public participation or community participation in integrated water resources management programme are always challenged by the public's poor level of knowledge, by their reluctance to participate as well as by the lack of an organised platform (Rault et al., 2013). Several studies; however, have reported potential willingness on the part of the public to participate in water management, especially in the higher water stress countries (Bjerregaard, 1998; Carr et al., 2012; De Marchi, 2003). Rault et al. (2013) also reported active potential participation of the public, even in the limited number of democratic countries, through expressing and exchanging views and opinions of their surroundings instead of communicating through any media. Therefore, people would have sufficient knowledge of water management problems both at the institutional and household levels. In Malaysia, ASM has produced the 'National Integrated Water Resources Management Plan' (2016) in line with the 11th Malaysia Plan (2016 –2020), Integrated Water Resources Management (IWRM), Integrated River Basin Management (IRBM), Integrated Lake Basin Management (ILBM), and others. Moreover, the Malaysia Industry-Government Group for High Technology (MIGHT) exists to establish the public-private partnerships for sustainable development, including the management of water resources. All approaches, including the approach of Sustainable Development Solutions Network (SDSN), are trying to involve civil society and local authorities in sustainable water resources management to achieve the SDGs (Sustainable Development Goals), especially SDG target 6.5, aims to implement integrated water resources management at all levels, and SDG target 17.17, whose goal is to strengthen public, private, academia, NGO and civil society partnerships (Ahmed et al., 2020).

Several studies have claimed that people's attitudes towards and perceptions of water resources are reflected in the government's water resources management programme as people's intentions are the necessary ingredients for political will and action (Burstein, 2010; Stoutenborough & Vedlitz, 2013). Therefore, when there is a reflection of people's perceptions and attitudes in the relevant water management programme, then there will be a healthy positive relation between people's perceptions and attitudes as well as their willingness to be engaged in water resources management. Lai et al. (2017) reported that educating people is very important and essential to reduce the non-revenue water (NRW) tariff on water resources management in Malaysia. Although the government is looking for the NRW tariff, education can make people be aware of engaging in water resources management and can also promote their interests to reduce the NRW tariff. Accordingly, prediction and control approaches were used as an instrument to manage water resources for a quite long time, especially the management dominated by engineering solutions, such as supply water management through pipeline distributions. However, pollution control should address both the point and non-point sources of pollution, including the land-use changes, especially for rapid development activities (Pahl-Wostl et al., 2008). Therefore, sustainable and integrated water resources management requires societal search and learning processes for the inclusion of both infrastructural and noninfrastructural measures (Pahl-Wostl, 2002). Therefore, understanding the total ecosystem management by the local government is very important towards contributing sustainable development, including the IWRM. In this regard, the world famous medical journal 'The Lancet' has come out with a remarkable Planetary Health Infographics 'Safeguarding human health in the Anthropocene epoch: report of The Rockefeller Foundation–Lancet Commission on Planetary Health'.

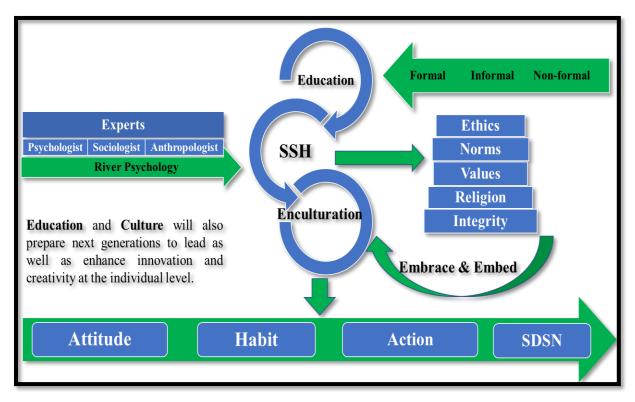
In Malaysia, the shortcomings in sustainable water resources management are reported mainly because of inadequate enforcement of laws, lack of public participation, along with an inadequate emphasis on non-structural measures (Chan 2009, 2012; Mokhtar et al., 2010, 2011). Moreover, the transboundary pollution of the Langat River mainly from the sewerage and industrial discharges, agricultural runoff and such has been reported by several studies even though the river is one of the prime sources of drinking water in the Selangor state, Malaysia (Ahmed et al., 2020, 2018a, 2018b). Therefore, public engagement with the government, non-government, academia and business sectors could be effective in water resources management (Chan, 2012; Mokhtar et al., 2011). Although there are a few studies in Malaysia concerning public perceptions and involvement in integrated water resources management based on statistical analysis (Ab Razak et al., 2015; Afroz et al., 2016; Lai et al., 2017), Ahmed et al. (2020) reported that public's perception of and attitude towards river and drinking water as well as their perceived water quality were significant indicators that influence their participation in water management platforms.



Source: (Ahmed et al., 2018a)

Figure 37. Elements needed for the proactive leadership roles by the local authority

Therefore, the responsible authorities in Malaysia should focus on raising awareness, advocacy and capacity building for people's effective participation in water resources management. For instance, the National Water Resources Policy 2011, the Water Services Industry Act 2006, the Waters Act 1920, the Environmental Quality Act 1974, and others mainly focus on raising awareness. However, advocacy and capacity building of the stakeholders in water management are not highlighted significantly in the policies and acts. Therefore, the agencies should take special non-structural measures such as campaigns, advertisements, water fairs, trainings and such to raise the awareness and capacity building of the people to enhance their participation in the effective water resources management platform. The proactive and effective leadership of local authority is an urgent requirement for the Integrated and Holistic IWRM along with safe and available drinking water supply to the household level. To be proactive four elements (mandate, finance, manpower and support) are required for the Local Authorities (Figure 37). Meanwhile, Local Authorities have the full mandate to manage both the river and drinking water in Malaysia. Finance and manpower are also very important for the local authorities, but the finance is not adequate as well as there is lack of training of the lowest rank officials to enhance multitasking capability in taking leadership roles for IWRM. Moreover, the inadequate support from the multi stakeholders is the major problems to manage the river. However, Local Authorities/district officials could be better in arranging multi stakeholders' platform as well as networking with public, private, NGO and civil sectors in managing and monitoring the quality and quantity of raw as well as drinking water (Ahmed et al., 2018a).

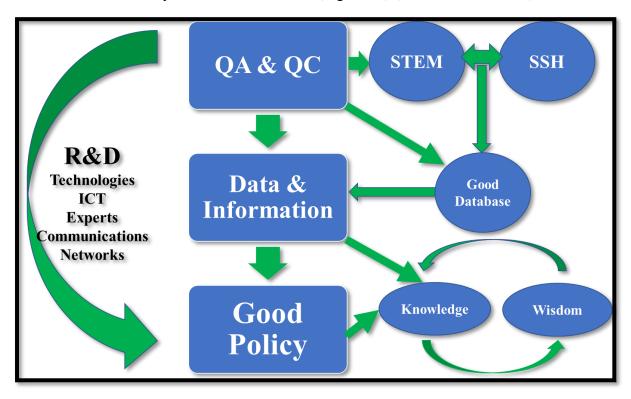


Source: (Ahmed et al. 2018a)

Figure 38. Stewardship towards IWRM via effective multi-stakeholder platform

Local Authorities should be recognised to lead and control other stakeholders. Leadership in both top-down and bottom-up approaches might solve the implementation problems, since local authorities and district offices are the lowest government administrative institute at local

level. Engagement and participation of all stakeholders will contribute to enhance the leadership skill of local authority and/or individuals. Moreover, education (i.e. formal, informal,) and culture will also prepare next generations in taking leadership as well as enhance innovation and creativity at the individual level (Figure 38) (Ahmed et al., 2018a).



Source: (Ahmed et al. 2018a)

Figure 39. Data and information to produce good policy and make effective decision

Moreover, quality data and information is very vital for the policy makers as well as researchers to produce better policies and modification of existing policies and guidelines. Therefore, quality assurance (QA) and quality control (QC) of science, technology, engineering and mathematics (STEM) data as well as social science and humanities (SSH) data will help to produce better policy as well as updating existing policies through good database (Figure 39). Moreover, QA and QC at many levels will ensure precision and accuracy of data and information for effective decision making processes by the local authorities. Therefore, the local authorities as well as the individual will get the best authentic knowledge which will influence and inspire them to act well and to take leadership in doing good things through their wisdom (Ahmed et al., 2018a).

People in Malaysia are aware of the importance of water quality not only for aquatic life, but also for a healthy and high-quality standard of living. They also think that quality water is an essential requirement for economic development. They are willing to participate in water resources management if they are well informed about the benefits of better water quality. Therefore, education and awareness-raising activities should be advocated by the appropriate agencies to increase the number of people participating in a water resources management programme. People also think that the effective implementation of policies is required for water

management. Although there are many sound policies in Malaysia for water resources management, the promotion and enforcement of these policies are a big challenge and might be due to low participation of relevant stakeholders and inadequate leadership roles from relevant agencies. Therefore, an effective multi-stakeholder platform for water resources management would be useful for a meaningful participation in a management programme along with government, non-government, civil society, academic and business entities. Therefore, the local authorities can take proactive leadership roles because they have the power of enforcement via the Local Government Act of 1976 to change the mindset of people about the importance of water management through special training, campaigns, etc. Special training is also required for thetrain the trainers (TOT) training to enhance their capacity building in water resources management. Campaigns and public meetings are useful tools for active people's participation in natural resources management, and their participations can contribute significantly to sustainable water resources management (Ahmed et al., 2020).

2.1.1. Leadership Roles with Volunteerism, Integrity and Successor

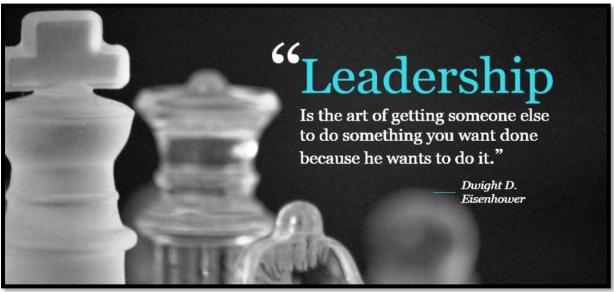


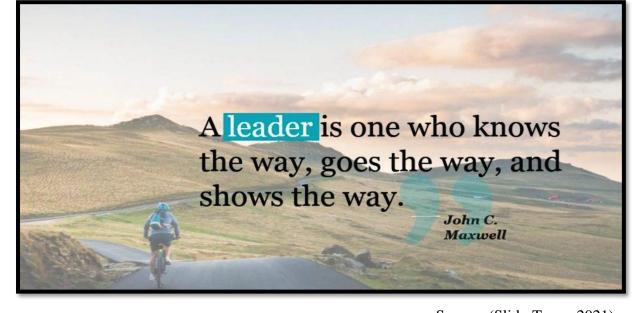
What is Leadership?

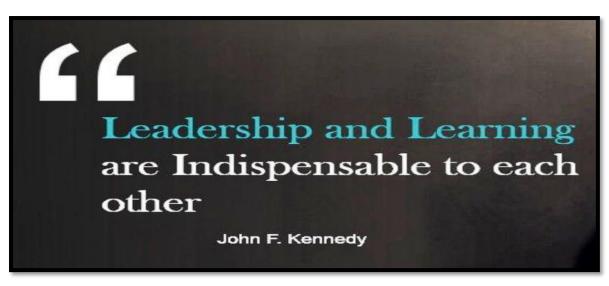
Leadership is the process of influencing people and providing an environment for them to achieve team or organizational objectives

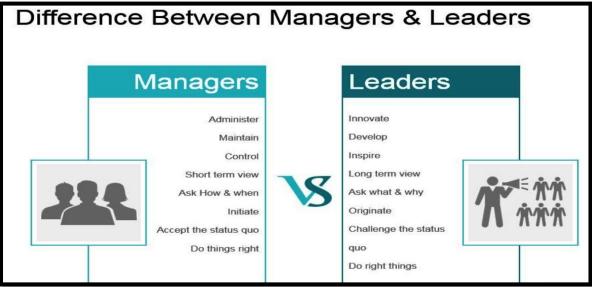


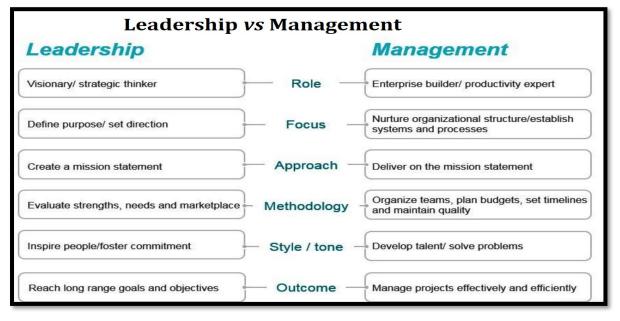












Formal and Informal Leadership

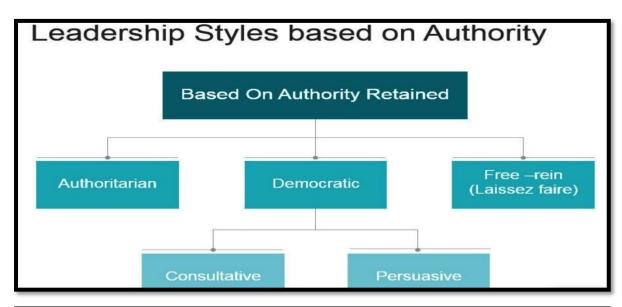
ormal leadership

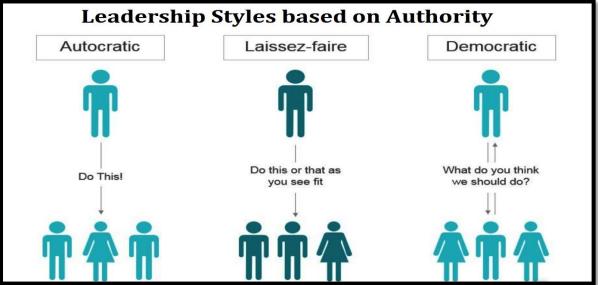
- Occurs when a manager leads by exercising formal authority.
- The exercise of formal authority through assigning duties derives, from the managers official position within the organization's hierarchy of authority.
- Any employee who is assigned a managerial position has the opportunity and responsibility to exercise formal leadership.

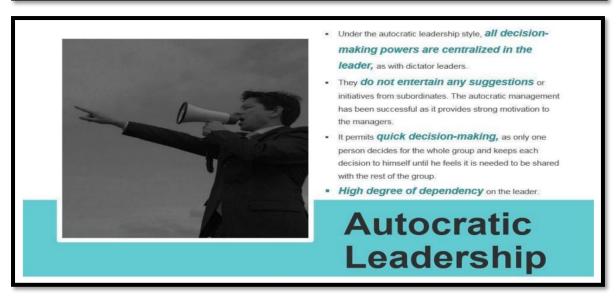
formal leadership

 Arises when a person without formal authority is influential in directing the behaviors of others.
 Although not formally appointed or elected he becomes a leader through his actions or personal attractions.

Styles of Leadership







Autocratic Leadership Advantages & Disadvantages

Advantages of Autocratic Style of leadership

- · Provides for quick decision-making
- Subordinates like to work under centralized authority
- Confidential matters can be kept secretly.
- Less competent subordinates are required.



Disadvantages of Autocratic Style of Leadership

- Subordinates are not informed about why they are asked to do a particular work
- Subordinates are forced to follow the directions.
- Depends entirely upon the efficiency of the leader.
- Creative ideas are not utilized.
- Organizational continuity is threatened

Democratic Leadership

Consultative:

Process of consultation before decisions are taken.

· Persuasive:

Leader takes decision and seeks to persuade others that the decision is correct.



Democratic Leadership Advantages & Disadvantages

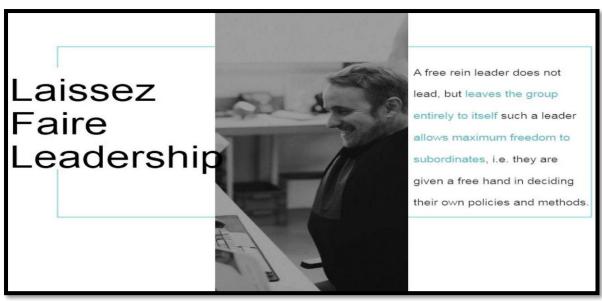
List of Advantages of Democratic Leadership Style

- It fits almost every business.
- It often has solutions for complex problems.
- It promotes a creative environment.
- · It builds strong teams.

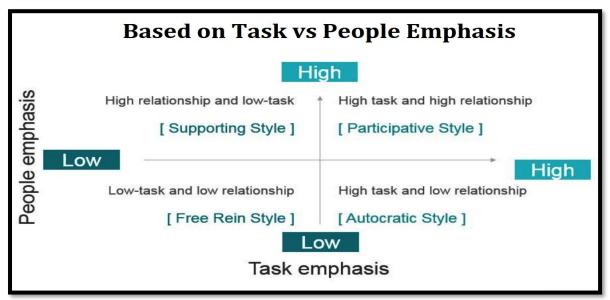
List of Disadvantages of Democratic Leadership Style

- It tends to become apologetic.
- It is time-consuming.
- It takes long to process

 decisions
- · It can seem to be uncertain.







Based on Assumptions about People

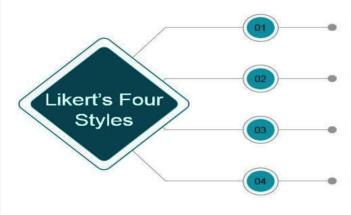


Mc Gregor's Theory



They distrust people and believe in close supervision and tight control over the subordinates. They are participative, trust subordinate and allow them to participate in decisionmaking.

Likert's Styles of Leadership



Benevolent Authoritative

Adapt it to your needs and capture your audience's attention.

Consultative Leadership

Adapt it to your needs and capture your audience's attention.

Participate Leadership

Adapt it to your needs and capture your

Exploitative Authoritative

Adapt it to your needs and capture your audience's attention.

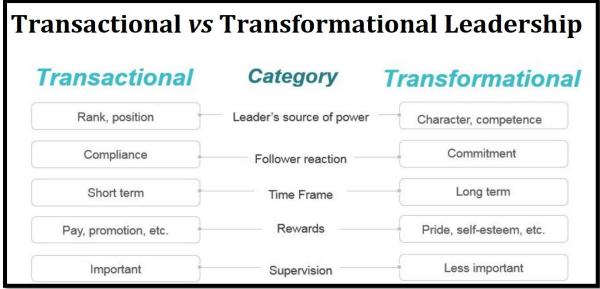


- A charismatic personality that inspires others to do business with him.
- A much stronger interest in dealing with customers than employees.
- A strong dislike for bureaucratic rules and regulations.
- Anxiety to consolidate business gains as quickly as possible.

Entrepreneurial Leadership

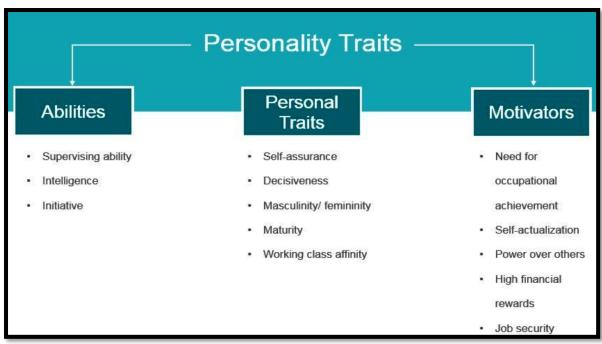




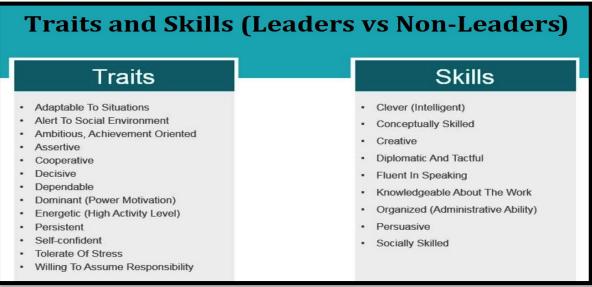


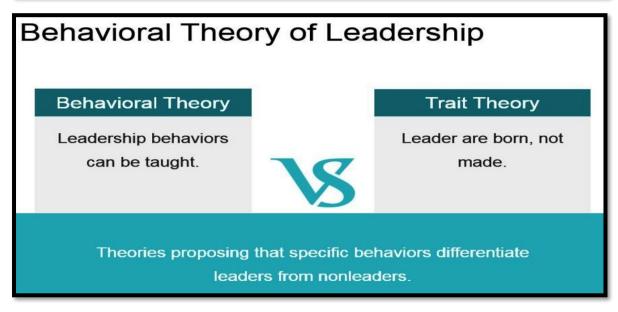
Theories of Leadership

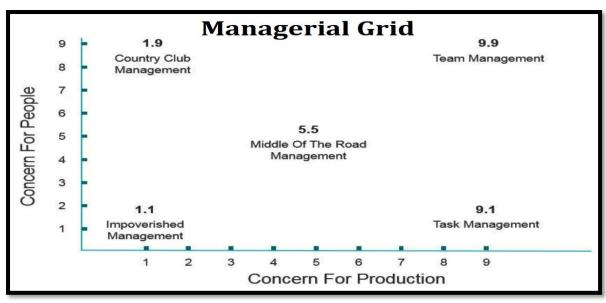




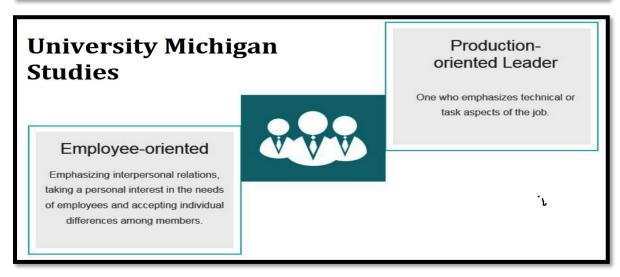


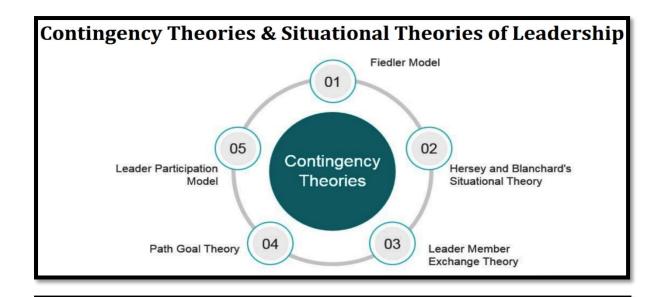






Behavioral Theory Studies-Ohio State Studies Initiating Structure The extent to which a leader is likely to define and structure his or her role and those of subordinates in the search for goal attainment. Consideration The extent to which a leader is likely to have job relationships characterized by mutual trust, respect for subordinates' ideas, and regard for their feelings.



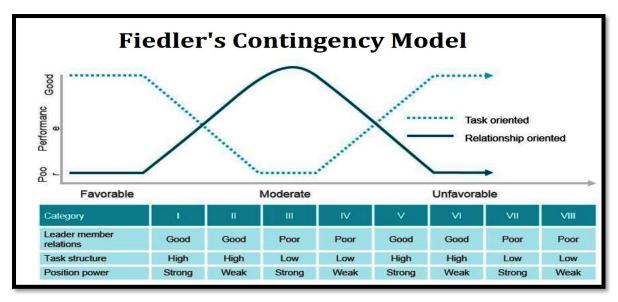


Contingency Theory

- · Behavior of leader depends upon characteristic of situation leader is in.
- Implies under what conditions will employee oriented leadership will be effective
 and under what type of conditions production oriented leadership be more
 effective.

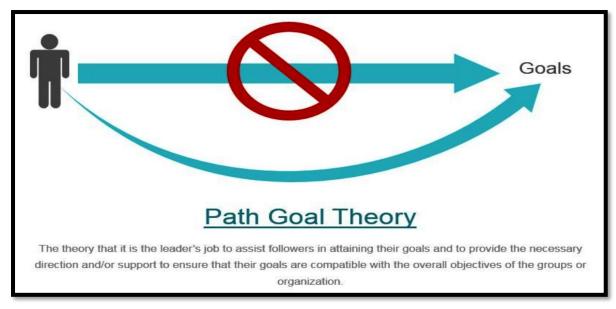
Fiedler's Model

- The theory that effective groups depends upon a proper match between a leader's style of interesting with subordinates and the degree to which the situation gives control and influence to the leader.
- · There are basically three steps in the model
 - a) Identifying leadership style
 - b) Defining the situation
 - c) Matching leaders and situations



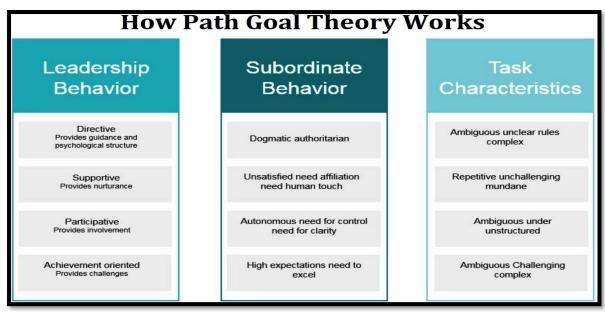
				_					
				Sc	ale				
Pleasant	8	7	6	5	4	3	2	1	Unpleasant
Friendly	8	7	6	5	4	3	2	1	Unfriendly
Rejecting	8	7	6	5	4	3	2	1	Accepting
Tense	8	7	6	5	4	3	2	1	Relaxed
Cold	8	7	6	5	4	3	2	1	Warm
Supportive	8	7	6	5	4	3	2	.1	Hostile
Boring	8	7	6	5	4	3	2	1	Interesting
Quarrelsome	8	7	6	5	4	3	2	1	Harmonious
Scoring									
Your final scor	e is the to	tal of the nu	mbers you c	ircled on the	18 scales				
57 or less	= low LPG	C (Task moti	vated)						
58-63 = Mid	dle LPC (s	socio-indepe	ndent leader	rs, task or wi	th how other	s view them)		
64 or abov	40 - Uish	1.00 /							

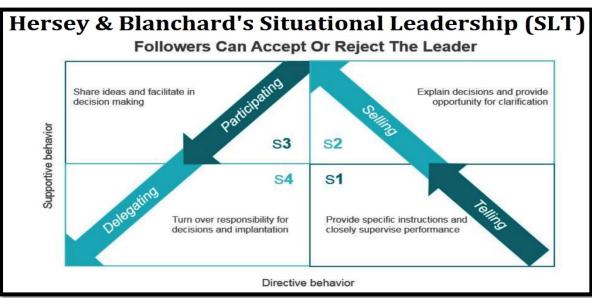
Contingency Model								
Leader-member relations	Good			Poor				
Task Structure	High Structure		Low Structure		High Structure		Low Structure	
Position power	Strong power	Weak power	Strong power	Weak power	Strong power	Weak power	Strong power	Weak power
Preferred leadership Style	1	2	3	4	5	6	7	8
	Low LPCs Middle LPCs			High LPCs				Low LPCs



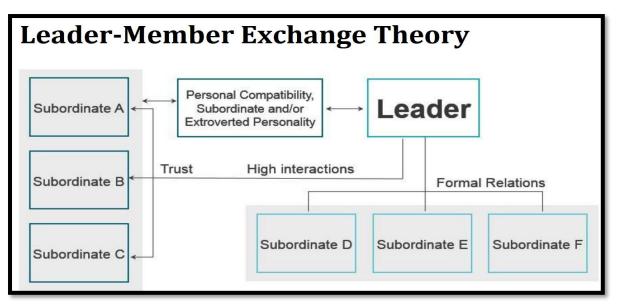


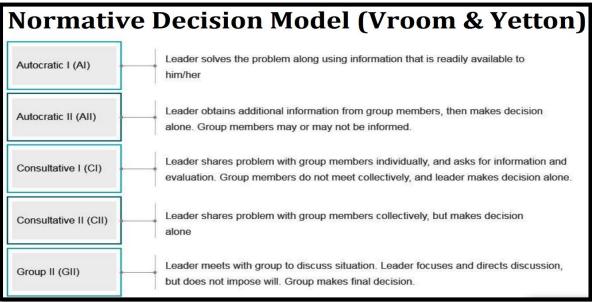




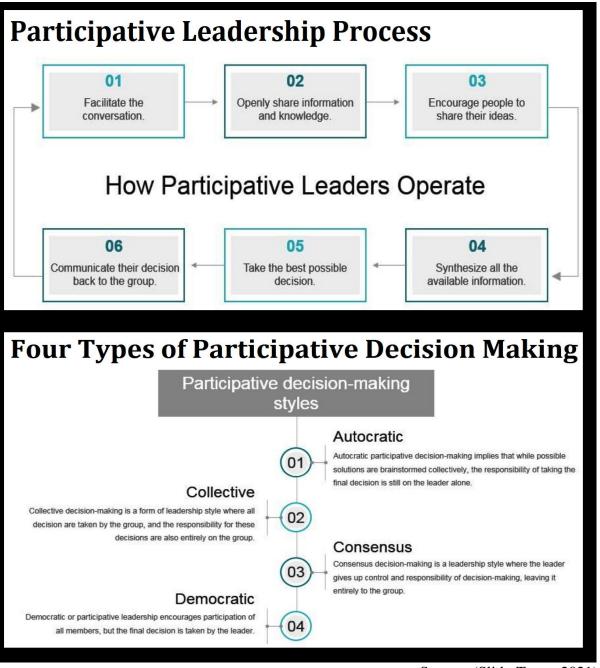












2.1.1.1. Leadership with Volunteerism

Leadership education is a prominent component of youth programming. In their efforts to promote leadership development, most youth programmes promote character development and teach interpersonal skills but fall short in teaching leadership because they fail to encourage the use of authority. The emergence of leadership through volunteerism occurs when an individual goes from participating in volunteer work to creating volunteer opportunities for themselves and others (Harris & Beckert, 2019).

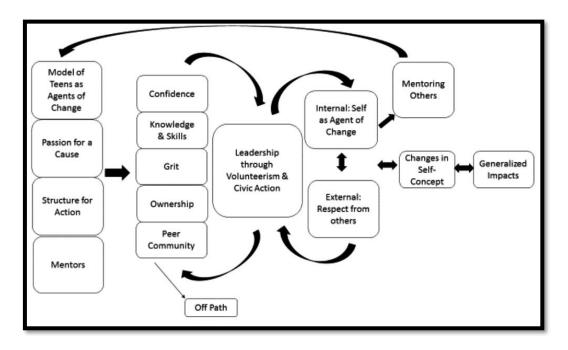


Figure 40. Leadership via volunteerism and civic action (adapted from Schwartz & Suyemoto, 2012; Harris & Beckert, 2019).

This adapted model (Figure 40) incorporates the themes from the present study with those of Schwartz and Suyemoto. These factors can guide youth development programmes to better facilitate the emergence of leadership through volunteerism and social change. In concert with those of Schwartz and Suyemoto (2012), the youth development programmes should provide salient models, structure for action, and a focus on the passions of its participants. Additionally, these programmes should facilitate a mechanism for mentorship. The mechanism for mentorship was one of the strengths of the Advanced Leadership Academy (ALA) programme. In addition to knowledge, skills, and a peer community, the programming should also promote confidence, grit, and ownership. Roach et al. (1999) suggested that leadership education should focus in helping young people see themselves as leaders now, not just in the future, by encouraging them to work together to accomplish bold group projects that are based on the interests of youth. While they do not suggest that those projects exclusively focus on social change, it is one way of encouraging these collaborative projects. Finally, when young people emerge as leaders through volunteerism and social change, they should be given opportunities to mentor other youths. This will provide the salient models that both Harris and Beckert (2019), and that of Schwartz and Suvemoto (2012) have shown as an important aspect of

programming. Youth Force (YF) implements this through its programming by allowing youth who complete the general programme to apply to work for YF and be in charge of implementing programming for future participants. Successful aspects of these programmes, such as those outlined above, should be incorporated into existing programmes that facilitate youth-led social change work such as youth city councils (Carlson, 2006). Beyond facilitating leadership emergence, programmes that incorporate these suggestions can have profound impact on communities. It is also believed that young people have untapped potential to act as agents for positive social change towards improving conditions in their communities and society.

Leadership Style and Its Impact on Volunteers' Outcomes

The knowledge about the impact of leadership styles on volunteers' behaviors is still far away from being fully explored. Whereas, it is well-known in the literature that NPOs' positive leadership is linked with sustained volunteering (Benevene et al., 2021; Richardson & Vandenberg, 2005; Rowold & Rohmann, 2009; Yahaya & Ebrahim, 2016) on the other hand, many of the studies carried out on the outcomes of leadership styles on the members of NPO did not make a distinction between paid staff and volunteers (Benevene et al., 2021; Peng et al., 2020).

The Mediating Role of Volunteer Satisfaction

Satisfaction and affective commitment of volunteers are both related to their well-being, performance, and intention to stay. However, while satisfaction is more determined than newer volunteers, affective commitment is more crucial than veteran volunteers (Chacón et al., 2007; Vecina et al., 2012). This happens because volunteers' satisfaction is linked more to the first phase of the actual experience within the organisation, and more subject to change, while affective commitment is built over time and tends to be more stable, being built over a more factual knowledge of the non-profit organisations, whereby volunteers operate (Jiménez et al., 2010). In fact, the primary difference between these constructs relies on the stability of beliefs and affects related to them. Therefore, somehow, satisfaction acts as a precursor of affective commitment in the volunteering experience, which, in turn, promotes sustained volunteerism (Chacón et al., 2007). Satisfied volunteers have higher chances to become more committed to the non-profit organisation over time (Jiménez et al., 2010; Cady et al., 2018). Indeed it seems that satisfaction for the volunteering experience protects volunteers from the strain occurring from their activities and at the same time enhances the affective commitment towards the organisational mission and objectives, when a more realistic knowledge of their organisation has been developed (Benevene et al., 2021; Chacón et al., 2007).

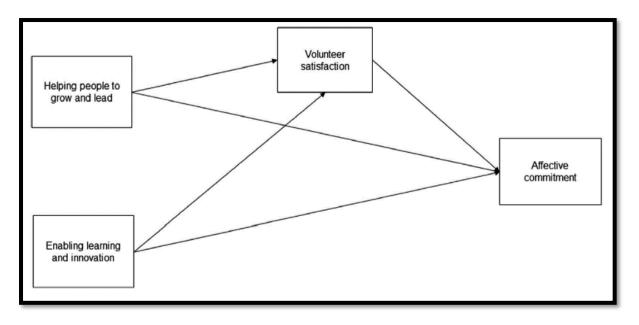


Figure 41. Mediating role of volunteer satisfaction in the leadership behaviours towards volunteer commitment (Benevene et al., 2021)

Consequently, volunteer satisfaction is linked to volunteer affective commitment. Since volunteers' satisfaction is positively associated with their affective commitment, and both are linked with sustained volunteerism, effective non-profit organisation management needs to endorse leadership styles and strategies that generate volunteer satisfaction and affective commitment. This link is a crucial factor in guaranteeing the quality and the sustainability of their organisational activities.

2.1.1.2. Leadership with Integrity

The term integrity has been variously defined. Integrity comes from the Latin 'integritas' meaning uprightness, truthfulness, authenticity, reliable consistency between word and deed and as such it describes a kind of 'wholeness' as described by Worden. We are told: "There are many ways to fall short of integrity and many rationalisations for doing so", but that "[i]t is the leader's role to send the clear and pragmatic messages that good ethics is still the foundation of good business" (Shacklock & Lewis, 2006).

Ethical Leadership: Ethical leadership has been defined in many ways and although much has been said about the importance of ethical leadership, the topic has received somewhat patchy empirical attention. One recent definition tells us that ethical leadership should be about "the creation and fulfilment of worthwhile opportunities by honourable means" (Shacklock & Lewis, 2006).

Values-based leadership: In any setting where the achievement of values-based governance is sought, the issue of leaders' values becomes integral in establishing an ethical organisation. The literature in this area is wide and varied, but the case for a strong focus on, and understanding of, leader values and beliefs is well established. There is little doubt that ethical leaders are those who adhere to strong personal values, emanating from notions of correctness, fairness, equity and reasonableness. So we are looking for leaders who can deliver across a range of requirements, but whose personal integrity is unquestionable (Shacklock & Lewis, 2006).

Integrity from the Top: The importance of the commitment of senior level leaders, particularly the Chief Executive Officer cannot be overstated in the quest for an ethical organisation in which people at all levels lead with integrity. Numerous authors in the leadership field have referred to the special importance of people at the very top of the organisation, those who hold senior executive roles. However, in a 2002 CBS poll, less than one-third of respondents said that they believed most CEOs are honest (Shacklock & Lewis, 2006).

Ethical Climate: Clearly, leaders have a major influence on the nature of the climate that surrounds them. The construct of ethical climate is not new. Drexel and Elliot stressed that managers need to provide continuing support and participation if they are to maintain an ethical climate, stating: "the managers must back up their commitment to an ethical atmosphere by positive outcomes in terms of promotion and other rewards." The body of work in this area has confirmed. However, that ethical climate is a multidimensional phenomenon with many determinants. It is clear that "the ethical climate within which they (people) work, their leadership, and the pressures acting upon them are all factors that can influence what might be their natural inclination based upon their moral development as individuals (Shacklock & Lewis, 2006).

Ethical Decision-making: There is a considerable body of work on the issue of how to make better ethical decisions and the various dimensions and complexities of this leadership skill. The various models are very helpful in the pursuit of enhancing ethical leadership. For example, Koehn suggests that the value of integrity in the business setting is based on the way decision-making with integrity avoids short-term thinking and acting, assists with maintaining

healthy relations with stakeholders, promotes genuineness when dealing with customers, promotes decision-making that is undertaken with care and diligence, assists with seeking diverse perspectives and encourages introspective analysis that develops creativity. Peters considers the need for ethical leadership and discusses the ethics of leaders' motives, influence process strategies, and the nature of the self-transformation required for ethical leadership (Shacklock & Lewis, 2006).

Transformational Leadership: Transformational leadership has been widely heralded in the literature as a desirable switch from traditional transactional forms of leadership. Its focus on idealised influence, inspirational motivation, intellectual stimulation and individualised consideration suggests a very likely ethical link. Avolio argued that the idealised influence frame has clear ethical connotations (Shacklock & Lewis, 2006).

Leader Member Exchange: Leader Member Exchange (LMX) theory developed by Graen and Novak and others, has clear implications for ethical leadership behaviour. The links between role conflict, role ambiguity and intrinsic task satisfaction, and the impact of constructive resistance by employees on leader responses depend upon the value of higher quality long-term relationships. These dyadic relation issues are very likely to be predictors of ethical outcomes and conversely ethics may lead to higher quality dyadic relations (Shacklock & Lewis, 2006).

The role that leadership plays in respect to concepts of integrity at each level presented in Figure 41. Specifically, the Figure 42 links how a leader's personal integrity results in outcomes such as followers' integrity, trust in the leader, satisfaction with the leader, and leader performance (Palanski & Yammarino, 2009).

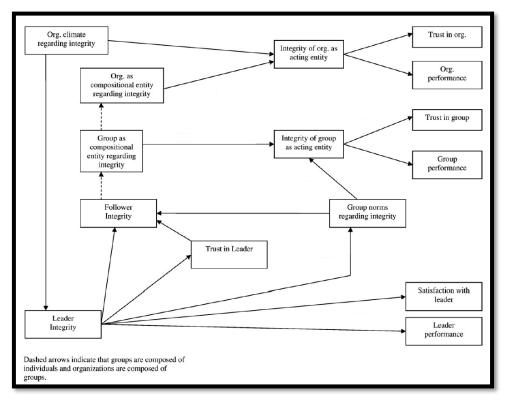


Figure 42. Integrity at individual, group, and organisation levels (Palanski & Yammarino, 2009).

Individual level: leader integrity

Integrity is a central concept in many leadership theories, but the meaning and theoretical role of integrity varies amongst theories. Therefore, the Palanski and Yammarino (2007) definition of integrity is used as the basis for the following discussion and propositions.

Trust in leader

Trust in leadership has been a topic of perennial interest to organisational researchers. Research showed that when followers develop trust in their leaders, they tend to perform better, display more organisational citizenship behaviours (OCBs) and greater organisational commitment, experience greater job satisfaction and have less intent to leave the organisation (Dirks & Ferrin, 2002). In short, trust in leadership has emerged as a critical topic of interest in organisational studies. Although still in its infancy, research on integrity has posited strong theoretical links to trust. Simons (2002) expounds at length on the theoretical links between behavioural intention (BI) and trust, but the key point appears to be that a leader's high BI may provide a follower a sense of certainty regarding the actions that the leader will take based on his or her words. With this sense of certainty, a follower is more likely to become vulnerable to the leader (i.e., to trust the leader). Simons (2002) conceptualisation of BI posits that BI's effect on outcomes such as performance, satisfaction, OCBs, and intent to leave is fully mediated by trust in the leader, but it should be noted that the mediating role of trust has not been tested. Emerging empirical evidence supports the idea that BI leads to trust (e.g., Simons et al., 2007). Therefore, all other things equal, a high-integrity leader will engender more trust in followers, and thus produce more positive outcomes than a low-integrity leader. This line of reasoning leads to this proposition:

Proposition: Leader integrity will be positively related to follower trust in the leader.

Follower satisfaction with leader

Dirks and Ferrin (2002) noted that trust in the leader and satisfaction in the leader "are conceptually similar because they both reflect an attitude or assessment that individuals hold about the same referent: the leader" and that it is difficult to assess the direction of causality. There is no specific theory that links leader integrity to follower satisfaction. Though integrity may affect follower satisfaction with the leader for the same basic reasons as trust: high integrity gives the follower a sense of certainty about what will happen. To be sure, the follower may not like what the leader does and may not be satisfied. However, in the case in which there is no certainty (because of low integrity), it is not likely that the follower will be satisfied with the leader under any circumstances.

Given its conceptual similarity to trust, it is expected that leader integrity will affect followers' satisfaction with the leader in a similar way.

Proposition: Leader integrity will be positively related to follower satisfaction with the leader.

Leader performance

Do leaders who exhibit high integrity outperform other leaders? Past research indicated that leadership is correlated with leader job performance (Judge & Piccolo, 2004), but there is no specific theoretical relation between integrity and leader job performance. Leadership theories

which contain integrity as an important element (i.e., transformational [Bass, 1985], authentic [Avolio et al., 2004], and spiritual [Fry, 2003]) all suggest a positive relation with performance. It is possible; though, that the effort and resources required to maintain and to demonstrate high levels of integrity may adversely impact non-social aspects of job performance such as efficiently producing quality output. Therefore, it is likely that integrity has a greater positive impact on social aspects of job performance (e.g., dealing with clients or managing team relations) as opposed to non-social aspects of job performance (e.g., managing budgets or delegating work). Therefore,

Proposition. Leader integrity is positively related to social aspects of leader job performance, but unrelated to non-social aspects of leader job performance.

Follower integrity

Virtually all major charismatic and transformational leadership theories (Bass, 1985) discuss role modelling as a key characteristic of charismatic leaders. In other words, leaders influence the values and actions of followers by setting a personal example of conduct. Bandura (1986) refers to this process as modelling, whereby people learn by observing the behaviour of others and its consequences. However, role modelling is not necessarily limited to charismatic leaders. For example, Brown et al. (2005) propose that one of the main characteristics of ethical leaders is developing ethical followers by intentionally acting as a role model as well as by using reward systems as incentive for ethical behaviour. Based on this research, it is likely that leaders who display high integrity are likely to develop followers who also display high integrity (i.e., a cascading effect with respect to integrity).

Relatedly, a leader may influence a follower to have integrity indirectly in two ways. Firstly, based on the substantial support for the role of trust in leadership and integrity, it is possible that a leader influences follower integrity through trust in the leader, although the relative impact of trust is unclear. Secondly, a leader may influence a follower's integrity indirectly by setting group norms for integral behaviour (discussed in detail below), but the impact of this mechanism is also unclear.

Proposition. Leader integrity will be positively related to follower integrity, but this relation will be partially mediated by trust in the leader and group norms for integrity.

Group norms regarding integrity

Thus far, some ideas about how a leader's integrity may affect relevant follower and leader outcomes have been mentioned. It is also interesting to consider a leader's integrity directly affect a group-level outcome such as norms regarding integrity. Grojean et al. (2004) pointed out that leaders can have an influence in shaping the formal policies and practices in a collective (group) setting.

Moreover, leaders play a key role in recognising and rewarding behaviours that are supportive of group values. For instance, in a customer service team, the leader may establish a policy that promises made to a customer must be fulfilled within a reasonable amount of time. To support this policy, the leader may establish away to track each member's performance with respect to keeping promises to customers. The leader may also reward expected behaviour and provide coaching and feedback to encourage expected behaviour. Depending on the authority that a leader possesses, a compensation system may even be linked to the promise-keeping aspect. In

this example, the value that a leader places on integrity is reflected in the norms of the group. Group norms become somewhat of a reflection of the character of a group leader.

Proposition. Leader integrity will be positively related to group norms for integrity.

Leader effects on group-level integrity

Multi-level effects (Dansereau et al., 1984; Kozlowski & Klein, 2000) involve the effects that an entity at one level (an individual leader) has on an entity at a different level (integrity of a group as an acting entity). As such, possible multi-level effects are potentially amongst the most interesting and important reasons for conducting multi-level research. In the present conceptual framework, the primary multi-level effect under consideration is simply, "How does a group leader (individual) affect the integrity of the group?"

Proposition: Leader integrity will be positively related to group-level integrity (whereby the group is an acting entity). This effect will be mediated by both group norms for integrity and group composition for integrity.

Group-level integrity

In their guidelines for multi-level theory building, Kozlowski and Klein (2000) mention that an explanation of a higher-level construct function is desirable; in other words, does a higher-level construct function in the same way as the lower-level construct vis-à-vis other variables? Kozlowski and Klein (2000) stated the principle that theory building should begin with endogenous construct(s) of interest. Their warning is well-taken and, in a sense, the explanation above addresses group integrity (whereby the group is an acting entity) as an endogenous construct resulting from group composition and group norms. Still, it seems that a multi-level model of integrity would be incomplete without some discussion about the effects on group integrity (whereby the group is an acting entity) on relevant outcomes. For simplicity, only two outcomes are discussed in this model. Because of its important association at the individual level, trust in the group is explored as a potential outcome. Because of its ubiquitous importance in organisational behaviour, performance of the group is also explored as a potential outcome.

Trust in group

A number of studies have examined group-level trust, but trust in most of these conceptualisations concerns within-group trust, not trust in the group as a whole (Dirks & Ferrin, 2002). However, Currall and Inkpen (2002) examined issues surrounding trust at various levels of analysis and propose a 3×3 approach to study trust. In their model, an individual, a group, or a firm (organisation) may be either a trustor or a trustee. For instance, trust may exist, between two different firms, between an individual (e.g., employee) and a firm, or between two groups within an organisation. For the present purposes, it is sufficient to note that the trustee can be the group as a whole, with the trustor being an individual, another group, or even an organisation. More specifically, a group may be trusted by a variety of stakeholders (e.g., customers, other internal groups, or other firms).

The hypothesis that group integrity (whereby the group is an acting entity) will lead to trust in the group is based upon an assumption of isomorphism (Kozlowski & Klein, 2000) in which the higher-level construct (group integrity) has the same structure and function as the lower-level construct (individual integrity). In the conceptualisation of integrity presented here,

integrity at the group level has the same structure (consistency of words and actions) as integrity at the individual level. Given the theoretical importance of individual integrity for trust in the individual, it makes sense to explore this same function (relation) at the group level.

Proposition: Group-level integrity will be positively related to stakeholder trust in the group.

Group performance

Research has shown that group performance depends in part, on how groups relate to other groups (Guzzo & Shea, 1992). For example, how a group deals with inter-group conflict may play an important role with respect to group performance as opposing groups may inhibit performance. By extension, it seems that group performance is related not just to inter-group relations but more broadly to "inter-entity" relations. In other words, a group performance may depend on other groups but also individuals (e.g., CEOs) or organisations (a supplier of a critical part or service).

As with leaders and followers, there is little theory to guide speculation about the relation between group integrity and group performance. High integrity may lead to higher performance as a group promises and then delivers desirable outcomes to other stakeholders. As with individuals, high integrity may simply affect the variability of performance over time such that a high integrity group neither over-promises nor under-delivers, and thus has a relatively stable performance over time. Given this uncertainty, the following proposition is offered.

Proposition: Group integrity will be positively related to absolute amount of group performance and negatively related to variability of group performance over time.

Organisation-level integrity

As mentioned in the previous section, organisational integrity is likely to be more concrete and easier to conceptualise than group integrity as organisational promise-keeping and value-enactment are relatively more salient. Just as a discussion of group integrity is incomplete without mentioning some of outcomes, so it is also a discussion of organisational-level integrity. Trust in the organisation and organisational performance are examined here for the same reasons that they are examined at roup level (association with integrity and ubiquitous interest, respectively).

Trust in organisations

The important role of trust within organisations is well-documented (Dirks & Ferrin, 2002) within the field of organisational behaviour. Research in other areas of management has begun to examine the role of organisational-level trust (whereby the organisation itself is the referent of trust) in various contexts. For example, Panteli and Sockalingam (2005) examined the role that trust plays in inter-organisational alliances, and Ratnasingam (2005) considered the role of institutional trust in business-to business commerce. Similarly, customer trust in an organisation may play a key role in outcomes such as satisfaction and loyalty.

As with group integrity, the proposition that organisational integrity (whereby the organisation is an acting entity) will lead to trust in the organisation based on an assumption of isomorphism (Kozlowski & Klein, 2000) in which the higher-level construct (organisation integrity) has the same structure and function as the lower-level construct (individual or group integrity). Given

the theoretical importance of individual integrity for trust in the individual, it makes sense to explore this same function (relation) at the organisation level.

Proposition: Organisation-level integrity will be positively related to stakeholder trust in the organisation.

Organisational performance

Organisational performance is affected by the organizational relations with its stakeholders (Freeman, 2005). Indeed, one may argue that an organisational performance, whether financial or social, is intimately tied to the organisation's ability to create value for its stakeholders. From the perspective of value creation, it seems very likely that organisation-level integrity may be an important factor with respect to organisational performance.

As with individual and group levels, there is little theory to guide speculation about the relation between organisational integrity and organisational performance. High integrity may lead to higher performance as an organisation promises and then delivers desirable outcomes. As with individuals, high integrity may simply affect the variability of performance over time neither such that a high-integrity organization over-promises nor under-delivers. Given this uncertainty, the following proposition is offered.

Proposition: Organisation integrity will be positively related to absolute level of organisation performance and negatively related to variability of organisation performance over time.

Effect of organisational climate on leadership

The organizational climate regarding integrity might also have a strong influence on the behaviour of lower-level entities (i.e., individuals and groups). However, some research has shown that the effect across levels may not be direct. Instead, leaders may play a mediating role between the organisation and the individual. As Grojean et al. (2004) state, "Direct leaders are the link between the organisation and its members. The enactment of the supervisor's values by supporting or inhibiting ethical policies communicates the immediate importance for the subordinate." therefore, the organisational climate regarding integrity, which is perhaps formalised through policy or directives of top management (CEOs or TMTs), is largely transmitted to individuals by the influence of their direct leader. Therefore,

Proposition: Organisational climate regarding integrity will be positively related to integrity of the group leader.

Achieving a "Leading with Integrity" Organisation

Some of the strategies below are necessary to ensure that organisations attract and recruit ethical people and then deal with them in ways which will sustain and enhance the organisational integrity (Shacklock & Lewis, 2006).

Pre-employment Ethics Education: People entering the workforce for the first time are the building blocks for future organisational integrity - our leaders of tomorrow. While it is not the primary role of employing organisations to concern themselves with pre-employment agendas, organisations can nevertheless have an indirect influence by pressing for their own requirements when dealing with job seekers. This has the potential to influence curricula and its ethics content at the secondary school and college level. Organisations can directly brief educationalists at the secondary school level to highlight what they expect in terms of preparation of the young prior to them seeking employment. There appears to be evidence to support the usefulness and efficacy of ethics related content in secondary and college educational experiences.

Recruiting Ethical People: Organisations need to devise recruitment strategies and techniques that can carefully assess potential employees in terms of their ethical stance and propensity for ethical (and unethical) behaviour. At the entry level, finding the right people to join the organisation in the first place can be a challenge. At the higher levels, when selecting people from outside for senior roles, all the more care needs to be taken to not make serious selection mistakes by choosing people whose ethics are questionable. Very few recruitment processes actually include ethics as a specific selection criterion. Recruitment strategies need to carefully examine candidates with a range of techniques to test, as near as possible to real life experiences, their values and likely reactions to morally hazardous situations.

Training and developing Ethical Leaders: Having recruited the right people into the organisation, through an ethics emphasis at recruitment and selection stage, the process does not stop there. An ongoing and focused ethical leadership training strategy can be a major boost to an organisation's integrity. Such ongoing training should include strong ethical content, from orientation through to executive development, with special training for those in positions of high ethical risk (such as purchasing, contracting, and finance) and in professional areas that present special dilemmas and needs (for example, marketing, nursing, police, uniformed services).

Mentoring up-and-coming leaders: The pro-active mentoring of up-and-coming leaders by partnering them with more senior leaders who have proven their integrity, ethical qualities and skills, is another useful investment in leading with integrity.

Sponsoring Business Education: Since the recent corporate scandals of Enron, WorldCom and the like, there has rightly been considerable pressure on business schools to substantially

reinforce their contribution in teaching ethics. Some studies have reported the fact that postsecondary education systems are generally inadequate in the teaching of ethics. Milton-Smith reported the slow and uneven progress in business ethics education across universities, professional bodies and industry association. Despite increasing numbers of educational programmes established by ethicists, "narrow vocationalism still takes precedence over personal values in the business and management curriculum." For example, regarding entrepreneurship studies in Canada, Kyleen noted an inadequate treatment of ethics in the curriculum.

Performance Management: Performance management (or appraisal) of staff is potentially a key tool in promoting and rewarding ethical behaviour, although not without its own ethical difficulties. For example in 2003, a study into ethical dilemmas associated with performance appraisals found unethical behaviour partly explained lower than expected effectiveness of the performance measurement procedures. Performance management schemes that include a substantial measure of ethical measurement and feedback can assist organisations to plan for the advancement of the right people into positions which involve higher levels of trust. There have been calls for its use in this domain by several authors. Most recently, Selvarajan observed that performance appraisal systems had "exclusively concentrated on business performance to the exclusion of ethical dimensions of job performance". Selvarajan suggested that ethical elements need to be developed within performance appraisals and proposes a cognitive process model for this purpose.

Rewards, Promotion and Advancement: There is some evidence of ethics being considered in promotion selection in the psychology profession. There is also some evidence of considerations of 'character' in promotion decisions in the public sector, but even the more recent work in the promotion selection domain reveals that there is work to do. Zauderer, in examining the US Office of Personnel Management's Executive Core Competencies (ECQ), pointed out that "this would be strengthened substantially if 'high character' were added to the list of criteria". A strong focus on ethics in an organisation's promotion selection systems is required, which really does examine propensity towards ethical (and unethical) behaviour. Certainly in the past, this has been one area that has been lacking in emphasis. Ponemon, by using the field of accounting, highlighted that promotion decisions were often based on the selectors trying to clone their own ethical reasoning styles, such that there was little likelihood that higher levels of ethical reasoning would emerge. The development of appropriate rewards systems to address these needs is seen as a primary responsibility of human resource management.

2.1.1.3. Leadership with Successors

One of the hardest decisions for successful leaders is deciding when to step down. Many leaders find it very hard to leave. Some, like Teddy Roosevelt, leave and then find it impossible to stay away, which then creates problems for their successor. This leads to the commonly given advice to presidents, CEOs, and other leaders to try for a clean break. The problem in many situations of that approach is that there is often far too little planning and preparation for that break, leading to a vacuum and discontinuity in leadership when the end of our service comes. In 2010, at major leadership meeting, a survey of the leaders in attendance revealed that less than half of the practices represented had a plan for succession (Lexa, 2017).

STRATEGIC PLANNING FOR LEADERSHIP TRANSITIONS

The first point about succession is that it is inevitable. Like death and taxes, it is one of the few sure things in our life. You will not work forever nor will you lead forever, so you need to consider ways that you can help your group prepare for that day. An added benefit of actively planning for and preparing for that day is that it will also help in the unfortunate circumstance if your reign ends prematurely. Not to be morbid about this, but if one person is doing most of the leadership work in a medium sized practice while everyone else focuses on clinical work and no one else has been involved in leadership or prepared for a leadership role (or even briefed on the major issues), then that practice is always one car accident or airplane crash away from a leadership crisis with both short-term and long-term implications for the group success. To the extent that your succession planning begins early, it can help with this potential problem as well (Lexa, 2017).

TACTICAL STEPS IN SUCCESSION PLANNING

Start to Think About a Date

In an ideal situation, you should start your tenure by planning and working with the end in mind. That includes thinking about how you hand the reigns over to your successor. As we saw previously, the majority of leaders in my field do not have a plan and that may also be as bad or even worse in your part of the healthcare world. Most leaders do not begin by thinking about this until their age or their personal circumstances force them to confront the issue. I advise leaders to start preparing at least five years ahead of their expected date of retirement. This is usually more of a window (plus or minus a few years) than a date, but it is a big step forward in getting the process underway (Lexa, 2017).

Gain Buy-In From Your Group or Organisation

As the time gets closer and you begin to focus on the reality of succession, you need to have a serious discussion about the transition with the members of your group or institution. At this point, you need their support with your decision to begin the planning process and discussion. Many leaders loathe to take this step because they are concerned that this will alarm the group and cause anxiety. In some groups that may occur, but it is much more likely that the group members have been thinking about this almost as much or more than you have, so if anything they will be relieved that someone has finally brought up this delicate issue at your partners meeting (Lexa, 2017).

DELEGATE AND DISTRIBUTE

The aforementioned header is good, general advice for most leaders, but as we have discussed in the section on delegation, far too rare in our fields until you get into the larger practices. Asking one person to shoulder all of the leadership tasks is a poor way to run an organisation and carries the risks as outlined previously. If your group is run this way now, then thinking about succession is a good reason to start to distribute some of the leadership work amongst a select group of individuals. It is also the next step in your succession plan (Lexa, 2017).

This accomplishes several worthy goals at once. Firstly, it helps to train promising candidates for leadership work. Secondly, it establishes a more robust structure for the organisation that starts helping you know and will also be part of your legacy. Thirdly, it allows you to watch these candidates and assess their capability for replacing you. It may sound obvious, but the best test of a leader is to have them lead. By starting to distribute leadership tasks to likely candidates, you can test your potential replacements. Many medical practices today are likely to promote from within to fill an important leadership vacancy, rather than bring someone in from outside.

If this is your expectation, then these three steps are the way to embark (Lexa, 2017).

EVALUATE

If you are planning on promoting from within your group be wary of skipping any of the aforementioned steps or of moving through them too quickly. It is critical that you spend time evaluating your possible successors and the best way to evaluate their leadership skills is by giving them leadership opportunities. Sometimes the person in your group who seemed to be an obvious choice for a leader turns out to be mediocre once you give them some leadership tasks. By starting at least a few years in advance and by giving people incremental amounts of responsibility you will have a chance to assess whether they are right people to carry the group forward. Getting outside help from a smart consultant may be helpful at this stage. They can take a fresh look at the candidates and their performance. They will not have the emotional and historical baggage with these people that may cloud your judgement. In the end it is your call, but as in other domains it does not hurt a leader to have some additional expertise and advice in a difficult situation (Lexa, 2017).

MENTOR

Mentoring is critical to developing your next generation of leaders. This involves both general principles of leadership as well as the key practice specific information that you have accumulated during your tenure. Do not just throw your candidates into leadership challenge, mentor them as they grow into their responsibilities. Contrary to conventional mythology, leaders are not born. Most other types of important organizations use mentoring in order to develop their leaders and you as a leader need to mentor your future leaders. You have an important responsibility here, particularly for the specifics, but you should also use external resources as well. You should consider sending them to courses on leadership and perhaps more formal certificate or degree granting programmes so that they can gain additional skills and insights into the tasks and roles of being a leader (Lexa, 2017).

CONSIDER YOUR PERSONAL PLAN

Most of the aforementioned milestones are focused on the greater good of your group and the plan for the group and future leader. Also, you need to consider your personal needs. Are you going to retire when you step down or are you going to continue to be a member of the group? Are you staying in the community or are you moving to another state to start your retirement? Think carefully about this. After a long tenure as the leader, will you be happy as a partner while someone else leads? Will you be able to step aside? Will you need to retire entirely from the practice in order to keep yourself from meddling in the current leader's work? Your replacement will probably always be able to benefit from your advice, but if you are unable to completely hand over the reigns, you may make it impossible for them to do their jobs and you may make yourself look foolish. Think of the example of Teddy Roosevelt who embarrassed himself and damaged his party so much that the election split between him and his immediate successor, Taft, meant that the opposition party won the White House. If that does not have enough impact, then think of the numerous examples of professional athletes who kept coming back long after their prime, embarrassing themselves, but unable to resist the lure of returning until they got hurt and/or humiliated themselves (Lexa, 2017).

Instead, try to aim for what people like Johnny Carson and Jerry Seinfeld succeeded in doing—go out on top and really go. That is not easy for successful leaders. Alpha leaders have great experience, and in the process of gaining that experience, their identity and self-esteem become tied up in the position. That can make it hard, very hard, to let go. Leaving before someone forces you to can be a very difficult decision to make and for some leaders even more difficult to carry out. Have the courage to go at the right time rather than waiting until someone has to gently tell you that that time is long past. In your case, begin the planning and consider the aforementioned milestones to help making this difficult process less painful and more successful (Lexa, 2017).

KEY POINTS

- 1. Succession planning begins with you and should begin now.
- **2.** Timing is important- try to go out on top.
- **3.** While every plan will be different, several key milestones need to be met in order to smooth the transition.
- **4.** You and your group need to work together to make this work.
- **5.** Both mentoring and formal preparation are keys to leadership development.
- **6.** Selecting a successor should occur after a process of progressive delegation and evaluation to make sure that you have the right person with the right preparation.

From Sherpa to Mountaineer: Learning to Lead

Because leadership and professional development skills are rarely explicitly taught to graduate students and postdocs, making the transition from apprentice to master can be extremely difficult. Some graduate students find the whole concept of "leadership" nebulous and vexing. Others hope to find a position where they can conduct their research without having to deal with "office politics." I have some sobering news for such people: No matter what direction your career takes you, some amount of leadership will be required for you to be successful. Developing the skills now can speed your progress to a fulfiling permanent job (Fiske, 1999).

Leadership Can Be Learned!

Many people -- scientists and non-scientists alike -- think that leadership is an innate skill. Either you are born with it, or you are not. This is simply not so. You can develop the elements of effective leadership wherever you are in your career and these skills will make a big difference in your future (Fiske, 1999).

Here are some of the elements that I believe are critical for effective leadership (Fiske, 1999):

i. **Organisation**.

Many people fail to appreciate that leadership skills are more than personal traits and charisma. The ability to analyse, organise, and bring clarity to a project or organisation is, I believe, a key trait of successful leaders. Courses and books on project management can teach you a great deal of what you need to know.

ii. Communication.

The ability to receive and communicate ideas and feelings to people is another critical skill. Listening is often more critical than speaking. Obviously, this goes beyond being articulate and comfortable with people -- it includes an ability to connect with people. There are books and courses that teach people about effective communication and organisations, such as Toastmasters which help people improve their communication skills.

iii. Vision.

A leader must be able to articulate a compelling vision for, whereby the group is going. People who want to lead for the sake of leading often encounter difficulties when steep climbing is required.

Practise Makes Perfect

These skills are best developed by practise. I have found that the graduate students and postdocs who have taken on some leadership role in their department, school, or community tend to have an easier time when they transition from research apprentice to research master. While some degree of "nose to the grindstone" is critical to succeed in the early stages of your career, finding an extracurricular project to manage can be an invaluable opportunity for you to practise leading, as well as to broaden your horizons (Fiske, 1999).

Picking the Right Leader

For those of you who will be choosing graduate or postdoc advisors -- consider your choices carefully. There are a number of "Sir Edmund Hillary's" out there who can lead you to the summit of whatever scientific mountain you choose to climb. There are also quite a few "dog sled drivers." Check out the PI's accomplishments, record of accomplishment with students and postdocs, and by all means TALK TO THE SHERPAS YOURSELF (Fiske, 1999).

2.2. Water-related Disaster Risk Reduction

Water availability

Water stress, essentially measured as water use as a function of available supply, affects many parts of the world (Figure 43). *Over two billion people live in countries experiencing water stress*. However, physical water stress is often a seasonal rather than an annual phenomenon, as exemplified by the seasonal variability in water availability (Figure 44). An estimated four billion people live in areas that suffer from severe physical water scarcity for at least one month per year (UNESCO, 2021). It should also be noted that about 1.6 billion people face 'economic' water scarcity, which means that while water may be physically available, they lack the necessary infrastructure to access that water.

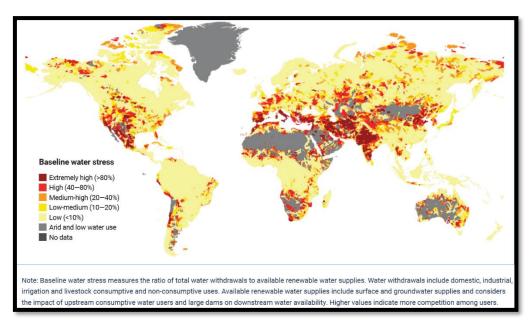


Figure 43. Annual baseline water stress (UNESCO 2021)

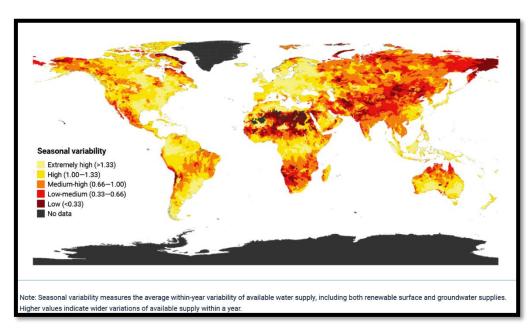


Figure 44. Seasonal variability in available water supply (UNESCO 2021)

Climate change is likely to increase seasonal variability, creating a more erratic and uncertain water supply, and thus exacerbating problems in already water-stressed areas and potentially generating water stress in places, whereby it has not yet been a recurring phenomenon. Several of the world's main aquifers are under increasing stress and 30% of the largest groundwater systems are being depleted. The areas experiencing the highest levels of decline are shown in Figure 45. Water withdrawals for irrigation are the primary driver of groundwater depletion worldwide (UNESCO, 2021).

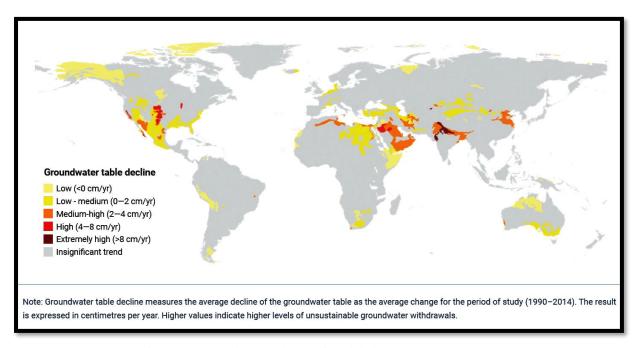


Figure 45. Groundwater table decline globally (UNESCO 2021)

Water Quality

While global water quality data remain sparse due to a lack of monitoring and reporting capacity, especially in many of the least developed countries, a number of trends have nonetheless been reported. Water quality has deteriorated because of pollution in nearly all major rivers in Africa, Asia and Latin America. Nutrient loading, which is often associated with pathogen loading, is amongst the most prevalent sources of pollution (UNESCO, 2021). Globally, an estimated 80% of all industrial and municipal wastewater is released into the environment without any prior treatment, with detrimental effects on human health and ecosystems. This ratio is much higher in least developed countries, whereby sanitation and wastewater treatment facilities are grossly lacking. Managing excess nutrients in agricultural runoff is also considered as one of the most prevalent water quality-related challenges globally. Hundreds of chemicals are also negatively impacting water quality. Risks related to emerging pollutants, including micropollutants, have been acknowledged since the early 2000s (UNESCO, 2021).

Extreme Events

Floods and droughts represent the two main water-related disasters. Over the period 2009–2019, floods caused nearly 55,000 deaths (including 5,110 in 2019 alone), affected another 103 million people (including 31,000 in 2019 alone) and caused US\$76.8 billion in

economic losses (including US\$36.8 billion in 2019 alone) (UNESCO, 2021). Over the same period, droughts affected over 100 million people, killing over 2,000 people more, and directly causing over US\$10 billion in economic losses. *Globally, floods and extreme rainfall events have increased by more than 50% over the past decade, occurring at a rate four times greater than in 1980*. Climate change is expected to further increase the frequency and severity of floods and droughts (UNESCO, 2021).

Water, Sanitation & Hygiene (WASH)

In 2017, 5.3 billion people (71% of the global population of 7.55 billion) used a safely managed drinking water service — one located on premises, available when needed and free from contamination (Figure 46). 3.4 billion people (or 45% of the global population) used safely managed sanitation services — an improved toilet or latrine that is not shared, from which excreta are safely disposed of in situ or treated off-site (UNESCO, 2021).

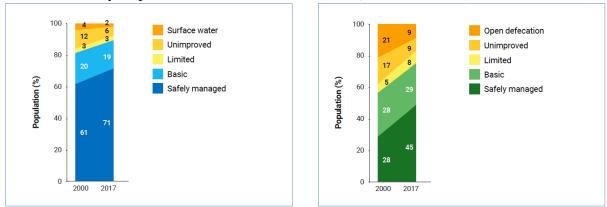


Figure 46. Global drinking water and sanitation coverage, 2000–2017 (%) (UNESCO 2021)

Water-related Ecosystem Services

Of the 18 categories of 'nature's contributions to people' (which include bundles of ecosystem services), 14 are in decline. These include the three explicitly water-related categories: regulation of freshwater quantity, coastal and freshwater quality, and hazards and extreme events. Declines in these categories also contribute to declines in most other services categories, threatening the sustainability of those currently increasing (energy, food, animal feed and materials). Taking into consideration that *the Sustainable Development Goals* (*SDGs*) are integrated, indivisible, and nationally implemented, current negative trends in biodiversity and ecosystems will undermine progress towards 80% (35 out of 44) of the assessed targets of SDGs related to poverty (SDG 1), hunger (2), health (3), water (6), cities (11), climate (13), oceans (14) and land (15) (UNESCO, 2021).

Chart of the Sendai Framework for Disaster Risk Reduction 2015–2030

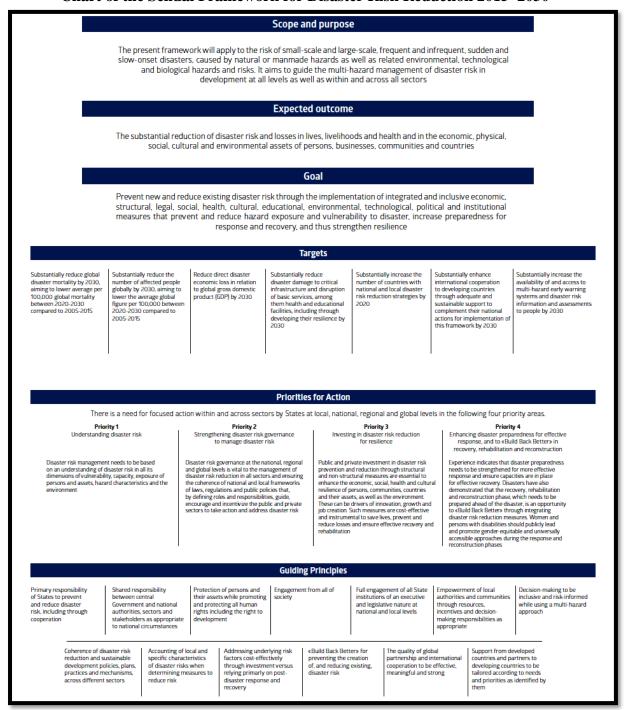


Figure 47. Overview of the Sendai Framework for Disaster Risk Reduction (UNDRR, 2021)

The world is changing. The interactions between climate change trends, ecosystem fragility, disease outbreaks, rapid unplanned urbanisation, mass displacement and geopolitical instability, fuelled by the interconnectivity of communications, trade, financial systems and politics, mean that shocks, stresses, and crises reverberate globally. *The COVID-19 pandemic has reminded the world what the Sendai Framework for Disaster Rick Reduction 2015-2030 is all about: risk is systemic, interconnected and cascading* (Figure 47).

Climate change is driving increased risk across all countries, and unpredictable hazards can have devastating cascading impacts on all sectors, with long-lasting, debilitating socioeconomic and environmental consequences (Figure 48). We are trapped in a vicious and self-fulfiling cycle of disaster > respond > recover > repeat. The people hit hardest are those who have done the least to cause these significant changes. There is no denying that disasters of any kind are expensive: in the cost to human life and economies. Sadly, despite all the evidence that abounds, prevention is not yet prioritised. Therefore, humanitarian needs continue to multiply, jeopardising development gains. Poverty, inequity, and insecurity continue to drive disaster risk, compounding vulnerabilities and increasing its impact. The world is not on track to achieve the Sustainable Development Goals (SDGs). As UN Member States move forward with Agenda 2030, more focused, accelerated action is required to help countries identify and analyse the broad range of risks they face, put in place appropriate measures to mitigate existing risks and to prevent the creation of new risks (UNDRR, 2021).

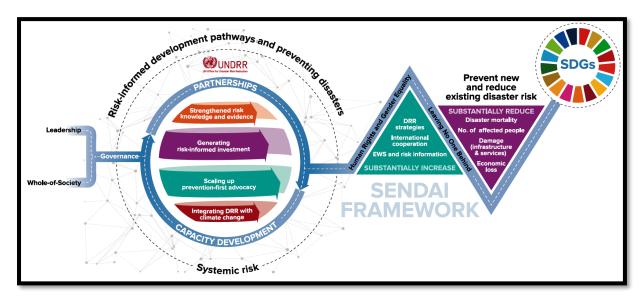


Figure 48. UNDRR's Theory of Change (UNDRR, 2021)

We believe that risk can be reduced and that disasters do not have to devastate. Improvements in disaster risk management along with rising living standards have reduced mortality rates from natural hazards significantly. But these gains can easily be reversed. However, we must act now. We are facing more intense, frequent and compounding disasters, which are outpacing our efforts in resilience building. If we persist with a 'business as usual' approach, we will not meet the goal and global targets of the Sendai Framework and the inter-dependent goals of Agenda 2030. We will condemn generations to continue living with increased risk and ever more devastating consequences to their lives and livelihoods. We must commit to accelerating and transforming. Reducing existing risk, preventing the creation of new risk and building resilience take a whole-of-society approach. Moreover, they all take committed leadership and governance. The global community requires leadership to meet the scale of the challenge. Political momentum and commitment to action must be secured beyond election terms. We have persisted in our silos for too long, compartmentalising knowledge and resources, focusing on immediate short-term 'fixes' rather than on funded, national and local level strategies, which build resilience in the medium to long-term when implemented (UNDRR, 2021).

The higher costs, lower earnings and financial losses related to water risks are significant. According to the Carbon Disclosure Project (CDP), the top five water risk drivers are increased water scarcity, flooding, drought, increased water stress and climate change. The ensuing top five risks were higher operating costs, supply chain disruption, water supply disruption, constraint to growth and brand damage. From another perspective, 76 % of the water-related risks were physical, while regulatory risks constituted 16 %, and reputation and markets 6 % of these risks. When risk to Energy, Industry and Business (EIB) is considered financially through valuation, there is a stronger case for good stewardship. Water-related financial company losses of US\$38.5 billion were noted in 2018, with the largest impacts relating to two companies in mineral extraction and power generation. These numbers may be larger, as at least 50 companies could not provide figures. In 2019, the combined risk to business value was US\$425 billion. Figure 49 illustrates how water risk relates to financial consequences (UNESCO, 2021).

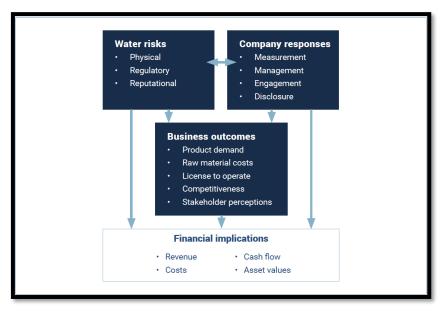


Figure 49. Water risk and financial consequences (UNESCO, 2021)

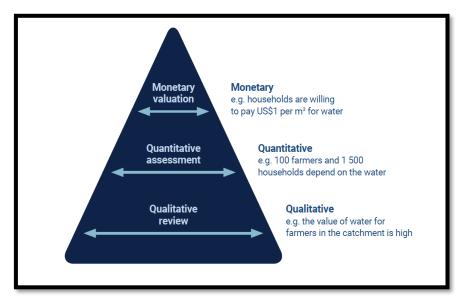


Figure 50. Hierarchy of water valuation approaches (UNESCO, 2021)

Water is seen as both a resource with withdrawal and consumption costs determined by prices, and as a liability involving treatment costs and regulatory penalties, leading to a perception that water is a cost or risk to sales and compliance. A series of case studies brought together by the World Wide Fund for Nature (WWF) and the International Finance Corporation (IFC) led to the conclusion that business tends to focus on operational savings and short-term revenue impacts, and tends to pay less attention to water value in administrative costs, natural capital, financial risk, future growth and operations, and innovation. The World Business Council for Sustainable Development (WBCSD) has argued, "it is not always possible or desirable to express all values in monetary terms". In fact, qualitative valuation (descriptive, high, medium, low) should be the starting point. Then follows quantitative valuation using 'indicators' or metrics of value (cubic metres, people affected). Finally, the monetary value is calculated (UNESCO, 2021). This hierarchy is shown in Figure 50.

The World Business Council for Sustainable Development (WBCSD) prefers a welfare economics approach based on human well-being, and therefore recognises that social and environmental aspects also should be considered. To address this, it uses total economic value (TEV), an approach it argues is more attractive to international policy makers and business. By contrast, WWF and IFC advocate for the importance of water risk (uncertainty) in valuation and for risk mitigation by stewardship. They also point to how time and space play into this view (Figure 51). However, any approach would benefit from including what is not currently being valued, looking at any changes in values over time, and scalable solutions for valuing water.

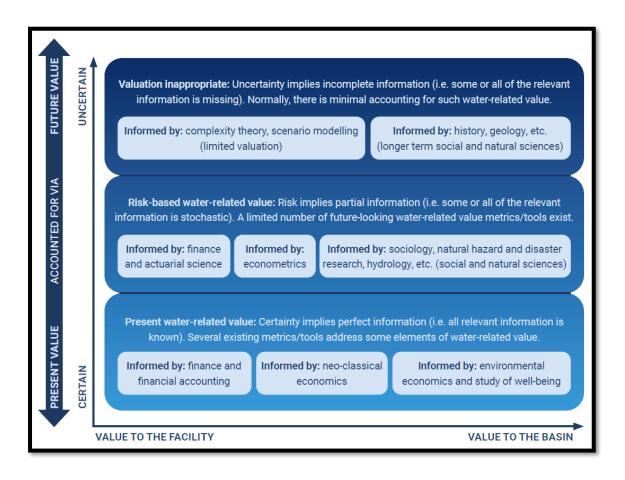


Figure 51. How valuation is affected by uncertainty (UNESCO, 2021)



Water efficiency, mitigating risks and water value

Sustainable access to water is essential to all of Unilever's operations, 40% of which take place in water-stressed areas. In such locations, the cost of buying water is often low and does not reflect its availability, or its true value, to the company's business or to local communities. Consequently, where the business case for many water efficiency measures is made solely on the basis of the purchase price of water, they may not meet the standard investment criteria.

The company's Clean Technology Fund for sustainable capital expenditure has different allocation criteria for water saving projects at water-stressed sites. First, the payback period is increased from three to five years, increasing also the number of projects that can receive funding and changing the investment mindset. Second, a water stress factor is applied as water saved in water-stressed sites could be five times more valuable than where water is in abundance. In 2019, the amount of water abstracted by Unilever's factories was cut by 46.8% per tonne of production, as compared to 2008. The cumulative costs avoided through direct water savings driven by water efficiency improvements are over €122 million since 2008. In addition, sites are encouraged to explore the energy, chemical and labour cost savings/costs avoided through the water efficiency measures (the true costs of water), which have shown very attractive payback periods of 1.3 years.



Costs and ramifications of pollution

In March 2018, two pipeline leakages occurred at Anglo American's mine in the State of Minas Gerais, Brazil. 1,686 tonnes of iron ore slurry were discharged, 492 of which flowed directly into the Santo Antônio stream. The water supply to the Santo Antônio do Grama community was interrupted and operations were suspended until December 2018. The incident resulted in a substantive impact of US\$0.6 billion on the group's earnings before interest, taxes, depreciations and amortization (EBITDA). This included the cost of 280 days of lost production; immediate risk mitigation, including river clean-up and community compensation (approximately US\$7.5 million); the inspection and repair of the pipeline (US\$20 million); and eight non-compliance notices (US\$50 million). Remedial action included provision of potable water to the community; immediate clearing of iron ore sediment on affected land and in the river; and recovery and restoration of areas directly affected and over eight miles beyond.



Fostering eco-industrial parks in Viet Nam

This five-year project of the United Nations Industrial Development Organization (UNIDO), completed in 2019, aimed to increase the transfer, deployment and diffusion of clean and low-carbon technologies, to minimize emissions of greenhouse gases (GHGs), persistent organic pollutants (POPs) and water pollutants, and to improve water efficiency and the sound management of chemicals. The project promoted and supported the gradual transformation of industrial zones into eco-industrial parks. If all 18 opportunities that were identified are implemented, 885,333 m³ of freshwater is expected to be saved every year, along with Resource Efficient and Cleaner Production (RECP) options saving 488,653 m³ of water per year. The water reductions contribute to overall financial savings that often have short payback periods: in the order of months.

Source: (UNESCO, 2021).

2.3. Value of Water and IWRM

United Nations High Level Panel on Water (HLPW) Principles about Valuing Water can be used to sustainably, efficiently and inclusively allocate and manage water resources, as well as to deliver and price water services accordingly (UNHLPW, 2021).

- Apply the "HLPW Principles on Valuing Water" in order to recognise the various values that societies accord to water and its uses, take these into account in political and business decisions, and in decisions to price water and sanitation services appropriately.
- Conduct all processes to reconcile values in ways that are equitable, transparent, and inclusive, and value, manage, and protect all sources of water, including watersheds, rivers, and aquifers, associated ecosystems, and used water flows for current and future generations.
- ➤ Promote education and public awareness about the intrinsic value of water and its essential role in all aspects of life and ensure adequate investment in institutions, infrastructure, information, and innovation to realise the many different benefits derived from water and reduce risks.

Preamble

- 1. Water is precious, fragile, and dangerous. Water, in combination with land, air, and energy, is the foundation of life, societies and economies. Water is more than a substance: it carries multiple values and meanings. These are expressed in spiritual, cultural and emotional terms and found in the heritage of water language, norms and artefacts. These reflect the deep perceptions, need for connections and participation of all of society. Making water available for its many uses and users requires tools and institutions to transform it from a natural resource to one providing services and then to recover and return it safely back to ecosystems. Water and its sources must be respected because if neglected or misused, they have the power to harm, divide or even destroy societies.
- 2. Water resources are finite and are under threat from multiple pressures: there is an urgent need for action at scale. Water is essential for human health, food security, energy supplies, sustaining cities, and ecosystems. Today, the world's water systems are facing a growing crisis, threatened by overuse, pollution, and climate change. Communities all over the world are experiencing extreme events, droughts, and floods. Billions of people do not have access to safe drinking water at home, or lack safely managed sanitation. Demands are growing from a rising population and growing economies.
- 3. Valuing water means recognising and considering all the diverse benefits and risks provided by water, and encompassing its economic, social, and ecological dimensions as well as its diverse cultural and religious meanings. Safeguarding ecosystems, and the poor, the excluded, and the vulnerable is required in all instances. Access to water services is necessary for equitable and inclusive human development. Universal access to safe drinking water and sanitation is a fundamental human right.
- 4. Making all the values of water explicit gives recognition and a voice to dimensions that are easily overlooked. Identifying and recognising all the values of water, their interdependencies and impacts on all areas of life and activity underlines the importance of collaboration and interaction between all sectors and interests. Valuing water is more

than a cost-benefit analysis and is necessary to make collective decisions and trade-offs that lead towards sustainable and equitable solutions. Women and youths play an essential role in achieving these sustainable solutions.

- 5. Valuing water promotes efficiency and better practices by exposing the short and long-term costs of pollution, waste and misallocation, and facilitating investments. Value-based economic instruments and regulation can signal scarcity, avoid waste, and promote conservation. Any use of water relies on functioning ecosystems and infrastructure, which are valuable and costly to preserve, provide, operate and maintain. Sustainable water management requires these costs to be covered completely. Pricing is part of the solution, but price does not equal the value. Where tariffs and prices are used, safeguards are essential to ensure that access to water is available, equitable, and affordable to all.
- 6. Valuing and managing water effectively presents a transformative opportunity to convert risk to resilience, poverty to well-being, and degraded ecosystems to sustainable ones. Working across sectors, communities and nations to value water will help to mitigate conflicts and build collaborative relationships, and thus contributing to stability and peace both within and between countries.
- 7. The Valuing Water Initiative of the HLPW is a collaborative process aimed at building capacity, champions, and ownership at all levels, for a shared pathway forward. This initiative presents a unique and mutually reinforcing opportunity to meet all 17 of the Sustainable Development Goals.

Why Value Water?

The real worth of water, combined and contrasted across all stakeholder perspectives, has often been neglected, leading to its wastage, misuse and misappropriation by certain interests. Sometimes the contention around the value of water resides in the measurement of its worth. Other times, contention, or even conflict, resides in comparing differing value domains, for example, economic versus more intangible cultural values. Those who control how water is valued control how it is used. Values are a central aspect of power and equity in water resources governance (UNESCO 2021).

Figure 52 compares water intensity of Gross Domestic Product (GDP) with water scarcity. Water intensity of GDP is measured as the ratio of total economic output to total water withdrawals, and water scarcity is measured as the ratio of total water withdrawals to renewable freshwater resources. Country abbreviations are the International Organisation for Standardisation.

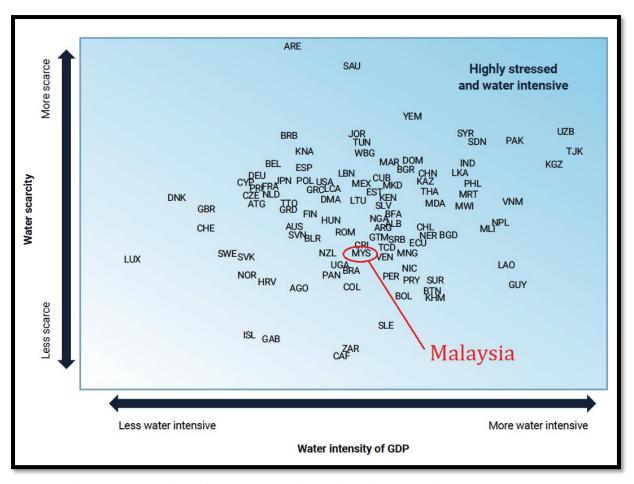


Figure 52. Comparison of water-scarce and water-intensive economies (UNESCO, 2021)

2.3.1. Valuing the environment

The source of water is the environment and water abstracted by humans eventually returns there, together with any impurities added to it. The environment—water interface can be proactively managed in order to address water-related challenges through what has become known as 'nature-based solutions' (UNESCO, 2021). But the status and trends of the environment—water interactions clearly indicate the need for much better incorporation of the value of the environment in water resources management. In most studies, water-related ecosystem services are not treated as a distinct or separate category, and clusters or bundles of services must often be combined from the underlying results to obtain relevant analyses and conclusions regarding water.

Significant values can also be attributed to ecosystem services that relate to supporting resilience, or reducing risks. Many disaster risks are exacerbated by the loss of relevant ecosystem services, as these services played a role in preventing disasters in the first place. The values of these services can be calculated, but they are often not recognised or adequately included in economic planning, which tends to favour short-term gains over longer-term sustainability. Expressing the values of ecosystem services in monetary terms enables values to be more easily as compared to other economic assessments, which often use monetary-based units. However, the environment can have important values that cannot, or should not, be constrained or defined by monetary-based approaches.

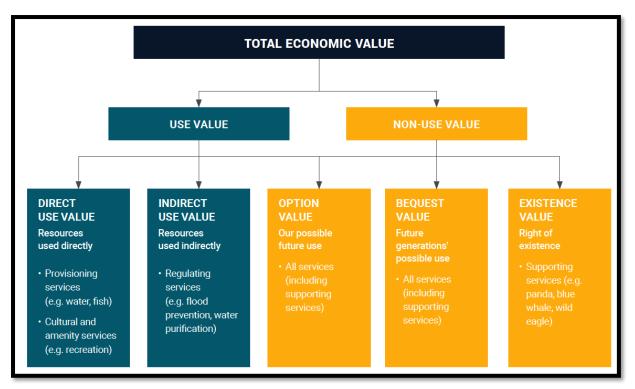


Figure 53. Examples of some key considerations in assessing total economic value (TEV) of the environment or an ecosystem asset (UNESCO, 2021)

The existence of different value systems infers that it would be problematic to develop a unified system of, and metrics for, valuing water and/or the environment. What is feasible is to develop a common approach under which different environmental values or value systems can be compared, contrasted and used.

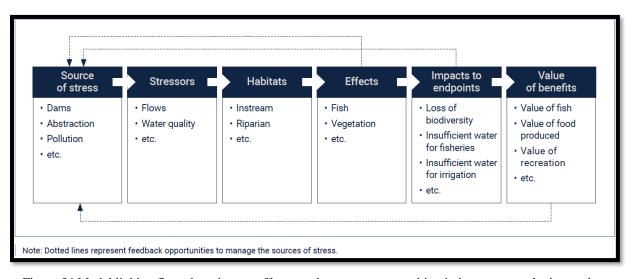


Figure 54 Model linking flow alterations to effects on the ecosystem, resulting in impacts to endpoints and finally the value of benefits (UNESCO, 2021)

2.3.2. Valuing hydraulic infrastructure

The value of water to society is underpinned by hydraulic infrastructure, which serves to store or move water, and thus delivering substantial social and economic benefits. Socio-economic development is curtailed in countries that have insufficient infrastructure to manage water.

While more infrastructures are needed, past experience showed that the valuation of hydraulic infrastructure has been seriously flawed (UNESCO, 2021).

Brazil

Valuations help identify how green infrastructure supports grey infrastructure – The case of the Itaipu Dam in

The Itaipu Dam in Brazil is among the world's largest in terms of hydropower generation. However, due to the nature of the soils in its catchment area and land use practices of local farmers, the Itaipu Reservoir (like most others) is vulnerable to excessive sediment loads that gradually fill it and reduce the storage capacity, and therefore shorten the reservoir's life expectancy, while increasing maintenance costs.



Itaipu Dam, Brazil. Photo: © nicolasdecorte/Shutterstock.com

Natural capital accounting (described further in Chapter 2) identified relevant natural capital flows (ecosystem services). Farmers in the watershed were able to develop a quantified scoring system that could account for how much each farm might contribute to reducing siltation (Laurent et al., 2011). This enabled farmers to be considered as 'water producers' by the National Water Agency, which assigns values to the ecosystem services generated by farms participating in the programme based on their contribution to savings in terms of dam maintenance, operational costs and capital depreciation (ANA, 2011). The resulting programme, Cultivando Água Boa ("cultivating good water"), has established a partnership with farmers to

achieve mutual goals of sustainability based largely on the adoption of no-till farming (Mello and Van Raij, 2006). The life expectancy of the dam complex has now been increased from 60 years to 350 years. Additionally, other environmental benefits are delivered (such as reduced nutrient runoff and biodiversity conservation) and, importantly, farm productivity and sustainability have also increased – presenting a win-win scenario for farmers and the hydropower company.

Source: (UNESCO, 2021)

In spite of the large sums of money invested in water infrastructure, the valuation of costs and benefits are not well developed, standardised or widely applied. Societal benefits delivered are often unquantified, costs (particularly external costs) are not adequately accounted for, options are often not appropriately valued and compared, and hydrological data are often poor and outdated.

The valuation of hydraulic infrastructure is beset with conceptual and methodological difficulties, particularly regarding non-consumptive use, and indirect and non-use values. Most methods of valuing water infrastructure centre on a cost–benefit approach, but there is a tendency to overestimate benefits and underestimate costs, and in particular to not include all costs.

One of the most critical questions is 'value to whom'. Valuations tend to excessively focus on target beneficiaries while other stakeholders may benefit less or even be negatively impacted. A major shortcoming in many approaches is that they focus mainly on financial costs (cash flows, and capital and operational expenditure) and financial returns. They often omit indirect costs, and in particular social and environmental costs, which are treated as externalities.

A key question in valuation is whether large capital and operational and maintenance (O&M) costs are included in subsequent valuations of end uses. Full-cost charging for water services is the exception rather than the rule. In many countries, only part or all of the operational costs are recovered, and capital investments are covered by public funds.

Valuation is only of use if the decision-making process in question is based on a fair assessment of values. Too many projects, particularly for high-profile water infrastructure such as dams, remain essentially vanity projects, politically motivated and/or potentially subject to corruption. Under such circumstances, values, if assessed, are opaque, selective, manipulated or ignored. No amount of guidance on valuation will change that. Fundamentally, valuation of water infrastructure is about good governance. At least, the attempt to govern well must be in place for proper valuations to play their part.

2.3.3. Valuing water supply, sanitation and hygiene (WASH) services

The role of water within households, schools, workplaces and health care facilities is often overlooked or not assigned a value comparable with other uses. Water is a basic human need, required for drinking and to support sanitation and hygiene, sustaining life and health. Access to both water and sanitation are human rights. A direct extension of access to WASH services not only improves educational opportunities and workforce productivity, but also contributes to a life of dignity and equality. WASH services also indirectly add value in the form of a healthier environment (UNESCO, 2021).

It has been estimated that achieving universal access to safe drinking water and sanitation (SDG Target 6.1 and Target 6.2) in 140 low- and middle-income countries would cost approximately US\$1.7 trillion from 2016 to 2030, or US\$114 billion per year. The benefit—cost ratio of such investments has been shown to provide a significant positive return in most regions. Returns on hygiene are even higher, as they can greatly improve health outcomes in many cases with little need for additional expensive infrastructure.

The year 2020 saw the rise of the COVID-19 pandemic, which hit the world's most vulnerable people the hardest — many of them living in informal settlements and urban slums. Hand hygiene is extremely important to prevent the spread of COVID-19. Globally, over three billion people and two out of five healthcare facilities lack adequate access to hand hygiene facilities. Because access to WASH is so fundamental to life and public health, in many countries WASH services are considered the realm of governments and therefore often subsidised, even in high-income countries.

However, subsidies do not necessarily ensure that the poor are able to access basic services. Water subsidies can end up benefiting those with existing connections to sewerage or water networks, many of whom are non-poor. As a result, the poor do not benefit from the subsidy and the water service provider loses the tariff revenue it could have collected from wealthier households. Value is lost in terms of revenue to the provider, and the negative impacts of not having access to WASH services, such as school and work absenteeism, are not mitigated. It is important to examine affordability from the perspective of disadvantaged groups, based on their income, location and the socio-economic challenges they face.



Challenges to addressing COVID-19 in informal settlements and other poor or deprived communities

Most of the COVID-19 guidelines are almost impossible to implement in informal settlements and other poor or deprived communities. Overcrowding, housing design, and lack of access to water, sanitation and waste management facilities, make any form of physical/social distancing and simple interventions, such as regular handwashing, extremely difficult.

- In informal urban settlements, a large proportion of the population may have existing health conditions (respiratory
 infections, waterborne diseases and other chronic illnesses), aggravated by the harsh living conditions and, increasingly,
 some lifestyle diseases associated with poor nutrition and substance abuse. These communities also have limited access
 to, and ability to pay for, health care.
- Most households rely on day-to-day work to meet their living costs and do not have any savings or financial buffers to
 rely on to pay for basic services such as water, sanitation and hygiene (WASH). Balancing the need to control the public
 health emergency with the economic livelihood impacts on the poor, particularly women and children, will be critical to the
 success of any intervention strategy in the response and recovery phases.
- The lack of adequate data and information on informal settlements makes the planning and response to COVID-19
 interventions difficult. The current use of city-wide data for access to WASH facilities masks the inequities present.
- The population profile in many informal settlements may not be the same as the rest of the urban agglomeration.
 Inequalities in access to basic WASH services also exist within this population. Access to such services can be less than 10% for many of the slum populations.
- Slums and informal settlements may be cut off from service provision in the event of quarantine without proper consultations. WASH services being essential, under no circumstances should they be discontinued.

Source: (UNESCO, 2021)

2.3.4. Valuing water for food and agriculture

Agriculture uses the major share (69%) of global freshwater resources. However, water use for food production is being questioned as intersectoral competition for water intensifies and water scarcity increases. Moreover, in many regions of the world, water for food production is used inefficiently. This is a major driver of environmental degradation, including depletion of aquifers, reduction of river flows, degradation of wildlife habitats, and pollution (UNESCO, 2021).

The value assigned to water in food production is generally low as compared to other uses. It is usually very low (typically less than US\$0.05/m3), whereby water is used for irrigating food grains and fodder, while it can be relatively high (of the same order of magnitude as values in domestic and industrial uses) for high-value crops such as vegetables, fruits and flowers.

Estimates of values of water for food production normally only consider the direct economically beneficial use of water (value to users of water), while many of the other direct and indirect benefits associated with water, which may be economic, sociocultural or environmental, remain unaccounted for or only partially quantified. Some benefits include improving nutrition, accommodating shifts in consumption patterns, generating employment and providing livelihood resilience, especially for smallholder farmers, contributing to alleviating poverty and revitalising rural economies, and supporting climate change mitigation and adaptation. The food security value of water is high but rarely quantified – and it is often a political imperative irrespective of other values.

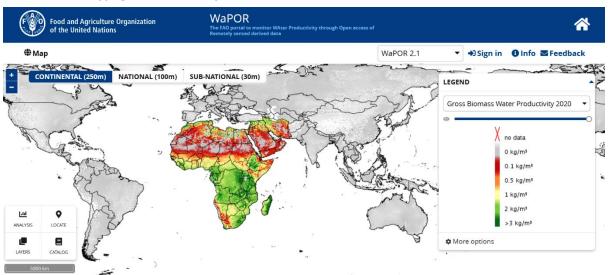
Several management strategies that could maximise the multiple values of water for food production could be implemented, including improving water management in rainfed areas; transitioning to sustainable intensification; sourcing water for irrigated agriculture, especially from nature-based and non-conventional sources; improving water use efficiency; reducing

demand for food and its consequent water use; and improving knowledge and understanding of water use for food production.

Water Productivity Open Access Portal (WaPOR)

Water productivity, which is expressed as the quantity of biomass produced in relation to the total volume of water consumed in that year (actual evapotranspiration) can be retrieved from the FAO Water Productivity Open Access Portal (WaPOR). These data can be assessed at the continental, national, river basin and sub-basin/irrigation scheme scales (FAO, n.d.c). Water productivity gaps can be identified this way, facilitating proposed solutions to reduce them, and contributing to a sustainable increase of agricultural production, while taking valued ecosystems and equitable use of water resources into account (FAO, 2020d). Eventually these steps should lead to reduced overall water stress. Many of the new digital technology interventions are already in use on large-scale commercial farms (e.g. in Europe), but knowledge transfer to small-scale farms using simple agricultural methods (e.g. in Africa or Asia) is limited and needs to be further enhanced.

Illustration of mapping with the WaPOR system



Systems of Rice Intensification (more productivity with less water)

Rice is a staple for nearly half the world's population. Irrigated, lowland rice cultivation, which covers about 56% of the total rice-cropped area, produces about 76% of the total amount of rice produced globally (Uphoff and Dazzo, 2016). The System of Rice Intensification (SRI) provides an example of a successful water-smart agricultural practice. SRI is a practice developed to increase the productivity of land, water and other resources in rice production systems, and is promoted in many rice-producing countries. It is based on the principle of developing healthy, large and deep root systems that can better resist drought, waterlogging and rainfall variability – all of which are potential impacts of climate change. SRI has proved particularly beneficial as it requires only intermittent water application, rather than continuous flood irrigation. The average increase in income from SRI compared to conventional practices in eight countries (Bangladesh, Cambodia, China, India, Indonesia, Nepal, Sri Lanka and Viet Nam) amounted to around 68%. Crop yields increased between 17 and 105%, while water requirements decreased between 24 and 50%. Additionally, SRI can possibly reduce methane emissions, as it reduces the amount of flooding required for irrigated rice cultivation (FAO, 2013c).

Source: (UNESCO, 2021)

Improving water security for food production in both rainfed and irrigated systems can contribute to reduce poverty and close the gender gap directly or indirectly. Direct effects include higher yields; reduced risk of crop failure and increased diversity of cropping; higher wages from enhanced employment opportunities; and stable local food production and prices. Indirect effects include income and employment multipliers beyond the farm, and reduction in migration. Enhanced and more stable incomes could help improve education and the skillsets of women, and thus foster their active participation in decision-making. Although increasing

water productivity can have substantial positive impacts, care should be taken to account for possible perverse effects and implications on poverty alleviation (land grabbing and increasing inequality).

2.3.5. Energy, industry and business

In the energy, industry and business (EIB) sector, water is seen as both a resource with withdrawal and consumption costs determined by prices, and a liability that involve treatment costs and regulatory penalties, leading to a perception that water is a cost or risk to sales and compliance. Business tends to focus on operational savings and short-term revenue impacts, and tends to pay less attention to water value in administrative costs, natural capital, financial risk, future growth and operations, and innovation (UNESCO, 2021).

There are drivers that push and others that pull businesses towards valuing water. The former are trends, both global and regulatory, involving natural capital accounting, water valuation and water pricing. The latter is the growing business case for prospective benefits, including better decision-making, higher revenues, lower costs, improved risk management and better reputation.

The higher costs, lower earnings and financial losses related to water risks are significant. The risks associated with increased water scarcity, flooding and climate change include higher operating costs, supply chain disruption, water supply disruption, constraints to growth and brand damage.

Due to its character, the EIB sector is highly focused on monetisation. This provides a predisposition towards certain aspects of value (price of a cubic metre of water) and sometimes an indifference to others (e.g. the tangible and intangible value of water to other stakeholders). The most straightforward monetary valuation is volumetric – price per cubic metre, multiplied by the volume of water used, plus the cost to treat and dispose of wastewater. The metrics for the commercial performance of water use in EIB are relatively simple. They include water productivity, defined as profit or value of production per volume (\$/m3); water use intensity, defined as volume to produce a unit of value added (m3/\$); water use efficiency, defined as value added per volume (\$/m3); and the change in water use efficiency over time (SDG Indicator 6.4.1).

The overall economic productivity of water (GDP/m3) in the EIB sector also leads at local, regional and national levels to various co-benefits, such as job creation and new enterprises. These are not easy to quantify, as many factors come into play, of which water is only one. A better understanding of the motivations behind corporate interests in water management should align with those of water management agencies pursuing Integrated Water Resources Management (IWRM) planning approaches. The circular economy will value water to the extent that each litre is reused again and again, making water itself almost become part of the infrastructure rather than a consumable resource.

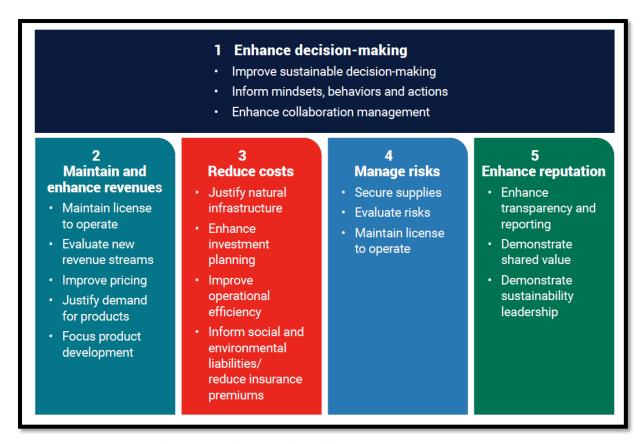


Figure 55. Business case for valuing water (UNESCO, 2021)

2.3.6. Cultural values of water

Culture directly influences how the values of water are perceived, derived and used. Every society, group or individual exists in its own cultural setting that is moulded by a varying mix of heritage, tradition, history, education, life experience, exposure to information and media, social status, and gender, amongst many other factors (UNESCO, 2021).

Some cultures can hold values that are difficult to quantify or indeed, in some cases, to articulate. Water can appeal to people for spiritual reasons, or through scenic beauty, because of its importance for wildlife or recreation, amongst others, or combinations of these. These values can be problematic to compare with values derived through other formal means, such as economics, and are; therefore, often excluded from value assessments that favour those. Moreover, culture changes and evolves over time, sometimes rapidly.

There is a close relation between religion, or faith, and ethics. For example, narratives originating from regions characterised by water scarcity often feature illustrations of lawful and morally correct living beings, often as characterised by the local religion, rewarded with rainfall and access to water. By contrast, the modern economic conception of water can be characterised by its abstraction from social, cultural and religious contexts. Water in the global economic development context is often considered a resource at the disposal of society and is; therefore, distinct from water as it may be recognised by religions or the belief systems of many indigenous people, creating quite diverse, and potentially contradictory, perspectives of value. The values of water in the context of conflict, peace and security are paradoxical. While much has been written about the positive value of water in promoting peace, in many cases water

itself was a contributing factor to the conflict in the first place. It has been argued that a spirit of dialogue helps to transform water-related conflicts into cooperation.

The values of water to human well-being extend well beyond its role in supporting direct physical life-sustaining functions, and include mental health, spiritual well-being, emotional balance and happiness.

After understanding, categorising or codifying cultural values, there is a need to identify ways and means of incorporating these values into decision-making. These tools, such as cultural mapping, can help to better understand cultural values of water, reconcile antagonistic values, and build resilience with regard to current and future challenges, such as climate change. A fundamental need is the full and effective gender-sensitive participation of all stakeholders in decision-making, allowing everyone to express their own values in their own way.

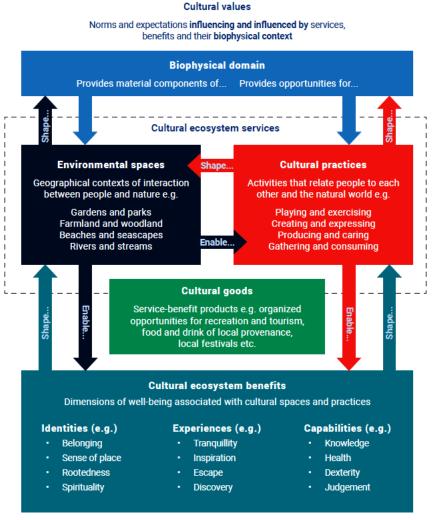


Figure 56. A conceptual framework of cultural ecosystem services (UNESCO, 2021)

2.3.7. Principles for valuing water

Valuing water is a shared responsibility of all. Whether acting as governments, municipalities, businesses, farmers, civil societies, communities, or as individuals, we all have a duty to:

Recognise and Embrace Water's Multiple Values

Principle 1. Identify and take into account the multiple and diverse values of water to different groups and interests in all decisions that affect water. There are deep interconnections between human needs, social and economic well-being, spiritual beliefs, and the viability of ecosystems that need to be considered.

Reconcile Values and Build Trust

Principle 2. Conduct all processes to reconcile values in ways that are equitable, transparent, and inclusive. Trade-offs will be inevitable, especially when water is scarce, and these call for sharing benefits amongst all those affected. Inaction may also have costs that involve steeper trade-offs. These processes need to be adaptive in the face of local and global changes.

Protect the Sources

Principle 3. Value, manage, and protect all sources of water, including watersheds, rivers, aquifers, associated ecosystems, and used water flows for current and future generations. There is growing urgency to protect sources, control, and prevent pollution and address other pressures across multiple scales.

Educate to Empower

Principle 4. Promote education and public awareness about the intrinsic value of water and its essential role in all aspects of life. This will enable broader participation, water-wise decisions, and sustainable practices in areas, such as spatial planning, development of infrastructure, city management, industrial development, farming, protection of ecosystems, and domestic use.

Invest and Innovate

Principle 5. Ensure adequate investment in institutions, infrastructure, information, and innovation to realise the many different benefits derived from water and reduce risks. This requires concerted action and institutional coherence. It should harness new ideas, tools, and solutions while drawing on existing and indigenous knowledge and practices in ways that nurture the innovative leaders of tomorrow.

Pathways Forward

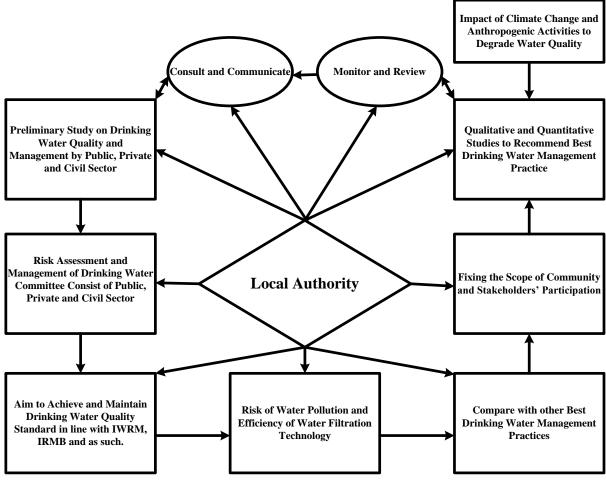
There are many pathways forward to implement the HLPW Principles for Valuing Water, including:

- a) Raise awareness on values of water and their importance amongst policy makers, industry and community leaders, journalists, writers, scientists, young professionals and teachers with special attention to vulnerable groups and youths. Reports, audio-visual materials and examples need to be compiled and curated to illustrate how and where the HLPW Principles for Valuing Water could be or have been applied successfully.
- b) Establish a Global Leadership Coalition on valuing water to mobilise champions that lead by example and highlight the application of the HLPW Principles for Valuing Water in a range of different contexts and settings.
- c) Promote collaborative action of key parties such as national and local governments, industry, civil societies, on valuing water in their context, revealing their incentives to act (across risks and co-benefits) and identifying opportunities to improve their practices. Co-benefits and risk management have to be harnessed by a broader range of actors; these cannot be driven by the water sector alone.
- d) Encourage key institutions and networks to incorporate valuing water in their policies and practices, building on existing criteria or paradigms, such as Corporate Social Responsibility (CSR), Environmental, Social and Governance (ESG), The UN Global Compact, Natural and Social Capital Accounting, Payment for Ecosystem Services (PES), Disaster Risk Reduction (DRR) frameworks, and the OECD Principles for Good Governance.
- e) Build a valuing water action agenda and investment strategies across institutions and networks.

2.4. Risk Assessment & Management

2.4.1. Monitoring and Accountability

ASM has already produced better policy and planning for water and other sectors. Similarly, Malaysian Industry-Government Group for High Technology (MIGHT) is a public-private partnership organisation in providing a consensus building platform for collaboration in developing policies and strategic advice to the government. Accordingly, Malaysian Foresight Institute was also established for effective integration and implementation of policies and planning. Meanwhile, the National Integrated Water Resources Management Plan (Volume I & Volume II) by ASM is an excellent roadmap of integrated water resources management (IWRM) in Malaysia. The plan also mainstream water resource in national economic policy, food policy, environmental policy, health policy and energy policy (Ahmed et al., 2019).



Source: (Wainwright and Verdon-Kidd, 2016; Ahmed et al., 2019, 2020) Figure 57. Risk Assessment and Management for IWRM

However, the integration and implementation of these institutes and policies are not adequate might be due to the shortcomings of willingness to lead by the lead agency of water resource management. Therefore, the local authority has the controlling power to enforce laws and policies through the Local Government Act 1976. Local authority also has the coordination capability amongst stakeholders in river and drinking water management in line with the IWRM, IRBM, ILBM and ICZM. Similarly, the Kuala Lumpur Declaration on Cities 2030 by UN-HABITAT also inspires a strong spirit of collaboration, creativity and innovation for the

local authority to take the leadership roles for IWRM (Figure 57). Therefore, the aspirations for the resilient and sustainable future of Cities 2030 as the cities for all, whereby no-one and no place is left behind to foster prosperity and quality of life for all.

Mokhtar et al. (2010) reported polycentric institutional arrangements under Federal administration are capable of coordinating and integrating river basin management by extending the scope for iterative learning processes that could address institutional challenges for adaptive and ecosystem-based management approaches. For instance, Rakan Alam Sekitat under the Dept. of Environment has taken many programmes to raising awareness of the stakeholders through environmental education (RAK, 2014). Mokhtar et al. (2011) also reported that iterative learning through the participation of individual stakeholder at the lowest appropriate level. There should also be an iterative learning mechanism within the interorganisational network for Integrated River Basin Management since there are several management sectors concerning particular statute and agency. Therefore, the major stakeholders for IWRM will play a very important role to assist to implement the water management policies effectively (Ahmed et al., 2019).

2.5. Risk Management Tools

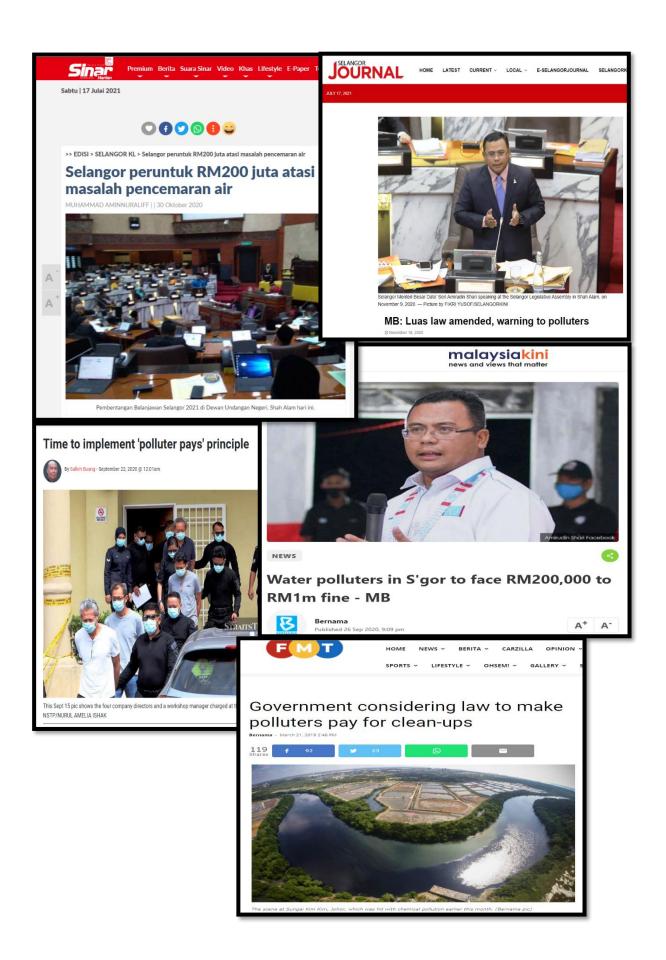
2.5.1. Polluters Pay Principal

SELANGOR WATERS MANAGEMENT AUTHORITY ENACTMENT 1999 PART IX

PROTECTION OF THE ENVIRONMENT

Clause 78. Restrictions on pollution Clause 79. Prohibition of pollution of a water source.

- **78.** (1) The Authority may, in consultation with the Director General of Environmental Quality, prescribe acceptable conditions for the emission, discharge or deposit of wastes by any person into any designated area or part thereof,
- (2) For the purpose of implementing conditions specified in accordance with subsection (1), the Authority may prevent, control or regulate the emission, discharge or deposit of wastes by any person into any designated area or part thereof,
- (3) Without limiting the generality of subsection (1) and subsection (2), a person shall be deemed to emit, discharge or deposit wastes into any designated area if:
 - (a) he places any waste or allows any waste to gain, access to any land, soil or water; or
 - (b) he causes any alteration to the natural state and usage of the receiving land, soil or water.
- (4) Any person who contravenes this section commits an offence and shall upon conviction be liable to a fine not exceeding fifty thousand ringgit or to imprisonment for a period not exceeding two years or to both and to a further fine of three thousand ringgit for every day that the offence is continued after a notice by the Authority requiring compliance has been served.
- **79.** (1) Save as may be expressly authorised under any written law no person shall, except under and in accordance with the terms and conditions of licence issued under this section, cause to enter or discharge into any water source:
 - (a) any poisonous, noxious or polluting matter or waste that will render or is likely to render or contribute to rendering such water source or part thereof harmful, detrimental or injurious to the health, safety or welfare of the public or to animal or vegetable life or health therein or to other beneficial uses of such water sources
 - (b) any matter which by virtue of its temperature, biological or chemical content or its effect in discolouring water makes or contributes to making the water source or part thereof a potential danger to public health, safety or welfare or to animal or vegetable life or health or affects other beneficial uses of such water source
 - (c) any matter which by virtue of its physical nature, chemical or biological content, or its effect in discolouring water makes or contributes to making such water source difficult to treat or affects the flow, quality or quantity of water in the water source
 - (d) oil of any nature, used, waste or waste containing oil or otherwise
- (2) Whenever any such entry or discharge shall have been made, the owner or occupier of the property from which such entry or discharge originates shall, unless the contrary is proved, be presumed to have discharged or caused it to enter into the water source.
- (3) Licence to enter or discharge into any water source any of the matter described subsection (1) may be granted by the authority pursuant to the provisions of section.
- (4) Any person who contravenes this section commits an offence and shall upon conviction be liable to a fine not exceeding one hundred thousand ringgit or to imprisonment for a period not exceeding three years or to both and to a further fine of three thousand ringgit for every day that the offence is continued after a notice by the Director requiring compliance has been served.



Third Meeting of the Third Term of the Selangor State Assembly Year 2020 30 October - 12November 2020

123) RIVER POLLUTION

Year : 2020, **Session** : 3

Issue: Environment

Assemblyman: YB Tuan Mohd Sany Bin Hamzan

Category: Written

Sub Question

1. What are the initiatives by the State Government to overcome the problem of pollution of rivers and drains as well as drainage in rural areas?

The State Government through LUAS always conducts monitoring in the river basin to ensure that water resources are protected. The sources of pollution identified are not only in the rapidly developing areas but include rural areas which are mostly water catchment areas. The State Government's initiative through LUAS to overcome the problem of river and drain pollution and drainage in rural areas is to intensify and strengthen public awareness programmes amongst river communities such as the implementation of Friends of River (FoR) in collaboration with PBT and PDT agencies. The implementation of the FoR initiative at the Selangor State level was launched at 30 for locations on 26 September 2020, which also involved communities in rural areas.

2. What steps have been taken by the State Government in an effort to overcome the problem of river pollution in Selangor?

The control and prevention measures implemented by the State Government through the Selangor Water Management Authority (LUAS) in ensuring sustainable water resources with the Integrated River Basin Management (IRBM) approach are based on the Integrated Action Plan to Address Selangor Water Resources Pollution. as follows:

- (i) Legal review of the LUAS Enactment 1999 which involves increasing the number of fines, compounds and imprisonment so that legal action is taken more feared by irresponsible parties to commit pollution. Proposed Amendments to the LUAS Enactment 1999 will be tabled in the Third Meeting (Budget), Third Term Conference, Fourteenth Year 2020;
- (ii) Updating and monitoring of inventory of land use activities in river reserves in the Geographic Information System (GIS). Inventory study and land-use mapping in 50 meters of river reserve was carried out by LUAS by using aerial surveillance method through drones at Sungai Semenyih, including Sungai Rinching and Sungai Beranang, Sungai Klang and Sungai Damansara as well as Sungai Sembah and its tributaries in 2018. While the study in Sungai Selangor, Sungai Langat and Sungai Buloh in the implementation stage starting in 2019 and expected to be completed by end of 2020. The implementation of periodic monitoring has been carried out on a monthly basis for risky activities identified in the inventory for the purpose of controlling activities in river reserves which are risky areas near sources air;
- (iii) The implementation of pollution monitoring and enforcement actions in an integrated manner is monitored through existing governance, namely Sungai Klang, Sungai Langat and Sungai Selangor Basin Task Force chaired by the Director of LUAS and held four times/ year for the implementation of monitoring and enforcement actions, with relevant agencies integration. If the issue cannot be resolved, it will be raised to the Selangor River Basin and Coastal Management Committee chaired by the Chairman

of the Infrastructure Standing Committee, YB Tuan Ir. Izham bin Hashim, which is also held four times/year. Both Committees/Task Forces are under the secretariat of LUAS;

- (iv) To hold discussions and coordination between State Government and Federal Government agencies through two meetings, namely the Meeting of the Top Management Committee to Address Water Pollution, chaired by YB Tuan Ir. Izham bin Hashim, Chairman of the Selangor State Infrastructure and Public Facilities Standing Committee and the Selangor State Water Pollution Emergency Committee chaired by YB Tuan Hee Loy Sian, Chairman of the Selangor State Environmental Standing Committee;
- (v) Implementation of Water Resources Ops where the Selangor State Government through LUAS began implementing the Water Resources Ops in January 2020 in line with the decision of the Selangor Water Resources Pollution Emergency Committee chaired by YB Tuan Hee Loy Sian, Chairman of the Standing Committee Environment. This Water Resources Ops is a 24-hour integrated monitoring operation in major river basins and water resource sensitive areas in Selangor. It is implemented to ensure that incidents of pollution of water resources, especially rivers, can be addressed immediately to minimise the risk of WTP shutdown which will cause water supply disruption to consumers. This integrated operation is led by LUAS, which involves various agencies, including the Department of Environment (DOE), Royal Malaysian Police (PDRM), Selangor State Disaster Management Unit (UPBN), National Water Services Commission (SPAN), District & Land Office (PDT), Local Authority (PBT) Pengurusan Air Selangor Sdn Bhd (Air Selangor) and Indah Water Konsortium Sdn. Bhd. (IWK). To date, the number of cases that can be handled by LUAS with non -stop WTP (Yellow Code) is 10 cases
- (vi) Intensify strict enforcement and legal actions such as Compounding and prosecution in Court. Based on records up to August 2020, 357 Notices and 12 Compounds were issued. The proposal to set up an intelligence team to increase the effectiveness of enforcement and prevent suspicious activity is still under study
- (vii) Intensify periodic monitoring of compliance with the conditions of licensed premises by LUAS subject to Written Permission for source modification activities and Pollutant Entry or Release License
- (viii) Implementation of Letter of Instruction under Section 121 (1) and Water Protection Order under Section 122 (1), LUAS Enactment 1999 to pollutant/risky premises for pollution control at source and carry out cleaning work promptly. LUAS also provides cleaning contractor panel services in the event of any water pollution emergency
- (ix) Provide an early warning system with the development of water quality telemetry stations (15 River Monitoring Stations) in strategic areas upstream with the strategic cooperation of Selangor Water Management. Data sharing and access between relevant agencies involves the integration of data into the Integrated Water Resources Management System (IWRIMS). Currently, there are 11 LUAS telemetry stations with one LUAS water quality station upstream of the Bukit Tampoi WTP inlet, involving six parameters monitored in line with the Water Quality Index (IKA)
- (x) Study and identify appropriate and effective equipment to detect odor pollution to assist in the investigation of the source of pollution. In addition, the proposed use of high -tech drones for the purpose of monitoring areas at risk of pollution in river basins on a regular basis
- (xi) Intensify and strengthen public awareness programs amongst agencies, stakeholders and the community such as the implementation of Friends of River (FoR). This is to ensure that all development or activities carried out take into account the protection of water resources.
- 3. What is the action of the State Government to prevent the problem of river pollution from recurring?

The State Government through LUAS is always committed in ensuring that water resources in the Selangor state are always preserved. In line with that, several actions have been implemented and planned by the State Government to prevent the problem of river pollution from recurring as follows:

- 1. Strengthen the LUAS Enactment 1999 by increasing fines, compounds and imprisonment for water resource pollution offenses. The proposed provision of incentives for informants regarding water pollution pollution until convicted and it is subject to amendments to the LUAS Enactment 1999
- 2. Enhance integrated action with the implementation of Water Resources Ops in collaboration with relevant agencies. The operation led by LUAS was carried out to ensure that incidents of water pollution, especially rivers, can be addressed immediately so as not to result in the shutdown of WTPs, which will cause disruption of water supply to consumers
- 3. Improving monitoring operations with the establishment of the LUAS Rapid Squad through increasing the number of staff for patrol and static purposes in water resource sensitive areas in the main river basin of Selangor to address water resource pollution implemented 24 hours
- 4. Implementation of Pollution Control with the Proposed New Zero Discharge Policy and Polluters Pay Principle (PPP). One of the proposals being studied and scrutinised by the Selangor State Government through LUAS is the zero discharge policy/policy by the industrial and manufacturing sectors. The implementation of zero discharge is a green initiative, whereby premises recycle effluent discharge from their premises instead of releasing it into the environment and water resources. The implementation of zero discharge will be implemented together with all local authorities (PBT) and DOE.

In line with the zero emission policy, the concept of polluters pay principle is also being studied and scrutinised by LUAS, which allows any premises to be charged for the amount of pollution load discharged into the river. Both policies are being studied for their overall feasibility in terms of the impact of water resources balance and sustainability, as well as the economy.

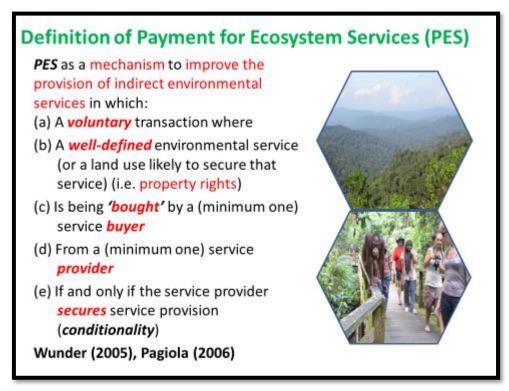
Source: (Selangor State Assembly, 2020).

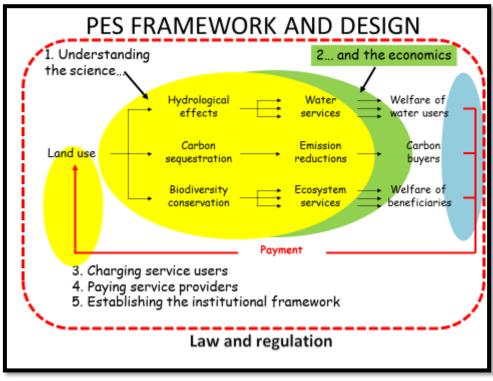
2.5.2. Payment for Ecosystem Services

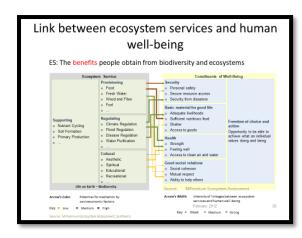
Payment for Ecosystem Services (PES) in Malaysia

By

Prof. Dr. Awang Noor Abd Ghani, Universiti Putra Malaysia (UPM)

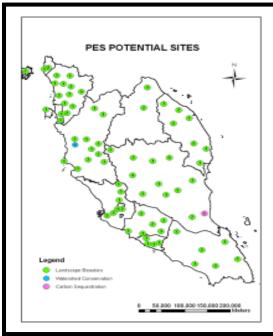






PES in Malaysia

- · 401 cases identified
- Government-financed (forest recreation, protected areas, state park)
- User-financed (tagal system)
- Mixed-financed (marine parks, sabah parks, forest recreation area, community-based project)
- · Two major ecosystems (21% of the total database)
 - biodiversity conservation (including wildlife conservation, national parks, state parks)
 - Landscape/seascape beauty (including recreation areas, ecotourism areas, marine park for recreation and ecotourism)

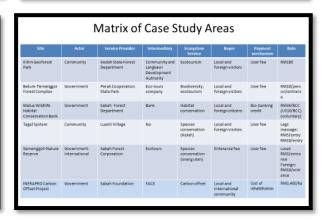


Current Projects – have PES elements

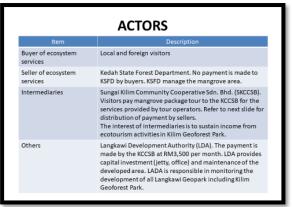
- Heart of Borneo (Sabah, Sarawak, Kalimantan)
- Central Forest Spine
- Enhancing Protected Area in Peninsular Malaysia (UNDP Project)
- ITTO-FRIM REDD+ Project
- National Biodiversity Palnning to support NBAP
- Perak Hydroelectricity Energy Corporation (PHEC)

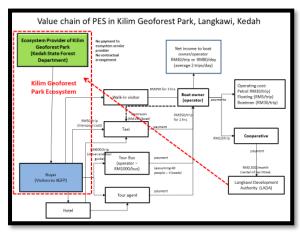
Five case studies

- 1. Kilim Geoforest Park, Langkawi, Kedah, PM
- 2. Belum-Temenggor Forest Complex, Gerik, Perak. PM
- 3. Tagal System, Ranau, Sabah
- 4. Malua Wildlife Habitat Conservation Bank, Ulu Segama, Sabah
- Semenggoh Nature Reserve, Kuching, Sarawak









Actors Category Payment Percent					
Kedah State Forest Department	Service provider (seller)	0	0		
Visitors	Buyer	RM350/boat (2 hours)			
Taxi driver	Intermediary	- RM180/boat/trip	51.4		
Boatman	Community	- RM30/boat/trip	8.6		
Other business	Community	- RM30/boat/trip	9.6		
	- RM/5/boat/trip		1.4		
Kilim Cooperative	ooperative Community - RM10/boat/trip		2.9		
Boat owner	Operator	Gross: RM95/boat/trip	27.1		
	Boat maintenance	- RM10/boat/day	3.4		
		Net: RM75/boat/day	21.4		

SERVICE			
Item			
Baseline situation	These Geoforest Parks are located in the permanent reserved forests that provide outdoor recreation and ecotourism resources. The Forestry Department of Kedah has undertaken initiative in conserving geodiversity for recreational purposes on sustainable manner.		
Environmental Services protection scheme	Area: 8,261 ha (total area of Kilim Geoforest Park) Coverage of the PES scheme: The area is contiguous of mangrove area that is located within Kilim Geoforest Park. The area is declared as UNESCO World heritage site in 2006. Types/sector: Biodiversity, Recreation Kedah State Forestry Department manages the area. Get support from Federal Government through Langkawi Development Authority in terms of infastructure development such as jetty, office, parking area, gift shops, food stalls, toiltes, surau. A project is underway to develop an Ecoscience in the adjacent area.		
Sustainability of the scheme and uses of funds	The sustainability is ensured through gazettement of area as permanent forest reserve (mangrove) and Kilim Geoforest Park. The fund for the management of the area through government allocation.		

PAYMENT SCHEME				
Item				
Establishment of payment rate	The rate is fixed based on negotiation among the community and other stakeholders (particularly taxi drivers). Even though some studies on economic valuation have been made, the estimated rate is not used in setting up the fee. This is because there is no legal and institutional arrangements between sellers and buyers.			
Legal basis for the fee	There is no legal basis on the fee charges to visitors. There is no specific duration fixed on the payment charged.			
Use of payment in ecosystem service protection and conservation	There is no provision of payment from sellers in ecosystem service protection and conservation. The budget is from the state allocation to kedah State Forest Department and federal government to Langkawi Development Authority.			

PES EVALUATION			
Item			
Environmental impact	Protection of mangrove, wildlife and geology in the area is secured through gazettement of mangrove as permanent forest reserve and declaration of Kilim Geoforest Park as World Heritage in 2006. Through these legislations, the area is secured for the provision of ecosystem services and ecosystem protection. The area for habitat protection of wildlife, plants and geology is secured.		
Economic impact	Employment opportunities to the community (intermediary) that provides tour packages, transport, restaurants, workers at LADA, boat operators. This helps to increase income and improve their standard of living. Before the scheme: income of fishermen - about RM600 - 800 a month. Now: income has increased up to RM 1,800 a month. With own boat: can earn more than RM 2,000; holiday season: up to RM10,000 a month. The visitors to the area is steadily increased over the years (see figure).		
Social and institutional impact	Training is provided to local community by Langkawi Development Authority. Organization of community engagement is done through the cooperative.		

LESSONS LEARNT

- The program can be replicated in other areas with unique mangrove characteristics and attractions to visitors
- It can be enlarged to inlcude the whole Killim Geoforest Park or the whole Langkawi Island but the contractual arrangement has to be clearly defined and established
- PES is a right model for enhancing the sustainable management of mangrove and geological features of the area because it provides incentive to local community for sustainable income and at the same time promote ecotourism
- The scheme will be modified by state authority in order to obtain the payment made by buyers. So far the state government do not have any revenue collection from ecosystem services provided by mangrove
- The role of community as an intermediary in providing ecotourism services to visitors. The payment to Langkawi Development Authority can be maintained because LADA provide capital investment and infrastructure facilities for the benefits of visitors. The payment arrangement between users and intermediary can also be maintained in view of the fact that this arrangement provide long term employment to local community and helps to improve standard of living

2.5.3. Ecosystems Approach to Fisheries Management

Ecosystem Approach for Fisheries Management (EAFM), Langkawi By

Mr. Jamil Tajam, UiTM Perlis

Nowadays, we have seen that the depletion and loss of coral reef biodiversity in our region is significantly worsening. Therefore, biodiversity conservation and significant issues related to sustainable use of this biological resource should be given specific attention. In my research, Langkawi UNESCO Global Geopark (LUGG) is good example to be a demonstration site, whereby the deterioration of coral reefs is at a critical level. A comprehensive and up-to-date understanding of coral reefs in LUGG, its values, the processes that supported it and the pressures that influence it are fundamental to protecting and restoring the reefs and in making informed decisions to avoid, mitigate and offset the pressures. This information should be taken into account in informing the adaptive management before proclaiming this area as marine protected area (MPA) through Ecosystem Approach for Fisheries Management (EAFM). Therefore, LESTARI-UKM has played an important role in the formation of this adaptive management approach. The overall objective of this project is to develop ecosystem approaches to fisheries management for biologically-globally significant and commercially-important areas beyond national jurisdiction. By focusing on this island at the northern part of Malaysia Peninsular and closed to Andaman Sea, it aims to serve as an innovative demonstration site for improving the conservation and management of unique coral biodiversity and ecological resources in the unclear water condition. The project has been addressing the three main barriers to marine biodiversity conservation in this particular area:

- 1) Lack of scientific knowledge about coral reefs ecosystems and their resources that live in unclear water condition
- 2) Lack of comprehensive and effective governance frameworks for marine biodiversity in turbid water
- 3) Lack of awareness amongst the community that live in this area

During this research, marine habitat mapping (by using acoustic approach), ecological risk assessment (heavy metal and physico-chemical) and coral reefs biodiversity were conducted in late 2014 until 2015. Work negotiations with the local fishermen community were successfully implemented in three separate workshops on 2015–2016. As a result of this workshop, the local fishing communities agreed to gazette no-take zone, which is 200 metres from the island in order to conserve the continuity of marine life. This had a positive impact in this area gazetted as a State Park or Langkawi Marine Sactuary. A part from that, the paperwork on regarding establishment of a state park and draft of establishment Fisheries Management Unit (FMU) was submitted to the State Legal Advisor and State Executive Council for carrying the process of gazettement.

From this research also suggested that multi-sectoral integrated management approach (such as, IWRM, EAFM, ICZM, ISWM and ICM) should be coordinated and should be employed together mainly to address the problem from catchment area (fresh water resources) to the marine ecosystem in a more holistic and comprehensive way. This multi-sectoral integrated

management approach can help LUGG managers deal with the complex interdependencies coral reef system and to balance between short-term local community needs and the long-term mandate of Sustainable Development Goals (SDG) target. Furthermore, this research work is in respond to global strategic plans of the Convention on Biological Diversity (Aichi Biodiversity Targets), which stated that at least 10% of coastal and marine areas should be conserved effectively, and equitably managed by 2020 (Lundquist et al., 2017; Wilhelm et al., 2014; Toonen et al., 2013). However, Malaysia currently has 2.3 % of MPAs (World Bank, 2016), indicating that more must be done to meet international targets and standards.

Finally, the project proposed a road map process towards sustainable use and conservation of marine biodiversity via the development of an adaptive and collaborative management plan. By generating interest from varies fisheries stockholder, the project raised awareness of policy makers and the locals' community about the importance of coral biodiversity and need to manage and protect the coral reefs ecosystem. This outcome are aligned with the requirements of the 11th Malaysia Plan, 2016–2020 and strengthened the Agenda 2030, which will facilitate a shift in the local socio-economic and this transformation will ensure sustainability of the nation's natural resources, minimise pollution, and reinforce energy, food and water security. By conserving biodiversity, the continuity of their function as a natural buffer against climate change and natural disaster can be intensified. Hopefully, the outcome from my research will benefit the locals and even regionally and globally in ensuring the survival of marine life, particularly the coral reefs in this area so that they are immaculately maintained for the future generation.













2.5.4. Willingness to Participate and Pay

Willingness to Pay for Watershed Conservation at Hulu Langat, Selangor

Malaysia is endowed as one of the twelfth richest of biodiversities in the world (Mohamed et al., 2012). Malaysia's flora and faura faces serious threats and has already lost its original vegetation due to deforestation activities. In Malaysta, forest areas are mainly recognised as mportant sources of water supply for industry, agriculture, households and recreation pairposes However, owadays the forest areas are under threats due to deforestation activities. Given to that matter, watershed areas are affected. Based on study by Beruviles and Veenstra (2005), tropical deforestation activities in fact lead to detrimental issues to river water quality due to increment in concentrations of sediment, nitrogen and phosphorus (Mohamed et al., 2012).

Forest areas in Selangor have been officially designated as Permanent Forest since 1898 (Selangor Forestry Department, 2009). This designation amed to protect, manage, preserve and develop forest resources in sustainable marner. However, deforestation activities in Selangor are unavoidable. Hulu Langat forest is one of such forests that suffer from deforestation. It is estimated that, about 14,567 hecteres of the forest were cut down for timber within 12 years (Jeafar et al., 2009). In addition, recent illegal logging activities reported in mass media caused impulse severity in forest destruction. This issue is in fact crucial because the Hulu Langat forest serves as watershed areas for commruties at Hulu Langat. The reliance of communities for fresh water scurces give rise to the need of Hulu Langat watershed conservation.

Hulu Langat watershed covers the area of Hulu Langat Forest reserve in Selangor, a fast developing state in West Malaysia. This forest reserve represents about 26% of nine forest reserves in Selangor. It is covered with Lill dipterocarps forest at elevation of 120 to 1,265 m above sea level (Mohd Shalhwahid et al., 2003). The serve of Hulu Langat forest as watershed is entrenched from the forest's main river, Langat River. The river constitures several branches, such as Langat River, Lupok River, Chongkak River, Pangson River, Lolo River and Lui River These ancillaries are upstream catchment areas which function as Langat Catchment area, placing a regulatory dam for domestic water supply. The dam releases domestic water supply to downstream to where the water treatment facilities are located for water purification process. A private water supply company, Syarikat Bekalan Air Selangor (SYABAS), operates these facilities. Apart of important function of upstream catchment areas, the downstream part of Langat River is at leisure used by local pecple for recreational and fishing activities (Mohamed et al., 2012).

Estimation of mean willingness to pay

The survey revealed that out of 500 respondents, 58% showed willingness to pay for the watershed conservation while 42.4% declined. The survey revealed that the respondents have more tendencies to pay lower price for watershed conservation. While 97% of the respondents who were presented with the first set of bid offer (10% increment in monthly water bill) were willing to pay for watershed conservation. In contrast, only 16% of 100 respondents were willing to pay when they were presented with bid offer of 30% increment in monthly water bill.

Based on the logit regression analysis, probability of "YES" responses for WTP was regarded as dependent variable and explanatory variables comprised offered bid amounts, income, education and residential area. The results revealed that explanatory variables are significant, which have the best fit to the model. Positive sign of coefficients from regression denotes direct relation between explanatory and dependent variables. In contrast, negative sign of coefficient otherwise implies indirect relation. The bid amount offered to respondents for the watershed conservation showed negative sign and it was statistically significant. Meanwhile, income showed a positive sign, signifying its positive correlation with WTP.

Household Willingness to Pay for Watershed Protection Services in Langat Basin, Selangor by Using Contingent Valuation Method

Willingness to Pay (WTP)

The mean WTP of estimated upstream household WTP is RM30.01 while the mean of middlestream household WTP is RM33.07 as compared to downstream household WTP, which is RM32.41 (Krishnan et al., 2018). The estimated results appear to be lower than previous WTP studies conducted on hydrological services provided in Opequon watershed. The WTP for Opequon watershed protection is RM192 per month (Collins et al. 2006). On the other hand, WTP for Flagstaff watershed is \$4.89 (RM19.56) monthly (Mueller, 2012), Dejen Woreda watershed is 28.48 Birr (RM63.24) annually (Ebrahim, 2014), WTP for Wondo Genet forested watershed is 30-35 ETB (RM6.54) monthly (Ayenew & Tesfaye, 2015) and willingness to pay for improved watershed services of the Layawan watershed in Oroquieta City is 57.48php and 53.89php (RM4.66 and RM4.98) (Calderon et al., 2012).

Besides, willingness to pay for restoration of highly urbanised coastal watershed is \$132.72 annually per household (Nicosia et al., 2014). The differences in WTP for watershed protection indicated that a household's quality of life, income and awareness of watershed protection services, as well as effectiveness of management of payment collection are factors that influenced WTP. Higher WTP based on the estimation results indicated a greater concern amongst households towards environmental awareness and watershed protection services in the Langat Basin. In this context, this study showed a higher WTP as compared to Costa Rica's PES project. Therefore, it is well understood that the possibilities of developing effective payment mechanism for the Langat Basin is high amongst households. Extensive promotion and PES education amongst households will lead to the development of a robust PES scheme because 2.8% of households with no prior knowledge on PES in this study possess RM8 WTP annually based on a clear hypothetical market.

2.6. Risk Management Communication

2.6.1. Multi-Stakeholders' Consultation

The Dialogic Change Model presents a structured way for organisations to plan and implement their stakeholder communication initiatives. It is divided into four phases: Exploring and Engaging; Building and Formalising; Implementing and Evaluating; and Developing Further, Replicating or Institutionalising. It was created to focus on the importance and value of dialogue between stakeholders, and is a pivot away from a top-heavy style of project management (SustaiNet, 2020).

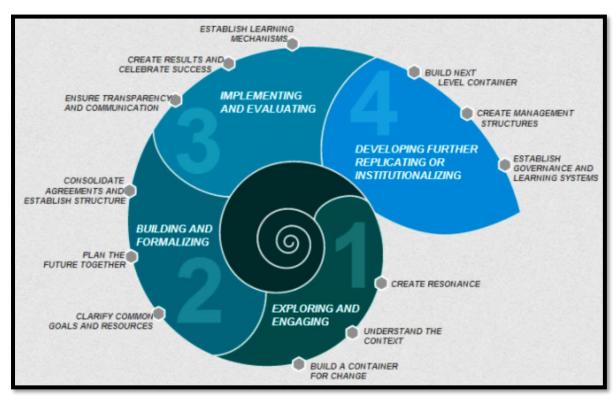


Figure 58. A Stakeholder Communication Model (SustaiNet, 2020)

1. Exploring and Engaging:

In this phase, the stakeholder communication context is explored. What factors may influence the dialogue? Who are the primary and secondary stakeholders? What systems are in place and how might they impact stakeholder participation?

Talking to selected but relevant stakeholders and opinion-leaders informally at this point helps to understand the prospects and potential obstacles for dialogue and change.

Expected outcomes:

- Identifying stakeholders
- Building stakeholder trust
- Gaining credibility required for implementation
- Understanding the context of the project/issue with respect to stakeholders
- Identifying external influencing factors

2. Building and Formalising:

This phase is focused on solidifying the stakeholder communication process and moving towards formal acknowledgement of stakeholder commitment. Project teams are set up, meeting schedules are developed and agreements are signed – depending on the nature of the project this could mean formal contracts, memos of understanding, project plans, etc.

The structure for the Stakeholder Dialogue needs to offer a sufficient degree of 'process safety' in an otherwise unpredictable and complex environment: contribution, roles and allocation of work as well as communication and process designs need to be agreed upon jointly.

Expected outcomes:

- Collaboration agreements
- Project plans
- Implementation agreements
- Formal organisational units to help guide the process i.e. committees, dedicated teams, working groups.

3. Implementing and Evaluating:

This is the actual implementation phase – with the key performance indicator being "results". For a stakeholder dialogue to be effective it must deliver on the promise of visible progress, change or benefits, or stakeholders will just lose interest in the process. During this phase organisations often recognise that specific project components or issues may have not been addressed or properly considered earlier in the process. In addition, it is common that new and/or "missed" stakeholder get introduced to a project.

The complexity of a process often becomes evident during this phase, sometimes in the form of a crisis. Crisis symptoms may include criticism from external parties, stakeholders voicing new, previously unspoken interests, negative press, counter initiatives, endless non-productive discussions, or a group of actors threatening to back out of the dialogue process. Political interests can often hold up an initiative's development or complicate consensus-building. The more stability and trusting relations have been created in Phase 1 and Phase 2, the better such phases of instability can be overcome.

Expected outcomes:

- Sharing/publishing successful milestones
- Generating project implementation and status reports
- Public communication and media coverage
- Stakeholder communication monitoring system in place

4. Further Development, Replicating or Institutionalising:

It is common for many stakeholder dialogues to end after the successful completion of phase three. However, some stakeholder communication initiatives do move on to get set up as "sustainable structures" as this fourth phase. This can take many forms, including replication of programs at other locations or across multiple projects or formalising the stakeholder dialogue process within the organisation.

The major challenge in Phase 4 is keeping the spirit of change alive. The move from a more loosely structured initiative to an institution is not necessarily an easy process. Replication or institutionalisation often requires a professional management structure. Roles change and decision-making structures have to become more efficient. Existing management structures require additional legitimacy and credibility. Therefore, it is recommended that the original core group remains actively involved in Phase 4 of a Stakeholder Dialogue, progressively handing over their function to new actors and transferring the process step-by-step into its future structure.

Expected outcomes:

- Ongoing stakeholder participation
- Setting extended objectives
- Institutionalising the stakeholder communication programme
- Leveraging the dialogue experience and use it to inform other processes or projects

2.7. Training Methods of AACB IWRM

2.7.1. National River Trail Programme

The National River Trail Programme (DSK) is one of the initiatives implemented by the Ministry of Environment and Water (KASA) to change the image of industrial factories in the country as river polluters in the eyes of the people. KASA has targeted 10,000 km of trails in selected river areas by 2030. This programme is a strategic partner programme with district officials, local authorities, DID, NGOs, community and industry. The existence of trails along rivers or bodies of water will encourage environmentally based activities, such as picnics, fishing and cycling in the local community, thus preventing irresponsible parties from making the river as an eventual waste disposal site causing pollution. This programme is a good example of platform for public participation (KASA, 2021).

KONSEP DSK

enerusi DSK, pembinaan denai akan dibangunkan dengan pendekatan *Nature-based Solutions* (NBS), yang bertujuan menangani cabaran sosio-alam sekitar melalui pengurusan dan penggunaan alam secara lestari, membabitkan kerjasama pelbagai pihak, termasuk PBT, badan bukan kerajaan (NGO), badan korporat, komuniti setempat, pelajar dan lain-lain yang akan berperanan menerusi tanggungjawabnya masing-masing.

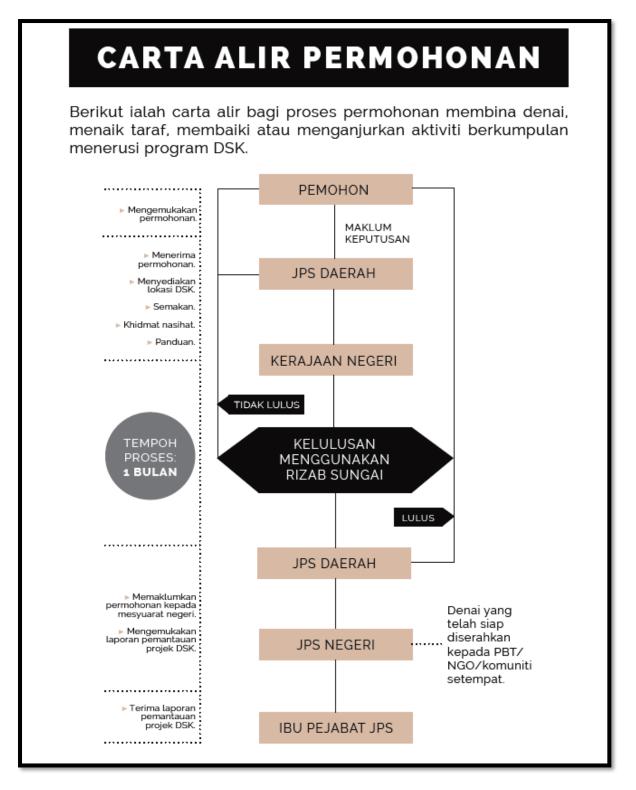
Pelaksanaan DSK turut melibatkan kerjasama KASA serta agensi di bawahnya dengan kementerian dan agensi lain seperti Kementerian Perumahan dan Kerajaan Tempatan (KPKT). Kementerian Kerja Raya (KKR), Kementerian Pelancongan, Seni dan Budaya (MOTAC), Jabatan Kerajaan Tempatan (JKT), Jabatan Kerja Raya (JKR), Jabatan Landskap Negara (JLN) dan PBT yang berkaitan.

Melalui pelaksanaan DSK, kerjasama strategik di antara beberapa NGO seperti Friends of Rivers Malaysia (FoRM), Rakan Alam Sekitar, badan-badan korporat dan pusat pengajian tinggi dengan Pihak Berkuasa Negeri dan Kerajaan Persekutuan dapat diwujudkan bagi menjayakan dan meningkatkan inisiatif komunikasi, pendidikan, pembabitan dan kesedaran (communication, education, participation and awareness, CEPA).

Walaupun DSK ialah inisiatif kerajaan, namun badan korporat. NGO dan komuniti setempat akan menjadi peneraju dengan menjadikan kawasan denai terpilih sebagai 'anak angkat' dan menjayakan pelbagai aktiviti pengindahan dan penyelenggaraan, sekali gus meningkatkan kesedaran dalam kalangan khalayak. Dengan adanya program sebegini, semangat dan rasa tanggungjawab bersama dan rasa kepunyaan (sense of belonging) semua pihak dapat dipertingkat, sekali gus menghalang perbuatan pihak tidak bertanggungjawab menjadikan sungai sebagai tempat pembuangan sisa.



Source: (KASA, 2021)



Source: (KASA, 2021)

2.7.2. River of Life

The River of Life (ROL) is a seven-year project headed by the Malaysian Government to transform the Klang River into a vibrant and liveable waterfront along with the high economic value. Meanwhile, the ROL project has been successful to ensure the involvement of several communities along the Klang River Basin specially via the recycling as well as river monitoring and pollution mapping activities. Some of the communities that are involved with ROL project are as follows- Wangsa Melawati Green Community (WMGC), Persatuan Rekreasi Taman AU3 Kuala Lumpur (PRTAU3), AU2 Committee Rukun Tetangga, Sierra Ukay Community (SEGORA), KRT Perumahan Awam Seri Terengganu, KRT Kampung Kasipillay, KRT Kampung Segambut Dalam, KRT PPR Beringin and as such. Some of the community involvement activities of ROL project are Recycling Initiative with Communities: Recycle for Life, Programme Jaringan Komuniti (Community Networking Programme)-River Monitoring and Pollution Mapping, and as such.

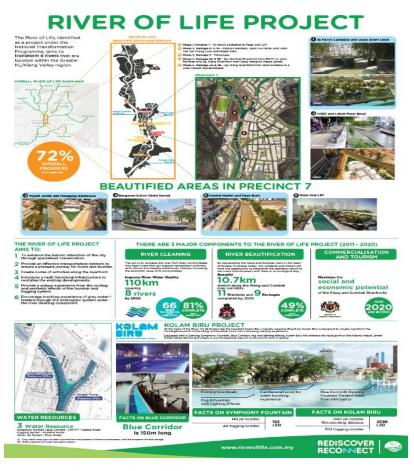


Figure 59. River of life panning (Source: GEC, 2021)

The platform, Friends of Klang River Basin, covers eight rivers within the Klang River Basin, along with a total length of 110 km. The main activities of the Friends of Klang River Basin are divided into three major components:

- 1. River Cleaning (led by Department of Irrigation and Drainage (DID) Malaysia)
- 2. River Beautification (led Kuala Lumpur City Hall (DBKL))
- 3. Commercialisation and Tourism (led Ministry of Federal Territory (KWP))

Target groups of the Friends of Klang River Basin and its initiatives are:

- 1. Educational institutions- Issues related to solid waste management from the inside and outside of the campus as well as the waste disposal from the cafeterias and canteens into drains.
- **2.** Local communities- Issues related to household wastes disposal into the drains, riverbanks, and residential areas, as well as sewerage wastewater discharges and riverbank encroachment.
- **3.** Food establishments, wet markets, and automobile workshops- Issues related to food waste disposal and inefficient management of food waste, engine oil and spare parts.
- **4.** Industries, corporates, and developers- Issues related to inefficient management of solid waste, residual effluent and construction waste as well as mass production of waste.

Phase 1 and Phase 2 of the River of Life- Public Outreach Programme (ROL-POP) were completed for the Upper Klang River catchment and Bunus River. The ROL-POP has now expanded to Phase 3A, Phase 3B, Phase 4 and Phase 5 that covers the entire River of Life project's boundary. Global Environment Centre (GEC) is in charge to implement the ROL-POP's activities, including the activities in the) Phase 5 area.

GEC via the ROL-POP has developed a mobile application called Citizen's Eye. Citizen's Eye is an application that has been developed to allow the Public Outreach Programme's (POP) participants as well as the public to be the eyes and ears to immediately and efficiently record any event or activity related to river management (for example, a good management practice), including pollution problems. The application is capable of providing a link about the river management activities to the local authorities for taking further actions.

There have been many efforts that involved the communities as part of water stakeholders and public participatory platforms in Malaysia. Few existing public participatory platforms, such as Inspirasi Kawa, River rangers, Department of Environment Department of Irrigation and Drainage (DID), Friends of Rivers, and WWF, have actively engaged with local communities to participate in AACB water programmes. However, due to some limitations, the community involvements on water management are still limited.

Community participation in IWRM implementation is not represented equally and is limited. One of the widely recognised causes of the above-mentioned failure to develop and implement IWRM is the lack of involvement from local people and communities. Participation is often limited to public consultations, whereby communities can merely react to plans that have

already been decided. The government has installed coordination forums on environment. However, the exposure, awareness, knowledge, and skills has yet to be fully developed. Community has not been actively involved and participate in developing policy and monitoring the environment surrounding.

Ahmed et al. (2020) found that the exposure of perception on river and drinking water in Langat River basin has significantly improved the willingness of community to participate in the water management. The study suggested that responsible authorities at the Langat River Basin, Malaysia should focus on raising awareness, advocacy, and capacity building for people's effective participation in water resources management. The National Water Resources Policy 2012 mainly focuses on raising awareness. However, it was found that advocacy and capacity building of the stakeholders in water management are not highlighted significantly in the policy. It is suggested that relevant agencies should take special non-structural measures such as campaigns, advertisements, water fairs, trainings, as such to raise the awareness and capacity building of the people to enhance their participation in the effective water resources management platform. People in Malaysia are aware of the importance of water quality not only for aquatic life but also for a healthy and high-quality standard of living. The communities also think that quality water is an essential requirement for economic development. The communities are willing to participate in water resources management if they are well informed and aware on the water management.

Some examples of the public participatory platforms (PPPs) are discussed below, and the information about the PPPs were based on the desktop review as well as the interviews with the personnel of the specific platforms.

- 1. To provide and disseminate synthesised knowledge and experience on best management practices (BMPs) in IWRM.
- 2. To foster interaction amongst its members by promoting cross sectional and multistakeholder dialogues at local, river basin, state and national levels to meet critical needs.
- 3. To provide support in capacity building and training programmes and activities related to IWRM.
- 4. To provide support for research and development initiatives related to IWRM.
- 5. To act as the focal point and coordinating centre for collaborative action with similar or related organisations locally, regionally and internationally.

2.7.3. River Care Programme

Global Environment Centre (GEC) established a River Care Programme (RCP) focusing on promoting community participation in river and water resource protection and sustainable use of it through the Civic Science approach. GEC work closely with all stakeholders in solid waste management, and water and river management, and believe that everyone has a role to play in the environment.

RCP's mission is to promote the protection, restoration and sustainable use of rivers by enhancing multi-stakeholder participation and knowledge to stimulate local action and vision to have the clean, healthy, living and vibrant rivers for people and the environment.

Objectives of the River Care Programme are:

- 1. Protect, conserve and promote living rivers and their biodiversity.
- 2. Promote restoration and rehabilitation of river and other water bodies.
- 3. Raise awareness and educate all stakeholders about river care.
- 4. Promote civic consciousness and local action through river monitoring and mapping.
- 5. Support capacity building and networking of individuals, communities and organisations in river management
- 6. The focus of this program is to promote and support the integrated management of river basins with particular emphasis on ensuring that biodiversity and wetland conservation and community considerations are incorporated into river basin management.

GEC's River Care Programme has undertaken a range of projects and initiatives related to integrated river basin management and has involved with various partners in the following site-based riverine assessment and management projects which emphasised community participation. RCP is working together with five target groups (general public; educational institutions; local communities; food establishment, hawkers, wet markets and workshops; industries, corporation and developers) to better understand their perception, concerns and issues about the river and implement strategies and action plans to curb the river pollution.

In 2019, RCP has managed to outreach to more than 30,000 target audiences in ROLPOP-related activities, extended community adoption by 6.8 km river stretch, community monitoring for 14.1km stretch of river and established four environmental-based community education corners. The constructed and well-established program and module developed by GEC under RCP was tremendous. More than 300 communities are involved in this RCP program. Other successful programs include waste recycling and collection of used cooking oil for biodiesel, school-based initiatives via the Squad Ranger and implementation of Best Management Practices in wet markets, restaurants, industries, corporation and developers. Some examples of the River Care Programme are:

Table 124. River care programme

Project	Details	Module Developed	
W.A.T.E.R Project	This water stewardship project is a	a. GEC - River Care Module 2019	
a. W.A.T.E.R Project	continuation of W.A.T.E.R Project	b. GEC - River Report Card	
Water Stewardship –	working on rivers rehabilitation and	c. GEC Booklet - RIVER Ranger	
Water Balancing and	educational outreach to various	Programme	
Sustainable River	stakeholders to change mindsets and	d. GEC - River Ranger Water	
Catchment Management	adopt water conservation initiatives	Conservation Module (School)	
for Selangor River Basin	for water resources protection.	2016	
b. Sungai Penchala River		e. GEC poster – What you have	
Programme - Water		thrown today?	
Stewardship		f. GEC brochure -River Water	
c. Sg Kinta River		Quality Monitoring and	
Education Programme		Classification	
SMART (Start Managing	This is a project developed to	g. GEC Poster - Water auditing	
All Resources Today)	support a comprehensive recycling	h. GEC- River Report Card	
Ranger for Schools within	programme through buy-back system	i. GEC poster – River ranger Klang	
Klang Valley	and increase recycling practices	River	
	amongst students.	j. GEC booklet – River Auditing	
Integrated Management of	This project is a collaborative effort	'let's get to know our rivers!'	
Kinta River Basin for	of various stakeholders, especially	k. River of Life Map	
Community and Ecosystem	key relevant government agencies in	ASEAN Secretariat and GEC -	
Services through Active	Perak aims to conserve and preserve	Peatlands and Climate Change in	
Community and Stakeholder	the upper catchment of Kinta River	Southeast Asia	
Participation	Basin that serves as water supply to	m. GEC - Peat for life? Peatlands &	
_	Orang Asli and local communities.	climate change adaptation	
River of Life Public	The main objective of ROL-POP is	n. GEC – Lake report card	
Outreach Programme Phase	to generate evidential improvement	o. GEC – Hutan Bakau, Kuala Gula,	
5 (ROLPOP 5)	in attitudes and behaviours of target	Perak	
	groups within the Project Area	p. GEC - Kad Laporan Sungai	
	towards river care and preservation	q. ASEAN Secretariat and GEC –	
	in order to improve water quality and	Addressing Peatland Degradation	
	reduce pollution within project area.	in South East Asia ASEAN's	
	other than that, it is to promote a	Regional Efforts	
	sense of ownership towards the river	r. GEC poster - Fiery Southeast	
	and initiating long-term and	Asia -Our resources, lives, future	
	sustainable change in behaviour	under threat-	
	towards preserving the river.	s. GEC – Biological monitoring -	
Sustainable Water Resource	GEC recognises the lack of clean	have you ever wondered what's	
Management for	water supply in the rural areas and	living inside a river?	

a			ana
Community via Drinking	amongst the indigenous communities	t.	GEC – Handbook account for
Water Supply	in Malaysia. This project is initiated		recycle SMART RANGER
	to find solution for this problem by	u.	GEC – The Tsunami and Coastal
	providing suitable and practical		Wetlands – Recommendations for
	alternative sources of potable water		Action
~	for them.	v.	GEC – Assessment on peatlands,
Sungai Penchala River	Sungai Kinta River Education		biodiversity and climate change
Education Programme	Programme was funded by G.A.B	w.	GEC – Assessment on peatlands,
	Foundation to empower Malaysians		biodiversity and climate change -
	to make the choice to conserve the		key interim findings related to
	water sources.		climate change
Community-based Waste	A 3-year project focused on	х.	GEC – Assessment on peatlands,
Management in Pulau	empowering local community to		biodiversity and climate change-
Pangkor	reduce coastal water pollution by		executive summary
	managing waste and water	у.	ASEAN and GEC – ASEAN
	sustainably via Waste to Wealth		Peatland Management Strategy
	concept. The initiative was	z.	ASEAN and GEC – ASEAN
	implemented by GEC, funded by		Peatland Management Initiative
	Vale in Malaysia. Supported by	aa.	ASEAN Peatland Forests Project
	Department of Irrigation and		(APFP) – Rehabilitation and
TO AN A TO SEE TO A SECOND SEC	Drainage, Manjung, Perak.		Sustainable Use of Peatlands Forests Southeast Asia
The W.A.T.E.R project by	The W.A.T.E.R project by SPARK	h h	
SPARK Foundation	Foundation, in partnership with	UU.	GEC - Peatland Forest Ranger Module
	Global Environment Centre (GEC)	00	GEC – Hutan Paya Laut Manjung
	was commenced in December 2007.	CC.	Selatan – Southern Manjung
	W.A.T.E.R is a pioneer initiative to		Mangrove, Kampung Nelayan,
	educate the public about the		Fishing Village
	importance of water and why and	dd	GEC – River of Life Segregate
	how we should conserve and protect	uu.	Solid Waste
HSBC Water Conservation	its sources i.e. the rivers.	ee.	GEC – River of Life -Public
and Environmental	Water Conservation Programme was	cc.	Outreach Programme Phase 5
	a two-year project funded by HSBC	ff.	GEC – River of Life Public
Programme for Schools in	Bank Malaysia Berhad to educate student on wise management of the	11.	Outreach Programme
Malaysia	water resources.	gg.	
Community Flood-Proofing	Malaysian Water Partnership	55.	CommunityGEC – 2017 Bunting
and Adaptation for Climate	(MyWP) under the Global World		on Academic Insitut
Resilience	Partnership (GWP) aims to create a	hh.	GEC – 2017 Bunting on Solid
Resilience	platform and pathway to the		Waate
	community to be flood-proofing and	ii.	GEC – 2017 Industy's Solid waste
	adapt for climate resilience. Global	jj.	GEC – Bunting on Best
	Environment Centre has been	33	Environmental Management
	entrusted as a working partner to		Practices: What we can do
	implement this activity.	kk.	GEC – Bunting River of Life
River of Life Public	The main objective of ROL-POP is		"Communities' Activities"
Outreach Programme	to generate evidential improvement	11.	GEC pamphlet –
(www.myrol.my)	in attitudes and behaviours of target	mm	. Friends of Kuala Gula Mangrove
, , , , , , , , , , , , , , , , , , , ,	groups within the Project Area		Forest
	towards river care and preservation	nn.	GEC – River of Life Public
	in order to improve water quality and		Outreach Programme
	reduce pollution within project area.		GEC -
	Other than that, it is to promote a		friends of Selangor Peat Forest
	sense of ownership towards the river	qq.	GEC pamphlet- Mangrove South
	and initiating long-term and		MnajungGEC Poster - Water
	sustainable change in behaviour		Saving Tips
	towards preserving the river.	rr.	GEC Poster - River of Life -
Rehabilitation of Kelana	The Kelana Jaya Lakes		Public Outreach Programme
Jaya Lakes, Selangor	Rehabilitation Programme was		(POP)
onju names, semigor	developed in 2002 by Global	ss.	GEC Poster - 4R, 2C way of life
	Environment Centre (GEC) with		
	funding from the UNDP-GEF Small		
	Grant Fund. The goal of the project		

	was "to rehabilitate and sustainably	
	manage the lakes of Kelana Jaya	
	Municipal Park through participatory	
	approach involving all key	
	stakeholders especially the	
	community groups".	
Community Involvement in The Nenggiri River Consertaion		
Conservation of Biodiversity	Programme (NRCP) was established	
of Sg Nenggiri basin,	in 2004 following concerns	
Kelantan	expressed by the local community	
	and other stakeholders over the	
	degradation of Nenggiri River and	
	loss of livelihood from fishing and	
	other natural resource-based	
	activities. NRCP was established by	
	the Global Environment Centre and	
	Titiwangsa Heritage Sdn. Bhd. in	
	partnrship with local communities	
	and the Kelantan State Government.	
Sg Pinang River Care	Sg. Pinang RIVER Care Programme	
programme	which is a three years project funded	
2	by HSBC Bank Malaysia Berhad in	
	partnership with Global Environment	
	Centre (GEC) to enhance community	
	participation in river protection and	
	river rehabilitation ends in 2013.	
Rapid Assessment of Upper	A one year project to provide	
Kinta Catchment	baseline data on the upper Kinta	
	catchment	
Community Flood-Proofing	A short term project, funded by	
and Adaptation for Climate	University Putra Malaysia (UPM) to	
Resilience, Kuantan, Pahang	enhance and develop training module	
_	for community flood awareness and	
	preparedness, incorporating	
	experiential learning styles, to	
	enhance climate change resilience.	
	The project was implemented in	
	partnership with GEC, MyWp and	
	DID Pahang.	

2.7.4. Wakaf Air

The *Wakaf Air* Fund is an initiative of KASA in collaboration with YWM aimed at providing alternative sources of funding for water service projects easily, quickly and sustainably through endowment instruments. *Wakaf Air* provides a platform for the public, corporate and private sectors to participate based on their respective abilities in the government's efforts to provide water services to those in need across religious, racial and ethnic boundaries. *Wakaf Air* is a structured scheme to enable the public to perform *wakaf* in the water services sector that is very important in human life (KASA, 2021, 2020; Ali 2021; Noh, 2021).

The initial stage of the use of *Wakaf Air* Fund is to fund small-scale water service projects worth below RM50,000.00 such as well excavation, maintenance and purchase of spare parts to continue the supply of clean water and the provision of alternative water sources. This *wakaf* contribution can be channeled through the Malaysian Cash *Wakaf* System that can be accessed through the link https://www.ywm.gov.my/wakaf-air. Each contribution is eligible for income tax deduction under Section 44 (11C) of the Income Tax Act 1967, subject to the deduction that can be claimed by the individual is 7% and the company 10% of the aggregate income in accordance with the approval of the Ministry of Finance Malaysia [No. Tax Reference: (8.09) 248/40/7-2078 (29) dated 17 July 2019 (KASA, 2021, 2020; Ali, 2021; Noh, 2021).

2.7.5. Friends of River (FoR)

According to Friends of River Malaysia, a total of 145 Friends of river were established nationwide. In Selangor, the State Executive Council (EXCO) or Majlis Mesyuarat Kerajaan Negeri (MMKN) Selangor on 25 January 2019 approved the establishment of the rivers conservation implementation chaired by the chairman of the standing committee on infrastructure and public facilities and the board as the secretariat. Selangor Government approved budget of RM1 Million as an effort to support Friends of River programme in 2021. One of the river conservation initiatives introduced through this committee is the creation of Friends of River (FoR) in the Selangor State.

The objectives of Friends of River (FoR) are:

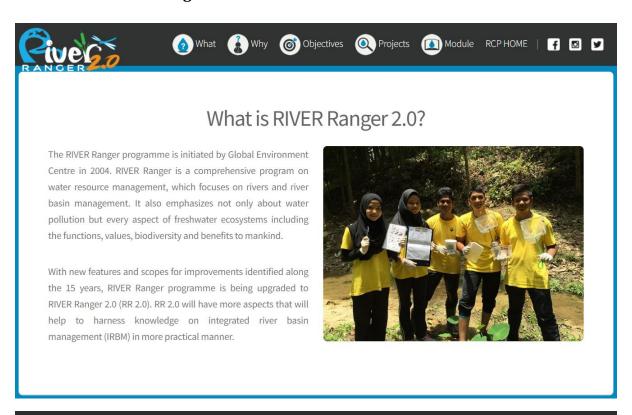
- 1. To increase public awareness and love for the importance of rivers in the Selangor state and the preservation of ecosystems
- 2. Sense of ownership and accountability amongst the community towards the river
- 3. Collaborate with the local community in implementing river conservation programmes / activities consistently.
- 4. Creating a clean, lively, and safe river environment to visit.

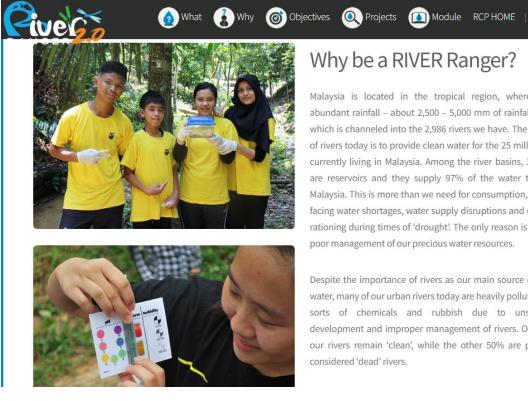
Meanwhile, 19 community-based platforms have been established and platforms are listed below in the table:

Table 13. Friends of river in Selangor (under LUAS)

No	Community Name	Community Leader	Name of River	
1	Friends Sungai Klang	Kennedy Michael	Sungai Klang	
	Taman Melawati River	** ** **	× 1 2 2	
2	Friends of Klang River Basin	Kalithasan K.	Lembangan Sg. Klang	
3	Inspirasi Kawa and Water Warriors	Affan Nasaruddin	Sungai Selangor	
4	Belia Patriot YPNM	Lt Kol Bersekutu (PA) Hj Yann Razal	Taman Warisan Hulu Sg. Klang	
5	JKP Zon 4 MPSJ	Ar Kamarul Hisham Bin Hj. Yeop Hashim	Sungai Klang	
6	Inspirasi Kawa	Masbudi Abdul Malek	Sungai Selangor	
7	Friends of Sg. Garing	Samsudin Bin Mohamad	Sungai Garing	
8	Taman Rekreasi Paya Bakau Kg. Sijangkang	Mohd Suhaimi Bin Sanusi	Sungai Batu 8 Sijangkang	
9	MPKK Kg. Melayu Bt. 16, Rawang	Adnan Bin Ahmad	Sungai Sepakat	
10	Kelab Kebun Rumah Pangsa AU2	Tn. Haji Mohamad Halim Bin Mohamad Said	Sungai Klang	
11	Kampung Taman Warisan	Mazelan Bin Jamaluddin	Sungai Klang	
12	Kelab Rekreasi Sirip Biru Negeri Selangor	Zaidi Bin Ahmat at Haron	Sungai Sepang Besar	
13	Komuniti Bestari Jaya	Zaleha Mat Saat	ORS Bestari Jaya	
14	River4life	Airudin Bin Saranor	Sg. Alor Lempah	
15	Kelab Rotary Malaysia	Dr. Dhileepan	Sungai Selangor	
16	Desa Anggerik Serendah	Dr. Ir. Mohamad Asari Bin Daud	Sungai Selaru	
17	MPKK Sungai Apong	Mohd Shahrazad Bin Abd Ghani	Sungai Apong	
18	Friends of Rivers, Malaysia	Dato Seri Zaini Ujang /	Sungai seMalaysia /Friends of	
10		Mansor Abd Ghani	River Malaysia	
19	Indah Water Konsortium	Indah Water Konsortium (Shah Alam)	Anak Sungai Tambul Kota Damansara	
		(Shan 7 ham)	Anak Sungai Bukit Gasing,	
			Petaling Jaya	
			Desa Mentari, Petaling Jaya	
			Tasik Seksyen 7, Shah Alam	
			Sungai Langat (Kawasan	
			Perdagangan Banting)	
			Sungai Kanching, Templer Sungai Air Hitam / Parit Besar,	
			Seksyen 4, Bandar Baru Bangi	
			Sungai Air Hitam Tributary, Klang	
			1	

2.7.6. River Ranger





Why be a RIVER Ranger?

Malaysia is located in the tropical region, where there is abundant rainfall - about 2,500 - 5,000 mm of rainfall annually, which is channeled into the 2,986 rivers we have. The major role of rivers today is to provide clean water for the 25 million people currently living in Malaysia. Among the river basins, 30 of them are reservoirs and they supply 97% of the water throughout Malaysia. This is more than we need for consumption, yet we are facing water shortages, water supply disruptions and even water rationing during times of 'drought'. The only reason is due to the poor management of our precious water resources.

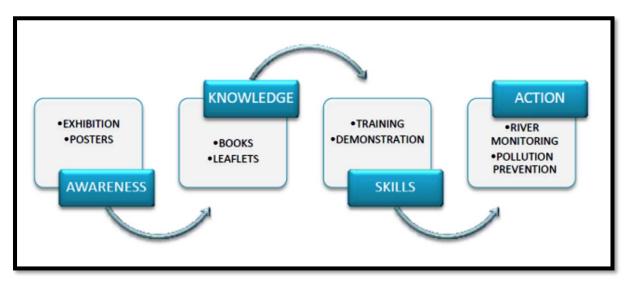
Despite the importance of rivers as our main source of drinking water, many of our urban rivers today are heavily polluted with all sorts of chemicals and rubbish due to unsustainable development and improper management of rivers. Only 50% of our rivers remain 'clean', while the other 50% are polluted or

Source: (GEC, 2021)

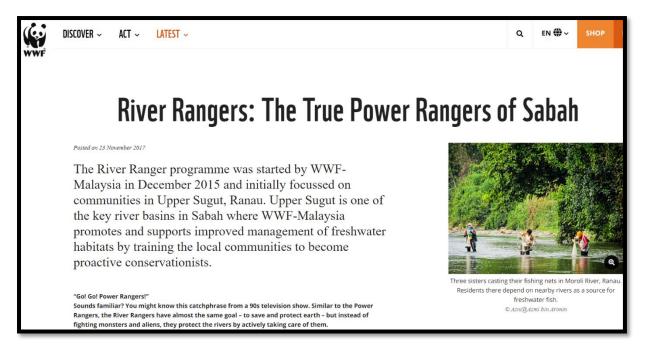
With pollution of water sources arising to be one of our major issues, it is everyone's responsibilty to play a part and protect our water resources together.

Global Environment Centre (GEC) prides itself in being the first in Malaysia to introduce the concept of "Civic Science" as a way to approach community participation in river management. The concept applied is as follows:

Many projects emphasise on the awareness and knowledge, but what lacks is the skill to take action on issues that matter the most. By ensuring that people have the awareness, knowledge and skill, only then can they take action to fix the problems at hand. Through training the general public to become citizen scientists, they can take ownership of their nearby river basins to play a key part in protecting and conserving our rivers.



Source: (GEC, 2021)



Source: (WWF, 2017a)

From trainee to trainer

With funding from HSBC Bank Malaysia Berhad, WWF-Malaysia collaborated with the Community Development Unit of Ranau's district office to train 16 residents living in the Upper Sugut River basin and its tributaries as River Rangers. Since becoming the River Rangers of Ranau, the locals have formed a club called the Kelab Pemantau Sungai Daerah Ranau. Their first ever activity was a river monitoring programme for the villagers of Kampung Perancangan and Kampung Togis in January 2016.

Out of the 16 River Rangers of Ranau, Zaini Sapin, Japli Sapin, Muslimah Sapin, and Kanisah Asin have become trainers to a new batch of River Rangers in Inanam. They are tasked with training and guiding new rangers on practical skills such as pollution monitoring and mapping, and simple ways to ensure river cleanliness (WWF, 2017a).

Inanam's River Ranger recruitment

About 13.4 kilometres long, the Inanam catchment is located in the north-east of Kota Kinabalu and is one of the key river basins in the state. A catchment is an area, whereby water is collected by the natural landscape, such as when rainwater is captured by mountains and hills, which eventually flows to rivers, lake and ocean. There are three major rivers in this catchment; namely, Inanam, Likas and Darau Rivers. These rivers are greatly affected by unsustainable development and polluted by drainage and industrial waste (WWF, 2017a).

According to the Department of Environment Sabah, there were 293 potential sources of water pollution along the riverbanks of Inanam River as of August 2017. The sources of this pollution were traceable to small and medium-sized industries and residential areas in Inanam. Indiscriminate dumping of waste is the main reason why the Inanam River remains polluted and if this continues, the river may never recover. Recognising the severity of this issue, WWF-Malaysia collaborated with the Kota Kinabalu City Hall to expand the River Ranger programme to Inanam with funding from HSBC Bank Malaysia Berhad.

From 28 to 29 October 2017, local communities living close to the Inanam River were invited to participate in their first River Ranger workshop. Just like in Ranau, this workshop was held to recruit River Rangers from the Inanam community to drive river conservation efforts in their area. Organised by the City Hall and WWF-Malaysia, the workshop was also attended by representatives from the Department of Irrigation and Drainage (DID), Community Development Unit of Inanam (UPPM) and Sabah Environmental Protection Department (EPD).

Kota Kinabalu Mayor Datuk Yeo Boon Hai said, "We need to realise that rivers are not dumping sites, as disposing waste unsustainably negatively impacts the environment and we must join hands in looking after our rivers." He further stressed that instilling love and care for our rivers is the long lasting solution to the problem. He added, "Kota Kinabalu City Hall fully supports the River Ranger programme in Inanam as it is in line with our vision to make Kota Kinabalu a clean, green and liveable city by 2020."

On Day 1 of the workshop, participants were introduced to the River Ranger programme and the environmental issues affecting rivers, water resource management, and the freshwater ecosystems, which included biodiversity, functions, values, and benefits to people.

During the fieldwork on Day 2, participants learned three techniques of river monitoring:

- **Physical observation**, which involves the use of five human senses (smell, sight, sound, touch, and taste) to determine the health of the river.
- Chemical testing, to determine levels of pH, dissolved oxygen and other elements in the water.
- Biological observation, which involves analysing the number and type of species that exist in the monitored river.

An Inanam resident, Fatimah Munsin, is excited to be a River Ranger and is keen to apply her newly gained knowledge through river monitoring activities in her village. The new River Rangers will be conducting these monthly activities and submitting the reports to WWF-Malaysia.

"I would also like to share my River Ranger knowledge with other communities, including those beyond Inanam," Fatimah added. "Now that we have the River Ranger programme in Inanam, more people, especially our youths, will see why we need to protect our rivers."

The two-day event concluded with a discussion on challenges faced by the new River Rangers in their villages, as well as their future initiatives. Inspired by this workshop, the River Rangers also took the initiative to set up a River Cleanliness Monitoring Committee for the conservation of Inanam River.

According to Dato' Dr Dionysius Sharma, the then Executive Director/CEO of WWF-Malaysia, "The River Ranger programme enhances the appreciation of rivers and reminds us that clean water is very valuable and is a very limited natural resource. Our past experience with the River Rangers of Ranau has taught us that the programme is a powerful community-driven initiative and a great example of working together to make everything possible."

2.8. Communication, Education and Public Awareness (CEPA) for IWRM

What is CEPA?

Article 13 of the Convention on Biological Diversity directs the Parties to promote and encourage understanding and develop education and public awareness programs. This Article has been interpreted in subsequent decisions to encompass communication, education and public awareness or CEPA.

Unfortunately it not sufficient to simply tell people about biodiversity and what is happening so that they can correct what they do. The changes required of people will not come about by rational individual choice alone. Biodiversity planners need to think differently about using communication, education and public awareness rather than just as a way to make scientific information available to the public.

What does CEPA mean?

CEPA stands for Communication, Education and Public Awareness and is a term introduced for the work program of the CBD on this cross cutting issue.

- CEPA deals with the processes that attract, motivate and mobilize individual and collective action for biodiversity.
- CEPA comprises a broad range of social instruments including information exchange, participatory dialogue, education and social marketing.
- CEPA brings out common interests amongst stakeholders to conserve and use biodiversity sustainably.
- CEPA provides the means to develop networks, partnerships and support knowledge management.
- CEPA provides the ways to manage the processes of multi stakeholder dialogue, and to gain cooperation of different groups.
- CEPA includes action learning or action research as a means to learn reflectively from experience, such as in adaptive management.
- CEPA provides the tools to develop capacity to support biodiversity.
- CEPA is a change management process vital to implement the NBSAPs.

THE TERMS ASSOCIATED WITH CEPA

C for communicating, connecting, capacity building, change in behaviour;

E for educating, empowerment (learning and professional updating);

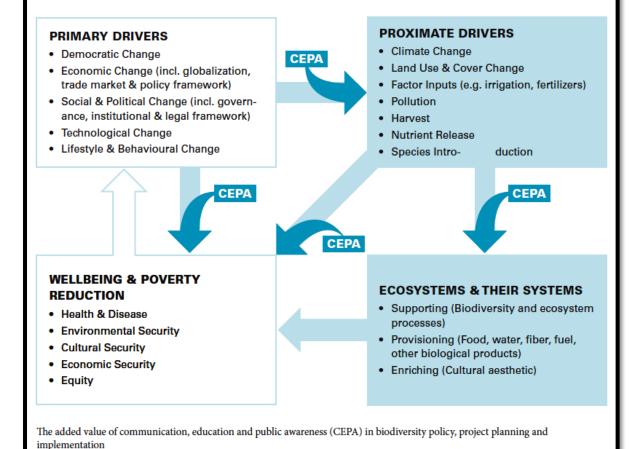
P for public, public awareness, public participation, policy instrument;

A for awareness, action, action research.

Source: (IUCN, 2007)

What role does CEPA play in biodiversity conservation? As shown in the diagram below, there is a complex interplay of underlying causes (primary drivers) and direct causes (proximate drivers) that affect biodiversity conservation. To reduce the impact of these driv-

ers on biodiversity many sectors need to be involved. CEPA (Communication, Education and Public Awareness) has a role in identifying these drivers as well as in bringing about the learning and change processes in society to deal with them.



Source: (IUCN, 2007)

Role of CEPA

CEPA has many important roles in natural resource and biodiversity management. It provides the tools to manage the social processes involved in:

☐ Facilitating participation:

- · offering opportunities for input, and actively soliciting it;
- · giving voice to less powerful groups;
- · enhancing participants' involvement in planning environmental programs;
- · supporting stakeholders to engage in decision-making.

□ Fostering policy change:

· sharing knowledge from practice to policy makers.

☐ Making information understandable and meaningful:

- explaining and conveying information for the purpose of training, exchanging experience, sharing know-how and technology;
- · providing factual information to those who will be affected by environmental development projects.

□ Fostering policy acceptance:

- enacting and promoting policies, especially when these bring new opportunities for people to access services and resources;
- helping to reduce negative environmental and social attitudes and behaviour among policy makers and citizens.

□ Supporting project management

- · understanding audience concerns to better target messages;
- motivating beneficiaries of a project to participate in the process;
- · improving efficiency of projects by informing internally and externally.

Positioning and branding an organisation or project

- · enabling internal communication so that all staff understand the mission and goals;
- explaining the roles and functions of the organisation/ project;
- reporting on the achievements of the organisation to acquire support and reputation and to support fund raising;
- · branding the organisation or project.

Drawn from FAO Communication for Development Group (2006) Communication for Sustainable Development, World Congress on Communication for Development

Source: (IUCN, 2007)

2.8.1. Systems Thinking

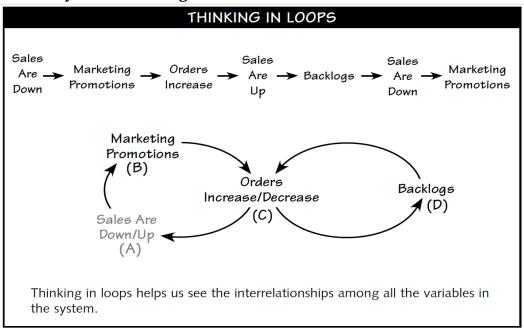


Figure 60. Process in systems thinking to see the interrelations amongst all the variables in the systems (Kim, 1999)

The Building Blocks of Systemic Behavior

Reinforcing and Balancing Processes Feedback is just one piece of the picture when we are thinking about how systems behave. To fill out the picture, let's consider some examples of systemic behaviour that we have experienced. For instance, maybe you've worked in a company that was initially growing exponentially in sales, only to collapse a few years later. Or, maybe you've engaged in one of America's favourite pastimes-dieting-whereby you kept losing the same 15 pounds over and over again. Or, you may recall that, when you were first learning to ride a bicycle, you wobbled down the street trying to stabilise yourself and eventually fell down (Kim, 1999).

All of these examples might seem completely unrelated on the surface. However, if we take a closer look at them, we can identify some very basic things that they have in common. In fact, all systemic behaviour can be described through just two basic processes — called reinforcing and balancing processes. Both of these "building blocks" of systemic behaviour involve distinctly different feedback. And, it's the combinations of these processes that give rise to the vast variety of dynamic behaviour in the systems we see all around us (Kim, 1999).

Reinforcing Processes: The Engines of Growth and Collapse

Reinforcing processes arise from what's known as positive feedback. No, this is not praised for a job well done. In systems terminology, it means information that compounds change in one direction with feedback. In other words, successive changes add to the previous changes and keep the changes going in the same direction (Kim, 1999).

Table 145. Agencies IWRM methods for capacity building

No.	Activity	Date	Medium	Collaboration
			Agencies	
Suru	uhanjaya Perkhidmatan Air Negara	(SPAN)		
1	NRW reduction campaign	Occasional	Newspaper (BH & NST)	-
2	Water Conservation Campaign	Occasional	Jayerawara	Kerajaan Negeri Kedah
3	Clean Water Conservation Campaign	Occasional	Electronic media (RTM, TV1)	RTM
4	Sludge Removal Campaign	Occasional	Video/Graphic (social media)	ML Studios
5	Clean Water Conservation Campaign	Occasional	Electronic media (Bernama TV)	Bernama
6	Sustain Environmental Conservation Campaign (Water)	Occasional	Billboard	-
7	NRW Reduction Awareness Campaign	Occasional	Video/Graphic (social media)	ML Studios
8	Clean Water Conservation Campaign	Occasional	Electronic media (TV Al Hijrah)	TV Al Hijrah
9	Enforcement Activities (water theft)	Occasional	National Media	Pengurusan Air Selangor
10	Enforcement Activities (water theft)	Occasional	National Media	Pengurusan Air Selangor
11	Enforcement Activities (waterway pollution)	Occasional	National Media	LUAS & Air Selangor
12	Stop River Pollution Campaign	Occasional	Press (BH & NST)	-
13	Campaign to Stop Scheduled Waste Disposal into Public Sewerage Channels	Occasional	Social media	-
14	Product Use Campaign with Water Efficient Labels	Occasional	Social media	-
15	Enforcement Activities (odor pollution)	Occasional	National Media	JAS & LUAS
16	Enforcement Activities (waterway pollution)	Occasional	Social media	-
17	Enforcement Activities (pollution of water resources)	Occasional	National Media	-
18	Collaboration on SPAN with Mara TVET Students - Online	Occasional	Facebook	MARA
19	OPS AIR RAYA (pollution of sewers and watercourses)	Occasional	Social media	-
20	Enforcement Activities (water theft)	Occasional	National Media	Air Selangor Management
21	Enforcement Activities (water theft)	Occasional	National Media	Air Selangor Management
22	Talk about Water Pollution	Occasional	Electronic media (Bernama TV)	Bernama
23	Enforcement Activities (water theft)	Occasional	Social media	RSAJ
24	Malaysia Prihatin : Consumer Water Resources (interview)	Occasional	Electronic media (RTM, TV1)	RTM
25	Enforcement Activities (water theft)	Occasional	Social media	SATU
26	Enforcement Activities (water theft)	Occasional	Social media	SAINS
27	Enforcement Activities (water theft)	Occasional	Social media	SAINS
28	Enforcement Activities (water theft)	Occasional	National Media	Air Selangor Management

29	Enforcement Activities (water theft)	Occasional	National Media	Air Colongor
29	Enforcement Activities (water theft)	Occasional	National Media	Air Selangor
20	W. G		771	Management
30	Water Conservation is our Responsibility	Occasional	Electronic media (RTM, TV1)	RTM
31	Talk about the Implications of River	Occasional	Electronic media	Bernama
	Pollution		(Bernama TV)	
32	Video Campaign: Save Water	Occasional	Social media/	RTM
			Electronic media	
33	Video Campaign: The Impact of Climate	Occasional	Social media/	RTM
	Change		Electronic media	
34	Environmental Conservation Discussion	Occasional	Webinar	
35	Video Campaign: Don't Contaminate	Occasional	Social media/	RTM
	Water Resources		Electronic media	
36	Gotong-royong Community Water Pipe	Occasional	Social media	Kerajaan Negeri
				Kedah
37	Video Campaign: Water Treatment	Occasional	Social media/	RTM
-	Process	Cousional	Electronic media	
38	Enforcement Activities (odor pollution)	Occasional	National Media	JAS, LUAS, IWK,
20	Emoleciment retritles (odor ponditor)	Secasional	Transfiai Wiodia	MPS
39	Interview on Water Pollution	Occasional	Electronic media	RTM
3,	merview on water rondition	Occasional	(RTM, TV1)	KIIVI
40	Radio Campaign - The Role of SPAN	Occasional	Manis FM	Manis FM
41	Prosecution Case Workshop to	Yearly	Ivianis I ivi	
41	1	rearry		SPAN dan Operator
	Certification Agency (Sewerage) under Sections 20 & 45 of Act 655			Sewerage
12		371		CDAN 1 1 1
42	Product Compliance Audit Training	Yearly		SPAN and related
42	E.C. W. 1.1 D. W. 1	37 1		agencies
43	Enforcement Workshop Program Under	Yearly		SPAN dan Operator
	Act 655 And Anti -Corruption			Air dan Sewerage
_	Programme			
	artment of Environment	ı	I	
1	22 April - Hari Bumi	Yearly	Physical/Online	
2	5 Jun – Hari Alam Sekitar Sedunia	Yearly	Physical/Online	
3	16 September – Hari Ozon Sedunia	Yearly	Physical/Online	
4	21 Oktober – Hari Alam Sekitar Negara	Yearly	Physical/Online	
5	Kem Kesedaran Alam Sekitar	Yearly	Physical/Online	
6	Program Rakan Alam Sekitar;	Yearly	Physical/Online	
	a. Denai Sungai Kebangsaan			
	b. Friend of River			
	c. Aktiviti gotong royong di			
	kawasan sungai			
	d. River Rangers bersama NGO			
	e. Rakan Saintis Sungai			
7	Anugerah Sekolah Lestari Anugerah	Yearly	Physical/Online	
	Alam Sekitar			
	Modul pengurusan / kepentingan sumber			
	air			
8	Pameran bertemakan alam sekitar	Yearly	Physical/Online	
9	Pidato Alam Sekitar	Yearly	Physical/Online	
10	Anugerah Langkawi Kelestarian Alam	Yearly	Physical/Online	
	Sekitar			
11	Pertandingan 3 Minit Tesis Alam Sekitar	Yearly	Physical/Online	
	Bahasa Melayu		J	
	··	1	1	

2.8.2. Advocacy via Training

To best ensure the safety of drinking water, World Health Organisation (WHO, 2004), through its Guidelines for Drinking-water Quality recommends the application of WSPs as the optimum approach for risk assessment and management of drinking water quality. WSPs are typically developed by water suppliers with the aim of controlling hazards and the events that introduce such hazards to the system, and of increasing the overall safety of drinking water. The WSPs provide the basis for system protection and process control to ensure that the numbers of pathogens and concentrations of chemicals and radionuclides do not exceed levels defined to meet the public health targets, and that water is acceptable to consumers.

Although not all hazards to human health are relevant to aquatic ecosystems, there is some overlap between environmental management for environmental protection and for the protection of human health. Where environmental management systems are in place, they may usefully support catchment management for water supplies, and it may be possible to expand the systems to include drinking water quality targets (Figure 61).

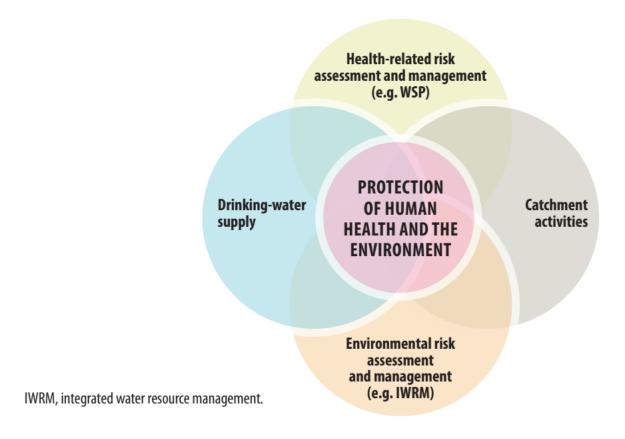


Figure 61. Common ground between environmental and health management in water catchments (WHO, 2016)

Figure 62 shows a possible example framework for managing water quality issues in a catchment by integrating the WSP philosophy with existing approaches for environmental protection. Such an approach may protect water quality for the benefit of both human health and environment.

Some countries' experience in integrating the risk management principles for drinking water quality into the context of environmental risk management can be included, alongside the advantages of such integration.

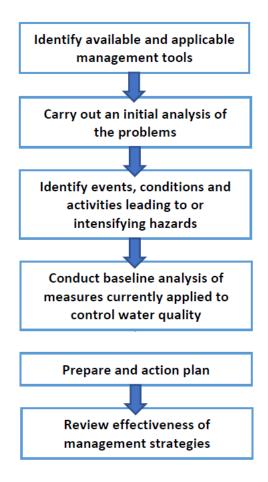


Figure 62. Example framework for integration of WSPs with approaches for environmental protection

Besides IWRM, WSPs and SSPs, there are numerous risk assessment principles and management frameworks with an environmental focus are available and in use worldwide, including:

- Hazard Analysis and Critical Control Points (HACCPs)
- Environmental Impact Assessment (EIA)
- Environmental Risk Assessment (ERA), and
- ISO 14000 Environmental Management Standards.

Many IWRM tools, on the other hand, are associated with the institutional and governance arrangements for water management rather than direct control measures. For instance, developing and enforcing environmental water quality and pollution regulations would help to minimise the risks of source water contamination. Stakeholders' engagement, including with catchment stakeholders and environmental regulators, is encouraged within the WSP process. Engaging with a range of catchment stakeholders, for example, would be crucial in identifying risks and opportunities outside the immediate sphere of influence of the water supplier itself. Although not all catchment management issues are feasible to include in a WSP, the protection

of drinking water resources necessitates a concerted and strategic initiative between a range of stakeholders, including the water supplier and WSP team (WHO, 2017).

Polluters Pay Principle (PPP), for instance, is a commonly accepted practice, not one of the risk management tools. Other tools that already implemented or easily available includes regulations, management procedures and by-laws, water quality standards, economic instruments, monitoring systems, modelling tools and established communication and planning platforms.

3. Intermediate Level 2- Capacity Building of IWRM Advocator

${\bf 3.1. \, Policy \, Support \, for \, IWRM \, Implementation}$

3.1.1. Analysis of Policy for IWRM

Table 156. Policy analysis on AACB for IWRM in Malaysia

Sl.	Thematic	Policies/	Implementing	Strength	Weakness	Opportunity	Challenges/ Issues
1.	Water Policy	Strategic Plans National Resources Water Policy 2011	Authority MNRE/MOSTI	1. Ensuring complimentary between 18 national polies reviewed and mapped (policies from MNRE, MOE, MPIC, KeTTHA, MOSTI and ect) 1. Managing water resources efficiently and effectively (addressing both quantity and quality aspects) - Increasing water demand as a result of population growth and industrialization, further compounded by the degradation of land and water resources, point to the need to efficiently and effectively manage water resources. 2. Moving towards integrated river basin management - The river basin is a geographical unit with a well-defined boundary that defines the totality of the hydrological process	1. The NWR policy is time bound policy to matched with the Malaysia Development Plans timeline 2. No Advocacy strategies found 3. No proactive policy strategies and to do list in capacity building and awareness of the justifications sections 4. Not clear on institutional governance - Politics Conflict 5. Not embedded the awareness, advocacy and capacity building on water in the national policies 6. Lack of risk management and risk value of water resources in the national policies. 7. No clear direction on fund and financial At the moment, since the water management has been sectorised and fragmented, the fund and financial also are sector- based. Some awareness, advocacy and capacity building of water	1. Resolve matters pertaining to policy directions in mapping the linkage between the policies and related legislative regime 2. Water resources shall be treated as national priority 3. Partnership to extend beyond traditional government stakeholders	1. Panel comments: -Gazettement of water catchment was not included 2. Need to broaden the policy objectives covering on conservation and sustainable use objectives, social, cultural, and equity objectives, and institutional to support and strengthen the institutional and legal frameworks

Sl.	Thematic	Policies/	Implementing	Strength	Weakness	Opportunity	Challenges/ Issues
	Area	Strategic Plans	Authority				
				and transcends political	management were also based on		
				and administrative	the corporate social		
				limits. It is therefore the	responsibility of industries and		
				ideal management unit	business.		
				to address water	1. No institutionalization on		
				problems. 3. Translating awareness	Capacity Building		
				3. Translating awareness into political will and	2. Unclear communication		
				capacity - The non-	strategy at all hierarchy level		
				existence of sector	3. Unclear legislations		
				leadership and political	Overlapping policies and		
				will to implement	regulations among government		
				much-needed reforms	institutions, horizontally and		
				has resulted in a	vertically. IWRM at river basin		
				deterioration of water	level is hampered by different		
				quality, a decrease in	mandates, regulations and		
				water availability and	policies amongst government		
				conflicts among users	institutions. A major problem,		
				(irrigation, hydropower,	for example, is the unclear status		
				industry and domestic	of land in fragile watershed		
				users). Therefore, there	conservation areas and along		
				is a need to instil	river banks. This causes		
				awareness on the	unsettled conflicts about land,		
				economic, social and	natural resources, and		
				environmental value of water among politicians,	environment among the various		
				decision-makers and	ministries, department, agencies and even worst at State		
				other stakeholders in the	Government.		
				water sector.	Government.		
				4. Moving towards			
				adequate, safe and	Lack of access to adequate		
				affordable water	and reliable data.		
				services as will befit			
				developed-nation status			
				by 2020 - Inadequate	Data relevant to IWRM at basin		
				infrastructure, lack of	level are scattered amongst		
				public awareness in	different government institutions.		
				water resources	Many institutions collect and		

Sl.	Thematic Area	Policies/ Strategic Plans	Implementing Authority	Strength	Weakness	Opportunity	Challenges/ Issues
				management, and inappropriate water policies have had a negative impact on the water sector. In general, existing water distribution systems for domestic use and irrigation are largely inefficient and fast deteriorating. There is a need for legislation and policies to encourage private-sector participation.	manage data and information on water resources, but the quality of data and exchange of information meet obstacles. Weak law enforcement. The Malaysia government often fails to enforce laws that protect people and the environment. This is partly due to the lack of capacity and capability for monitoring, but also due to lack of knowledge on environmental laws by law enforcement officers, such as judges. Environmental cases often need scientific verification. Due to the lack of knowledge and scientific data, cases and evidence brought to the court are often very weak46. As a result, industrial pollution has become an environmental problem without end, with many cases remaining unresolved. The current penalty under Environmental Quality Act 1987 also needs to be revised. The penalty of RM500,000 per offense seems to be "easy money" specially to major industries. Community participation in IWRM implementation is not represented equally and is limited. One of the widely recognised causes of the abovementioned failure to develop and implement IWRM is the lack of		

Sl.	Thematic Area	Policies/ Strategic Plans	Implementing Authority	Strength	Weakness	Opportunity	Challenges/ Issues
					involvement of local people and communities. Participation is often limited to public consultations, whereby communities can merely react to plans that have already been decided. The government has installed coordination forums on Environment. However, the exposure, awareness, knowledge and skills has yet fully developed. Community has not been actively involved, and participate to develop policy, and monitoring the environment.		
		Transforming The Water Sector: National Integrated Water Resources Management Plan Strategies And Road Map 2016	MNRE/MOSTI	1. Enabling Environment contains strategies to strengthen the policy and legal framework both at national and state levels to ensure sound and effective implementation consistent with the provisions of the Federal Constitution (Page: 126, Point 3). 2. Institutional Framework comprises strategies to ensure greater integration within and among water-related institutions, and to supplement or reinforce institutional structures at all hierarchical levels	1. Fragmented Management and Conflicts among Sectors 2. Government need to be advised on strategic waterrelated policies, issues, and programs 3. Government need to set and facilitating R&D and capacity building agenda based on S&T needs for the water sector 4. Government need to raise STI awareness, advocacy, and capacity building 5. Need augment supplies through shared river basins and inter-basin water transfers 6. Need to strengthen the role of Forum Air to enhance collaborative governance	1. Awareness Raising -Awareness-raising activities are needed to help inform and sensitise decisionmakers outside the water community (e.g. agriculture, energy, health and safety, and finance) about water- related challenges and their implications for and interrelations with these sectors 2. Advocacy -There is a need to use the IWRM awareness raising strategy to serve as a key method for informing policymakers, the public and the academy of the	1. Enabling environment - Inadequate funding and no funding at all in some areas 2. In need of critical mass for organisational change at catchment level 3. There is a need to develop more capacity building programmes in IWRM link with Sustainable Development Goals (SDGs)

Sl.	Thematic Area	Policies/ Strategic Plans	Implementing Authority	Strength	Weakness	Opportunity	Challenges/ Issues
	Pit Ca	Strategy Frank	Additiv	of management (Page:128, Point 4). 3. Management Instruments comprise strategies to ensure the effective use of such instruments to assist decision makers in making wise 129 Transforming the Water Sector: National Integrated Water Resources Management Plan Strategies and Road Map choices. Management instruments range from information management, planning, economic and financial, legal, technical, operation and maintenance, R&D, capacity building, participatory management, to international cooperation (Page:128, Point 5).	and participatory management 7. Need to expedite the integration of water supply and wastewater services sectors 8. Need for review of coverage of sewerage services currently fragmented over three ministries (KeTTHA, MOH, and MHLG) to ensure greater efficiency and effectiveness	benefits of IWRM and for suggesting possible ways the target groups could contribute to its implementation It is important to advocate the entirety of the environmental and socioeconomic issues relating to water management 3. Capacity building -Capacity building, training, and education in a more general sense, the generation and dissemination of knowledge, can take place through formal, non-formal and informal education and training. Some recommended strategies for capacity building of IWRM implementation in Malaysia	
2.	Economic Policy	Malaysia Economy Planning-12 (2021 – 2025)	PMO (EPU)	Involving public in the entire water management system - Expanding Community-driven Conservation Programmes (Tagal system, Friends of River, and community-	Challenges of good water governance: Ineffective participation and lack of ownership of stakeholders Inefficient water sector governance	To establish a public consultation platform at state and local level linking with National Water Council (NWC) To ensure active stakeholders'	Harmonizing Water Legislative Framework through States water legislation based on Water Resources Bill 2016

of rivers) science-based decision- estable 2. Structured modules will be developed based on Limited financing	articipation by 2. Number of laws will be revised to
effective implementation of the AACB programme AACB programme technology farm main infra wate initia (Part Irriga Man) 4. Colle envir educ priva 5. Com certif releve educ programme programme impropression of infrastructure and technology 6. Colla strate inclusional inclusion of infrastructure and technology and technology 4. Colle envir educ priva 5. Com certif releve educ programme 6. Colla strate inclusional inclusion of infrastructure and technology and technology by the control of the infrastructure and technology and technology by the control of the infrastructure and technology and technology by the control of the infrastructure and technology and technology by the control of the infrastructure and technology and technology by the control of the infrastructure and technology and technology by the control of the infrastructure and technology and technology by the control of infrastructure and technology control of the infrastructure and technology by the control of the infrastructure and technology control of the infrastructure and	regulate emerging pollutants and increase penalties on polluter-pays principle (giving greater emphasis on pollution sources which are not enforced under EQA 1974) ollaboration on environmental-related ducation with NGOs, rivate sectors ompetency entification and the elevant tertiary ducation cogrammes will be ontinuously inproved to increase the competencies of atter professionals ollaboration with rategic partners, including at regional and international vels on water-

Sl.	Thematic	Policies/	Implementing	Strength	Weakness	Opportunity	Challenges/ Issues
	Area	Strategic Plans	Authority				
		National Policy on Industry 4.0- Industry 4WRD (2018)	MITI	Emphasis on the technology and industry revolution towards IR 4.0 Focuses on awareness, need and benefits of IR 4.0 Strengthening	-	Connectivity between the industry players and educational training hubs in adoption of IR4.0	3. Government is trying to provide the right platform for SMEs to reinvent themselves and adopt the latest technologies to be competitive globally.
				institutional frameworks underpins the role of Government in creating the right ecosystem and facilitating collaborative platforms			4. Although Malaysia's labour productivity has grown at 3%–4% over the last few years, its relative global position and use of high-skilled labour have not moved forward
							5. Digitalisation of the manufacturing system will be important to build direct links to end customers and produce innovative and customised products.
							6. Lack of awareness on the impact of, and need for, Industry 4.0

Sl.	Thematic Area	Policies/ Strategic Plans	Implementing Authority	Strength	Weakness	Opportunity	Challenges/ Issues
							technologies, both in terms of opportunities and business model disruption, especially amongst SMEs
							7. Existing training programmes are not sufficiently geared towards Industry 4.0 and current pool of trainers are unable to keep up with the advancement of technology
3.	Environment Policy	National Policy on the Environment 2002	MEWA	1. Policy guided that local community plays an important role in looking after the environment. Efforts from all age groups in the community are required in maintaining a clean environment. 2. Many awareness programs have been conducted involving stakeholders. 3. International strategic Collaboration memorandum 4. Formal, informal and non-formal communication was conducted such as	1. Hereditary practice (Guidelines, Procedure) 2. No specific module followed	1. Linking the policy with the federal and state economic planning unit in playing the central role through cooperation government agencies, whether federal-state or intersectoral, nongovernment organisations, the media, the private sector, professional bodies	Indiscriminate utilisation. Over- consumption and unsustainable development practices

Sl.	Thematic Area	Policies/ Strategic Plans	Implementing Authority	Strength	Weakness	Opportunity	Challenges/ Issues
		Solid Waste Management Policy (2016)	MHLG	campaign, poster, competition 5. Social media platform 6. Conducive infrastructure, communication channel and incentive for encouragement 7. Risk and value were considered. 8. For awareness, the policy highlighted the contributions of indigenous peoples and local communities, civil society and the private sector is required. 1. Strengthen the legislation and institutionalisation of solid waste management 2. A comprehensive, integrated, cost effective and sustainable waste management system 3. Comprehensive formal and informal environmental educations and training and information dissemination programs established. 4. Integrated the awareness into educational activities from school to tertiary institutions	Thrust 4 (Awareness-raising and educating the society on solid waste management) and Thrust 5 (Integrated and comprehensive data management) still could not be implemented wholly because of limited fund	Active and effective participation of the international community Efficient service through privatisation and monitoring	Acceptance of Act 672 not comprehensively for all States (only 7 States)
		National Policy on Climate Change, 2009	KeTSA/ MOSTI	Increase awareness and community participation to promote behavioural responses to climate change.	Hereditary practice (Guidelines, Procedure) No specific module followed	Promoting regional cooperation in climate change within existing inter-governmental and non-governmental	Continued dependence on conventional energy sources has contributed to

Sl.	Thematic	Policies/	Implementing	Strength	Weakness	Opportunity	Challenges/ Issues
	Area	Strategic Plans	Authority	2. Adopt systematic and targeted formal and informal education and awareness raising on climate change through the following approaches: • Involvement of various stakeholders including nongovernment organisations (NGOs), community-based organisations (CBOs) and the media; • Enhance cooperation between government and private sectors including corporate responsibility; and • Targeting special groups. 3. Institute continuous capacity building programmes to support negotiation and implementation of international obligations. 4. Support knowledge-based decision making through intensive climate related research and development and capacity building of human resources. 5. Strengthen collaborative networks and capacity of agencies at the federal, state and local government levels. 6. Institute continuous capacity building		mechanisms and to institutionalise in responses to address current and emerging issues for international negotiations.	greenhouse gas emissions

Sl.	Thematic	Policies/	Implementing	Strength	Weakness		Opportunity	(Challenges/ Issues
	Area	Strategic Plans	Authority						
				negotiation and					
				implementation of					
		361		international obligations.	1 1 (2016	-	******		261 1 1 1 1
		Malaysia		1. Active and effective	1. As of 2016, our exports	1.	Will provide	1.	Malaysia is a global
		Roadmap		participation of the	amounted to RM30 billion which saw a 2.26 million metric		opportunities for the		player in the plastic
		Towards Zero		international community	****		local industries to		industry with
		Single Use		2. Comprehensive formal	tonnes of resin utilised to produce		embrace new eco-		currently about
		Plastics (2018-		and informal environmental	plastics		friendly alternatives		1,300 plastic
		2030)		educations and training and information dissemination			that could facilitate		manufacturers
							penetration to a wider		
				programmes established.			global market		
				3. Integrated the awareness		_	G		
				into educational activities		2.	States continues to		
				from school to tertiary institutions			charge for bags		
						2	D-11		
				4. Comprehensive communication, education		3.	Pollution charges to		
				and public awareness			non-fixed premises		
				(CEPA) strategy was					
				mentioned but not detailed.					
4.	Biodiversity	National Policy	KeTSA/MOSTI	Our policy biodiversity	1. Sectoral based.	1.	Implementing the	1.	The nation has
٦.	Policy	on Biological	Ke15A/MOS11	offers the fundamental	2. Recent change of responsible	1.	capacity of the	1.	undergone
	Toney	Diversity 2016-		natural types of assistance	Ministry		national and		significant
		2025		that empower us to	Willistry		subnational		population increase
		2023		appreciate magnificent			biodiversity strategies		and socio-economic
				conditions, clean air and			in consistent with the		changes
				water, and participate in the			on Access to Genetic		changes
				abundance of gainful and			Resources and the	2.	Numerous housing
				solid biological systems.			Fair and Equitable		and industrial areas,
				2. The importance of water			Sharing of Benefits		townships and
				in this policy was portrayed			Arising from their		infrastructure have
				by emphasized the important			Utilisation.		been built
				of water in the biodiversity					(increasing
				as part of the ecosystem and					competition for
				habitat of life.					land)
				3. The policy highlighted the					
				importance of water by					
				empowered and harnessed					

Sl.	Thematic Area	Policies/ Strategic Plans	Implementing Authority	Strength	Weakness	Opportunity	Challenges/ Issues
				the commitment of all stakeholders to conserve biodiversity. The capacity, knowledge and skills of all stakeholders were also will be improved to conserve biodiversity. 4. For awareness, the policy highlighted the contributions of indigenous peoples and local communities, civil society and the private sector is required. 5. For advocacy, the policy outlines the strict governance in order to conserve and protect the biodiversity 6. For capacity building, the policy outlines three important factors which were national and international partnership			
5.	Green Technology Policy	Green Technology master plan Malaysia 2013- 2030	KETTHA/MOSTI	1. Emphasis has been on shifting towards a closed water loop system, water efficient products and services, as well as intensification of R&D&C on water conservation, treatment, distribution and rainwater harvesting. 2. The policy covered the build and development of green technology in water sector to cover the below area:	1. The policy lack in emphasising and highlighted the value and risk of water management. 2. No awareness, advocacy and capacity building mechanism and tools of water management in the policy. 3. The role of water in development is not recognised fully in this policy	Increasing the nation's GDP by 11 million (2013) by the following Strategic Thrust Market Enablers Government Green Procurement (GGP) Green incentives Innovative financing Green cities - International collaborations	Challenges highlighted were pegged on the fact that The manufacturing sector covers a diverse range of industrial segments, each with its Own unique environmental issues and circumstances requiring tailored solutions.

Sl.	Thematic	Policies/	Implementing	Strength	Weakness	Opportunity	Challenges/ Issues
6.	Food Policy	National Agrofood Policy 2011-2020	MOA	- Integrated River Basin Management - Water Treatment & Distribution Technology - Water Utilisation Technology - Water Harvesting Technology - Wastewater Treatment Technology - Wastewater Treatment Technology 1. The policy emphasises the importance of water to ensure the food security and agriculture usage 2. It highlighted the issue of limitation natural resources such as water and land which might impact the food security.	1. The policy only emphasised in ensuring the water supply and demand is sufficient and clean, technology and infrastructure on water supply and drainage were properly improved and maintain to ensure the food security. (Focused on sufficient quantity and high quality of water to be supply to agriculture sector) 2. The policy lack in emphasizing and highlighted the value and risk of water management.	Collaboration through 'Majlis Pembangunan Industri Agromakanan Strategik'	4. Lack of coordination in the regulation of the multiple transportation segments 5. Affordability of new transportation technologies such as energy efficient vehicles (EEVs) and the poor market perception and confidence in these new technologies 6. Complex challenge to embed it in a coordinated manner across all sectors in the economic plans of the country. 1. Challenges: - meet the needs of a skilled and semi-skilled workforce - ensuring adequate food supply - develop the industry sustainably - attracting private investment

Sl.	Thematic Area	Policies/ Strategic Plans	Implementing Authority	Strength	Weakness	Opportunity	Challenges/ Issues
					3. No awareness, advocacy and capacity building mechanism and tools of water management in the policy. The role of water in development is not recognised fully in this policy		
	Health Policy	Malaysia Ministry of Health (MOH) Strategic Plan 2015-2020	МОН	Various health awareness programs in schools Capacity building in enhancing the quality of healthcare services to the people	No known programme/strategies on advocacy or water related awareness program	Collaboration with MOE on promoting health awareness in the early age of education Private sector involvement	1. Issue faced by the health sector in Malaysia: - change in demographic patterns - double burden disease - the growing expectations of the people on healthcare services - increased healthcare costs various aspects of enforcement under the MOH implemented by nine (9) different entities (with 4895 officers enforcement)
		National Environmental Health Action Plan (NEHAP) Malaysia	МОН	Implementing the National Environmental Health Action Plan (NEHAP) through blue ocean strategy Besides, the policy highlighted the Enforcement of Safe Drinking Water Act (SDWA).	The strategic plan emphasise on the low awareness of water borne disease such as dengue. There are still weaknesses in this of all stages in the control of dengue cases such as rubbish problems, stagnant water and levels low people's awareness.	Enhancement of the roles and responsibilities of governmental and non-governmental organisations, business organizations and the community to reduce environmental impacts on health	Environmental factors that caused the leading diseases are: -94% of diarrhoea cases are due to untreated water, unsafe drinking water,

Sl.	Thematic	Policies/	Implementing	Strength	Weakness		Opportunity	Challenges/ Issues
	Area	Strategic Plans	Authority		 The policy only emphasised on the water and vector borne disease and clean drinking water The policy lack in emphasizing and highlighted the value and risk of water management. No awareness, advocacy and capacity building mechanism and tools of water management in the policy. 	3.	Enhancement of inter- sectoral cooperation through strategic alliances, with the aim of reducing environmental risks to health Professional Training and Education which introduce courses in environment and health (e.g. as part of undergraduate programs)	personal hygiene, poor sanitation and unsafe food consumption. - 42% of malaria cases are impacted by poor management of habitat and land use and poor water resources management. 2. General Issues Requiring Improvement: - Institutional development and intersectoral collaboration. - Human resources development
8.	Development Policy	Dasar Perbandaran Negara Kedua (Semenanjung Malaysia & Wilayah Persekutuan Labuan) (2016)	MHLG	 Dasar Perbandaran Negara Kedua (Semenanjung Malaysia & Wilayah Persekutuan Labuan) (2016) Policy guided that local community plays an important role in looking after the environment. Efforts from all age groups in the community is required in maintaining a clean environment. Communities must prioritise healthcare starting with themselves and their families and the community at large. 	1. Rapid urbanization rate – 74.8 % for Peninsular Malaysia and 85.3% for Wilayah Persekutuan Labuan 2. Rapid urbanization rates increases the water usage (10 billions of liter of water usage for Malaysians in 2013) 3. Issues and challenges: -urban economic competitiveness -high cost of living - high house prices -the effects of global warming and climate change -human capital development	2.	Action plan: brainstorming session with the community in developing the planning visions by the LA Regular discussion session with the community Involving private stakeholders in community projects such as 'gotong — royong' and recycling campaign	1. Issues -conservation of agricultural and biodiversity areas

Sl.	Thematic	Policies/	Implementing	Strength	Weakness	Opportunity	Challenges/ Issues
	Area	Strategic Plans	Authority				
				This includes ensuring	-provision of social facilities and,	4. Courses for	
				housing areas are clean	-strengthening of city governance	government servants	
				and free from diseases		of all levels on green	
				and epidemic threats.		development and	
				4. Local government being		climate change	
				the central authority for			
				Citizen Community		5. Waste segregation	
				Boards needs to		practices and 3R	
				undertake following		education at schools	
				initiatives for			
				sustainable community			
				driven development.			
				(Ahmad and Talib,			
				2014)			
				5. Elected representatives			
				at the local government			
				level must be provided			
				autonomy, resources			
				and capacity to use			
				them effectively.			
				(Ahmad and Talib,			
				2014)			
				6. Adequate information			
				on local planning			
				process, resources and			
				nature of local			
				economies, and have			
				their skills in, say,			
				financial management,			
				planning and budgeting			
				enhanced so that they			
				can sensibly participate			
				in deciding on local			
				plan, budgets and			
				investments. (Hot et al.,			
				2017)			
				7. Collaboration			
				Procedures Between			

Sl.	Thematic Area	Policies/ Strategic Plans	Implementing Authority	Strength	Weakness	Opportunity	Challenges/ Issues
		Ü		Community Consensus Office with Public Sector and Private Sector			
				8. In line with the SDGs			
				9. Objectives - Efficient and sustainable management of water bodies			
				10. Action plan: uploading all information on latest development on land matters, guidelines, and ect. In LA portal and State JPBD			
				11. Incentives for old business building to retrofit in reducing the use of water and energy			
				12. Sullage/grey water treatment systems at restaurant/food premises			
		Dasar Pembangunan Luar Bandar	MRRD	Ensure the bottom-up approach in implementing the policies in the local community	-	Participation from the rural community Closer networking between Government agencies and the	-
				Coordination in the implementation of rural development policies		private / corporate sector to transform rural areas	

Sl.	Thematic	Policies/	Implementing	Strength	Weakness		Opportunity	(Challenges/ Issues
	Area	Strategic Plans	Authority	1.17		,	G. d		TT 3 1
		National	MOT	1. Ensure water pollution	-	1.	Strengthen	1.	However, the rapid
		Transport Policy 2019-2030		management inland and			collaboration with		growth in mobility
		2019-2030		coastal waterway 2. Promote awareness to			Ministry of Education		over the years will continue to increase
							(MOE) to increase		
				transport operators and			awareness and		in the future and if
				service providers to prioritise			inculcate green		left unchecked, will
				quality service delivery to			behaviour amongst school students		lead to massive economic losses in
				enhance the productivity of the transport sector			school students		
				•		2	Dollary Thomas C1 2		productivity and
				3. Encourage modal shift from private vehicles to		2.	Policy Thrust S1.2: Enhance skills		pollution
				•				2	Total carbon
				public transport4. Inculcate positive			development in the	2.	emission:
							transport sector and make the sector an		The carbon
				behaviour such as proper					emission in the
				road usage etiquette			attractive career		
				Develop EffectiveCommunication, Education			opportunity		transport sector is
				And Public Awareness					largely from land
				(CEPA) To Create					transport, constituting 90%
				Behavioural Change					(48,200 ktonne) &
				Towards Practices Of					67% is from cars
				Sustainable Transport					07% IS HOIH Cars
				6. Develop communication				3.	From a
				mechanisms to increase				٥.	demographic
				awareness on benefits of					standpoint the
									population aged 65
				using public transport to increase utilisation					years and above is
				7. Conduct research to					expected to be 7%
				understand travel behaviour					in 2020 and this
				and travel pattern for right					value will increase
				intervention to promote					to 9% by 2030
				behavioural change					10 9% by 2030
				8. Implement programs to					
				promote behavioural change					
9.	Engrav		PMO (EPU)		1. No known	1	Government	1	Malaysia GDP
9.	Energy	-	FINIO (EPU)	Governance & Integrity Strongthoning		1.		1.	growth slower than
	Policy			-Strengthening	programme/strategies on		procurement for		China's, East Asia
				governance through	water awareness or water		development, supplies		and the Pacific
				transparency and	related systems				and the Pacific

Sl.	Thematic Area	Policies/ Strategic Plans	Implementing Authority	Strength	Weakness	Opportunity	Challenges/ Issues
		Service Servic		accountability to foster trust of rakyat		and services are RM 1.1 Trillion 2. Resilient new key factors: -Renewable energy -Green economy 3. Shared prosperity division enablers: -fiscal sustainability -sustainability	Dependencies on commodities products Large segments of industries are still in low value added category with low adoption of high technology

${\bf 3.2. \, Stakeholders' \, Mapping \, for \, IWRM}$

3.2.1. Stakeholders at Federal Level for IWRM

Table 16. 7 Stakeholders at Federal Level (government sector)

No.	Federal agencies	Details
01.	Ministry of Environment and Water (KASA)	Minister:
		Menteri Alam Sekitar dan Air
	 Jabatan Pengairan dan Saliran (JPS) 	YB. Dato' Tuan Ibrahim bin Tuan Man
	 Department of Environment (DOE) 	Department of Environment
	 National Water Services Commission (SPAN) 	Ministry of Environment And Water
	 Institut Penyelidikan Hidraulik Kebangsaan 	Level 1 - 4, Podium 2 & 3, Wisma Sumber Asli No.25, Persiaran Perdana, Presint 4, Pusat
	Malaysia (NAHRIM)	Pentadbiran Kerajaan Persekutuan, 62574 Putrajaya, Malaysia
	 Bahagian Bekalan Air 	
		YBhg. Dato' Seri Ir. Dr. Zaini Ujang
		Ketua Setiuasaha
		Kementerian Alam Sekitar dan Air
		Blok F11, Kompleks F
		Lebuh Perdana Timur, Presint 1
		Pusat Pentadbiran Kerajaan Persekutuan
		62000 Putrajaya, Malaysia
		zaini@kasa.gov.my
		+603 8091 7000
		YBhg. Dato' Ir. Dr. Hj. Md. Nasir bin Md. Noh
		Ketua Pengarah / Director General
		Pejabat Ketua Pengarah / Director General's Office
		Lot 5377, Jalan Putra Permai,
		43300 Seri Kembangan,
		Selangor Darul Ehsan.
		T: 03-89476400
		F: 03-89483044
		Tel:+603 8947 6400 samb. 6599 (PA)
		E-mel/E-mail:nasirnoh@nahrim.gov.my

		Director General: YBhg Dato' Ir. Haji Nor Hisham bin Mohd Ghazali (T) 03-26161501 (F) 03-26972892 Email :kp@water.gov.my Email: hisham@water.gov.my Y.Bhg. Dato' Hj. Ahmad Faizal bin Abdul Rahman Chief Executive Officer CEO's Office tel : 03 - 83179303 Rohaizah binti Bujang Personal Assistant CEO's Office Tel : 03 - 83179304 Address : Ground Floor and First Floor, Prima Avenue 7, Block 3510, Jalan Teknokrat 6, 63000 Cyberjaya, Selangor Tel : 03-8317 9333 / 334 / 335 Fax : 03-8317 9336
		Norlin Bt Jaafar Ketua Pengarah Ibu Pejabat, Wilayah Persekutuan Putrajaya Pejabat Ketua Pengarah Ministry of Environment and Water Level 1 - 4, Podium 2 & 3, Wisma Sumber Asli No.25, Persiaran Perdana, Presint 4, Pusat Pentadbiran Kerajaan Persekutuan, 62574 Putrajaya, Malaysia Tel: 03 88712173 YBrs. Ir Rahmat Bin Abd Rahman Pengarah Bahagian Bekalan Air Level 1 & 4, Block E 4/5 Parcel E (7.09 km) 62668 Putrajaya Tel: 03-8883 6321
02.	Ministry of Energy and Natural Resources (KETSA)	Minister:

		Montari Tangga dan Sumban Asli
		Menteri Tenaga dan Sumber Asli
		YB Datuk Seri Dr. Shamsul Anuar bin Hj Nasrah
		MINISTRY OF ENERGY AND NATURAL RESOURCES
		Wisma Sumber Asli, No.25 Persiaran Perdana,
		Presint 4, 62574 Putrajaya, Malaysia
		Phone: +603 8000 8000
		Fax: +603 8889 2672
		E-mail:shamsul.anuar@ketsa.gov.my
		YBhg. Datuk Zurinah binti Pawanteh
		Ketua Setiausaha Tenaga dan Sumber Asli
		MINISTRY OF ENERGY AND NATURAL RESOURCES
		Wisma Sumber Asli, No.25 Persiaran Perdana,
		Presint 4, 62574 Putrajaya, Malaysia
		zurinah@ketsa.gov.my
03.	Ministry of Science, Technology and Innovation	Minister:
05.	(MOSTI)	YB Khairy Jamaluddin
	(MOS11)	Menteri Kementerian Sains, Teknologi dan Inovasi
		Kementerian Sains, Teknologi & Inovasi (MOSTI)
		Aras 1-7, Blok C4 & C5, Kompleks C, Pusat Pentadbiran Kerajaan Persekutuan, 62662, Putrajaya, MALAYSIA
		kj@mosti.gov.my
		D. L. I. M. D. GULTI. L. I. M. L.
		Datuk Ir. Ts. Dr. Siti Hamisah Tapir
		Ketua Setiuasaha
		Kementerian Sains, Teknologi & Inovasi (MOSTI)
		Aras 1-7, Blok C4 & C5, Kompleks C, Pusat Pentadbiran Kerajaan Persekutuan, 62662, Putrajaya,
		MALAYSIA
		sitihamisah@mosti.gov.my
04.	Ministry of Health	Minister:
	 Engineering Service Department 	Dato' Sri Dr. Adham Bin Baba
		Menteri Kesihatan Malaysia
		Pejabat Menteri Kesihatan
		Aras 13, Blok E7, Kompleks E
		Pusat Pentadbiran Kerajaan Persekutuan

_		50500 D
		62590 Putrajaya
		E-mel pejabatybmk@moh.gov.my
		Bahagian
		Tel.: 03-8883 2512
		Fax: 03-88886188
		Dato' Mohd Shafiq bin Abdullah
		Ketua Setiausaha KSU
		Tel no. 03-8883 2539
		E-mel mohdshafiq@moh.gov.my
		Bahagian Pejabat Ketua Setiausaha
		Danagran Tejabat Ketua Senausana
		Tan Sri Dato' Seri Dr Noor Hisham bin Abdullah
		Ketua Pengarah Kesihatan KPK
		Tel no. 03-8883 2545
		E-mel anhisham@moh.gov.my
		Pejabat Ketua Pengarah Kesihatan
		Aras 12, Blok E7, Kompleks E
		Pusat Pentadbiran Kerajaan Persekutuan
		62590 Putrajaya
0.5	M' ' CH ' 11 1C (WDW)	Tel.: 03-8883 2545
05.	Ministry of Housing and Local Government (KPKT)	Minister:
		YB Datuk Hajah Zuraida Kamaruddin
	 Federal Department of Town and Country 	Menteri
	Planning (PLANMalaysia)	Kementerian Perumahan dan Kerajaan Tempatan
	 Solid Waste Department 	Aras 18, No. 51, Persiaran Perdana, Presint 4, 62100 Putrajaya
	 Local government department 	03-88915012
	 Sewage Service Department 	zuraida@kpkt.gov.my
		Datuk Zainal Abidin bin Abu Hassan
		Ketua Setiausaha
		Kementerian Perumahan dan Kerajaan Tempatan
		Aras 17, No. 51, Persiaran Perdana, Presint 4, 62100 Putrajaya
		03-88915003
		zainal@kpkt.gov.my
		<u>-~ · · · · · · · · · · · · · · · · · · ·</u>

06.	Ministry of Rural Development	Minister: Datuk Dr. Abd Latiff Ahmad Menteri Kementerian Pembangunan Luar Bandar No. 47, Persiaran Perdana, Presint 4, Pusat Pentadbiran Kerajaan Persekutuan, 62100 Putrajaya,
		Malaysia. E-mail: latiff@rurallink.gov.my
		Dato' Dr. Ahmad Jailani Bin Muhamed Yunus Ketua Setiausaha Kementerian Pembangunan Luar Bandar No. 47, Persiaran Perdana, Presint 4, Pusat Pentadbiran Kerajaan Persekutuan, 62100 Putrajaya,
		Malaysia <u>jailaniyunus@rurallink.gov.my</u>
07.	Ministry of Agriculture and Food Industry (MAFI) Department of Fisheries Department of Agriculture	Minister: YB Datuk Seri Dr. Ronald Kiandee Menteri Pejabat Menteri Aras 17, Wisma Tani, No. 28, Persiaran Perdana, Presint 4, Pusat Pentadbiran Kerajaan Persekutuan, 62624 Putrajaya rkiandee@mafi.gov.my 03-88701001 YBhg. Dato' Haslina binti Abdul Hamid Ketua Setiausaha Pejabat Ketua Setiausaha Aras 17, Wisma Tani, No. 28, Persiaran Perdana, Presint 4, Pusat Pentadbiran Kerajaan Persekutuan, 62624 Putrajaya haslinaabdhamid@mafi.gov.my 03-88701014
		Ahmad Tarmidzi bin Ramly Ketua Pengarah Perikanan Jabatan Perikanan Malaysia Aras 1-6, Blok 4G2,Wisma Tani,Presint 4, Pusat Pentadbiran kerajaan Persekutuan, 62628, Putrajaya Tel no.03-88704002

		E-mel: tarmidzi@dof.gov.my
		Z men ummezi e dongo maj
		Datuk Mohd Nasir Bin Warris
		Ketua Pengarah Pertanian
		Jabatan Pertanian
		Aras 7-17, Wisma Tani, No. 30,
		Persiaran Perdana, Presint 4,
		Pusat Pentadbiran Kerajaan Persekutuan,
		62624 Putrajaya, Malaysia.
		Tel no.:03-8870 3001
		E-mel: nasirwarris@doa.gov.my
00	Maria CT 1 A 1 1 C 1 A 1 C T 1	No. 1
08.	Ministry of Tourism, Arts and Culture (MOTAC)	Minister:
		YB Dato' Sri Hajah Nancy Shukri
		Menteri Pelancongan, Seni dan Budaya Malaysia
		Level 17,
		No. 2, Tower 1, Jalan P5/6
		Presint 5
		62200 PUTRAJAYA
		03 8891 7001
		nancyshukri@motac.gov.my
		YBhg. Dato' Dr. Noor Zari bin Hamat
		Ketua Setiausaha
		Level 17,
		No. 2, Tower 1, Jalan P5/6
		Presint 5
		62200 PUTRAJAYA
		03 8891 7001
		Zari.hamat@motac.gov.my
09.	Ministry of Home Affairs	Mininster:
		YB Dato' Seri Hamzah bin Zainudin
	 Royal Malaysia Police (PDRM) 	Menteri Kementerian Dalam Negeri
	 RELA (Volunteers Department of Malaysia) 	Kementerian Dalam Negeri
	•	Blok D1, D2 & D9, Kompleks D, Pusat Pentadbiran, Kerajaan Persekutuan, 62546 Putrajaya
		dshamzah@moha.gov.my

		YBhg. Datuk Wan Ahmad Dahlan bin Haji Abdul Aziz Ketua Setiausaha Kementerian Dalam Negeri Blok D1, D2 & D9, Kompleks D, Pusat Pentadbiran,Kerajaan Persekutuan, 62546 Putrajaya wdahlan@moha.gov.my Tan Sri Dato' Seri Abdul Hamid Bador Ketua Polis Negara Ibu Pejabat Polis Diraja Malaysia Bukit Aman 50560 Kuala Lumpur. Telefon:03 - 2266 2222 Emel:rmp@rmp.gov.my Yahya Bin Sulaiman Ketua Pengarah Ibu Pejabat RELA Malaysia Aras 7,8,& 9, Blok D9, Kompleks D, Pusat Pentadbiran Kerajaan Persekutuan, 62546 Putrajaya
		Tel: 03 8870 3760 / 3770
		yahya@moha.gov.my
10.	Ministry of Defense	Minister:
	 Tentera Darat Malaysia (TDM) 	YB DATO' SRI ISMAIL SABRI BIN YAAKOB Menteri Kanan Pertahanan
	- Temera Darat Maraysia (TDM)	Pejabat Menteri Pertahanan
		Jalan Padang Tembak
		50634 Kuala Lumpur
		MALAYSIA
		ismailsabri@mod.gov.my
		Tel 03-2698 5020
		VIDVIC DATES ON A WEST DIVANDO A STATE
		YBHG. DATO' SRI MUEZ BIN ABD AZIZ Ketua Setiausaha
		Pejabat Ketua Setiausaha
		muez@mod.gov.my
		Tel 03-4012 3000

		JENERAL TAN SRI DATUK ZAMROSE BIN MOHD ZAIN Panglima Tentera Darat TENTERA DARAT MALAYSIA Markas Tentera Darat, Sekretariat Tentera Darat, Wisma Pertahanan, Jalan Padang Tembak, 50634 KUALA LUMPUR Telefon: 03-20712304 sek_td@mod.gov.my
11.	Minister in the Prime Minister's Department (Religious Affairs)	YB SENATOR Datuk Dr. Zulkifli Bin Mohamad Al-Bakri Menteri di Jabatan Perdana Menteri (Hal Ehwal Agama), Aras 10, Blok A, Kompleks Islam Putrajaya, No.23, Jalan Tunku Abdul Rahman, Presint 3, Pusat Pentadbiran Kerajaan Persekutuan 62100 PUTRAJAYA. drzul_albakri@jpm.gov.my 03-88707000 samb.7071
12.	Ministry of Finance Pengurusan Aset Air Berhad (PAAB)	Menteri: YB Senator Tengku Datuk Seri Utama Zafrul bin Tengku Abdul Aziz Menteri Kewangan Aras 10,11 & 12, Blok Tengah, No. 5 Persiaran Perdana, Presint 2, Pusat Pentadbiran Kerajaan Persekutuan, 62592 WP Putrajaya. Kementerian Kewangan Malaysia No. 5 Persiaran Perdana, Presint 2, Pusat Pentadbiran Kerajaan Persekutuan, 62592 WP PUTRAJAYA. tengkuzafrul@treasury.gov.my

YBhg. Dato' Asri bin Hamidon Ketua Setiausaha Perbendaharaan Aras 10,11 & 12, Blok Tengah, No. 5 Persiaran Perdana, Presint 2, Pusat Pentadbiran Kerajaan Persekutuan, 62592 WP Putrajaya. Kementerian Kewangan Malaysia No. 5 Persiaran Perdana, Presint 2, Pusat Pentadbiran Kerajaan Persekutuan, 62592 WP PUTRAJAYA. asri.hamidon@treasury.gov.my Ms Patricia Paran CEO 24th Floor, Menara Multi-Purpose, Capital Square, 8, Jalan Munshi Abdullah, 50100 Kuala Lumpur, Malaysia 603 - 2614 5555 0122529476 patricia@paab.my

3.2.2. Stakeholders at State and Local Level for IWRM

3.2.2.1. Selangor Table 178. DID offices in Selangor

SL. NO.	State/Districs/Local Authority	Details
1.	Selangor HQ	Datuk Ir. Gapar Bin Asan
		Pengarah
		Jabatan Pengairan Dan Saliran Negeri Selangor
		Tingkat 5, Podium Selatan,
		Bangunan Sultan Salahuddin Abdul Aziz Shah,
		40626 Shah Alam,
		Selangor.
		Tel: 03-55192158
		Email: gapar@waterselangor.gov.my
2.	JPS Daerah Petaling	En. Mohd Kamal Bin Mustafa
		Jurutera JPS Daerah Petaling
3.	JPS Daerah Kuala Langat	YM Raja Redzuan Shah Bin Raja Iskandar Shah
		Jurutera JPS Daerah Kuala Langat
4.	JPS Daerah Klang	En. Ganesan A/L Balakrishnan
		Jurutera JPS Daerah Klang
5.	JPS Daerah Gombak	En. Mohd Hasrulhisham Bin Abdullah
		Jurutera JPS Daerah Gombak
6.	JPS Daerah Hulu Langat	En. Ir. Sv Kalaiselvam a/l Velayudan
		Jurutera JPS Daerah Hulu Langat
7.	JPS Daerah Sabak Bernam	En. Zakaris Bin Agustar
		Jurutera JPS Daerah Sabak Bernam
8.	JPS Daerah Kuala Selangor	En. Syaiful Mizan Bin Zamiyan
		Jurutera JPS Daerah Kuala Selangor
9.	JPS Daerah Sepang	En. Mohd Shafiq Bin Mohd Jabir
		Jurutera JPS Daerah Sepang

10.	JPS Daerah Hulu Selangor	En. Jamaludin Bin Sharif
		Penguasa Daerah JPS Daerah Hulu Selangor

Table 9. DOE offices at state and local level

SL. NO.	State/District/Local Authority	Details
1	Selangor HQ	NOR AZIAH BINTI JAAFAR
		PENGARAH
		JAS Selangor
		Tingkat 12, 13 & 14, Sunwaymas Jalan Tengku Ampuan Zabedah C
		9/C, Seksyen 9 40100 Shah Alam, SELANGOR.
		03-5521 4000
		aziah@doe.gov.my
2	Kajang	SHAARI BIN AMAT C44
		KETUA CAWANGAN KAJANG
		Pejabat JAS Cawangan Kajang
		Alamat Tingkat 3, Kompleks Perhentian Kajang Jalan Reko
		43000 Kajang SELANGOR
		No. Tel03-87376100
		No. Faks 03-87375100
		sa@doe.gov.my
3	Sepang	MOHD AMIR BIN ISMAIL C44
		KETUA CAWANGAN
		Pejabat JAS Cawangan Sepang
		Alamat No. B28-1&B28-2 Jalan 7, Bandar Baru Salak Tinggi
		43900 Sepang SELANGOR
		03-87061340
		amir@doe.gov.my
4	Gombak	NOR HAYATI BINTI MOHAMAD IDRIS C44

SL. NO.	State/District/Local Authority	Details
		PEGAWAI KAWALAN ALAM SEKITAR KANAN CAWANGAN
		GOMBAK
		Pejabat JAS Cawangan Gombak
		Alamat Jabatan Alam Sekitar Cawangan Gombak No. 20,
		Jalan Sri Batu Caves 68100 Batu Caves SELANGOR
		No. Tel03-6186948
		No. Faks 03-6186987
		ni@doe.gov.my
5	Sabak Bernam	NASRUM BIN ZUBIR C44
		PEGAWAI KAWALAN ALAM SEKITAR
		Pejabat JAS Cawangan Sabak Bernam
		Alamat NO.48 JALAN BEDENA 2/1, TAMAN BEDENA 2, 45300
		SUNGAU BESAR,SELANGOR DARUL EHSAN
		No. Tel 0332244240
		No. Faks 0332243280
		nasrum@doe.gov.my

Table 10. State Health Department offices in Selangor

SL. NO.	State	Details
1	Jabatan Kesihatan Negeri Selangor	YBhg. Dato' Indera Dr. Sha'ari bin Ngadiman
		Pejabat Pengarah Kesihatan Negeri
		Jabatan Kesihatan Negeri Selangor
		Tingkat 9, 10, 11 & 17, No. 1, Wisma Sunway, Jalan Tengku
		Ampuan Zabedah C 9/C, Seksyen 9, 40100 Shah Alam, Selangor.
		Tel: 03-51237333/200Fax: 603-5123 7202 (Pengarah), 603-
		5123 7209 (Pengurusan), 603-5123 7299
		drshaari@moh.gov.my

Table 2011. State Water Agency in Selangor

SL. NO.	State	Details
1	Lembaga Urus Air Selangor (LUAS)	Lembaga Urus Air Selangor
		Tingkat 13, Bangunan Darul Ehsan,
		No.3 Jalan Indah Seksyen 14,
		40000 Shah Alam,
		Selangor.
		Dato' Ir. Hashim Bin Osman
		Pengarah
		Emel: hashim@luas.gov.my
		Setiausaha Pejabat : Sharifah Azlin Shah Binti Syed Zainal
		No.Tel: 0355111800 samb 1302
		Emel: azlin@luas.gov.my

Table 2112. PLAN Malaysia in Selangor

SL. NO.	State	Details
1	PLANMalaysia@Selangor	PLANMalaysia@Selangor
		Tingkat 15-18 Bangunan Darul Ehsan, No.3 Jalan Indah, Seksyen
		14,
		40646 Shah Alam, Selangor
		03 5511 6666
		03 5511 3557 / 03 5510 5051
		webmaster@jpbdselangor.gov.my
		www.jpbdselangor.gov.my

Table 2213. Unit Perancang Ekonomi (UPEN) in Selangor

SL. NO.	State	Details
1	UPEN Selangor	Unit Perancang Ekonomi Negeri Selangor, Tingkat 4, Bangunan
		SSAAS, 40503 Shah Alam, SELANGOR.
		Tuan Dr Nor Fuad Bin Abdul Hamid
		Jawatan : Timbalan Setiausaha Kerajaan (Pembangunan),
		Merangkap Pengarah UPEN
		Alamat : Pejabat TSUK (Pembangunan),
		Tingkat 13, Bangunan SSAAS,
		40000 Shah Alam, Selangor
		Tel : 03-55447142
		Fax: 03-55101264
		E-mel : fuad.hamid@elangor.gov.my
		Tel: 03-55212326 / 03-55212381
		Pn Mazidah: 03-55447119
		Emel: mazidah@selangor.gov.my

Table 14. Polis Diraja Malaysia (PDRM) in Selangor

SL. NO.	State	Details
1	PDRM Selangor	Ibu Pejabat Polis Kontinjen Selangor
		Polis Diraja Malaysia
		40000 Shah Alam
		Selangor
		Telefon: 03-55145001
		Faks: 03-55195175
		Emel: IPK Selangor: cccsel@rmp.gov.my
		Ketua Polis Selangor : kpsel@rmp.gov.my

Table 15. Angkatan Pertahanan Awam Malaysia (APM) in Selangor

SL. NO.	State	Details
1		Kol. (PA) Mohd Yusoff Bin Samad
		Pengarah (KP48)
		PEJABAT JABATAN PERTAHANAN AWAM NEGERI SELANGOR
		Aras 3, Wisma Persekutuan Klang, Persiaran Bukit Raja 1/KU1,
		41150 Klang, Malaysia
		mohdyusoff[at]civildefence[dot]gov[dot]my
		03-3341 0443 ext 101

Table 2516. Jabatan Sukarelawan Malaysia (RELA) in Selangor

SL. NO.	State	Details
1	RELA Selangor	Nasharuddin bin Mat Nasir
		Pengarah Rela Selangor
		Lot 03-04A, Tingkat 3, Kompleks PKNS, 40000 Shah Alam
		Selangor Darul Ehsan
		03-55103436
		prn_selangor@moha.gov.my

Table 17. EXCO Environment in Selangor

SL. NO.	State	Details
1	EXCO Environment Selangor	YANG BERHORMAT TUAN HEE LOY SIAN
		AHLI DEWAN NEGERI : N25 KAJANG
		EXCO PELANCONGAN & ALAM SEKITAR

PORTFOLIO: PENGERUSI JAWATANKUASA TETAP
PELANCONGAN, ALAM SEKITAR, TEKNOLOGI HIJAU, HAL EHWAL
ORANG ASLI DAN JAWATANKUASA KHAS AGAMA BUDDHA,
KRISTIAN, HINDU, SIKH DAN TAO NEGERI SELANGOR (LIMAS)

Alamat Pejabat:

Pejabat Ahli Majlis Mesyuarat Kerajaan Negeri Selangor,

Tingkat 2, Bangunan SSAAS, 40503 Shah Alam, Selangor

Tel: 03-55447760 Fax: 03-55193328

E-mel: pejabatexcoybhee[at]gmail.com

Alamat DUN:

Pusat Khidmat DUN Kajang,

Jalan Metro Avenue 1, Metro Kajang,

43000 Kajang, Selangor

Tel: 03-87362363 Fax: 03-87412363

Table 2718. List of local authorities in Selangor

SL. NO.	Local Authority	Details
1	Majlis Bandaraya Shah Alam	Tingkat 1, Wisma MBSA
		Persiaran Perbandaran
		40706 SHAH ALAM
		norrita@mbsa.gov.my; mbsa@mbsa.gov.my
2	Majlis Bandaraya Petaling Jaya	Tingkat 2, Ibu Pejabat MBPJ
		Jalan Yong Shook Lin
		46675 PETALING JAYA
		info@mbpj.gov.my
3	Majlis Bandaraya Subang Jaya	Persiaran Perpaduan,
		Jalan USJ 5
		47610 SUBANG JAYA
		datukbandar@mbsj.gov.my
4	Majlis Perbandaran Ampang Jaya	Menara MPAJ, Persiaran MPAJ
		Jalan Pandan Utama, Pandan Indah
		55100 KUALA LUMPUR ydp@mpaj.gov.my;
		fauzi@mpaj.gov.my
5	Majlis Perbandaran Kajang	Menara MPKJ
		Jalan Cempaka Putih Off Jalan Semenyih
		43000 KAJANG
		ydp.mpkj@mpkj.gov.my
6	Majlis Perbandaran Klang	Bangunan Sultan Alam Shah
		Jalan Perbandaran
		41675 KLANG
		afadzli@mpklang.gov.my
7	Majlis Perbandaran Selayang	Menara MPS, Persiaran 3
		Bandar Baru Selayang
		68100 BATU CAVES

SL. NO.	Local Authority	Details
		ydp@mps.gov.my
8		Persiaran Semarak Api
	Majlis Perbandaran Sepang	Cyber 1
		63200 CYBERJAYA
		admin@mpsepang.gov.my
9	Majlis Perbandaran Kuala Langat	Persiaran Majlis
		Jalan Sultan Alam Shah
		42700 BANTING
		ydp@mpkl.gov.my
10	Majlis Daerah Hulu Selangor	Jalan Bukit Kerajaan
		44000 KUALA KUBU BHARU
		ydp@mdhs.gov.my
11	Majlis Daerah Sabak Bernam	45300 SUNGAI BESAR
		mdsb_sel@mdsb.gov.my

Table 19. List of district offices in Selangor

SL. NO.	Local Authority	Details
1	Pejabat Daerah/Tanah Hulu Langat	YBrs. Tuan Shamsul Shahril Badliza Bin Mohd Noor
		shahril@selangor.gov.my
		Kompleks Pentadbiran Daerah Hulu Langat
		Persiaran Pusat Bandar, Seksyen 9
		43650 Bandar Baru Bangi
		Tel: 03 89251992
		Faks: 03 89252137
		Web: www.selangor.gov.my/hululangat
2	Pejabat Daerah / Tanah Klang	YBrs. Tuan Haji Mohd Zainal Bin Mohd Nor
		mohdzainal@selangor.gov.my
		Pejabat Daerah Tanah Klang
		Jalan Kota, 41902 Klang
		Tel: 03 33718030
		Faks: 03 33723079
		Web: www.selangor.gov.my/klang
3	Pejabat Daerah / Tanah Klang	YBrs. Tuan Haji Mohd Zainal Bin Mohd Nor
		mohdzainal@selangor.gov.my
		Pejabat Daerah Tanah Klang

SL. NO.	Local Authority	Details
		Jalan Kota, 41902 Klang
		Tel: 03 33718030
		Faks: 03 33723079
		Web: www.selangor.gov.my/klang
4	Pejabat Daerah / Tanah Gombak	Nama Pegawai Daerah :
		Ybhg. Dato Amirul Azizan Bin Abd Rahim
		amirulazizan@selangor.gov.my
		Pejabat Daerah Tnaah Gombak
		Bangunan Sultan Sulaiman, Persiaran Pegawai
		Bandar Baru Selayang, 68100 Batu Caves
		Tel: 03 61261500
		Faks: 03 61361073
		Web: www.selangor.gov.my/gombak
5	Pejabat Daerah / Tanah Petaling	YBhg. Datin Paduka Roslinah Bt Md Jani
		roslinahjani@selangor.gov.my
		Pejabat Daerah Tanah Petaling
		No. 1 Persiaran Atmosfera, Seksyen U5
		40150 Shah Alam
		Tel: 03 78419500
		Faks: 03 78422140

SL. NO.	Local Authority	Details
		Web: www.selangor.gov.my/petaling
6	Pejabat Daerah / Tanah Sepang	YBrs. Tuan Mohd Yazid Bin Sairi mohdyazid.sairi@selangor.gov.my Pejabat Daerah Tanah Sepang Bangunan Tun Aziz, Bandar Baru Salak Tinggi 43900 Sepang Tel: 03 87061001 Faks: 03 87061731 Web: www.selangor.gov.my/sepang
7	Pejabat Daerah / Tanah Kuala Langat	YBrs. Tuan Mohd Jusni Bin Hashim jusni@selangor.gov.my Pejabat Daerah Tanah Kuala Langat Persiaran Sultan Abdul Aziz Shah Kota Seri Langat, Sungai Sedu, 42700 Banting Tel: 03 31822536 Faks: 03 31872011 Web: www.selangor.gov.my/kualalangat
8	Pejabat Daerah / Tanah Kuala Selangor	YBrs. Tuan Mohd Faizal Bin Abdul Rajil

SL. NO.	Local Authority	Details
		Kompleks Kerajaan Daerah Kuala Selangor
		45000 Kuala Selangor
		Tel: 03 32891355
		Faks: 03 32982145
		Web: www.selangor.gov.my/kualaselangor
9	Pejabat Daerah / Tanah Hulu Selangor	YBrs. Tuan Haji Musa Bin Ranli
		musaranli@selangor.gov.my
		Pejabat Daerah Tanah Hulu Selangor
		Jalan Bukit Kerajaan
		44000 Kala Kubu Bharu
		Tel: 03 60641258
		Faks: 03 60644253
		Web: www.selangor.gov.my/huluselangor
10	Pejabat Daerah / Tanah Sabak Bernam	YBrs. Tuan Nasir Bin Mamat
		nasir.mamat@selangor.gov.my
		Kompleks Pejabat Daerah Tanah Sabak Bernam
		Persiaran Pusat Bandar, Seksyen 9
		45300 Sungai Besar, Sabak Bernam
		Tel: 03 32241970
		Faks: 03 32242178
		Web: www.selangor.gov.my/sabakbernam

3.2.2.2. Putrajaya

Table 20. DID offices in Putrajaya

SL. NO.	State/Districs	Details
1.	JPS W.Persekutuan (Putrajaya)	Ir. Haji Mohd Nazri Bin Yasmin
		Pengarah
		Jabatan Pengairan Dan Saliran Negeri W.Persekutuan Putrajaya
		No.25, Persiaran Perdana, Presint 4, 62000 Putrajaya, Wilayah Persekutuan Putrajaya
		(T)03-8886 1012
		ppsn_wpp@water.gov.my
		nazri@water.gov.my
2.	JPS Putrajaya Engineer	Encik Mohamad Nazrizal bin Noor
		J44 JURUTERA AWAM
		JPS Wilayah Persekutuan Putrajaya
		Email nazrizal[at]water[dot]gov[dot]my
		Phone office 03-88861011
		Fax number 03-88901480

Table 21. UPEN in Putrajaya

SL. NO.	State	Details
1	Wilayah Persekutuan Kuala Lumpur, Putrajaya Dan Labuan	Wilayah Persekutuan Kuala Lumpur, Putrajaya Dan Labuan
		Kementerian Wilayah Persekutuan,
		Blok 1 & Blok 2, Menara Seri Wilayah,
		Presint 2, 62100 Putrajaya. Tel: 03 8000 8000
		Sebarang pertanyaan sila emel ke:
		amsyari.suhaimi@epu.gov.my
		nabeela.mansor@epu.gov.my

Table 22. PDRM in Putrajaya

SL.	State	Details
NO.		
1	Ibu Pejabat Polis Daerah	Ibu Pejabat Polis Daerah
	Putrajaya	Polis Diraja Malaysia
		Presint 7
		62520 Putrajaya
		Tel : 03-8886 2222
		Faks: 03-8888 0249
		kpdputrajaya@rmp.gov.my

Table 23. Angkatan Pertahanan Awam Malaysia (APM) in Putrajaya

SL. NO.	State	Details
1	PEJABAT JABATAN PERTAHANAN AWAM NEGERI WILAYAH PERSEKUTUAN	YS Kol. (PA) Effendy Bin Hj. Ali Pengarah PEJABAT JABATAN PERTAHANAN AWAM NEGERI WILAYAH PERSEKUTUAN Angkatan Pertahanan Awam Negeri Wilayah Persekutuan, Jabatan Perdana Menteri, Aras 3, Blok 1, Menara Seri Wilayah, Persiaran Perdana, Presint 2, Pusat Pentadbiran Kerajaan Persekutuan, 62100 Putrajaya, Malaysia effendy@civildefence.gov.my 03-88810469

Table 24. RELA in Putrajaya

SL. NO.	State	Details
1	HQ/Rela Putrajaya	YAHYA BIN SULAIMAN
		KETUA PENGARAH
		Ibu Pejabat RELA Malaysia
		Aras 7,8,& 9, Blok D9, Kompleks D, Pusat Pentadbiran Kerajaan Persekutuan, 62546 Putrajaya
		yahya@moha.gov.my
		03-88703665

Table 25. EXCO environment in Putrajaya

SL.	State	Details
NO.		
1	Wilayah Persekutuan Putrajaya	(No Environment Exco)
		YBhg. Datuk Saiful Anuar bin Lebai Hussen
		Wakil Kerajaan Persekutuan
		Ketua Pengarah Unit Perancang Ekonomi
		Jabatan Perdana Menteri
		PERBADANAN PUTRAJAYA
		Kompleks Perbadanan Putrajaya
		24, Persiaran Perdana, Presint 3
		62675 Putrajaya Malaysia

Table 26. Local authority in Putrajaya

SL.	Local Authority	Details
NO.		
1	Wilayah Persekutuan Putrajaya	DATUK MUHAMMAD AZMI BIN MOHD ZAIN
		Presiden
		PERBADANAN PUTRAJAYA
		Kompleks Perbadanan Putrajaya
		24, Persiaran Perdana, Presint 3
		62675 Putrajaya Malaysia.
		(Does not have DO)

3.2.2.3. Kuala Lumpur

Table 27. DID offices in Kuala Lumpur

SL.	State/Districs	Details
NO.		
1.	<u>IPS W.Persekutan(Kuala</u> <u>Lumpur)</u>	Hj Nishad Mohamed Bin Hj. C.j. Mohd. Shaffy
		Pengarah
		Jabatan Pengairan Dan Saliran W.Persekutan Kuala Lumpur
		JABATAN PENGAIRAN DAN SALIRAN
		WILAYAH PERSEKUTUAN KUALA LUMPUR
		JALAN SULTAN SALAHUDDIN,
		50626 KUALA LUMPUR
		(T)03-26981 711
		ppsn_wpkl@water.gov.my
2.	JPS KL Engineer	Ir. Ratna Rajah Sivapiragasam J54 JURUTERA AWAM
		JPS Wilayah Persekutuan Kuala Lumpur
		Email
		ratnarajah[at]water[dot]gov[dot]m
		у
		Phone office 03-26981711
		Fax number 03 2693 2285

Table 28. DOE offices in Kuala Lumpur

SL.	State/District/Local Authority	Details
NO.		
1	<u>Jabatan Alam Sekitar Wilayah</u> Persekutuan Kuala Lumpur	Azlan Bin Ahmad
	<u>i ersekutuan Kuaia Lumpur</u>	Pengarah
		Jabatan Alam Sekitar Wilayah Persekutuan Kuala Lumpur
		3, Jln Sungai Besi, Pudu, 55200 Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur
		03-89939023 ext 102
		azlan@doe.gov.my

Table 29. State Health Department Offices in Kuala Lumpur

SL. NO.	State	Details
1	<u>Jabatan Kesihatan WP Kuala</u> <u>Lumpur</u>	Datuk Dr. Param Jeeth Singh A/L Pakar Singh
		Pengarah Kesihatan Negeri
		Jabatan Kesihatan WP Kuala Lumpur
		Jalan Cenderasari, 50590 Kuala Lumpur, Wilayah Persekutuan.
		Tel : 03-2268 7333
		Fax : 03-2268 7555
		param@moh.gov.my

Table 30. Unit Perancang Ekonomi in Kuala Lumpur

SL.	State	Details
NO.		
1	Unit Perancang Ekonomi Negeri	Wilayah Persekutuan Kuala Lumpur,
	Wilayah Persekutuan	Putrajaya Dan Labuan
		Kementerian Wilayah Persekutuan,
		Blok 1 & Blok 2, Menara Seri Wilayah,
		Presint 2, 62100 Putrajaya. Tel: 03 8000
		8000
		Sebarang pertanyaan sila emel ke:
		amsyari.suhaimi@epu.gov.my
		nabeela.mansor@epu.gov.my

Table 31 PDRM in Kuala Lumpur

SL. NO.	State	Details
1	Ibu Pejabat Polis Kontinjen Kuala Lumpur	Ibu Pejabat Polis Kontinjen Kuala Lumpur
	Kuaia Lumpui	Polis Diraja Malaysia
		Jalan Hang Tuah
		51100 Kuala Lumpur
		Telefon: 03-21460522
		Faks: 03-20726786
		Emel : IPK Kuala Lumpur : ccckl@rmp.gov.my
		KP Kuala Lumpur : kpkl@rmp.gov.my

Table 32. Angkatan Pertahanan Awam Malaysia (APM) in Kuala Lumpur

SL. NO.	State	Details
1	Pejabat Jabatan Pertahanan Awam Negeri Wilayah Persekutuan	YS Kol. (PA) Effendy Bin Hj. Ali
		Pengarah
		Pejabat Jabatan Pertahanan Awam Negeri
		Wilayah Persekutuan
		Angkatan Pertahanan Awam Negeri Wilayah
		Persekutuan, Jabatan Perdana Menteri, Aras
		3, Blok 1, Menara Seri Wilayah, Persiaran
		Perdana, Presint 2, Pusat Pentadbiran
		Kerajaan Persekutuan, 62100 Putrajaya,
		Malaysia
		Email: effendy@civildefence.gov.my
		Tel: 03-88810469

Table 33. RELA in Kuala Lumpur

SL. NO.	State	Details
1	WP Kuala Lumpur	Darman bin Dabang
		Pengarah Rela WP Kuala Lumpur
		Aras 5, Kompleks KDN WPKL, No. 69,
		Jalan Sri Hartamas 1, 50480 Kuala Lumpur
		03-62052742
		Email: prn_wpkl@moha.gov.my

Table 34. EXCO environment in Kuala Lumpur

SL.	State	Details
NO.		
1	Wilayah Persekutuan Kuala Lumpur	(No Environment Exco)
		Dr. Umi Binti Ahmad
		Pengarah
		Health and Environment Department
		KM 4, Jalan Cheras, 56100 Kuala Lumpur.
		03-2027 5300
		03-9285 7295
		Email: jkas@dbkl.gov.my

Table 35. Local authority in Kuala Lumpur

SL.	Local Authority	Details
NO.		
1	Dewan Bandaraya Kuala Lumpu	Ybhg. Datuk Seri Hj. Mahadi
		Bin Che Ngah
		Datuk Bandar Kuala Lumpur
		Menara DBKL 1
		Jalan Raja Laut
		50350 Kuala Lumpur dbkl@dbkl.gov.my;
		jpm@dbkl.gov.my;
		datukbandar@dbkl.gov.my

Table 45. District office in Kuala Lumpur

SL. NO.	Local Authority	Details
1	Dewan Bandaraya Kuala Lumpur	-

3.2.2.4. Terengganu

Table 46. DID offices in Terengganu

SL. NO.	State/Districs	Details
1.	<u>IPS Terengganu</u>	Tuan Haji Mohd Sor bin Othman
		Pengarah
		Jabatan Pengairan Dan Saliran Negeri Terengganu
		TINGKAT 6, WISMA NEGERI,
		20626, KUALA TERENGGANU
		Terengganu
		(T)09-9751 037
		msor@water.gov.my
2.	JPS Daerah Kuala Terengganu	IR. STEVEN POH TZE WEI
		JURUTERA DAERAH TEKNIKAL
		KUALA TERENGGANU
3.	JPS Daerah Kemaman	ENCIK NIK MOHD FARIZ BIN ZAMANI
		JURUTERA DAERAH
		PEJABAT PENGAIRAN DAN SALIRAN
		DAERAH KEMAMAN
4.	JPS Daerah Dungun	ENCIK ABADI BIN HARUN
		PENOLONG JURUTERA DAERAH DUNGUN
		KHIDMAT TEKNIKAL
5.	JPS Daerah Besut	ENCIK ABDULLAH BIN AWANG
		JURUTERA DAERAH BESUT
		BAHAGIAN PENGURUSAN PROFESIONAL
6.	JPS Daerah Hulu Terengganu	ENCIK CHE MOHD ROSDAN BIN CHE
		ROSDAN
		JURUTERA DAERAH HULU TERENGGANU
		PENTADBIRAN
7.	JPS Daerah Marang	ENCIK MOHD AZLAN BIN MUSTAPA
	-	JURUTERA DAERAH TEKNIKAL DAERAH
		MARANG
8.	JPS Daerah Setiu	PUAN FATEN ADILAH BINTI AHMAD
		SHUKRI
		JURUTERA DAERAH SETIU

Table 47. DOE offices in Terengganu

SL.	State/District/Local Authority	Details
NO.		
1		RAMLI BIN ABD.RAHMAN
		PENGARAH
		JAS Terengganu
		WISMA ALAM SEKITAR
		OFF JALAN SULTAN OMAR
		20300 KUALA TERENGGANU
		TERENGGANU
		09-6261044
		rar@doe.gov.my
2		ROZAIMI BIN MAT ZIN C 44
		PEGAWAI KAWALAN ALAM SEKITAR
		KANAN CAWANGAN
		Pejabat Cawangan: JAS Cawangan
		Kemaman
		Pejabat JAS Cawangan Kemaman
		Alamat Aras 3, Bangunan
		Persekutuan Jalan Melor Gong Limau
		24000 Chukai, Kemaman, TERENGGANU
		No. Tel KEMAMAN09-6261044
		No. Faks 09-8502421
		rmz@doe.gov.my

Table 36. State Health Department offices in Terengganu

SL.	State	Details
NO.		
1	Jabatan Kesihatan Negeri Pahang	DATO' DR. HJ. BAHARI BIN DATO' TOK MUDA HJ. AWANG NGAH
		PENGARAH KESIHATAN NEGERI PAHANG
		drbahari
		Jabatan Kesihatan Negeri Pahang
		Jalan IM 4, Bandar indera Mahkota 25582 Kuantan Pahang Darul Makmur
		Tel : 09-570 7600 (pengarah)
		Fax : 09-570 7799 (pengurusan)

Table 37. State Water Agency in Terengganu

SL.	State	Details
NO.		
1	Jabatan Bekalan Air Terengganu	Jabatan Bekalan Air Negeri Terengganu,
	jabatan bekaian An Terengganu	Tingkat 2, Wisma Negeri,Jalan Pejabat,
		20200 Kuala Terengganu,
		Terengganu Darul Iman
		Safura Binti Mad Juhari
		Pengarah N44
		No.Tel: 09-626 4455 samb 4238
		Emel: safura@terengganu.gov.my
		Tel : 09-627 4242,
		Fax: 09-6264466
		Emel : jba@terengganu.gov.my

Table 38. PLAN Malaysia in Terengganu

SL.	State	Details
NO.		
1	PLANMalaysia@Terengganu	PLANMalaysia@Terengganu
		Tingkat 3 & 4, Wisma Negeri,
		20646 Kuala Terengganu
		09 630 1214 / 09 627 4225
		09 624 4117
		pbd@terengganu.gov.my
		www.jpbdtrg.gov.my

Table 39. Unit Perancang Ekonomi in Terengganu

SL.	State	Details
NO.		
1	Unit Perancang Ekonomi Negeri	Unit Perancang Ekonomi Negeri
	Terengganu	Terengganu
		Tingkat 13, Wisma Darul Iman 20503
		Kuala Terengganu.
		Pengarah : Tuan Haji Samiun Bin Salleh
		Emel : upend@terengganu.gov.my
		Tel : 09-622 1900/ 09-627 6452
		(Talian Terus)
		Tel : 09-623 1957 Samb. : 6452 Tel:
		09-623 1957
		Fax: 09-623 4278
		Emel: upentr@terengganu.gov.my

Table 40. PDRM in Terengganu

SL. NO.	State	Details
1	Ibu Pejabat Polis Kontinjen Terengganu	Ibu Pejabat Polis Kontinjen Terengganu
		Polis Diraja Malaysia
		20918 Kuala Terengganu,
		Terengganu.
		Telefon :09-6354722
		Faks: 09-6226941
		Emel : IPK Terengganu :
		ccctrg@rmp.gov.my
		KP Terengganu :
		cpo.trengganu@rmp.gov.my

Table 41. Angkatan Pertahanan Awam Malaysia (APM) in Terengganu

SL. NO.	State	Details
	PEJABAT JABATAN PERTAHANAN AWAM NEGERI TERENGGANU	YS Lt. Kol. (PA) Mohd Rosman Bin Abdullah
	12.12.133.1113	Pengarah
		PEJABAT JABATAN PERTAHANAN AWAM NEGERI TERENGGANU
		Jalan Lapangan Terbang, 21300 Kuala Terengganu, Malaysia
		mohdrosman
		09-6672991/123

Table 42. RELA in Terengganu

SL.	State	Details
NO.		
1	TERENGGANU	(KOSONG)
		Pengarah Rela Terengganu
		Tingkat 4 Wisma Persekutuan 20200
		Kuala Terengganu, Terengganu
		09-6222751
		prn_terengganu@moha.gov.my

Table 43. EXCO environment in Terengganu

SL.	State	Details
NO.		
1	EXCO Environment	Yang Berhormat Dr. Haji Alias bin Razak,
		S.M.T.
		Pengerusi Jawatankuasa
		Kerajaan Tempatan, Perumahan, Kesihatan
		Dan Alam Sekitar

Table 44. Local authorities in Terengganu

SL.	Local Authority	Details
NO.		
1	Majlis Bandaraya Kuala Terengganu	Tingkat 4 - 8
		Jalan Sultan Ismail
		20200 KUALA TERENGGANU
		mbkt@terengganu.gov.my
2	Majlis Perbandaran Kemaman	Jalan Air Putih
		24000 KEMAMAN
		ydp@mpkemaman.gov.my
3	Majlis Perbandaran Dungun	23000 DUNGUN
		mdd@tm.net.my
4	Majlis Daerah Besut	22200 BESUT
		mdb.terengganu.gov.my
5	Majlis Daerah Hulu Terengganu	21700 HULU TERENGGANU
		mdht.terengganu.gov.my
6	Majlis Daerah Marang	21600 MARANG
		huzairil@terengganu.gov.my
7	Majlis Daerah Setiu	22100 SETIU
		ydp@mds.gov.my

Table 45. District offices in Terengganu

SL. NO.	Local Authority	Details
1	Pejabat Daerah Kuala Terengganu	YBRS. TUAN HAJI ARIFFIN BIN ABDULLAH
		PEGAWAI DAERAH
		Alamat Jabatan :
		KOMPLEKS SRI IMAN, JALAN SULTAN MOHAMAD.
		20692, KUALA TERENGGANU
		ptkt@terengganu.gov.my
		096222966
2	Pejabat Dearah Kemaman	YBRS. TUAN HAJI MOHD SOPHIAN BIN ABU BAKAR
		JALAN SENTOSA,
		24000, KEMAMAN
		Emel Jabatan : pdk@terengganu.gov.my
		No. Telefon : 098591961
		No. Fax : 098594954
3	Pejabat Daerah Besut	ENCIK AHMAD FARHAN BIN ABDUL WAHAB
		KAMPUNG RAJA
		22000, BESUT
		Emel Jabatan : pdbesut [at] terengganu [dot] gov [dot] my
		No. Telefon : 096956326
		No. Fax : 096956390
4	Pejabat Daerah Dungun	TUAN HAJI ANUAR BIN AWANG
		JALAN YAHYA AHMAD,
		23000, DUNGUN
		Emel Jabatan : pddungun [at] terengganu [dot] gov [dot] my
		No. Telefon : 098481617
		No. Fax : 098484594

5	Pejabat Daerah Hulu Terengganu	ENCIK AHMAD AZIZI BIN ZULKIFLI KUALA BERANG 21700, HULU TERENGGANU Emel Jabatan : pdht [at] terengganu [dot] gov [dot] my No. Telefon : 096811244 No. Fax : 096811964
6	Pejabat Daerah Marang	YBRS. TUAN HAJI TUN AHMAD FAISAL BIN TUN ABDUL RAZAK MARANG, 21600, MARANG Emel Jabatan : pdmarang@terengganu.gov.my No. Telefon: 096182211 No. Fax: 096181963
7	Pejabat Daerah Setiu	TUAN HAJI ROSLI BIN LATIF Alamat Jabatan: BANDAR PERMAISURI, SETIU. 22100, SETIU Emel Jabatan: pdsetiu [at] terengganu [dot] gov [dot] my No. Telefon: 096099266 No. Fax: 096099017
8	Pejabat Daerah Kuala Nerus	YBRS. ENCIK AHMAD FARIS BIN ABDUL RAZAK LOT 54998-55003, JALAN TENGKU MOHAMAD, 21200, KUALA NERUS Emel Jabatan : pdkn [at] terengganu [dot] gov [dot] my No. Telefon : 096664000 No. Fax : 096624000

3.2.2.5. Pahang

Table 46. DID offices in Pahang

SL. NO.	State/Districs	Details
1.	JPS Pahang	Ir. Mohd Noor bin Bidin
		Pengarah
		Jabatan Pengairan Dan Saliran Negeri Pahang
		Tingkat 8, Kompleks Tun Razak,
		Bandar Indera Mahkota,
		25626 Kuantan, Pahang Darul Makmur
		(T)09-5733 966
		ppsn_pahang@water.gov.my
		mnordid@water.gov.my
2.	JPS Daerah Temerloh	Encik Mohd Fisham bin Abu
		J48 JURUTERA AWAM
		Jurutera Daerah Temerloh
3.	JPS Daerah Pekan	Ir. Mohamad Azam bin Mohd Nor
		J44 JURUTERA AWAM
		Jurutera Daerah Pekan
4.	JPS Daerah Kuala Lipis	Encik Nurual Hadi Bin Daud
		J41 JURUTERA AWAM
		Jurutera Daerah Kuala Lipis
5.	JPS Daerah Maran	Puan Nurul Wahida binti Mohd Nabin
		Grade FLEKSI J41 JURUTERA AWAM
		Jurutera Daerah Maran
6.	JPS Daerah Jerantut	YM RAJA MOHD NOORHAFIZUDDIN BIN RAJA
		DAUD
		FLEKSI J41 JURUTERA AWAM
		Jurutera Daerah Jerantut
7.	JPS Daerah Raub	Encik MOHAMMAD KAMAL REDZUAN BIN
	,	KAMARUDIN
		Grade FLEKSI J41 JURUTERA AWAM
		Jurutera Daerah Raub
8.	JPS Daerah Rompin	Encik Muhammad Zulhafiz Bin Shafei
	,	Grade J41 JURUTERA AWAM
		Jurutera Daerah Rompin
9.	JPS Daerah Kuantan	Ir. Mohamad Razali bin Jusoh
	•	J48 JURUTERA AWAM
		Jurutera Daerah Kuantan
10	JPS Daerah Bentong	Encik ABD HALIM BIN ABD AZIZ
	,	Grade J41 JURUTERA AWAM
		Jurutera Daerah Bentong
11	JPS Daerah Bera	Encik Mohd Fahmi Bin Hamzah
	,	J41 JURUTERA AWAM
		Jurutera Daerah Bera
12	JPS Daerah Cameron Highlands	Encik Ahmad Irsyaduddin Bin AmirJ 41 JURUTERA
	, o bactan damer on migmanas	AWAM
		Jurutera Daerah Cameron Highlands
		jui utera Daeran Gamerun Ingmanus

Table 47. DOE offices in Pahang

SL. NO.	State/District/Local Authority	Details
1	Jabatan Alam Sekitar PAHANG	MOHD SANI BIN MAT DAUD
		PENGARAH
		JAS Pahang
		Aras 1, Kompleks Mahkamah Kuantan
		Bandar Indera Mahkota
		25200 Kuantan
		PEJABAT PENGARAH NEGERI
		09-573 0636 EXT:102
		msmd@doe.gov.my
2	JAS Rompin	MOHD JAMALI BIN ABD MAJID C44
		PEGAWAI KAWALAN ALAM SEKITAR
		09-4145522
		Pejabat Cawangan: JAS Cawangan Rompin
		Pejabat JAS Cawangan Rompin
		Alamat Lot No. PT 859 No. 3, Jalan
		Syed Osman 26800 Kuala Rompin
		PAHANG
		No. Tel09-4145522
		No. Faks 09-4145524
		jamali@doe.gov.my
3	JAS Cameron Highland	MOHD SHAHRIN BIN
		MUDZARAP@MANSOR C44
		KETUA CAWANGAN CAMERON
		HIGHLANDS
		Pejabat Cawangan: JAS Cawangan
		Cameron Highland
		Pejabat JAS Cawangan Cameron
		Highland
		Alamat RL,C3 SHG 3,4,6,8,10 Taman
		Royal Lily, Taman Rata 39100 Cameron
		Highlands PAHANG
		No. Tel05-4915343
		No. Faks 05-4915323
	IAC The control of	shahrin@doe.gov.my
4	JAS Temerloh	SITI NORIAH BINTI ABU BAKAR C44
		PEGAWAI KAWALAN ALAM SEKITAR
		CAWANGAN TEMERLOH
		Pejabat Cawangan: JAS Cawangan
		Temerloh
		Pejabat JAS Cawangan Temerloh

		Alamat Lot 12 & Lot 14, Jalan Pak
		Sako 3 Bandar Sri Semantan 28000
		Temerloh PAHANG
		No. Tel09-2964688
		No. Faks 09-2965198
		Sitinoriah@doe.gov.my
5	JAS Gebeng	MOHD NAZIR BIN MANSOR C48
		KETUA CAWANGAN GEBENG
		Pejabat Cawangan: JAS Cawangan Gebeng
		Pejabat JAS Cawangan Gebeng
		Alamat Jabatan Alam Sekitar
		Cawangan Gebeng, Tingkat 1, Bangunan
		Kontena Nasional,Jalan Gebeng
		2/3,Kawasan Perindustrian Gebeng,26080
		Kuantan, Pahang
		No. Tel09-5834102
		No. Faks 09-5834086
		mdnazir@doe.gov.my

Table 48. State Health Department offices in Pahang

SL. NO.	State	Details
1	<u>Jabatan Kesihatan Negeri</u> <u>Pahang</u>	DATO' DR. HJ. BAHARI BIN DATO' TOK MUDA HJ. AWANG NGAH
		PENGARAH KESIHATAN NEGERI PAHANG
		drbahari
		Jabatan Kesihatan Negeri Pahang
		Jalan IM 4, Bandar indera Mahkota 25582 Kuantan Pahang Darul Makmur
		Tel: 09-570 7600 (pengarah)
		Fax : 09-570 7799 (pengurusan)

Table 49. State Water Agency in Pahang

SL.	State	Details
NO.		
1	Perbadanan Bekalan Air Pahang	Ibu Pejabat
		Pengurusan Air Pahang Berhad, Bandar Indera Mahkota,
		25200 Kuantan, Pahang Darul Makmur.
		Ir Abdul Aziz Bin Mohamed Noh

	Ketua bahagian Perkhidmatan Air
	No. Tel : 09-571 2222
	No. Fax: 09-571 2221

Table 50. PLAN Malaysia in Pahang

SL.	State	Details
NO.		
1	PLANMalaysia@Pahang	PLANMalaysia@Pahang
		Tingkat 4, Kompleks Tun Razak,
		Bandar Indera Mahkota,
		25200 Kuantan Pahang
		09 572 1181
		09 573 2001
		jpbd[at]pahang[dot]gov[dot]my
		jpbd.pahang.gov.my

Table 51. Unit Perancang Ekonomi in Pahang

SL.	State	Details
NO.		
1	Unit Perancang Ekonomi Negeri Pahang	Unit Perancang Ekonomi Negeri Pahang
	, and	4th Floor, Wisma Sri Pahang, Jalan Gambut, 25000, Kuantan, PAHANG.
		Yb Dato' Razihan bin Adzaharuddin
		Timb. Setiausaha Kerajaan (Pembangunan) Tel: 09-512 6700
		Emel: tsuk1@pahang.gov.my

Table 52. PDRM in Pahang

SL. NO.	State	Details
1	Ibupejabat Polis Kontinjen Pahang	Ibupejabat Polis Kontinjen Pahang Polis Diraja Malaysia,
		Jalan Gambut, 25990 Kuantan
		Pahang.

Telefon :09-5052222

Faks: 09-5179018

Emel: IPK Pahang: cccphg@rmp.gov.my

KETUA Polis Pahang:
cpo.pahang@rmp.gov.my

Table 53. Angkatan Pertahanan Awam Malaysia (APM) in Pahang

SL.	State	Details
NO.		
1	PEJABAT NEGERI PERTAHANAN AWAM PAHANG	YS Kol. (PA) Che Adam bin A. Rahman
	111111111111111111111111111111111111111	Pengarah
		PEJABAT NEGERI PERTAHANAN AWAM PAHANG
		Jabatan Pertahanan Awam Negeri Pahang, Lot 1057 & 1058, Jalan Berserah, 26100 Kuantan, Pahang Darul Makmur.
		che_adam[at]civildefence[dot]gov[dot]my

Table 54. RELA in Pahang

SL.	State	Details
NO.		
1	PAHANG	Abdul Aziz bin Sidi Ahmad
		Aras 4, Kompleks KDN Pahang, Bandar Indera Mahkota,
		25200 Kuantan, Pahang
		09-5721449
		prn_pahang@moha.gov.my

Table 55. EXCO Environment in Pahang

SL.	State	Details
NO.		
1	EXCO Environment Pahang	YB. Dato' Sri Haji Mohd. Sharkar bin Haji Shamsudin, SSAP., SIMP., DSAP., DIMP.
		Pengerusi Jawatankuasa Pelancongan, Kebudayaan, Alam Sekitar, Perladangan dan Komoditi Negeri Pahang.

	Tingkat 7, Blok B, Wisma Sri Pahang, 25503 Kuantan.
	Telefon: 09-5164837, 09-5126607, Faks: 09-5164971
	E-mel: msharkar@pahang.gov.my
	Dmsharkar.gmail.com

Table 56. Local authorities in Pahang

SL. NO.	Local Authority	Details
1	Majlis Bandaraya Kuantan	Jalan Tanah Putih
		25100 KUANTAN
		aduan mbk.gov.my
2	Majlis Perbandaran Temerloh	Aras 6 & 7
		Kompleks Pejabat Plaza Temerloh
		28000 TEMERLOH
		ydp@mpt.gov.my
3	Majlis Perbandaran Bentong	Jalan Ketari
		28700 BENTONG
		ydp@mpbentong.gov.my
4	Majlis Daerah Cameron Highlands	P.O Box 66
		Cameron Hihglands
		39700 TANAH RATA
		majlis@mdcameron.gov.my
5	Majlis Daerah Jerantut	27000 JERANTUT
		ydp@mdjerantut.gov.my
6	Majlis Daerah Lipis	Aras 4
		Bangunan Lipis Centre Point
		27200 KUALA LIPIS
		mdlipis@pahang.gov.my
7	Majlis Daerah Maran	26500 MARAN
		ydp@mdmaran.gov.my
8	Majlis Daerah Pekan	Jalan Mahkota
		26600 Pekan
		jamie@mdpekan.gov.my
9	Majlis Daerah Raub	26700 RAUB
		mdrraub2@tm.net.my
10	Majlis Daerah Rompin	Pejabat MD Rompin
		26800 KUALA ROMPIN
		ydp@mdrompin.gov.my

11	Majlis Daerah Bera	Jalan Majlis
		28300 Triang
		mdbera@pahang.com

Table 57. District offices in Pahang

SL. NO.	Local Authority	Details
1	Pejabat Daerah Dan Tanah	Dato' Mohd Zulkifli bin Hashim
	Bentong	09-220 1513
		Pegawai Daerah Bentong
		Wisma Sri Bentong
		28700 Bentong
		Pahang Darul Makmur.
		pdtbentong@pahang.gov.my
2	Pejabat Daerah Dan Tanah Bera	Dato' Zaman Azam bin Mohamat Sarif @ Ahmat
		Pegawai Daerah Bera,
		Pejabat Daerah dan Tanah Bera
		28200 Bandar Bera
		Pahang Darul Makmur.
		pdtbera@pahang.gov.my
		09-255 3109
3	Pejabat Daerah Dan Tanah Cameron Highlands	YH. Dato' Hj. Ishak bin Md Napis DIMP., PMP., ACM., PPT.,
		Pegawai Daerah Cameron Highlands
		Pejabat Daerah dan Tanah
		Cameron Highlands
		39000 Tanah Rata
		Pahang Darul Makmur
		ishak@pahang.gov.my
		05-490 1700
4	Pejabat Daerah Dan Tanah Jerantut	Puan Khairun Nissa binti Aris, AAP.
		Pegawai Daerah Jerantut
		Pejabat Daerah dan Tanah Jerantut
		Kompleks Pejabat-Pejabat Kerajaan
		27000 Jerantut
		Pahang Darul Makmur

		nissa@pahang,gov.my
		09-266 3511
5	Pejabat Daerah Dan Tanah Lipis	YH. Dato' Mohd Hafizi bin Ibrahim, DIMP.,
		SMP., AAP., AMP
		Pegawai Daerah Lipis
		Pejabat Daerah & Tanah Lipis
		Bandar Baru Kuala Lipis
		27200 Kuala Lipis
		Pahang Darul Makmur
		pdtl@pahang.gov.my
		09-312 1963
6	Pejabat Daerah Dan Tanah	YM. Tengku Dato' Nor Asmaliza binti Ku
	Kuantan	Lah, DIMP., SMP.
		Pegawai Daerah Kuantan
		Bangunan Pejabat Daerah dan Tanah
		Kuantan,
		Bandar Indera Mahkota,
		25990 Kuantan
		Pahang Darul Makmur
		Tg.norasmaliza@pahang.gov.my
		09-571 2404
7	Pejabat Daerah Dan Tanah Pekan	YH. Dato' Zaliza b Zulkipli, DIMP., AAP.
		Pegawai Daerah Pekan
		YH. Dato' Zaliza b Zulkipli, DIMP., AAP.
		Pejabat Daerah Dan Tanah Pekan
		Jalan Sultan Abu Bakar
		26600 Pekan
		Pahang Darul Makmur
		zaliza@pahang.gov.my
		09-421 1776

8	Pejabat Daerah Dan Tanah Maran	Sharuddin bin Jali, SMP.
	,	Pegawai Daerah Maran
		Bangunan Pejabat Daerah dan Tanah
		Maran,
		26500 Maran
		Pahang Darul Makmur.
		sharuddin@pahang.gov.my
		09-477 1500
9	Pejabat Daerah Dan Tanah Raub	
	Tejabat baeran ban Tanan Raub	YH. Dato' Mohammad Shahid bin Ismail, DIMP., AAP.
		Pegawai Daerah Raub
		Pejabat Daerah dan Tanah Raub
		Jalan Tengku Abdul Samad
		27600 Raub
		Pahang Darul Makmur
		pdr@pahang.gov.my
		09-355 1963
10	Pejabat Daerah Dan Tanah Rompin	Ahmad Nasim Bin Dato' Haji Mohd Sidek
		Pegawai Daerah Rompin
		Pejabat Daerah & Tanah Rompin,
		Kompleks Pentadbiran Kerajaan Negeri Daerah Rompin Blok A,
		26800 Kuala Rompin,
		Pahang Darul Makmur
		pdtrompin@pahang.gov.my
		09-414 5205
11	Pejabat Daerah Dan Tanah	YH. Dato' Ali Syahbana Bin Sabaruddin
	Temerloh	Pegawai Daerah Temerloh
		Pejabat Daerah dan Tanah Temerloh
		Kompleks Pejabat Dan Tanah Temerloh
		28000 Temerloh
		Pahang Darul Makmur
		ali.syahbana@pahang.gov.my
		09-290 1313
L	1	

3.2.2.6. Sarawak

Table 58. DID offices in Sarawak

SL. NO.	State/Districs	Details
1.	JPS Sarawak	Encik Chok Moi Soon
		Pengarah
		_
		Jabatan Pengairan Dan Saliran Negeri Sarawak
		7th, 9th & 10th FLOOR, WISMA SEBERKAS,
		JALAN TUN ABANG HAJI OPENG
		P.O.BOX 1230, 93626 KUCHING, SARAWAK
		(T)082-414212
		chokms@sarawak.gov.my
2.	JPS Daerah Samarahan	IR. IRWANDEE B.REDUAN
		Jurutera Bahagian Samarahan
3.	JPS Daerah Serian	ROLLIN JENTA AK GEM
		Divisional Engineer Serian
4.	JPS Daerah Sri Aman	Ir. FAIZUL BIN ABDUL WAHAB
_		Divisional Engineer Sri Aman
5.	JPS Daerah Betong	BARTHOLOMEW A/L EMILY AYU
	1000 1000	DIVISIONAL ENGINEER Betong
6.	JPS Daerah Sarikei	Daniel Chen Chun Ing
-	IDC D l. Cil.	Divisional Engineer Sarikei
7.	JPS Daerah Sibu	Ir. Rudi Bin Abang Zamhari
0	IDC Dooreh Vonit	Divisional Engineer Sibu
8.	JPS Daerah Kapit	Ms. Inja Hellegers Anak Achong Divisional Engineer Kapit
9.	JPS Daerah Mukah	FAIZAL BIN SUKI
9.	ji 5 Daeran Mukan	Divisional Engineer Mukah
10	JPS Daerah Bintulu	HENRY TUAH
	,	Divisional Engineer Bintulu
11	JPS Daerah Miri	Ir. Hiew Si Tien
	,	Divisional Engineer Miri
12	JPS Daerah Limbang	Anisah Bt Ahmad
		Divisional Engineer Limbang

Table 59. DOE offices in Sarawak

SL.	State/District/Local Authority	Details
NO.		
1	Jabatan Alam Sekitar Sarawak	HAMZAH BIN MOHAMAD
		PENGARAH
		JAS Sarawak
		Alamat Tingkat 7-9, Wisma STA,
		No. 26, jalan Datuk Abang Abdul Rahim,
		93450, Kuching, Sarawak
		082-483863 ext 201
		hamzahmd@doe.gov.my
2	JAS CAWANGAN MIRI	GRACE PUYANG EMANG C44
		PEGAWAI KAWALAN ALAM SEKITAR
		KANAN CAWANGAN MIRI
		Pejabat JAS Cawangan Miri
		Alamat Lot 97, Tingkat 8 Plaza Yu
		Lan, Jalan Brooke 98000 Miri, SARAWAK
		No. Tel085-426994
3	JAS CAWANGAN SIBU	grace@doe.gov.my MICHEAL ANAK WILSON UNTING C32
3	JAS CAWANGAN SIDU	PENOLONG PEGAWAI KAWALAN ALAM
		SEKITAR CAWANGAN SIBU
		Pejabat JAS Cawangan Sibu
		Alamat No. 6, Tingkat 5, Bangunan
		Grand Merdin Jalan Kampung Nyabor
		96008 Sibu, SARAWAK
		No. Tel084-334790
		mw@doe.gov.my
4	JAS CAWANGAN BINTULU	Abdul Mazli Hafiz Bin Abdul Malik C44
		PEGAWAI KAWALAN ALAM SEKITAR
		KANAN CAWANGAN BINTULU
		Pejabat JAS Cawangan Bintulu
		Alamat
		Tingkat 2, Bangunan Pejabat BPA No. 1,
		Jalan Tanjung Kidurong 97000 Bintulu,
		SARAWAK
		No. Tel086-3138247
		No. Faks 086-312958
		mazlihafiz@doe.gov.my

Table 60. State Health Department offices in Sarawak

SL.	State	Details
NO.		
1	Jabatan Kesihatan Negeri Sarawak	Dato' Dr. Mohamed Sapian Mohamed Pengarah Jabatan Kesihatan Negeri Sarawak
		Jabatan Kesihatan Negeri Sarawak
		Jalan Diplomatik, Off Jalan Bako, 93050 Kuching, Sarawak.
		Tel : 082-473200
		Fax: 082 - 443031
		pkns@moh.gov.my

Table 61. State Water Agency in Sarawak

SL.	State	Details
NO.		
1	Kuching Water Board	MADAM RODZIAH BINTI MOHAMAD
		General Manager
		Kuching Water Board
		Jalan Batu Lintang,
		Kuching, Sarawak.
		Tel: 082-222 222
		Fax: 082-222 259
		Email : kwb@kwb.gov.my

Table 62. Unit Perancang Ekonomi in Sarawak

SL. NO.	State	Details
1	Unit Perancang Ekonomi Negeri Sarawak	Unit Perancang Ekonomi Negeri Sarawak Setiausaha Kerajaan Negeri, Pejabat Setiausaha Kerajaan Negeri Tingkat 20, Wisma Bapa Malaysia Petra Jaya, 93502 Kuching, Sarawak. Pengarah : Assoc. Prof. Dr. Muhammad Abdullah Bin Haji Zaidel Tel :+6082-440911 ext. 2281 Fax :082-449481/442536 Email : zmabdullah@sarawak.gov.my Tel: 08-2441957

Fax: 082-441677
Officer : En Iwan: 08-2319425
Emel: mohamibb@sarawak.gov.my

Table 63. PDRM in Sarawak

SL.	State	Details
NO.		
1	Ibu Pejabat PDRM	Ibu Pejabat Polis Diraja Malaysia
		Bukit Aman
		50560 Kuala Lumpur.
		Telefon :03 - 2266 2222
		Faks : 03 - 2070 7500
		Emel :rmp@rmp.gov.my

Table 64 . Angkatan Pertahanan Awam Malaysia (APM) in Sarawak

SL.	State	Details
NO.		
1	PEJABAT JABATAN PERTAHANAN AWAM NEGERI	PPj. (PA) Mohtar Bin Samat
	SARAWAK	Pengarah APM Sarawak KP52 (M)
		PEJABAT JABATAN PERTAHANAN AWAM NEGERI SARAWAK
		Tingkat 11, Bangunan Sultan Iskandar, Jalan Simpang Tiga, Peti Surat 1298, 93300 Kuching, Sarawak.
		mohtar[at]civildefence[dot]gov[dot]my
		082-256658

Table 65. RELA in Sarawak

SL. NO.	State	Details
1	RELA Sarawak	Abang Zulfikar bin Abang Razuan
		Pengarah Rela Sarawak
		No. 176, Lot 28, Blok 10, KCLD, Batu 2 $\frac{1}{2}$,
		Jalan Rock, 93200 Kuching, Sarawak
		082-244889
		prn_sarawak@moha.gov.my

Table 66. EXCO environment in Sarawak

SL. NO.	State	Details
1	Sarawak	(No Environment Exco)
		YAB DATUK PATINGGI (DR) ABANG HAJI ABDUL RAHMAN ZOHARI BIN TUN DATUK ABANG HAJI OPENG
		KETUA MENTERI SARAWAK
		MENTERI KEWANGAN DAN PERANCANGAN EKONOMI
		MENTERI PEMBANGUNAN BANDAR DAN SUMBER ASLI
		Office Of The Chief Minister Of Sarawak
		22nd Floor, Wisma Bapa Malaysia Petra Jaya,
		92502 Kuching, Sarawak.
		Tel : 082-440801
		Fax: 082-444566

Table 67. Local authorities in Sarawak

SL.	Local Authority	Details
NO.		
1	<u>Dewan Bandaraya Kuching Utara</u>	Bukit Siol, Jalan Semariang
		Petra Jaya
		93050 KUCHING
		prd@dbku.gov.my
2	Majlis Bandaraya Kuching Selatan	Jalan Padungan
		93675 KUCHING
		mayor@mbks.gov.my
3	<u>Majlis Bandaraya Miri</u>	Jalan Raja
		98000 MIRI
		mfredrick@miricouncil.gov.my;
		mbm@miricouncil.gov.my
4	Majlis Perbandaran Padawan	Kota Padawan,Batu 10
		Jalan Penrissen
		93250 KUCHING
		mpp@sarawak.gov.my;
		lokc@sarawak.gov.my;
		Yvonne.goh@sarawak.gov.my

5	Majlis Perbandaran Sibu	Tingkat 19-24, Wisma Sanyan
		No 1 Jalan Sukan Peti Surat 557
		96007 SIBU SMC@smc.gov.my;
		lawTH1@sarawak.gov.my
6	Majlis Perbandaran Kota Samarahan	94300 KOTA SAMARAHAN
		mdshan@tm.net.my;
		norha1@sarawak.gov.my;
7	Lembaga Kemajuan Bintulu	No. 1, Jalan Tanjung Kidurong
'	<u>(Perbandaran)</u>	Peti Surat 55
		97007 BINTULU
		bda@bda.gov.my; gm@bda.gov.my;
		yakupbk@bda.gov.my;
8	<u>Majlis Daerah Bau</u>	Jalan Ong Guan Cheng
		94000 BAU KUCHING
		mdbau@po.jaring.my;
		simonwhy@sarawak.gov.my
9	Majlis Daerah Betong	Bangunan Kubu Rentap
		95700
		BETONGbetongdc@gmail.com;
		Charliek@sarawak.gov.my
10	Majlis Daerah Dalat & Mukah	Aras 1, Pusat Pentadbiran Baru
		Bahagian Mukah, Jalan Wawasan, Peti
		Surat 68
		96400 MUKAH
		aidens@sarawak.gov.my;
		yongic@sarawak.gov.my;
11	<u>Majlis Daerah Kanowit</u>	Jalan Kubu
		Jalan Kubu, Peti Surat 1,
		96707 KANOWIT
		kdcict@tm.net.my;
		herbert2rt@sarawak.gov.my
12	<u>Majlis Daerah Kapit</u>	Jalan Kubu, Peti Surat 57
		96800 KAPIT
		kptdc@tm.net.my; mdkapit@gmail.com
13	<u>Majlis Daerah Lawas</u>	Jalan Trusan By-Pass
		98857 LAWAS
		mdlawas@sarawak.gov.my
14	Majlis Daerah Luar Bandar Sibu	Level 18, Wisma Sanyan
		Jalan Sanyan
		96008 SIBU
		mdlbs@sarawaknet.gov.my
15	<u>Majlis Daerah Lubok Antu</u>	Jalan Penghulu Imong ak. Awan
		95800 ENGKILILI, BAHAGIAN SRI AMAN
		said@sarawak.gov.my

16	Majlis Daerah Maradong & Julau	Peti Surat 4, Jalan Mahkamah 96507 BINTANGOR mdmjadm@pd.jaring.my
17	<u>Majlis Daerah Lundu</u>	94500 LUNDU lundudc@sarawak.gov.my
18	<u>Majlis Daerah Marudi</u>	Peti Surat 374 Marudi 98058 BARAM marudidc@tm.net.my
19	<u>Majlis Daerah Matu & Daro</u>	96250 MATU mdmdmatu@tm.net.my
20	<u>Majlis Daerah Saratok</u>	Jln Datuk Abang Abu Talib Peti Surat No 73 95400 SARATOK awatu@sarawaknet.gov.my
21	<u>Majlis Daerah Sarikei</u>	Jalan Nyelong Peti Surat 420 96100 SARIKEI mdsarikei@moeswk.gov.my
22	<u>Majlis Daerah Serian</u>	No. 1 JLn Bunga Tanjung 94700 SERIAN cons@sarawak.gov.my
23	<u>Majlis Daerah Simunjan</u>	LOT 805 New Service Centre GUNUNG NGELI 94800 SIMUNJAN bilonge@sarawaknet.gov.my; Geoffrey21@sarawak.gov.my
24	<u>Majlis Daerah Sri Aman</u>	Peti Surat 78 95700 SRI AMAN mdsa@tm.net.my; tgh@sarawak.gov.my
25	<u>Majlis Daerah Subis</u>	98150 BEKENU mdsubis@sarawak.gov.my
26	<u>Majlis Daerah Limbang</u>	Peti Surat 390 98708 LIMBANG lmndc@limbangdc.gov.my;

Table 68. District offices in Sarawak

SL. NO.	Local Authority	Details
1	Pejabat Daerah Asajaya	Pejabat Daerah Asajaya,
		94600 Asajaya,
		Sarawak, Malaysia.
		+6082-829007
		+6082-821206
2	Pejabat Daerah Belaga	Pejabat Daerah Belaga,
		96900 Belaga,
		Sarawak, Malaysia.
		+6086-461315
		+6086-461435
3	Pejabat Daerah Bau	Pejabat Daerah Bau,
		Jalan Penghulu Durin
		94000 Bau,
		Sarawak, Malaysia.
		+6082-763022
		+6082-763530
4	Pejabat Daerah Betong	Pejabat Daerah Betong,
		Jalan Pengarah Isek
		95700 Betong,
		Sarawak, Malaysia.
		+6083-472204
		+6083-472504
5	Pejabat Daerah Bintulu	Pejabat Daerah Bintulu,
		Aras Bawah, Wisma Residen
		Jalan Pisang Keling
		Off Jalan Tun Razak
		97000 Bintulu,
		Sarawak, Malaysia.
		+6086-331896
		+6086-338441
6	Pejabat Daerah Dalat	Pejabat Daerah Dalat,
		96300 Dalat, Mukah,
		Sarawak, Malaysia.

		+6084-864219
		+6084-864435
7	Pejabat Daerah Daro	Pejabat Daerah Daro,
		Jalan Sentral
		96200 Daro,
		Sarawak, Malaysia.
		+6084-823363
		+6084-823528
8	Pejabat Daerah Julau	Pejabat Daerah Julau,
		Jalan SMK Julau
		96600 Julau,
		Sarawak, Malaysia.
		+6084-734228
		+6084-734449
9	Pejabat Daerah Kanowit	Pejabat Daerah Kanowit,
		Jalan Kanowit Durin
		96700 Kanowit,
		Sarawak, Malaysia.
		+6084-752939 / +6084-752963
		+6084-752937
10	Pejabat Daerah Kapit	Pejabat Daerah Kapit,
		Aras 2, Kompleks Kerajaan Negeri
		Jalan Bleteh
		96800 Kapit,
		Sarawak, Malaysia.
		+6084-796322
		+6084-797625
11	Pejabat Daerah Kuching	Pejabat Daerah Kuching,
		Level 6, Majma' Tuanku Abdul Halim
		Mu'adzam Shah
		Lorong P. Ramlee 5
		93400 Kuching,
		Sarawak, Malaysia.
		6082-507022
		+6082-507487

12	Pejabat Daerah Lawas	Pejabat Daerah Lawas,
	,	Jalan Gaya
		98850 Lawas,
		Sarawak, Malaysia.
		+6085-283103 / +6085-283105
		+6085-284553
13	Pejabat Daerah Limbang	Pejabat Daerah Limbang,
	_	Level 6, Limbang Plaza
		Buangsiol Limbang Road
		98700 Limbang,
		Sarawak, Malaysia.
		+6085-202115 / +6085-202122
		+6085-215003
14	Pejabat Daerah Lubok Antu	Pejabat Daerah Lubok Antu,
		Jalan Temenggong Simpi
		95900 Lubok Antu, Sri Aman,
		Sarawak, Malaysia.
		+6083-584108
		+6083-584141
15	Pejabat Daerah Lundu	Pejabat Daerah Lundu,
		Jalan Sekambal
		94500 Lundu,
		Sarawak, Malaysia.
		+6082-735008 / +6082-735001
		+6082-735599
16	Pejabat Daerah Marudi	Pejabat Daerah Marudi,
		Jalan Kubu
		98050 Marudi,
		Sarawak, Malaysia.
		+6085-755211
		+6085-756084
17	Pejabat Daerah Matu	Pejabat Daerah Matu,
		96250 Matu,
		Sarawak, Malaysia.
		+6084-832231
		+6084-832239

18	Pejabat Daerah Meradong	Pejabat Daerah Meradong,
		Jalan Mahkamah
		96500 Bintangor,
		Sarawak, Malaysia.
		+6084-693245
		+6084-692578
19	Pejabat Daerah Miri	Pejabat Daerah Miri,
		Aras 5,
		Kompleks Islam Sarawak, Miri
		Jalan Pujut
		98000 Miri,
		Sarawak, Malaysia.
		+6085-411841
		+6085-422146
20	Pejabat Daerah Mukah	Pejabat Daerah Mukah,
		Aras Bawah, Menara Pehin Setia Raja
		96400 Mukah,
		Sarawak, Malaysia.
		+6084-871963
		+6084-872117
21	Pejabat Daerah Pakan	Pejabat Daerah Pakan,
		96510 Pakan,
		Sarawak, Malaysia.
		+6011-18 444 211
		+6011-18 444 200
22	Pejabat Daerah Samarahan	Pejabat Daerah Samarahan,
		Bahagian Samarahan
		Jalan Datuk Mohd Musa
		94300 Kuching,
		Sarawak, Malaysia.
		+6082-671105/ 671148
		+6082-671042
23	Pejabat Daerah Saratok	Pejabat Daerah Saratok,
		Lot 42, Taman Muhibbah
		Saratok Town District
		95400 Saratok,

		Sarawak, Malaysia.
		+6083-436103/+6083-438564
		+6083-436833 / +6083-438564
24	Pejabat Daerah Sarikei	Pejabat Daerah Sarikei,
		Tingkat 8, Wisma Jubli Mutiara
		Jalan Bersatu
		96100 Sarikei,
		Sarawak, Malaysia.
		+6084-651299 / +6084-656725
		+6084-651012
25	Pejabat Daerah Serian	Pejabat Daerah Serian,
		94700 Serian,
		Sarawak, Malaysia.
		+6082-874022
		+6082-875159
26	Pejabat Daerah Sibu	Pejabat Daerah Sibu,
		Tingkat 4, Kompleks Islam Sarawak (Sibu)
		Jalan Awang Rambli Amit
		96000 Sibu,
		Sarawak, Malaysia.
		+6084-319687
		+6084-337022
27	Pejabat Daerah Simunjan	Pejabat Daerah Simunjan,
		Jalan Gunung Ngeli
		94800 Simunjan,
		Sarawak, Malaysia.
		+6082-803602 / +6082-803649
		+6082-803916
28	Pejabat Daerah Song	Pejabat Daerah Song,
		Jalan Bungalow
		96850 Song,
		Sarawak, Malaysia.
		+6084-777221 / +6084-777451
		+6084-777046

29	Pejabat Daerah Sri Aman	Pejabat Daerah Sri Aman,
	ŕ	Jalan Abang Aing
		95000 Sri Aman,
		Sarawak, Malaysia.
		+6083-322012 / +6083-322013
		+6083-321703
30	Pejabat Daerah Tatau	Pejabat Daerah Tatau,
	,	97200 Tatau,
		Sarawak, Malaysia.
		+6086-584617
		+6086-584718
31	Pejabat Daerah Selangau	Pejabat Daerah Selangau,
	,	KM80, Jalan Sibu / Bintulu
		96000 Selanggau,
		Sarawak, Malaysia.
		+6084-891231
		+6084-891380
32	Pejabat Daerah Telang Usan	Pejabat Daerah Telang Usan,
		98300 Long Lama, Baram, Miri,
		Sarawak, Malaysia.
		085-779422/ 085-779423
		085-779410
33	Pejabat Daerah Tebedu	Pejabat Daerah Tebedu,
		94760 Tebedu, Serian,
		Sarawak, Malaysia.
		082-797204
		082-797364
34	Pejabat Daerah Pusa	Pejabat Daerah Pusa,
		94950 Pusa, Betong,
		Sarawak, Malaysia.
		083-465130
		083-465441
35	Pejabat Daerah Kabong	Pejabat Daerah Kabong,
		94650 Kabong, Betong,,
		Sarawak, Malaysia.
		083-411267

		083-411670
36	Pejabat Daerah Sebauh	Pejabat Daerah Sebauh,
		Km1, Jalan Sebauh Bintulu
		97100 Sebauh, Bintulu,
		Sarawak, Malaysia.
		086-422111
		086-422366
37	Pejabat Daerah Bukit Mabong	Pejabat Daerah Bukit Mabong,
		4th Floor, Kompleks Kerajaan Negeri
		Bleteh Road
		96800 Kapit,
		Sarawak, Malaysia.
		084-796059
		084-796119
38	Pejabat Daerah Subis	Pejabat Daerah Subis,
		98150 Bekenu, Sibuti, Miri,
		Sarawak, Malaysia.
39	Pejabat Daerah Beluru	Pejabat Daerah Beluru,
		98050 Bakong.,
		Sarawak, Malaysia.
40	Pejabat Daerah Tanjung Manis	Pejabat Daerah Tanjung Manis,
		Sarawak, Malaysia.

3.2.2.7. Sabah

Table 69. DID offices in Sabah

SL. NO.	State/Districs	Details
1.	JPS Sabah	Tuan Waily Harim
		Pengarah
		Jabatan Pengairan Dan Saliran Negeri Sabah
		Jalan Pameran, 88400 Kota Kinabalu, Sabah
		(T)088-280507
		waily.harim@sabah.gov,my
2.		Ir. Irene Choo
		Jurutera Daerah Penampang / Kota Kinabalu
3.		Pg. Ismail Bin Pg. Othman
		Jurutera Daerah Beaufort
4.		Ir. Jaffri Bahan
		Jurutera Daerah Kota Belud
5.		Ir. Dachord Moujing
		Jurutera Daerah Keningau
6.		Mohd Khairul Anwar Bin Abd Rahman
		Jurutera Daerah Tuaran
7.		Ir. Terence Wong
		Jurutera Daerah Kota Marudu
8.		Peter Bosonol
		Jurutera Daerah Ranau
9.		Syahzarul Rizal Joddari
		Jurutera Daerah Tawau
10		(Kosong)
		Jurutera Daerah Sandakan
11		Ir. Dr. Tay Tshung Wang
		Jurutera Daerah Tambunan
12		Ng Yau Ming
		Jurutera Daerah Papar
13		Md. Izwan Bin Jumat
		Jurutera Daerah Kudat
14		Joseph Dinor
		Jurutera Daerah Tenom

Table 70. DOE offices in Sabah

SL. NO.	State/District/Local Authority	Details
1	Jabatan Alam Sekitar SABAH	AMIRUL BIN ARIPIN
	•	PENGARAH
		JAS Sabah
		Aras 4, Blok 4, Kompleks Pentadbiran
		Kerajaan Persekutuan Sabah, Jalan UMS-
		Sulaman, Likas, 88450, Kota Kinabalu,
		Sabah
		088-488171
		aba@doe.gov.my
2		SITI NOR AISHAH BINTI ABDUL RAZAK
		C44
		KETUA CAWANGAN CAWANGAN TAWAU
		Pejabat JAS Cawangan Tawau
		Alamat Tingkat 2, Lot 6, 7 dan 8
		Lorong Sabindo Square 1 Sabindo Square
		91000 Tawau, SABAH
		No. Tel089-767251
		sitinor@doe.gov.my
		ALIUDIN @ DIN BIN ATAT @ MOHD
		ARSYID C44
		KETUA CAWANGAN SANDAKAN
		Pejabat JAS Cawangan Sandakan
		Alamat Tingkat 2, Wisma Sabah Lot
		1 & 2, Megah Light Md. Estate Batu 7, Jalan
		Labuk 90000 Sandakan SABAH
		No. Tel089-674653
		aliudin@doe.gov.my JIKULA BIN MONGIJAL C44
		KETUA CAWANGAN
		Pejabat JAS Cawangan Sipitang
		Alamat Lot 21 & 22, Tingkat 1, Pusat
		Membeli Belah Sipitang 89850 Sipitang, SABAH
		No. Tel088-488166
		jikula@doe.gov.my

Table 71. State Health Department offices in Sabah

SL.	State	Details
NO.		
	Jabatan Kesihatan Negeri Sabah	YBhg. Datuk Dr. Christina Rundi
		Pengarah Kesihatan Negeri Sabah
		Jabatan Kesihatan Negeri Sabah
		Tingkat 3, Rumah Persekutuan, Jalan Mat Salleh, 88590 Kota Kinabalu, Sabah.
		Tel : 088-265960
		Fax: 088-221477

Table 72. State Water Agency in Sabah

SL. NO.	State	Details
1	Jabatan Air Negeri Sabah (JANS)	Jabatan Air Negeri Sabah
		Blok A, Tingkat 6,Wisma Muis,
		Beg Berkunci 210,
		88825 Kota Kinabalu,
		Sabah Ir. Edward Lingkapo
		Timbalan Pengarah
		Tel No.: 088-232391
		Fax No. : 088-232396

Table 73. Unit Perancang Ekonomi in Sabah

SL.	State	Details
NO.		
1	UPEN Sabah	UNIT PERANCANG EKONOMI NEGERI
		SABAH
		Aras 19 & 20, Blok A,
		Pusat Pentadbiran Negeri Sabah,
		Jalan UMS, Teluk Likas, 88400 Kota
		Kinabalu, Sabah.
		Nombor Telefon : 088-369789
		Nombor Faks : 088-213795

Table 74. PDRM in Sabah

SL.	State	Details
NO.		
	Ibu Pejabat Polis Kontinjen Sabah	Ibu Pejabat Polis Kontinjen Sabah
	Subun	Polis Diraja Malaysia
		Beg Berkunci No. 2062
		88560 Kota Kinabalu
		Sabah
		Telefon : 088-318555
		Faks: 088-230975
		Emel: IPK Sabah: cccsbh@rmp.gov.my
		Pesuruhjaya Polis Sabah : cpo.sabah@rmp.gov.my

Table 75. Angkatan Pertahanan Awam Malaysia (APM) inSabah

SL.	State	Details
NO.		
	PEJABAT JABATAN PERTAHANAN AWAM NEGERI SABAH	YS Kol.(PA) Sharudin bin Md Zain
		Pengarah
		PEJABAT JABATAN PERTAHANAN AWAM NEGERI SABAH
		Pejabat Pertahanan Awam Negeri Sabah , Tingkat 6, Rumah Persekutuan Peti Surat 11193, 88813 Kota Kinabalu, Sabah.
		sharudin[at]civildefence[dot]gov[dot]my
		088-221591

Table 76. RELA in Sabah

SL.	State	Details
NO.		
	SABAH	Mohammad Pauzi bin Jhumat
		Pengarah Rela Sabah
		Aras 3, Blok A, Kompleks Pentadbiran
		Kerajaan Persekutuan, Jalan UMS-Sulaiman,
		88400 KK Sabah
		088-488482
		prn_sabah@moha.gov.my

Table 77. EXCO environment in Sabah

SL. NO.	State	Details
	EXCO Environment Sabah	Datuk Jafry Bin Ariffin
		Tourism, Culture and Environment Minister
		Ministry of Tourism, Culture and Environment, Sabah (KePKAS)
		Tingkat 5, Blok A Wisma Tun Fuad Stephens Karamunsing, 88300
		Kota Kinabalu, Sabah
		Tel: (088) 253666 / 210848 / 242800
		Fax: (088) 267064

Table 78. Local authorities in Sabah

SL. NO.	Local Authority	Details
1	Dewan Bandaraya Kota Kinabalu	No.1 Jalan Bandaran
		88675 KOTA KINABALU
		Salmah.Batin@dbkk.sabah.gov.my
2	Majlis Perbandaran Sandakan	Peti Surat 221
		90702 SANDAKAN
		FooTin.Wong@sabah.gov.my
3	Majlis Perbandaran Tawau	Peti Surat 412
		91007 TAWAU
		majlisperbandarantawau@sabah.gov.
		my
4	Majlis Daerah Beaufort	Peti Surat Bil.181
		89808 BEAUFORT
		aduan@mdbft.sabah.gov.my;
5	Majlis Daerah Beluran	Peti Surat 20
		90107 BELURAN
		Nordin.Daling@sabah.gov.my
6	Majlis Daerah Keningau	Peti Surat 181
		89008 KENINGAU
		No. Faksimile : 089-560109
7	Majlis Daerah Kinabatangan	W.D.T No.8
		90200 KINABATANGAN
		mohdhafiz.dasrah@sabah.gov.my
8	Majlis Daerah Kota Belud	Peti Surat No.8
		89157 KOTA BELUD
		md.kb@sabah.gov.my;

9	Majlis Daerah Kota Marudu	Peti Surat 129
	Majns Baeran Nota Marada	89100 KOTA MARUDU
		mdkotamarudu@gmail.com
10	Majlis Daerah Kuala Penyu	Peti Surat No.120
	Flajno Bueran Rudia i enju	89740 KUALA PENYU
		md.kp@sabah.gov.my
11	Majlis Daerah Kunak	Peti Surat Bil 15
	Majiis Dactan Kunak	91207 KUNAK
12	Majlis Daerah Lahad Datu	Peti Surat 60249
		91112 LAHAD DATU
		Jaslee.Jaafar@sabah.gov.my
13	Majlis Daerah Nabawan	Peti Surat No.27
		89957 NABAWAN PENSIANGAN
		md.nbw@sabah.gov.my
14	Majlis Daerah Papar	Peti Surat 177
		89608 PAPAR
		md.ppr@sabah.gov.my
15	Majlis Daerah Penampang	Peti Surat 80
	, ,	89507 PENAMPANG
		Robert.Malangkig@sabah.gov.my
16	Majlis Daerah Ranau	Peti Surat No.57
	·	89308 RANAU
		md.mu@sabah.gov.my
17	Majlis Daerah Semporna	Peti Surat Bil. 134
	,	91308 SEMPORNA
		Suhaime.Ejip@sabah.gov.my
18	Majlis Daerah Sipitang	Peti Surat 28
	, 1 0	89857 SIPITANG
19	Majlis Daerah Tambunan	P.O. Box 31
	,	89650 TAMBUNAN
20	Majlis Daerah Tenom	Peti Surat 114
	,	89907 TENOM
21	Majlis Daerah Tuaran	Peti Surat Bil. 580
		89208 TUARAN
		md.trn@sabah.gov.my
22	Lembaga Bandaran Kudat	Peti Surat No.201
		89057 KUDAT
		aduan.mdkdt@sabah.gov.my
23	Majlis Daerah Pitas	Peti Pos No. 47
		Pos Mini Pitas
		89100 PITAS
24	Majlis Daerah Putatan	Dewan Mini, Pejabat Daerah Putatan
		88200 PUTATAN
		Sakina.AbdulRahman@sabah.gov.my
25	Majlis Daerah Tongod	PEJABAT POS MINI TONGOD
		PETI SURAT 38
		89300 TONGOD

Table 79. District offices in Sabah

Pejabat Daerah Beaufort Pejabat Daerah Beaufort, Peti Surat No. 38, 89807 Beaufort, Sabah 087-201208 / 201209 087-211519 pd.bft@sabah.gov.my Pejabat Daerah Kecil Membakut PEJABAT DAERAH KECIL MEMBAKUT PETI SURAT 54 89728 MEMBAKUT norjinah.muhammud@sabah.gov.my 087-887963 087-886452 Pejabat Daerah Beluran Peti surat no. 127 pos kod 90107 beluran, sabah. pdbeluran@gmail.com 089-511212 089-511255 Pejabat Daerah Kecil Paitan Peti Surat No. 139, 90108 Beluran. TELEFON:089 - 362 144 FAX:089 - 262 133 Pejabat Daerah Telupid Pejabat Daerah Peti Surat No. 1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Peti Surat No. 60746, 91017, Kalabakan, Peti Surat No. 60746, 91017, Kalabakan, No. Tel: 089-799697	SL. NO.	Local Authority	Details
Pejabat Daerah Kecil Membakut PEJABAT DAERAH KECIL MEMBAKUT PETI SURAT 54 89728 MEMBAKUT norjinah.muhammud@sabah.gov.my 087-88763 087-886452 Pejabat Daerah Beluran Peti surat no.127 pos kod 90107 beluran, sabah. pdbeluran@gmail.com 089-511212 089-511255 Pejabat Daerah Kecil Paitan Peti Surat No.139, 90108 Beluran. TELEFON:089 - 362 144 FAX:089 - 262 133 Pejabat Daerah Telupid Pejabat Daerah Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Taks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Peti Surat No. 60746, 91017, Kalabakan.		Pejabat Daerah Beaufort	
Pejabat Daerah Kecil Membakut PEJABAT DAERAH KECIL MEMBAKUT PETI SURAT 54 89728 MEMBAKUT norjinah.muhammud@sabah.gov.my 087-887963 087-886452 Pejabat Daerah Beluran Peti surat no.127 pos kod 90107 beluran, sabah. pdbeluran@gmail.com 089-511212 089-511225 089-511255 Pejabat Daerah Kecil Paitan Peti Surat No.139, 90108 Beluran. TELEFON:089 - 362 144 FAX:089 - 262 133 Pejabat Daerah Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan, Peti Surat No. 60746, 91017, Kalabakan.			087-201208 / 201209
Pejabat Daerah Kecil Membakut PEJABAT DAERAH KECIL MEMBAKUT PETI SURAT 54 89728 MEMBAKUT norjinah.muhammud@sabah.gov.my 087-887963 087-886452 Pejabat Daerah Beluran Peti surat no.127 pos kod 90107 beluran, sabah. pdbeluran@gmail.com 089-511212 089-511255 Pejabat Daerah Kecil Paitan Peti Surat No.139, 90108 Beluran. TELEFON:089 - 362 144 FAX:089 - 262 133 Pejabat Daerah Telupid Pejabat Daerah Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Peti Surat No. 60746, 91017, Kalabakan.			087-211519
PETI SURAT 54 89728 MEMBAKUT norjinah.muhammud@sabah.gov.my 087-887963 087-886452 Pejabat Daerah Beluran Peti surat no.127 pos kod 90107 beluran, sabah. pdbeluran@gmail.com 089-511212 089-511255 Pejabat Daerah Kecil Paitan Peti Surat No.139, 90108 Beluran. TELEFON:089 - 362 144 FAX:089 - 262 133 Pejabat Daerah Telupid Pejabat Daerah Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Peti Surat No. 60746, 91017, Kalabakan.			pd.bft@sabah.gov.my
B9728 MEMBAKUT norjinah.muhammud@sabah.gov.my 087-887963 087-886452 Pejabat Daerah Beluran Peti surat no.127 pos kod 90107 beluran, sabah. pdbeluran@gmail.com 089-511212 089-511255 Pejabat Daerah Kecil Paitan Peti Surat No.139, 90108 Beluran. TELEFON:089 - 362 144 FAX:089 - 262 133 Pejabat Daerah Telupid Pejabat Daerah Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Peti Surat No. 60746, 91017, Kalabakan.		Pejabat Daerah Kecil Membakut	PEJABAT DAERAH KECIL MEMBAKUT
norjinah.muhammud@sabah.gov.my 087-887963 087-886452 Pejabat Daerah Beluran Peti surat no.127 pos kod 90107 beluran, sabah. pdbeluran@gmail.com 089-511212 089-511255 Pejabat Daerah Kecil Paitan Peti Surat No.139, 90108 Beluran. TELEFON:089 - 362 144 FAX:089 - 262 133 Pejabat Daerah Telupid Pejabat Daerah Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Telefon: 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Peti Surat No. 60746, 91017, Kalabakan.			PETI SURAT 54
Pejabat Daerah Beluran Peti surat no.127 pos kod 90107 beluran, sabah. pdbeluran@gmail.com 089-511212 089-511215 Pejabat Daerah Kecil Paitan Peti Surat No.139, 90108 Beluran. TELEFON:089 - 362 144 FAX:089 - 262 133 Pejabat Daerah Telupid Pejabat Daerah Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Peti Surat No. 60746, 91017, Kalabakan.			89728 MEMBAKUT
Pejabat Daerah Beluran Peti surat no.127 pos kod 90107 beluran, sabah. pdbeluran@gmail.com 089-511212 089-511255 Pejabat Daerah Kecil Paitan Peti Surat No.139, 90108 Beluran. TELEFON:089 - 362 144 FAX:089 - 262 133 Pejabat Daerah Telupid Pejabat Daerah Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Peti Surat No. 60746, 91017, Kalabakan.			norjinah.muhammud@sabah.gov.my
Pejabat Daerah Beluran Peti surat no.127 pos kod 90107 beluran, sabah. pdbeluran@gmail.com 089-511212 089-511255 Pejabat Daerah Kecil Paitan Peti Surat No.139, 90108 Beluran. TELEFON:089 - 362 144 FAX:089 - 262 133 Pejabat Daerah Telupid Pejabat Daerah Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Peti Surat No. 60746, 91017, Kalabakan.			087-887963
Peti surat no.127 pos kod 90107 beluran, sabah. pdbeluran@gmail.com 089-511212 089-511255 Pejabat Daerah Kecil Paitan Peti Surat No.139, 90108 Beluran. TELEFON:089 - 362 144 FAX:089 - 262 133 Pejabat Daerah Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Peti Surat No. 60746, 91017, Kalabakan.			087-886452
pdbeluran@gmail.com 089-511212 089-511255 Pejabat Daerah Kecil Paitan Pejabat Daerah Kecil Paitan, Peti Surat No.139, 90108 Beluran. TELEFON:089 - 362 144 FAX:089 - 262 133 Pejabat Daerah Telupid Pejabat Daerah Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan, Peti Surat No. 60746, 91017, Kalabakan.		Pejabat Daerah Beluran	Pejabat Tanah Beluran
Pejabat Daerah Kecil Paitan Pejabat Daerah Kecil Paitan Pejabat Daerah Kecil Paitan, Peti Surat No.139, 90108 Beluran. TELEFON:089 - 362 144 FAX:089 - 262 133 Pejabat Daerah Telupid Pejabat Daerah Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan, Peti Surat No. 60746, 91017, Kalabakan.			Peti surat no.127 pos kod 90107 beluran, sabah.
Pejabat Daerah Kecil Paitan Pejabat Daerah Kecil Paitan, Peti Surat No.139, 90108 Beluran. TELEFON:089 - 362 144 FAX:089 - 262 133 Pejabat Daerah Telupid Pejabat Daerah Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan, Peti Surat No. 60746, 91017, Kalabakan.			pdbeluran@gmail.com
Pejabat Daerah Kecil Paitan Pejabat Daerah Kecil Paitan, Peti Surat No.139, 90108 Beluran. TELEFON:089 - 362 144 FAX:089 - 262 133 Pejabat Daerah Telupid Pejabat Daerah Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Peti Surat No. 60746, 91017, Kalabakan.			089-511212
Peti Surat No.139, 90108 Beluran. TELEFON:089 - 362 144 FAX:089 - 262 133 Pejabat Daerah Telupid Pejabat Daerah Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan, Peti Surat No. 60746, 91017, Kalabakan.			089-511255
Pejabat Daerah Telupid Pejabat Daerah Telupid Pejabat Daerah Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Peti Surat No. 60746, 91017, Kalabakan.		Pejabat Daerah Kecil Paitan	Pejabat Daerah Kecil Paitan,
Pejabat Daerah Telupid Pejabat Daerah Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Peti Surat No. 60746, 91017, Kalabakan.			Peti Surat No.139,
Pejabat Daerah Telupid Pejabat Daerah Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Peti Surat No. 60746, 91017, Kalabakan.			90108 Beluran.
Pejabat Daerah Telupid Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Peti Surat No. 60746, 91017, Kalabakan.			TELEFON:089 - 362 144
Peti Surat No.1 89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Pejabat Daerah Kalabakan, Peti Surat No. 60746, 91017, Kalabakan.			FAX:089 - 262 133
89300 TELUPID Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Peti Surat No. 60746, 91017, Kalabakan.		Pejabat Daerah Telupid	Pejabat Daerah
Sabah Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Peti Surat No. 60746, 91017, Kalabakan.			Peti Surat No.1
Malaysia Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Pejabat Daerah Kalabakan, Peti Surat No. 60746, 91017, Kalabakan.			89300 TELUPID
Nombor Telefon: 089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Pejabat Daerah Kalabakan, Peti Surat No. 60746, 91017, Kalabakan.			Sabah
089-521732 Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Pejabat Daerah Kalabakan, Peti Surat No. 60746, 91017, Kalabakan.			Malaysia
Nombor Faks 089-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Pejabat Daerah Kalabakan, Peti Surat No. 60746, 91017, Kalabakan.			Nombor Telefon:
D89-521752 kamsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Pejabat Daerah Kalabakan, Peti Surat No. 60746, 91017, Kalabakan.			089-521732
Ramsah.sulaiman@sabah.gov.my Pejabat Daerah Kalabakan Pejabat Daerah Kalabakan, Peti Surat No. 60746, 91017, Kalabakan.			Nombor Faks
Pejabat Daerah Kalabakan Pejabat Daerah Kalabakan, Peti Surat No. 60746, 91017, Kalabakan.			089-521752
Peti Surat No. 60746, 91017, Kalabakan.			kamsah.sulaiman@sabah.gov.my
91017, Kalabakan.		Pejabat Daerah Kalabakan	Pejabat Daerah Kalabakan,
			Peti Surat No. 60746,
No. Tel: 089-799697			91017, Kalabakan.
			No. Tel: 089-799697

Pejabat Daerah Kecil Kiulu	JUSTIN GINDOK @ GINDUK, PENOLONG PEGAWAI DAERAH
Pejabat Daerah Keningau	Pejabat Daerah keningau, Peti Surat 10, 89007 keningau, Sabah, Malaysia. 087-301 509
	087-331 535 Sharifahkhairuunisa.Wansahdi@sabah.gov.my
Pejabat Daerah Kecil Sook	Peti Surat Bil.1455, 89008 Keningau, Sabah, Malaysia. Tel. No: 087-365912/365184 (Direct Line Penolong Pegawai Daerah) Fax: 087-365568
Pejabat Daerah Kinabatangan	Pejabat Daerah Kinabatangan, Bangunan Urus Setia, W.D.T No.01, 90200 KINABATANGAN,SABAH TELEFON: 089-561811 / 812 FAKS: 089-561009 EMEL: kbn.kplb@sabah.gov.my
Pejabat Daerah Kota Belud	PEJABAT DAERAH, Peti Surat No.1, 89157 Kota Belud, Sabah. PejDaerah.KotaBelud@gmail.com 088-976620 (Pejabat Am) 088-976621-976624 (Operator) 088-976542 (Pegawai Daerah) 088-977064 (Faks)
Pejabat Daerah Kota Marudu	Pejabat Daerah Kota Marudu, Peti Surat 128, 89108 Kota Marudu, Sabah. TELEFON: 088 - 661 416 / 417 FAX: 088 - 661 419

Pejabat Daerah Kuala Penyu	SEBASTIAN INGKIM
	Pegawai Daerah
	Pejabat Daerah, Peti Surat No. 27,; 89747
	Kuala Penyu Sabah
	Telefon: (087) 884364 / 884900
	Faks: (087) 884229
Pejabat Daerah Kecil Menumbok	MATADIN AG. BESAR, PENOLONG PEGAWAI
	DAERAH
	Pejabat Daerah Kecil Menumbok, Peti Surat
	No. 5,; 89767 Menumbok Sabah
	Telefon: (087) 831104 / 831105 / 831216
	Faks: (087) 831071
Pejabat Daerah Kudat	AHMAD SHAH DATUK HJ MOHD SUNOH, PEGAWAI TADBIR
	Pejabat Daerah, Peti Surat No. 21,; 89057 Kudat Sabah
	Telefon: (088) 620401 / 620402
	Faks: (088) 611303
Pejabat Daerah Kecil Banggi	MOHD.AZMY @ AMING MAJIRUN, PEGAWAI TADBIR
	Pejabat Daerah Kecil Banggi, W.D.T No. 199,;
	89059 Kudat Sabah
	,
	89059 Kudat Sabah
Pejabat Daerah Kecil Matunggong	89059 Kudat Sabah Telefon: (088) 671495
Pejabat Daerah Kecil Matunggong	89059 Kudat Sabah Telefon: (088) 671495 Faks: (088) 671451 FRANCIS CHONG YU SHING, PENOLONG
Pejabat Daerah Kecil Matunggong	89059 Kudat Sabah Telefon: (088) 671495 Faks: (088) 671451 FRANCIS CHONG YU SHING, PENOLONG PEGAWAI DAERAH Pejabat Daerah Kecil Matunggong, Peti Surat
Pejabat Daerah Kecil Matunggong	89059 Kudat Sabah Telefon: (088) 671495 Faks: (088) 671451 FRANCIS CHONG YU SHING, PENOLONG PEGAWAI DAERAH Pejabat Daerah Kecil Matunggong, Peti Surat No. 574,; 89058 Kudat Sabah
Pejabat Daerah Kecil Matunggong Pejabat Daerah Kunak	89059 Kudat Sabah Telefon: (088) 671495 Faks: (088) 671451 FRANCIS CHONG YU SHING, PENOLONG PEGAWAI DAERAH Pejabat Daerah Kecil Matunggong, Peti Surat No. 574,; 89058 Kudat Sabah Telefon: (088) 613759 / 613760 / 613761
	89059 Kudat Sabah Telefon: (088) 671495 Faks: (088) 671451 FRANCIS CHONG YU SHING, PENOLONG PEGAWAI DAERAH Pejabat Daerah Kecil Matunggong, Peti Surat No. 574,; 89058 Kudat Sabah Telefon: (088) 613759 / 613760 / 613761 Faks: (088) 613786 SIMUDAH HJ. SULAIMAN @ ZAIDI, PENOLONG
	89059 Kudat Sabah Telefon: (088) 671495 Faks: (088) 671451 FRANCIS CHONG YU SHING, PENOLONG PEGAWAI DAERAH Pejabat Daerah Kecil Matunggong, Peti Surat No. 574,; 89058 Kudat Sabah Telefon: (088) 613759 / 613760 / 613761 Faks: (088) 613786 SIMUDAH HJ. SULAIMAN @ ZAIDI, PENOLONG PENGARAH Pejabat Daerah, Peti Surat No. 1,; 91207 Kunak

Pejabat Daerah Lahad Datu	MAHASITAH BTE AMIN, PENOLONG PEGAWAI DAERAH (PEMBANGUNAN)
	Pejabat Daerah, Peti Surat No. 60165,; 91111 Lahad Datu Sabah
	Telefon: (089) 881177 / 881518
	Faks: (089) 884518
Pejabat Daerah Kecil Tungku	FIRUZ IDZUALDEEN @ BENETTY B. MOHD. DZUL, PENOLONG PEGAWAI DAERAH
	Pejabat Daerah Lahad Datu Peti Surat 60165; 91108 Lahad Datu Sabah
Pejabat Daerah Nabawan	PETER JONU @ PETER J. MOINJIL, PENOLONG PEGAWAI DAERAH (PEMBANGUNAN)
	Pejabat Daerah, Peti Surat No. 66,; 89957 Nabawan, Pensiangan Sabah
	Telefon: (087) 366211
	Faks: (087) 366212
Pejabat Daerah Kecil Pagalungan	ROGER APPOLONIUS, PENOLONG PEGAWAI DAERAH
	Pejabat Daerah Kecil Pagalungan, D/a: Pejabat Daerah Nabawan, Peti Surat No. 66,; 89957 Nabawan Sabah
	Telefon: (089) 845106 / 845107
	Faks: (089) 845104
Pejabat Daerah Papar	HADZLAN BIN JABLEE, PEGAWAI TADBIR
	Pejabat Daerah, Peti Surat No. 324,; 89608 Papar Sabah
	Telefon: (088) 913516 / 913517 / 913518 Faks: (088) 911021
Pejabat Daerah Penampang	HENRY BIN IDOL, PEGAWAI DAERAH
	Pejabat Daerah, Peti Surat No. 320; 89507 Penampang Sabah
	Telefon: (088) 711791 / 711784
	Faks: (088) 711003
Pejabat Daerah Pitas	BAKRI NANUN (HAJI), PEGAWAI TADBIR
	Pejabat Daerah Pitas, Peti Surat No. 8; 89100 Pitas Sabah
	Telefon: (088) 615767 / 615760 / 615520
	Faks: (088) 615521

JAINUDDIN @ ZAINUDDIN BIN AWANG, PEGAWAI DAERAH
Pejabat Daerah Putatan, Bangunan Mini Sekretariat Daerah, Pusat Pentadbiran Daerah Putatan Jalan Pusat Bengkel JKR / Pasir Putih,; 88200 Putatan Sabah Telefon: (088) 762305 / 771501 / 771502
Faks: 771506
ALEXANDER LIEW, PENOLONG PEGAWAI DAERAH (PEMBANGUNAN)
Pejabat Daerah, Peti Surat No. 2,; 89307 Ranau Sabah
Telefon: (088) 870504 / 875253 Faks: (088) 876754
ABD. MOHD. IBNU BIN HJ. ABD. KADIR BABA, PEGAWAI TADBIR
Pejabat Daerah, Peti Surat No. 1,; 91307 Semporna Sabah
Telefon: (089) 781663 / 781518 Faks: (089) 781472
MASAWI BIN SALLEH, PENOLONG PEGAWAI DAERAH (PEMBANGUNAN)
Pejabat Daerah, Peti Surat No. 26,; 89857 Sipitang Sabah
Telefon: (087) 821964 / 821965 / 821426 Faks: (087) 822433
JUMAIN B. JIKAH @ ABDUL GHANI, PEGAWAI DAERAH
Pejabat Daerah, Peti Surat No. 25,; 89657 Tambunan Sabah
Telefon: (087) 774225
Faks: (087) 773122
SUNGKIM RUMANGUN, PEGAWAI DAERAH
Pejabat Daerah, Peti Surat No. 100,; 89907 Tenom Sabah
Telefon: (087) 735553 / 735573 Faks: (087) 736334

Pejabat Daerah Kecil Kemabong	YUESRI ISMAIL BIN YUSOF, PEGAWAI TADBIR
	Pejabat Daerah Kecil Kemabong, W.D.T No. 70,; 88909 Kemabong Sabah
	Telefon: (087) 733490 / 734490 / 737477
	Faks: (087) 736490
Pejabat Daerah Tongod	MOHD FAUZI BIN NORBEH, PEGAWAI TADBIR
	Pejabat Daerah, Pejabat Pos Mini, Peti Surat No. 01,; 89300 Telupid Sabah
	Telefon: (019) 8926061 / (013) 8836788
	Faks: 087-748880
Pejabat Daerah Tuaran	FELECIA GITAH SINDAN, PEGAWAI TADBIR
	Pejabat Daerah, Bangunan Urus Setia, Peti Surat No. 207,; 89208 Tuaran Sabah
	Telefon: (088) 788511 / 788518 / 788359
	Faks: (088) 788363
Pejabat Daerah Kecil Tamparuli	Pejabat Daerah Kecil Tamparuli, W.D.T No. 1,; 89257 Tamparuli Sabah
	Telefon: (088) 782357 / 782358
	Faks: (088) 782871

3.2.2.8. Labuan

Table 80. DID offices in Labuan

SL.	State/Districs	Details
NO.		
1.	<u> [PS W.Persekutuan (Labuan)</u>	Encik Junaiddi Awang Tuah
		(T)087-504 797
		Pengarah
		Jabatan Pengairan Dan Saliran Negeri W.Persekutuan Labuan
		Komplek JPS, 706, 87000 87000 Labuan, Labuan Federal Territory
		ppsn_wpl@water.gov.my
		junaiddi@water.gov.my

Table 81. DOE offices in Labuan

SL.	State/District/Local Authority	Details
NO.		
1	Jabatan Alam Sekitar Wilayah Persekutuan Labuan	AMIR HAMZAH MUSA
		PENGARAH
		Jabatan Alam Sekitar Wilayah Persekutuan Labuan
		Tingkat 4, Blok 4 Kompleks Ujana Kewangan, 87000, Wilayah Persekutuan Labuan
		087408773
		ahm@doe.gov.my

Table 82. State Health Department offices in Labuan

SL.	State	Details
NO.		
	Jabatan Kesihatan WP Labuan	Dr. Ismuni bin Bohari
		Pengarah Kesihatan Negeri UD56
		Jabatan Kesihatan WP Labuan
		Peti surat 80832, 87018 Wilayah Persekutuan
		Labuan.
		Tel : 087- 596146
		Fax : 087-411298(Pejabat Pengarah)
		ismuni@moh.gov.my

Table 83. State Water Agency in Labuan

SL.	State	Details
NO.		
	Jabatan Bekalan Air, Wilayah	Bahagian Bekalan Air W.P. Labuan
	Persekutuan Labuan	Kementerian Alam Sekitar Dan Air,
		(Ministry of Environment And Water
		Malaysia)
		Jalan Jumidar Buyong
		Call Centre : 087-410200
		aduanjbal@jba.gov.my

Table 84. UPEN in Labuan

SL.	State	Details
NO.		
	UPEN Wilayah Persekutuan Kuala Lumpur, Putrajaya Dan	Wilayah Persekutuan Kuala Lumpur, Putrajaya Dan Labuan
	Labuan	Kementerian Wilayah Persekutuan,
		Blok 1 & Blok 2, Menara Seri Wilayah,
		Presint 2, 62100 Putrajaya. Tel: 03 8000 8000
		Sebarang pertanyaan sila emel ke:
		amsyari.suhaimi@epu.gov.my
		nabeela.mansor@epu.gov.my

Table 85. PDRM in Labuan

SL.	State	Details
NO.		
	Ibu Pejabat Polis Daerah Labuan	Ibu Pejabat Polis Daerah Labuan
		Financial Park, 87007 Labuan, Labuan
		Federal Territory

Table 86. Angkatan Pertahanan Awam Malaysia (APM) in Labuan

SL.	State	Details
NO.		
	Pusat Kawalan Operasi Daerah	Pusat Kawalan Operasi Daerah Jabatan
	Jabatan Pertahanan Awam	Pertahanan Awam Labuan
	Labuan	LOT 4A2, TINGKAT 2 ,
		WISMA WONG WO LO,
		PETI SURAT NO. 81130,
		87021 WILAYAH PERSEKUTUAN LABUAN

Table 87. RELA in Labuan

SL.	State	Details
NO.		
	Pejabat RELA Daerah WP	Pejabat RELA Daerah WP Labuan
	Labuan	Tingkat 6, Blok 4, Office Tower Financial
		Park, Jalan Merdeka, 87010 Wp Labuan,
		Sabah
		Tel : 087424084
		Faks : 087424084

Table 88. EXCO environment in Labuan

SL. NO.	State	Details
	Wilayah Persekutuan Labuan	(No Environment Exco)
		Timb. Ketua Eksekutif (Pembangunan)
		(En. Ibrahim bin Tambi)
		Perbadanan Labuan
		Wisma Perbadanan Labuan, Peti Surat 81245, 87022, WP Labuan
		087-408600 / 087-408601
		087-419400
		webmaster@pl.gov.my

Table 89. Local authority in Labuan

SL.	Local Authority	Details
NO.		
1	Wilayah Persekutuan Labuan	Dr. Fary Akmal binti Osman
		Ketua Pegawai Eksekutif
		Wisma Perbadanan Labuan, Peti Surat 81245, 87022, WP Labuan
		087-408600 / 087-408601
		(Does not have DO)

3.2.2.9. Kelantan

Table 90. DID offices in Kelantan

SL. NO.	State/Districs	Details
1.	JPS Kelantan	Encik Kamal Bin Mustapha
		Pengarah
		Jabatan Pengairan Dan Saliran Negeri Kelantan
		Jalan Sultan Yahya Petra,15200, Kota Bharu,
		Kelantan
		(T)09-7419 624
		ppsn_kelantan@water.gov.my
		mkamal@water.gov.my
2.	Daerah Pasir Mas	Che Mahmud bin Che Mat
		Jurutera Awam
		Jajahan Pasir Mas
3.	Daerah Kota Bharu	(Kosong)
		Jurutera Awam
		Jajahan Kota Bharu
4.	Daerah Machang	Mohd Sabri bin Sidek
		Jurutera Awam
		Jajahan Machang
5.	Daerah Pasir Puteh	(Kosong)
		Jurutera Awam
		Jajahan Pasir Puteh
6.	Daerah Tumpat	Norasimah binti Mat Nor
		Jurutera Awam
		Jajahan Tumpat
7.	Daerah Tanah Merah	(Kosong)
		Jurutera Awam
		Jajahan Tanah Merah
8.	Daerah Kuala Krai	(Kosong)
		Jurutera Awam
		Jajahan Kuala Krai
9.	Daerah Bachok	(Kosong)
		Jurutera Awam
		Jajahan Bachok
10	Daerah Gua Musang	(Kosong)
		Jurutera Awam
		Jajahan Gua Musang
11	Daerah Jeli	Izani Bin Abd Rahman
		Penolong Kana Jurutera
		Jajahan Jeli
12	Daerah Lojing	(Kosong)
		Jurutera Awam
		Jajahan Lojing

Table 91. DOE offices in Kelantan

SL.	State/District/Local Authority	Details
NO.		
1	Jabatan Alam Sekitar Kelantan	SALAHUDIN BIN SIDIK
		PENGARAH
		JAS Kelantan
		Alamat LOT 322-324, SEKSYEN 27
		JALAN SRI CEMERLANG
		15300 KOTA BAHRU
		KELANTAN
		09-7414888
		sbs@doe.gov.my
2	JAS CAWANGAN GUA MUSANG	SHAIFUL BAKRI BIN SHAMSUDDIN
		C44
		PEGAWAI KAWALAN ALAM SEKITAR
		KANAN CAWANGAN GUA MUSANG
		Pejabat JAS Cawangan Gua Musang
		Alamat PT9342, Taman
		TitiwangsaBandar Baru Gua Musang
		18300 Gua Musang
		No. Tel099125202
		No. Faks 099125204
		bakri@doe.gov.my

Table 92. State Health Department offices in Kelantan

SL.	State	Details
NO.		
	<u>Jabatan Kesihatan Negeri</u> Kelantan	YBHG. DATO' DR. ZAINI BIN HUSSIN
	<u> </u>	PENGARAH KESIHATAN NEGERI KELANTAN
		JUSA B
		Jabatan Kesihatan Negeri Kelantan
		Tingkat 5, Wisma Persekutuan, 15590 Kota Baharu, Kelantan Darul Naim.
		Tel: 09-7413 330 (330)
		Fax: 09-7441333
		drzaini2@moh.gov.my

Table 93. State Water Agency in Kelantan

SL.	State	Details
NO.		
	Jabatan Sumber Air Negeri	PENGARAH
	Kelantan	YM. TENGKU SHARIFUDDIN BIN DATO
		TENGKU SHAH BUDDIN
		Jabatan Sumber Air Negeri Kelantan
		Aras Bawah, Blok 4, Kompleks Kota
		Darulnaim,
		15503 Kota Bharu, Kelantan
		Tel: 09-7475240
		Faks : 09-7475220
		Emel : jank[a]kelantan.gov.my

Table 94. PLAN Malaysia in Kelantan

SL.	State	Details
NO.		
	PLANMalaysia@Kelantan	PLANMalaysia@Kelantan
		Blok 4, Aras Bawah,
		Kota Darulnaim,
		15503 Kota Bharu, Kelantan
		09 748 1004
		09-7444454
		jpbd[at]kelantan[at]gov[at]my
		www.jpbd.kelantan.gov.my

Table 95. Unit Perancang Ekonomi in Kelantan

SL.	State	Details
NO.		
	Unit Perancang Ekonomi Negeri	Unit Perancang Ekonomi Negeri Kelantan
	Kelantan	Pejabat Setiausaha Kerajaan Negeri
		Kelantan, Aras 4, Mabna MBI (Blok 8),
		Kompleks Kota Darulnaim,]
		15503 Kota Bharu, KELANTAN.
		Ketua Bahagian/Unit: YM Dato' Dr. Tengku
		Mohamed Faziharudean bin Tengku Feissal
		@
		Wan Fahazil bin Wan Wan Mohammad
		Jaafar
		Timb. Pengarah
		j
		Telefon :7443333(6122)

	Faks:09-7443411
	Emel:upen@kelantan.gov.my
	Tel: 09-7482560 (1102)
	Fax: 09-7443411
	Emel: upen@kelantan.gov.my

Table 96. PDRM in Kelantan

SL.	State	Details
NO.		
	Ibu Pejabat Polis Kontinjen Kelantan	Ibu Pejabat Polis Kontinjen Kelantan
		Polis Diraja Malaysia
		Jalan Bayam
		15990 Kota Bharu
		Kelantan
		Telefon :09-7455622
		Faks: 09-7440022
		Emel : IPK Kelantan : ccckel[at]rmp[dot]gov[dot]my
		KP Kelantan : cpo.kelantan[at]rmp[dot]gov[dot]my

Table 97. Angkatan Pertahanan Awam Malaysia (APM) in Kelantan

SL.	State	Details
NO.		
	PEJABAT JABATAN PERTAHANAN AWAM NEGERI	Lt. Kol. (PA) Zainuddin Bin Hussin
	KELANTAN	Pengarah (KP44)
		PEJABAT JABATAN PERTAHANAN AWAM NEGERI KELANTAN
		Aras 2, Wisma Persekutuan, Jalan Bayam, 15200 Kota Bharu, Malaysia
		Zainuddin@civildefence.gov.my
		09-7416160 ext 61

Table 98. RELA in Kelantan

SL. NO.	State	Details
	RELA Kelantan	Mior Muhammad Taufik bin Mior Burhanuddin
		Pengarah Rela Kelantan
		Lot PT. 28 Kg. Chica, Jalan Pasir Puteh, Kubang Kerian 16100, Kota Bharu
		09-7678282
		prn_kelantan@moha,gov.my

Table 99. EXCO environment in Kelantan

SL. NO.	State	Details
	Kelantan Darul Naim	YB Haji Tuan Mohd Saripudin bin Tuan Ismail
		Pengerusi Jawatankuasa Pertanian, Industri Asas Tani, Bioteknologi, Teknologi Hijau Dan Alam Sekitar
		Pejabat Setiausaha Kerajaan Negeri Kelantan,
		Aras 4, Mabna MBI (Blok 8), Kompleks Kota Darulnaim,15503 Kota Bharu KELANTAN
		e-mel : saripudin[at]kelantan.gov.my

Table 100. Local authorities in Kelantan

SL. NO.	Local Authority	Details
1	Majlis Perbandaran Kota Bharu Bandaraya Islam	Bandaraya Islam Jalan Hospital 15000 KOTA BHARU khairul@mpkb.gov.my;
2	Majlis Daerah Bachok	16300 BACHOK mdbachok@kelantan.gov.my
3	Majlis Daerah Gua Musang	18300 GUA MUSANG mdgm@kelantan.gov.my

4	Majlis Daerah Ketereh	KM 19, Jalan Kuala Krai 16450 KETEREH mdk@mdketereh.gov.my
5	Majlis Daerah Dabong	18200 DABONG mddabong@kelantan.gov.my
6	Majlis Daerah Kuala Krai	JKR 60, Jalan Sultan Yahya Petra 18000 KUALA KRAI mdkkrai@kelantan.gov.my
7	Majlis Daerah Machang	Jalan Tok Kemuning 18500 MACHANG mdm@kelantan.gov.my
8	Majlis Daerah Pasir Mas	Kompleks Apam Putra Bandar Baru Lubok Jong 17000 PASIR MAS mdpm@kelantan.gov.my; hafriz@kelantan.gov.my
9	Majlis Daerah Pasir Puteh	16800 PASIR PUTEH setiausaha@mdpputeh.gov.my
10	Majlis Daerah Tanah Merah	17500 TANAH MERAH mdtm@kelantan.gov.my
11	Majlis Daerah Tumpat	Jalan Tanjung Kuala 16200 TUMPAT mdtumpat@kelantan.gov.my
12	Majlis Daerah Jeli	17600 JELI mdjeli@kelantan.gov.my

Table 101. District offices in Kelantan

SL. NO.	Local Authority	Details
	Daerah Kota Bharu	Ketua Jajahan : Rosnazli Bin Haji Amin
		E-mel : ptjkb@kelantan.gov.my
		Alamat : Pejabat Tanah Dan Jajahan Kota Bharu, 15000 Kota Bharu Kelantan
		Tel : 09-748 1963
		Faks : 09-7440688
		Laman web : https://ptjkb.kelantan.gov.my
	Daerah Gua Musang	Ketua Jajahan: Dato' Haji Norazman bin Abd. Ghani
		E-mel : ptjgm@kelantan.gov.my
		Alamat : Pejabat Tanah Dan Jajahan Gua Musang, 18300 Gua Musang,Kelantan
		Tel : 09-912 1963 / 1228
		Faks : 09-9121669
		Laman web :
		https://ptjgm.kelantan.gov.my
	Daerah Kuala Krai	Ketua Jajahan : Haji Ruslan bin Haji Hassan
		E-mel : ptjkk@kelantan.gov.my
		Alamat : Pejabat Tanah Dan Jajahan Kuala Krai, ,Kelantan
		Tel : 09-966 6393/6963
		Faks : 09-966 7060
		Laman web : https://ptjkk.kelantan.gov.my
	Daerah Pasir Mas	Ketua Jajahan : Tn Hj Nik Mohamed Noor bin Nik Ishak
		E-mel : ptjpm@kelantan.gov.my
		Alamat : Pejabat Tanah dan Jajahan Pasir Mas, Kompleks Apam Putra, Bandar Baru Pasir Mas, Lubok Jong,17000 Pasir Mas,Kelantan
		Tel : 09-791 7963/7693
		Faks : 09-791 7706

Daerah Tanah Merah Ketua Jajahan : Tuan Haji Mohd Anis I Hussein E-mel : ptjtm@kelantan.gov.my Alamat : Pejabata Tanah Dan Jajaha Tanah Merah, 17500 Tanah Merah Kelantan Tel : 09-9556963 Faks : 09-9556776 Laman web : https://ptjtm.kelantan.gov.my Daerah Tumpat Ketua Jajahan : En. Ibrahim Bakri bin I	n
Alamat : Pejabata Tanah Dan Jajaha Tanah Merah, 17500 Tanah Merah Kelantan Tel : 09-9556963 Faks : 09-9556776 Laman web : https://ptjtm.kelantan.gov.my	
Tanah Merah, 17500 Tanah Merah Kelantan Tel: 09-9556963 Faks: 09-9556776 Laman web: https://ptjtm.kelantan.gov.my Daerah Tumpat Ketua Jajahan: En. Ibrahim Bakri bin I	
Faks: 09-9556776 Laman web: https://ptjtm.kelantan.gov.my Daerah Tumpat Ketua Jajahan: En. Ibrahim Bakri bin I	
Laman web : https://ptjtm.kelantan.gov.my Daerah Tumpat Ketua Jajahan : En. Ibrahim Bakri bin I	
https://ptjtm.kelantan.gov.my Daerah Tumpat Ketua Jajahan : En. Ibrahim Bakri bin I	
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E-mel : ptjt@kelantan.gov.my	
Alamat : Pejabat Tanah Dan Jajahar Tumpat, Jalan Masjid, 16200 Tumpa Kelantan	
Tel: 09-7257963 / 7257267	
Faks: 09 - 7256577	
Laman web : https://ptjt.kelantan.gov	my
Daerah Bachok Ketua Jajahan : En. Hazmi bin Abdul Ha E-mel : ptjb@kelantan.gov.my	mid
Alamat : Pejabat Tanah Dan Jajahar Bachok, Kg. Telok, 16300 Bachok, Kela Tel : 09-778 8963 / 09 - 778 8314	
Faks: 09-7789500 / 09-7789809	
Laman web : https://ptjt.kelantan.gov	my
Daerah Pasir Puteh Ketua Jajahan : Haji Ab. Pattah bin Hasbullah	
E-mel : ptjpp@kelantan.gov.my	
Alamat : Pejabat Tanah Dan Jajahan Pa Puteh,16800 Pasir Puteh, Kelantan	
Tel: 09-7866963/4336 Faks: 09-7867931	

	Laman web : https://ptjpp.kelantan.gov.my
Daniel Markey	
Daerah Machang	Ketua Jajahan : Wan Mohd Suhaimi bin Wan Mustapha
	E-mel : ptjm@kelantan.gov.my
	Alamat : Pejabat Tanah Dan Jajahan Machang,18500 Machang, Kelantan
	Tel : 09-975 2963/2826
	Faks : 09-975 1903
	Laman web : https://ptjm.kelantan.gov.my
Daerah Jeli	Ketua Jajahan : En. Nik Raisnan bin Hj Daud
	E-mel : ptjj@kelantan.gov.my
	Alamat : Pejabat Tanah Dan Jajahan Jeli, 17600 Jeli, Kelantan
	Tel: 09-9440063/64
	Faks : 09-9440250
	Laman web : https://ptjj.kelantan.gov.my
Daerah Kecil Lojing	Ketua Jajahan: En. Shahrin bin Abdullah
	E-mel : ptjj@kelantan.gov.my
	Alamat : Pejabat Tanah Dan Jajahan Kecil Lojing, 18300 Gua Musang, Kelantan
	Tel : 09-9221963
	Faks : 09-9221863
	Laman web : https://ptjkl.kelantan.gov.my

3.2.2.10. Negeri Sembilan

Table 102. DID offices in Negeri Sembilan

SL. NO.	State/Districs	Details
1.	JPS Negeri Sembilan	Ir. Saari Bin Abdullah
	ji 5 Negeri sembilan	Pengarah
		Jabatan Pengairan dan Saliran Negeri
		Sembilan
		Pejabat Pengarah Jabatan Pengairan dan
		Saliran Negeri Sembilan, Tingkat 2, Blok C,
		Wisma Negeri,
		70503 Seremban,
		Negeri Sembilan.
		Tel: 06-7659641
		Email: saari@water.gov.my
2.	JPS Daerah Seremban	Shaiful Zakuan bin Mohamad
		Jurutera Daerah Seremban (J44)
3.	JPS Daerah Port Dickson	Muhamad Fariz Bin Ismail
	•	Jurutera Daerah Port Dickson (J44)
4.	JPS Daerah Kuala Pilah	Mohd Zamri Bin Ali
	•	Jurutera Daerah Kuala Pilah J41
5.	JPS Daerah Tampin	Muhammad Izuan Bin Baha
	•	Jurutera Daerah Tampin (Fleksi J41/J44)
6.	JPS Daerah Rembau	Encik Hanif Bin Hamzah
	•	Penolong Jurutera Awam Daerah Rembau
7.	JPS Daerah Jelebu	Encik Zahari Bin Nasir
	•	Penolong Jurutera Awam Daerah Jelebu
8.	JPS Daerah Jempol	Encik Azmir Syam bin Mat Saman
		Penolong Jurutera Awam Daerah Jempol

Table 103. DOE offices in Negeri Sembilan

SL.	State/District/Local Authority	Details
NO.		
1	JAS NEGERI SEMBILAN	AZURI AZIZAH BINTI SAEDON
		PENGARAH
		JAS Negeri Sembilan
		Tingkat 5, Arab Malaysian Business Centre,
		Jalan Pasar, 70200, Seremban, Negeri
		Sembilan

	067649017
	00/04901/
	aas@doe.gov.my
NUF	RUL HANI BINTI HASNAN C44
P	EGAWAI KAWALAN ALAM SEKITAR
	CAWANGAN KUALA PILAH
Pej	jabat JAS Cawangan Kuala Pilah
Alan	mat No.564, Tingkat 1 Bangunan
Wis	sma Kuala Pilah Jalan Perpateh 72000
	Kuala Pilah NEGERI SEMBILAN.
	No. Tel06-4816288
	No. Faks 06-4816310
	hani@doe.gov.my

Table 104. State Health Department offices in Negeri Sembilan

SL.	State	Details
NO.		
	<u>Jabatan Kesihatan Negeri</u> <u>Sembilan</u>	Datin Dr Harlina Binti Abdul Rashid Pengarah Kesihatan Negeri
		Jabatan Kesihatan Negeri Sembilan
		Jalan Rasah 70300 Seremban Negeri Sembilan Darul Khusus.
		Tel : 4999/ 06-762 4001
		Fax : 06-7648613 (Am) / 06-7638543 (Pengarah)
		dr_harlina@moh.gov.my

Table 105. State Water Agency in Negeri Sembilan

SL.	State	Details
NO.		
	Badan Kawal Selia Air Negeri	Pejabat Setiausaha Kerajaan Negeri
	Sembilan	Sembilan
	Sembhan	Tingkat 5, Blok A, Wisma Negeri
		Jalan Dato' Abdul Malek
		70503 Seremban, Negeri Sembilan.
		Tel: 606-765 9900
		Faks: 606-761 7386
		E-mel: korporatsukns[at]ns.gov.my

Table 106. PLAN Malaysia in Negeri Sembilan

SL.	State	Details
NO.		
	PLANMalaysia@Negeri Sembilan	PLANMalaysia@Negeri Sembilan
		Tingkat 3, Blok A, Wisma Negeri
		70646 Seremban, Negeri Sembilan
		06 765 9713
		06-764 5622
		jpbdns[at]ns[dot]gov[dot]my
		jpbd.ns.gov.my

Table 107. Unit Perancang Ekonomi in Negeri Sembilan

SL.	State	Details
NO.		
	Unit Perancang Ekonomi Negeri Sembilan	Unit Perancang Ekonomi Negeri Sembilan Unit Perancang Ekonomi Negeri, Tingkat 5, Blok D, Wisma Negeri, Jalan Dato' Abdul Malek, 70503 Seremban, Negeri Sembilan.Pengarah : Encik Muhamad Nahar Bin Haji Mohd Sidek Tingkat 5, Blok D, Wisma Negeri, 70503 Seremban, Negeri Sembilan EMEL: nahar@ns.gov.my TEL: 06-7625934 (T) TEL: 06-7631397

Table 108. PDRM in Negeri Sembilan

SL.	State	Details
NO.		
	Ibu pejabat Polis Kontinjen Negeri Sembilan	Ibu pejabat Polis Kontinjen Negeri Sembilan
		Jalan Cambell
		70710 Seremban
		Negeri Sembilan
		Telefon: 06-7682222

	Faks: 06-	7623506		
	Emel:			
	IPK cccns[at]r	Negeri mp[dot]gov[do	Sembilan ot]my	:
	сро.	KP Negeri Sei ns[at]rmp[dot		

Table 109. Angkatan Pertahanan Awam Malaysia (APM) in Negeri Sembilan

SL.	State	Details
NO.		
	PEJABAT JABATAN PERTAHANAN AWAM NEGERI	YS Lt. Kol. (PA) Mohd Syukri bin Madnor
	SEMBILAN	Pengarah
		PEJABAT JABATAN PERTAHANAN AWAM NEGERI SEMBILAN
		Pusat Pertahanan Awam Seremban
		Jalan Labu, Km 5
		70200 Seremban
		Negeri Sembilan
		mohd_syukri[at]civildefence[dot]gov[dot]my
		06-7615587/6190 (Ext.137)

Table 122. RELA in Negeri Sembilan

SL.	State	Details
NO.		
	NEGERI SEMBILAN	(KOSONG)
		Pengarah Rela Negeri Sembilan
		Tkt. 9, Wisma Persekutuan Jalan Dato' Abdul Kadir 70000 Seremban, Negeri Sembilan
		06-7612721
		prn_negerisembilan@moha.gov.my

Table 110. EXCO environment in Negeri Sembilan

SL.	State	Details
NO.		
	EXCO Environment Negeri Sembilan	YB TUAN VEERAPAN A/L SUPERAMANIAM
		Pengerusi Jawatankuasa Bertindak Kesihatan, Alam Sekitar, Koperasi Dan Kepenggunaan
		EXCO Kerajaan Negeri,
		Tingkat 1, Blok C, Wisma Negeri,
		70503 Seremban
		ybveerapan@ns.gov.my veera_30@yahoo.com
		baru 06-7659502 (Pej. EXCO) 06-7659577 (Pej. EXCO) 06-441 5052 (P) (Pusat Khidmat DUN)
		baru 06-7676395 (Pej. EXCO)

Table 111. Local authorities in Negeri Sembilan

	2 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5
Majlis Bandaraya Seremban	Wisma Bandar Raya
,	Lot 24392 Persiaran Forest Height 1
	70450 Seremban
	zazali@mbs.gov.my
Majlis Perbandaran Port Dickson	KM 1, Jalan Pantai
	71009 PORT DICKSON
	ydpmppd@mppd.gov.my
Majlis Perbandaran Jempol	72120 BANDAR SERI JEMPOL
	ydp@mdjl.gov.my
Majlis Daerah Jelebu	Tingkat 1, Pusat Komersial MDJ,
	71600 KUALA KELAWANG
	mdjelebu@ns.gov.my
Majlis Daerah Kuala Pilah	Jalan Perpateh
	72009 KUALA PILAH
	ydp@mdkp.gov.my
Majlis Daerah Rembau	Jalan Dato' Maharaja Lela
	71309 Rembau
	mdr@mdr.gov.my
Majlis Daerah Tampin	73000 TAMPIN
	mdt@mdtampin.gov.my
	Majlis Perbandaran Port Dickson Majlis Perbandaran Jempol Majlis Daerah Jelebu Majlis Daerah Kuala Pilah Majlis Daerah Rembau

Table 112. District offices in Negeri Sembilan

SL. NO.	Local Authority	Details
	Pejabat Daerah dan Tanah	Mohd Nizam bin Tajul Arus
	Seremban	Pegawai Daerah
		Pejabat Daerah & Tanah Seremban,
		Kompleks Pentadbiran Daerah Seremban,
		Persiaran S2 A2, Seremban 2,
		70300 Seremban,
		Negeri Sembilan.
		Telefon:
		06-6032201
		Faks:
		06-6032260
	Pejabat Daerah dan Tanah	Mohd Nizam bin Tajul Arus
	Seremban	Pegawai Daerah
		Pejabat Daerah & Tanah Seremban,
		Kompleks Pentadbiran Daerah Seremban,
		Persiaran S2 A2, Seremban 2,
		70300 Seremban,
		Negeri Sembilan.
		Telefon:
		06-6032201
		Faks:
		06-6032260
	Pejabat Daerah dan Tanah Rembau	Mohamad Najib Bin Mustafa,
		Pegawai Tadbir Dan Diplomatik M54
		Pejabat Daerah & Tanah Rembau,
		Kompleks Pentadbiran Daerah,
		71309 Rembau,
		Negeri Sembilan Darul KhususTel : 606-6851225 Faks : 606-6852884
		Emel:
		mohamadnajib@ns.gov.my
		E-mel: do_rembau@ns.gov.my

Pejabat Daerah dan Tanah Jelebu	Abdul Rahim Bin A. Aziz
	Pegawai Daerah,
	Pejabat Daerah dan Tanah Jelebu,
	Kompleks Pentadbiran Daerah Jelebu,
	71600 Kuala Klawang, Negeri Sembilan.
	Tel: 606-6136 311
	Faks : 606-6136 528
	E-mel: pentadbiranjelebu@ns.gov.my
Pejabat Daerah dan Tanah Kuala	Pegawai Daerah Kuala Pilah
Pilah	Mohd Faizal bin Abdul Manap Pegawai
	Daerah Kuala Pilah
	Pejabat Daerah dan Tanah Kuala Pilah,
	Kompleks Pentadbiran Daerah,
	72000 Kuala Pilah, Negeri Sembilan
	Tel : 06-4814166 Fax : 06-4815511
	email : pdtkp@ns.gov.my
Pejabat Daerah dan Tanah Jempol	Syahrul Nizam bin Saleh
	Pegawai Daerah M54
	Pejabat Daerah Dan Tanah Jempol Kompleks Pentadbiran Daerah
	72120 Bandar Seri Jempol
	Negeri Sembilan Darul Khusus
	Tel : 606-4585218 Fax: 606-4581242
	E-mail: pdtjempol@ns.gov.my
	E-mail: noora@ns.gov.my
Pejabat Daerah dan Tanah Tampin	Pn. Suhaiza Binti Sharudin
	Pegawai Daerah/Pentadbir Tanah
	Pejabat Daerah dan Tanah Tampin,
	Kompleks Pejabat Kerajaan, Jalan Padang,
	73000 Tampin,
	Negeri Sembilan. Tel : 606-4421229
	Faks : 606-4419511
	E-mel: tampinns@ns.gov.my

Pejabat Daerah dan Tanah Kecil Gemas	Pn. Suriani Binti Salihan Penolong Pegawai Daerah Pejabat Daerah Kecil dan Tanah Gemas, Negeri Sembilan, Telefon: 607-948 1242 / 1253 Faks: 607-948 2395 suriani@ns.gov.my
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3.2.2.11. Melaka

Table 113. DID offices in Melaka

SL. NO.	State/Districs	Details
1.	JPS Melaka	Mohamad Radzi bin Abdul Talib
	, i o Meiana	Pengarah
		Jabatan Pengairan Dan Saliran Negeri
		Melaka
		Bandar MITC, Hang Tuah Jaya,
		Aras 3, Wisma Negeri,
		75450 Ayer Keroh,
		Melaka
		Tel: 06-3333333.
2.	JPS Melaka Tengah	Encik Mokhtar bin Ab. Rahim
		Penolong Jurutera Awam JPS Melaka
		Tengah
3.	JPS Alor Gajah	Encik Adnan bin Abdullah
		Penolong Jurutera Awam JPS Alor Gajah
4.	JPS Jasin	Puan Rabiah Binti Isnin
		Penolong Jurutera Awam JPS Jasin

Table 114. DOE offices in Melaka

SL. NO.	State/District/Local Authority	Details
1	JAS Negeri Melaka	Rosli Bin Haji Osman
		Pengarah
		Jas Melaka
		Aras 19, Menara Persekutuan
		Bandar Mitc, Hang Tuah Jaya
		75450 Ayer Keroh
		Melaka
		06-2345720
		ro@doe.gov.my
	JAS Cawangan Alor Gajah	Shahlena Binti Abd Aziz C29
		Penolong Pegawai Kawalan Alam Sekitar
		Cawangan Taboh Naning
		Pejabat Cawangan: JAS Cawangan Tabuh
		Naning
		PejabatJAS Cawangan Tabuh Naning

	Alamat	Tabuh Naning, 78000 Alor
		Gajah, Melaka
		No. Tel06-2345720
		No. Faks 06-5520590
	S	shahlena@doe.gov.my

Table 115. State Health Department offices in Melaka

SL. NO.	State	Details
NOI	JKN Melaka	Datuk Dr. Ismail Bin Ali
		Pengarah Kesihatan Negeri Melaka
		Jusa C
		Jabatan Kesihatan Negeri Melaka
		Tingkat 3, 4, dan 5, Wisma Persekutuan, Jalan Business City, Bandar MITC 75450 Ayer Keroh, Melaka.
		Tel : 06 -235 ext 6888
		Fax: 06-2345969
		drismailali@moh.gov.my

Table 116. State Water Agency in Melaka

SL.	State	Details
NO.		
	Badan Kawal Selia Air Melaka	Jabatan Ketua Menteri Melaka,
	Badan Kawai Sena An Melaka	Aras 5, Blok Bentara,
		Seri Negeri, Hang Tuah Jaya,
		75450 Ayer Keroh, Melaka
		Nama : Puan Faizah binti Abdul
		Rahman@Sulaiman
		Jawatan : Pengarah
		Tel:+606-333 3333 samb. 7674/7686
		Faks:+606-232 1779
		E-mel : faizahrahman@melakagov[dot]my

Table 117. PLAN Malaysia in Melaka

SL.	State	Details
NO.		
	PLANMalaysia@Melaka	PLANMalaysia@Melaka
		Aras 5, Wisma Negeri,
		Hang Tuah Jaya, M.I.T.C,
		75450, Ayer Keroh, Melaka
		06 333 3333 ext 5135
		06 232 3443
		jpbdmelaka@melaka.gov.my
		www.jpbdmelaka.gov.my

Table 118. Unit Perancang Ekonomi in Melaka

SL.	State	Details
NO.		
	Unit Perancang Ekonomi Negeri Melaka	Unit Perancang Ekonomi Negeri Melaka
	- Totalia	Jabatan Ketua Menteri,
		Aras 3, Blok Temenggong, Seri Negeri, Hang Tuah Jaya, 75450 Ayer Keroh, Melaka.
		YBhg. Datuk Salhah binti Salleh
		Timbalan Setiausaha Kerajaan (Pembangunan)
		Tel: 06-230 7321
		Fax: 06-2328420
		Emel: salhah@melaka.gov.my

Table 119. PDRM in Melaka

SL.	State	Details
NO.		
	Ibu Pejabat Polis Kontinjen Melaka	Ibu Pejabat Polis Kontinjen Melaka
	- 2021	Jalan Ayer Keroh Lama
		75450 Bukit Beruang
		Melaka
		Telefon: 06-2851999
		Faks: 06-2837771, 06-2823727

	Emel : IPK	MELAKA	:
	cccmel[at]rmp[dot]ge	ov[dot]my	
	KETUA POL	IS MELAKA :	
	cpo.melaka[at]rm	p[dot]gov[dot]my	

Table 120. Angkatan Pertahanan Awam Malaysia (APM) in Melaka

SL.	State	Details
NO.		
	PEJABAT JABATAN PERTAHANAN AWAM NEGERI MELAKA	YS Lt. Kol. (PA) Cuthbert John Martin Quadra
	WELAKA	Pengarah (KP44)
		Pejabat Jabatan Pertahanan Awam Negeri Melaka
		Kompleks Kementerian Dalam Negeri, Jalan Seri Negeri, 75450, Ayer Keroh, Malaysia
		john[at]civildefence[dot]gov[dot]my
		06-232 4021

Table 121. RELA in Melaka

SL. NO.	State	Details
1101	RELA Melaka	Pengarah Rela Melaka
		Razali bin Ahmad
		Aras 2, Kompleks Kementerian Dalam Negeri, Jalan Seri Negeri, 75450 Ayer Keroh, Melaka
		06-2327314
		06-2327313
		prn_melaka@moha.gov.my

Table 122. EXCO environment in Melaka

SL. NO.	State	Details
	EXCO Environment Melaka	YB DATUK SERI HJ. ABDUL GHAFAR BIN ATAN

	EXCO Perumahan, Kerajaan Tempatan, Alam Sekitar
	JABATAN KETUA MENTERI MELAKA
	Kompleks Seri Negeri,
	Hang Tuah Jaya, 75450,
	Ayer Keroh, Melaka
	06-3333333
	webmaster[at]melaka[dot]gov[dot]my

Table 123. Local authorities in Melaka

SL.	Local Authority	Details
NO.		
	Majlis Bandaraya Melaka	Bangunan Graha Makmur
	Bersejarah	No, 1 Lebuh Ayer Keroh
		75450 MELAKA
		webmaster@mbmb.gov.my
	Majlis Perbandaran Alor Gajah	Jalan Dato' Dol Said
		78000 ALOR GAJAH
		ydp@mpag.gov.my
	Majlis Perbandaran Jasin	77000 JASIN
		ydp@mpj.gov.my
	Majlis Perbandaran Hang Tuah	Lot 51 & 52, Tingkat 1
	Jaya	Kompleks Melaka Mall, Jalan Tun Abdul
		Razak
		75450 Ayer Keroh
		ydp@mphtj.gov.my

Table 124. District offices in Melaka

SL. NO.	Local Authority	Details
1101	Pejabat Daerah Dan Tanah Negeri	DATUK SHAMSUL AMBIA BIN ABDUL AZIZ
	Melaka Tengah	Pegawai Daerah Melaka Tengah
		Pejabat Daerah Dan Tanah Melaka Tengah
		Aras Bawah & 1, Bangunan Wisma Negeri,
		Jln MITC-Ayer Keroh,
		Hang Tuah Jaya, M.I.T.C,
		75450, Ayer Keroh, Melaka,
		Malaysia

+606.333.3333
+606.232.6721 / 232.6582
pdtmt@melaka.gov.my
TUAN RAHIZI BIN RANOM
Pegawai Daerah
Pejabat Daerah Dan Tanah Alor Gajah
78000 Alor Gajah, Melaka
rahizi@melaka.gov.my
YBhg. Datuk Anis Binti Ali Hasan
Pegawai Daerah Jasin
Pejabat Daerah an Tanah Jasin
77000 Jasin,
Melaka
+606 5298100
+606 5293396
infopdtjasin@melaka.gov.m
_

3.2.2.12. Johor

Table 125. DID offices in Johor

SL. NO.	State/Districs	Details
1.	JPS Johor	Ir. Che Mohd Dahan bin Che Jusof
		Pengarah Jabatan Pengairan Dan Saliran Negeri Johor, Aras 3, Bangunan Dato' Mohamad Ibrahim Munsyi, Pusat Pentadbiran Kota Iskandar, 79626 Iskandar Puteri,
		Tel: 07 2667598
		cmd@water.gov.my
2.	JPS Daerah Batu Pahat	Jurutera Daerah Batu Pahat
		En. Saiful Lizan Bin Ibrahim
3.	JPS Daerah Pontian	Jurutera Daerah Pontian
		Pn. Fauziyah Hanim Binti Noubi @ Atan
4.	JPS Daerah Muar	Jurutera Daerah Muar
		Pn. Nurliza Binti Zakaria
5.	JPS Daerah Tangkak	Jurutera Daerah Tangkak Pn. Juliana Binti Abdullah
6.	JPS Daerah Kulai	Jurutera Daerah Kulai
		En. Faiz Bin Hassan
7.	JPS Daerah Johor Bahru	Jurutera Daerah Johor Bahru
		Cik Naz Zilla Binti Abdul Najir
8.	JPS Daerah Mersing	Jurutera Daerah Mersing
		En. Md Shahril Bin Md Shamsudin
9.	JPS Daerah Segamat	Jurutera Daerah Segamat
		Pn. Siti Juraidah Binti Md Kamsir
10	JPS Daerah Kluang	Jurutera Daerah Kluang
		Pn. Dhiya Ruzanna Binti Ab Wahid
11	JPS Daerah Kota Tinggi	Jurutera Daerah Kota Tinggi En. Wan Ahmad Hazmil Bin Wan A Aziz

Table 126. DOE offices in Johor

SL. NO.	State/District/Local Authority	Details
1	JAS Negeri Johor	DR. MOHD FAMEY BIN YUSOFF PENGARAH
		JAS Johor
		Wisma Alam Sekitar,No.46, Jalan Pertama,Pusat Perdagangan Danga
		Utama,81300 Johor Bahru,JOHOR
		BAHRU, JOHOR
		07-5500522 ext: 502
		famey@doe.gov.my
	JAS Cawangan Pengerang	MUHAMMAD TAKIYUDDIN BIN NORANI
	, 3 3 - 3 3 3	C44
		PEGAWAI KAWALAN ALAM SEKITAR
		CAWANGAN PENGERANG
		Pejabat JAS Cawangan Pengerang
		Alamat Jalan Pantai, Sungai Rengit
		81620 KOTA TINGGI, JOHOR
		No. Tel07-8266822
		takiyuddin@doe.gov.my
	JAS Cawangan Batu Pahat	JULAIHA BINTI JUMAL C44
		PEGAWAI KAWALAN ALAM SEKITAR
		KANAN CAWANGAN BATU PAHAT
		Pejabat JAS Cawangan Batu Pahat
		Alamat Tingkat 7, Wisma Sing Long
		No. 9, Jalan Zabedah 83000 Batu Pahat JOHOR
		No. Tel07-4388490
		No. Faks 07-4388492
		julaiha@doe.gov.my
	JAS Cawangan Kluang	AZLINA MAHMOOD C44
	,	PEGAWAI KAWALAN ALAM SEKITAR
		KANAN CAWANGAN KLUANG
		PEJABAT KETUA CAWANGAN
		Pejabat JAS Cawangan Kluang
		Alamat Tingkat 8, Bangunan Wisma
		Bunga No. 11, Jalan Lambak 86000 Kluang,
		JOHOR
		No. Tel07-7765892
		No. Faks 07-7767493
	1400	lynn@doe.gov.my
	JAS Cawangan Muar	MOHD AIZUDDIN BIN AB RAZAK
		C44

PEGAWAI KAWALAN ALAM SEKITAR
KANAN CAWANGAN MUAR
Pejabat JAS Cawangan Muar
Alamat Tingkat 1, Bangunan Thiam
Lock Lot 2129, Jalan Sungai Abong 84000
Muar JOHOR
No. Tel06-9556127
No. Faks 06-9556128
aizuddin@doe.gov.my

Table 127. State Health Department offices in Johor

SL.	State	Details
NO.		
	Jabatan Kesihatan Negeri Johor	YB Dato' Dr. Aman bin Rabu
		Pengarah Kesihatan Negeri , JUSA B
		Jabatan Kesihatan Negeri Johor
		Tingkat 3 & 4 Blok B, Wisma Persekutuan, Jalan Air Molek, 80590 Johor Bahru Johor Darul Takzim.
		Tel : 07 - 222 6757
		Fax: 072247361 (Pengurusan), 072232603(Pejabat Pengarah)
		draman@moh.gov.my

Table 128. State Water Agency in Johor

SL. NO.	State	Details
	Badan Kawal Selia Air Johor	Ketua Jabatan Encik Mohd Riduan Bin Md Ali
		Badan Kawal Selia Air Negeri Johor,
		Aras 1,
		Bangunan Dato' Jaafar Muhammad,
		Kota Iskandar,
		79000 Iskandar Puteri, Johor
		Tel:07-266 1201
		Faks:07-266 1202

Table 129. PLAN Malaysia in Johor

SL.	State	Details
NO.		
	PLANMalaysia@Johor	PLANMalaysia@Johor
		Tingkat 1 & 2, Bangunan Dato' Mohamad Salleh Perang,
		79646, Kota Iskandar,
		Iskandar Puteri, Johor
		07 266 7200 / 07 266 7201
		07 266 1402
		jpbd@johor.gov.my
		jpbd.johor.gov.my

Table 130. Unit Perancang Ekonomi in Johor

SL.	State	Details
NO.		
	Bahagian Perancang Ekonomi Negeri Johor	Bahagian Perancang Ekonomi Negeri Johor
		Aras 1 & 2, Blok B, Bangunan Dato' Jaafar Muhammad, Kota Iskandar, 79503 Iskandar Puteri, JOHOR.
		Dato' Dr. Badrul Hisham Kassim
		Timbalan Setiausaha Kerajaan Johor (Pembangunan)
		Email : bpen@johor.gov.my
		Tel: 07-266 6618
		Fax: 07-290 9992
		Email: bpen@johor.gov.my https://bpen.johor.gov.my/index.php/info- bpe/organisasi/direktori-telefon/

Table 131. PDRM in Johor

SL.	State	Details
NO.		
	Ibu Pejabat Polis Kontinjen Johor	Ibu Pejabat Polis Kontinjen Johor
	joiloi	Polis Diraja Malaysia
		80990 Jalan Tebrau
		Johor Bahru
		Johor
		Telefon :07-2254422
		Faks :07-2240115
		Emel :IPK Johor : cccjoh@rmp.gov.my
		Ketua Polis Johor : cpo.johor@rmp.gov.my

Table 132. Angkatan Pertahanan Awam Malaysia (APM) in Johor

SL.	State	Details
NO.		
	PEJABAT NEGERI PERTAHANAN	Kol.(PA) Kamal Bin Mokhtar
	AWAM JOHOR	Pengarah (KP48)
		PEJABAT JABATAN PERTAHANAN AWAM
		NEGERI JOHOR
		Pejabat Negeri Pertahanan Awam Johor
		Tingkat 5 Blok 2,
		Kompleks Kementerian Dalam Negeri,
		Taman Setia Tropika, Kempas,
		81200 Johor Bahru
		kamalmokhtar[at]civildefence[dot]gov[dot]my
		07-2364567 ext 201

Table 133. RELA in Johor

SL.	State	Details
NO.		
	JOHOR	Md Shah Rizal bin Zainal
		Pengarah Rela Johor
		Aras 1, Blok 3, Kompleks KDN Setia Tropika, 81200 Johor Bahru, Johor
		07-2351835
		prn_johor@moha.gov.my

Table 134. EXCO environment in Johor

SL.	State	Details
NO.		
	Johor Darul Takzim	YB Tuan Vidyananthan a/l Ramanadhan
		Pengerusi Jawatankuasa Kesihatan dan Alam Sekitar Negeri Johor
		Pejabat Am,
		Pengerusi Jawatankuasa Kesihatan dan Alam Sekitar Negeri Johor,
		Aras 3, Bangunan Dato' Jaafar Muhammad,
		Kota Iskandar, 79555 Iskandar Puteri
		No. Telefon: 07-266 6031
		No. Faks: 07-266 1075
		Email: vidyananthan@johor.gov.my / n31.kahang@johor.gov.my

Table 135. Local authorities in Johor

SL.	Local Authority	Details
NO.		
1	Majlis Bandaraya Johor Bahru	Jalan Dato' Onn
		Peti Surat 232
		80720 JOHOR BAHRU
		info@mbjb.gov.my;
2	Majlis Bandaraya Iskandar Puteri	Skudai
		81300 JOHOR BAHRU
		admin@mbip.gov.my:
3	Majlis Bandaraya Pasir Gudang	Aras 19, Menara Aqabah,
3	Fights Builduraya Fash Gadang	Jalan Bandar
		81700 PASIR GUDANG
		mppg@johor.gov.my
		mppg@jonor.gov.my
4	Majlis Perbandaran Batu Pahat	Jalan Pejabat
		83000 BATU PAHAT
		info@mpbp.gov.my
5	Majlis Perbandaran Kluang	Jalan Pejabat Kerajaan
	.,	Kluang
		86000 Kluang
		oooo maaag

		mpk@johor.gov.my
6	Majlis Perbandaran Kulai	Ialan Dajahat Vanajaan
0	Majiis i erbanuaran Kulai	Jalan Pejabat Kerajaan 81000 KULAI
		mdkulai@johor.gov.my
		mukulal@jonor.gov.my
7	Majlis Perbandaran Muar	Karung Berkunci No. 516
		84009 MUAR
		mpmuar@johor.gov.my
8	Majlis Perbandaran Segamat	No.1, Jalan Abdullah
		85000 SEGAMAT
		mpsgt@johor.gov.my
9	Majlis Perbandaran Pengerang	No. 1, Jalan Kempas 1
		Taman Desaru Utama
		81930 Bandar Penawar
		infopengerang@pbtpengerang.gov.my
10	Majlis Daerah Kota Tinggi	Jalan Padang
		81900 KOTA TINGGI
		mdkt@johor.gov.my
11	Majlis Daerah Labis	85300 LABIS
		mdlbs@johor.gov.my
12	Majlis Daerah Mersing	No. 1, Jalan Tun Dr. Ismail
		86800 MERSIN
		mdmg@johor.gov.my
13	Majlis Daerah Pontian	Bangunan Majlis Daerah
		82000 PONTIAN
		mdptn@johor.gov.my
14	Majlis Daerah Simpang Renggam	Jalan Pejabat
		86200 SIMPANG RENGGAM
		mdsr@johor.gov.my
15	Majlis Daerah Tangkak	Pejabat Besar Majlis Daerah Tangkak
		Peti Surat No. 63
		84907 TANGKAK
		mdtgk@johor.gov.my
16	Majlis Daerah Yong Peng	KM 1, Jalan Labis
		83700 YONG PENG
		mdyp@johor.gov.my

Table 136. District offices in Johor

SL. NO.	Local Authority	Details
	Pejabat Daerah Johor Bahru	TUAN HAJI ABDUL RAHMAN BIN SALLEH
		Pegawai Daerah
		Pejabat Daerah Johor Bahru
		Jalan Datin Halimah,
		80350 Johor Bahru, Johor Darul Ta'zim
		No. Telefon:+607-223 1963/1969
		No. Faks:+607-223 3132
		Emel:arahmans@johor.gov.my
	Pejabat Daerah Muar	TUAN HAJI 'ON BIN JABBAR@JA'FFAR
		Pegawai Daerah Muar
		Alamat :Pejabat Daerah Muar,
		Bangunan Sultan Abu Bakar,
		Jalan Petrie,
		84010 Muar, Johor
		No.Telefon:06-9521021 / 06-9522615
		No.Fax:06-9528817 / 06-9528936
		Email :onnjabbar@johor.gov.my
	Pejabat Daerah Batu Pahat	Haji Ismail Bin Abu
		Pegawai Daerah
		Alamat Pejabat :Pejabat Daerah Batu Pahat,
		Bangunan Tunku Mahkota Ibrahim Ismail,
		Jalan Bakau Chondong,
		83000 Batu Pahat,
		Johor.
		No. Telefon:07-4341333 / 07-4311858
		No. Faks:07-4347766
		Email:ismail.abu@johor.gov.my
	Pejabat Daerah Segamat	ENCIK EZAHAR BIN ABU SAIRIN
		Pentadbir Tanah Daerah (N52)
		Alamat: KM 5, Jalan Genuang, 85000 Segamat, Johor Darul Ta'zim
		No. Telefon: +607 9435728

	No. Faks: +607 9435731
	ezahar@johor.gov.my
Pejabat Daerah Kluang	Tuan Haji Jamaludin Bin Haji A. Hamid
	Pegawai Daerah
	Alamat Pejabat :Pejabat Daerah
	Jalan Pejabat Kerajaan,
	86000 Kluang, Johor
	No. Telefon:07-7721963
	No. Faks:07-7733896
	Email:jamaludin@johor.gov.my
Pejabat Daerah Pontian	Tuan Haji Mohd Rafi Bin Abdullah
	Pegawai Daerah
	Alamat Pejabat :Aras 1 Bangunan Sultan
	Ismail
	82000 Pontian
	Johor
	No. Telefon :07-6871322 / 07-6871323
	No. Faks :07-6870077
	Emel: mrafi@johor.gov.my
Pejabat Daerah Kota Tinggi	Puan Hajah Hazlina Binti Jalil
	Pegawai Daerah
	Alamat Pejabat :Pejabat Daerah Kota
	Tinggi
	Aras 2, Bangunan Sultan Iskandar,
	81900 Kota Tinggi.
	No. Telefon:07-8831241 / 07-8831281
	No. Faks:07-8834340
	Emel:pdkt@johor.gov.my
Pejabat Daerah Mersing	YBrs. Asman Shah Bin Abd Rahman
	Pegawai Daerah Mersing
	Alamat Pejabat :Pejabat Daerah
	Mersing,
	Aras 1&2, Kompleks Pejabat-Pejabat
	Kerajaan,

	Jalan Ibrahim, 86800 Mersing, Johor
	No.Telefon:07-7991121
	No. Faks:07-7992616
	No. Email:pdmsg@johor.gov.my
	Pendidikan
Pejabat Daerah Kulai	Tuan Haji Mohd Radzi Bin Haji Mohd Amin
	Pegawai Daerah
	Alamat Pejabat : Pejabat Daerah Kulai
	Aras 1 Bangunan Pejabat Kerajaan,
	Jalan Pejabat Kerajaan,
	81000 Kulai
	No Telefon: 07-6630006
	No Faks: 07-6639797
	Emel: mradzi@johor.gov.my
Pejabat Daerah Tangkak	Tuan Haji Shafiei Bin Ahamad
	Pegawai Daerah Tangkak
	Alamat Pejabat :Pejabat Daerah Tangkak
	Jalan Dataran 2
	84900
	Tangkak
	Johor Darul Ta'zim
	No. Telefon:06-978 7100 / 06-978 3214
	No. Fax :06-978 3882
	Email:shafiei.ahamad@johor.gov.my

3.2.2.13. Pulau Pinang

Table 137. DID offices in Pulau Pinang

SL. NO.	State/Districs	Details
1.	JPS Pulau Pinang	Ir. Shukri Bin Muslim
		Pengarah
		Jabatan Pengairan Dan Saliran Pulau Pinang,
		Tingkat 55, Bangunan Komtar,
		10000 Jalan Penang,
		Pulau Pinang.
		Tel: 04-2610460
		Email: Irshukri@Water.Gov.My
2.	Daerah SPU	Ir. Mohamad Adhar bin Yahya
		Jurutera Dearah SPU
3.	Daerah SPS	Mohd Kamarul bin Mohd Noh
		Jurutera Dearah SPS
4.	Daerah SPS	Nasyrul Bin Ahmad Rizan
		Jurutera Dearah SPT
5.	Daerah DBD	Mohamed Rizal bin Salim
		Jurutera Daerah DBD
6.	Daerah DTL	Muhammad Zamri bin Uzni
		Jurutera Dearah DTL

Table 138. DOE offices in Pulau Pinang

SL.	State/District/Local Authority	Details
NO.	IAG D. I. D.	CIVADIDAN GAMAM DINITI OVED CAMAD
1	JAS Pulau Pinang	SHARIFAH ZAKIAH BINTI SYED SAHAB
		PENGARAH
		JAS P.Pinang
		Aras bawah - Zon B Wisma Persekutuan
		Seberang Perai Utara, 13200, Kepala Batas,
		Pulau Pinang
		04-5751911
		sza@doe.gov.my
	JAS Cawangan Bayan Lepas	TS. MOHD FITRI SAID C44
		PEGAWAI KAWALAN ALAM SEKITAR KANAN
		CAWANGAN BAYAN LEPAS
		Pejabat Cawangan: JAS Cawangan Bayan Lepas
		PejabatJAS Cawangan Bayan Lepas
		Alamat Unit 4.3, Kompleks Mayang Mall
		Bandar Bayan Baru 11909 Bayan Lepas
		PULAU PINANG
		No. Tel 04-6432112
		No. Faks 04-6430692
		mdfitri@doe.gov.my

Table 139. State Health Department offices in Pulau Pinang

SL.	State	Details
NO.		
	<u>Jabatan Kesihatan Negeri Pulau</u> Pinang	Pn. Chan Pei Hong
		Penolong Pengarah (Kanan)
		Jabatan Kesihatan Negeri Pulau Pinang
		Jabatan Kesihatan Negeri Pulau Pinang (Bahagian Pengurusan) Tingkat 7, Bangunan MARA No. 33 Jalan Pangkalan Weld 10300 Pulau Pinang
		Tel: 04-2555 220
		Fax: 04 - 2 555 200

Table 140. State Water Agency in Pulau Pinang

SL.	State	Details
NO.		
	Perbadanan Bekalan Air Pahang	Ibu Pejabat
		Pengurusan Air Pahang Berhad, Bandar Indera Mahkota,
		25200 Kuantan, Pahang Darul Makmur.
		Ir Abdul Aziz Bin Mohamed Noh
		Ketua bahagian Perkhidmatan Air
		No. Tel : 09-571 2222
		No. Fax : 09-571 2221

Table 141. PLAN Malaysia in Pulau Pinang

SL. NO.	State	Details
PLAN	NMalaysia@Pulau Pinan	g PLANMalaysia@Pulau Pinang
		Tingkat 57, KOMTAR, 10000 George Town, Pulau Pinang 04 650 5276 04 263 7580 idris@penang.gov.my jpbd.penang.gov.my

Table 142. Unit Perancang Ekonomi in Pulau Pinang

SL.	State	Details
NO.		
	Unit Perancang Ekonomi Negeri	Unit Perancang Ekonomi Negeri Pulau
	Pulau Pinang	Pinang
		Level 26, Kompleks Tun Abdul Razak
		(KOMTAR) 10503 PENANG.
		Head Of Unit : Zepri bin Saad
		Address: Level 26, Kompleks Tun Abdul
		Razak (KOMTAR) 10503 PENANG.
		Tel :04 - 650 5151
		Fax :04 - 261 5493
		E-mail :abujamal@penang.gov.my
		Tel: 088-369000
		Fax: 088-213765

Table 143. PDRM in Pulau Pinang

SL. NO.	State	Details
	Ibu Pejabat Polis Kontinjen Pulau Pinang	Ibu Pejabat Polis Kontinjen Pulau Pinang
	I uluu I mung	Polis Diraja Malaysia
		Jalan Penang
		10760 Pulau Pinang
		Telefon :04-2221522
		Faks: 04-2623388
		Emel: IPK P/PINANG: cccpg@rmp.gov.my
		KETUA POLIS P/PINANG : pejabatkppg@gmail.com

Table 144. Angkatan Pertahanan Awam Malaysia (APM) in Pulau Pinang

SL. NO.	State	Details
NO.	PEJABAT JABATAN PERTAHANAN AWAM NEGERI	YS Kol. (PA) Ishak Bin Mohd Radzi
	PULAU PINANG	Pengarah PEJABAT JABATAN PERTAHANAN AWAM NEGERI PULAU PINANG
		Lot 277 & 278, Jalan Air Itam, 10460, George Town, Pulau Pinang, Malaysia
		ishak@civildefence.gov.my

Table 145. RELA in Pulau Pinang

SL.	State	Details
NO.		
	RELA PULAU PINANG	MARKAS 2 DIVISYEN, PULAU PINANG
		11900 Bayan Lepas, Penang
		Tel 04-6199100 / 04-227871

Table 146. EXCO environment in Pulau Pinang

SL.	State	Details
NO.		
	EXCO Environment Pulau Pinang	YB. Phee Boon Poh
		Exco Alam Sekitar Dan Kebajikan
		Pejabat Ahli Majlis Mesyuarat Kerajaan Negeri Pulau Pinang Tingkat 53, Komtar 10503 Pulau Pinang
		Telefon: (P) 04 - 2620860
		Fax: 04 - 2618745
		Email : pheeboonpoh[at]penang[dot]gov[dot]my

Table 147. Local authorities in Pulau Pinang

SL.	Local Authority	Details
NO.		
	Majlis Bandaraya Pulau Pinang	Paras 4, Menara KOMTAR
		Jalan Penang
		10675 Pulau Pinang
		datukbandar@mbpp.gov.my
	Majlis Bandaraya Seberang Perai	Jalan Perda Utama,
		Bandar Perda
		14000 Bukit Mertajam
		datukbandar@mbsp.gov.my

Table 148. District offices in Pulau Pinang

SL. NO.	Local Authority	Details
	PEJABAT DAERAH DAN TANAH DAERAH TIMUR LAUT (PDT DTL)	ROSLI BIN HALIM PEGAWAI DAERAH

Pejabat Daerah Dan Tanah Daerah Barat Daya (PDT DBD)	Tingkat 50 & 51, KOMTAR, 10000 Pulau Pinang No.Telefon::04-2616030 No.Faksimili:04-2616137 Pautan:http://dtl.penang.gov.my roslihalim@penang.gov.]my MOHD HAFIZ ASWAD BIN NADZRI
	PEGAWAI DAERAH 11000, Balik Pulau, Pulau Pinang No.Telefon: 04-8689400 No.Faksimili: 04-8661593 Pautan: http://dbd.penang.gov.my/
Pejabat Daerah Dan Tanah Daerah Seberang Perai Tengah (PDT SPT)	KAMARUL HAIZAL BIN KODERAT PEGAWAI DAERAH Jalan Betik, Sungai Rambai, 14000 Bukit Mertajam, Pulau Pinang. No.Telefon: 04-5488888 No.Faksimili: 04-5399549 Pautan: http://spt.penang.gov.my
Pejabat Daerah Dan Tanah Daerah Seberang Perai Utara (PDT SPU)	ZULKIFLI BIN RASHID PEGAWAI DAERAH Bertam, 13200 Kepala Batas, Seberang Perai Utara, Pulau Pinang No.Telefon: 04-5776500 No.Faksimili: 04-5758969 Pautan: http://spu.penang.gov.my
Pejabat Daerah Dan Tanah Daerah Seberang Perai Selatan (PDT SPS)	MARLIA BT MOHD BELIA PEGAWAI DAERAH 14200, Sungai Jawi, Pulau Pinang. No.Telefon: 04-5857800 No.Faksimili: 04-5821003 Pautan: http://sps.penang.gov.my

3.2.2.14. Perak

Table 149. DID offices in Perak

SL.	State/Districs	Details
NO. 1.	JPS Perak	Dato' Ir. Dr. Haji Ahmad Anuar Bin Othman,
	Ji 3 i erak	Pengarah
		Jabatan Pengairan dan Saliran Perak,
		Jalan Panglima Bukit Gantang Wahab,
		30000 Ipoh,
		Perak.
		Tel: 05-2095000 (5400)
		Email: aanuar@water.gov.my
2.	JPS Daerah Manjung	Encik Mohammad Rozdhi Bin Abdullah
		Jurutera Daerah Manjung
3.	JPS Daerah Hilir Perak	Encik Mahidi Bin Mahamood
		Jurutera Daerah Hilir Perak
4.	JPS Daerah Perak Tengah	Encik Masnizan bin Mustapha
		Jurutera Daerah Perak Tengah
5.	JPS Daerah Kerian	Encik Amphai A/L Ee Bau
		Jurutera Daerah Kerian
6.	JPS Daerah Kinta	Tuan Ir. Mustafa Bin Murad
		Jurutera Daerah Kinta
7.	JPS Daerah Larut Matang dan	Encik Taquddin Azmy Bin Zawawi
	Selama	Jurutera Daerah Larut Matang dan Selama
8.	JPS Daerah Kuala Kangsar	Encik Abdul Aziz Bin Mohamed Yusof
		Jurutera Daerah Kuala Kangsar

Table 150. DOE offices in Perak

SL. NO.	State/District/Local Authority	Details
1	JAS Negeri Perak	ROSLI BIN ZUL
		PENGARAH
		JAS Perak
		Alamat Tingkat 7 & 9, Bangunan Seri Kinta,
		jalan Sultan Idris Shah, 30000, Ipoh, Perak
		05-2542744
		roz@doe.gov.my
	JAS Cawangan Taiping	MUHAMMAD RIDZUAN BIN MOHD
		ALIAS C44
		PEGAWAI KAWALAN ALAM SEKITAR
		CAWANGAN TAIPING
		PejabatJAS Cawangan Taiping
		Alamat Majlis Perbandaran Taiping Tingkat 4,
		Jalan Kota 34000 Taiping PERAK
		No. Tel 05-8060858

	izuanalias@doe.gov.my
JAS Cawangan Gopeng	MOHAMMED RIZAL BIN MOHD KAMAL C32 PENOLONG PEGAWAI KAWALAN ALAM
	SEKITAR KANAN CAWANGAN GOPENG
	PejabatJAS Cawangan Gopeng
	Alamat Lot 2055 & 2056, Kawasan
	Perindustrian Gopeng, 31500, Gopeng, Perak
	No. Tel 05-3541570
	No. Faks 05-3541577
	riz@doe.gov.my
JAS Cawangan Teluk Intan	NURHIDAYAH BINTI ZAINAL ABIDIN C44
	KETUA CAWANGAN
	PejabatJAS Cawangan Teluk Intan
	Alamat No. 1, Medan Sri Intan Jalan Sekolah
	36000 TELUK INTAN PERAK
	No. Tel 056214498
	No. Faks 056214501
	hidayah@doe.gov.my

Table 151. State Health Department offices in Perak

SL.	State	Details
NO.		
	JKN Perak	DATO' DR. DING LAY MING
		Pengarah Kesihatan Negeri
		Jusa B
		Jabatan Kesihatan Negeri Perak
		Jalan Panglima Bukit Gantang Wahab, 30590 Ipoh, Perak Darul Ridzuan.
		Tel: 05-2456000
		Fax: 05-2438090
		drding@moh.gov.my

Table 152. State Water Agency in Perak

SL.	State	Details
NO.		
	Lembaga Air Perak	En Khor Soon Seng
		Head of Department, Operations
		Lembaga Air Perak
		Tuan Haji Ishak bin Abd Rahman
		Pejabat Pengurus
		Besarhjishak@lap.com.my
		Noramira binti Norddin Setiausaha Pejabat
		Pengurus Besar
		Setiausaha : noramira@lap.com.my
		Ibu Pejabat Lembaga Air Perak
		Jalan St. John
		30200 Ipoh
		Perak Darul Ridzuan
		Malaysia

Table 153. PLAN Malaysia in Perak

SL. NO.	State	Details
	PLANMalaysia@Perak	PLANMalaysia@Perak
		Tingkat 3&7, Bgn. Seri Perak, Jalan Panglima Bukit Gantang Wahab, 30646 Ipoh, Perak Darul Ridzuan 05 209 5708/ 05 209 5780 05 255 3022 townplan[at]perak[dot]gov[dot]my jpbd.perak.gov.my

Table 154. Unit Perancang Ekonomi in Perak

SL. NO.	State	Details
	Unit Perancang Ekonomi Negeri Perak	Unit Perancang Ekonomi Negeri Perak Unit Perancang Ekonomi Negeri Aras 1, Bangunan Perak Darul Ridzuan,
		Jalan Panglima Bukit Gantang Wahab, 30000 Ipoh, Perak. Tuan Hj. Mu'az bin Haji Zawawi

•	Setiausaha) merangkap Peng nomi Negeri (UPE	
Tel: 05-209500	0 (5126)	
Fax: 05-241817 Emel: penga	73 rah_upen@perak.	gov.mv

Table 155. PDRM in Perak

SL.	State	Details
NO.		
	Ibu Pejabat Polis Kontinjen Perak	Ibu Pejabat Polis Kontinjen Perak
	rerun	Polis Diraja Malaysia
		Jalan Sultan Iskandar
		30000 Ipoh
		Perak
		Telefon: 05-2451072
		Faks: 05-2533911, 05-2539993
		Emel : IPK PERAK : cccprk@rmp.gov.my
		KETUA POLIS PERAK : cpo.perak@rmp.gov.my

Table 156. Angkatan Pertahanan Awam Malaysia (APM) in Perak

SL.	State	Details
NO.		
	PEJABAT JABATAN PERTAHANAN AWAM NEGERI	Kol. (PA) Noor Azam Johari
	PERAK	Pengarah (KP48)
		PEJABAT JABATAN PERTAHANAN AWAM NEGERI PERAK
		Aras 1, Kompleks Pejabat KDN, Persiaran Meru Utama, Jelapang, 30020, Ipoh, Malaysia
		azam[at]civildefence[dot]gov[dot]my
		05-5288030

Table 157. RELA in Perak

SL.	State	Details
NO.		
	PERAK	Kamarul Idzham bin Kamal
		Pengarah Rela Perak
		Peiabat Rela Negeri Perak, Aras 2, Kompleks KDN, Persiaran Meru Utama, Bandar Meru Raya, Jalan Jelapang, 30020 Ipoh, Perak
		prn_perak@moha.gov.my

Table 158. EXCO environment in Perak

SL.	State	Details
NO.		
	EXCO Environment Perak	YB. MOHD AKMAL KAMARUDIN
		Pengerusi Jawatankuasa Kesihatan, Sains, Alam Sekitar dan Teknologi Hijau
		Pejabat Setiausaha Kerajaan Negeri Perak (Pejabat Setiausaha Kerajaan)
		Jalan Panglima Bukit Gantang Wahab, 30100 Ipoh, Perak
		No. Tel: 05-2095000
		No. Faks: 05-2555026
		Emel: prosuk[at]perak[dot]gov[dot]my

Table 159. Local authorities in Perak

SL.	Local Authority	Details
NO.		
	Majlis Bandaraya Ipoh	Jalan Sultan Abdul Jalil, Greentown
		Ipoh, Perak Darul Ridzuan
		30450 IPOH
		mbi@mbi.gov.my
	Majlis Perbandaran Manjung	Jalan Pinang Raja
		SERI MANJUNG , PERAK
		32040 SERI MANJUNG
		ydp@mpm.gov.my
	Majlis Perbandaran Kuala Kangsar	Wisma MPKK, Jalan Taiping
		Kuala KANGSAR, Perak Darul Ridzuan

	33000 KUALA KANGSAR
	ydp@mpkkpk.gov.my
Majlis Perbandaran Taiping	Wisma Perbandaran, Jalan Taming Sari
	34000 TAIPING
	mpt@mptaiping.gov.my
Majlis Perbandaran Teluk Intan	Jalan Sekolah
	Teluk Intan, Perak
	36000 Teluk Intan
	YDP@mpti.gov.my
Majlis Daerah Kampar	Kompleks Pentadbiran MD Kampar,
	Jalan Iskandar,
	31900 KAMPAR
	urusetia@mdkampar.gov.my
Majlis Daerah Gerik	Jalan Haji Meor Yahaya
	Perak Darul Ridzwan
	33300 GERIK
	mdg@gerik.gov.my
Majlis Daerah Kerian	No.1 Wisma MDK,Jalan Padang
	Perak Darul Ridzwan
	34200 PARIT BUNTAR
	pentadbiran@mdkerian.gov.my
Majlis Daerah Batu Gajah	Jalan Haji Abdul Wahab
	Batu Gajah, Perak Darul Ridzuan
	31000 BATU GAJAH
	pentadbiran@mdbg.gov.my
Majlis Daerah Lenggong	Jalan Alang Iskandar
	Lenggong , Perak
	33400 LENGGONG
	urusetia@mdlg.gov.my
Majlis Daerah Pengkalan Hulu	Jalan Pejabat
	Pengkalan Hulu, Perak Darul Ridzuan
	33100 PENGKALAN HULU
	urusetia@mdph.gov.my
Majlis Daerah Perak Tengah	Aras Bawah,
	Kompleks Pentadbiran Daerah Perak
	Tengah, Bandar Baru Seri Iskandar
	32600 SRI ISKANDAR
	admin@mdpt.gov.my
Majlis Daerah Selama	Selama, PERAK DARUL RIDZUAN
	34100 SELAMA
	webmaster@mdselama.gov.my
Majlis Daerah Tanjong Malim	Peti Surat 59
, ,	Bandar Behrang 2020
	35900 TANJUNG MALIM
	mdtmalim@mdtm.gov.my

Majlis Daerah Tapah	Jalan Stesen
	35000 TAPAH
	ydpmdtapah@mdtapah.gov.my
	ydpmdtapah@gmail.com

Table 160. District offices in Perak

SL. NO.	Local Authority	Details
	Pejabat Daerah & Tanah Kinta	Halizah Binti Sipun
		Pegawai Daerah
		Pejabat Daerah & Tanah Kinta,
		31000 Batu Gajah.
		Tel:053661204/ 3661204
		Fax:05-3665770
	Pej Daerah & Tanah Kampar	Tuan Khairul Anwar b. Ramli
		Pegawai Daerah
		Pejabat Daerah Dan Tanah,
		Kampar
		Pej Daerah & Tanah Kampar,
		31900 Kampar.
		Tel:05-4651963
		Fax:05-4664307
		pdtkampar[at]perak.gov.my
	Pej Daerah & Tanah Manjung	Zulhisham Bin Ahmad Shukori
		Pegawai Daerah Manjung
		Pej Daerah & Tanah Manjung,
		Kompleks Pentadbiran Daerah,
		32040 Seri Manjung.
		Tel:05-6886270/1120/2117
		Fax:605-6882106
		pdtmanjung[at]perak[dot]gov[dot]my
	Pejabat Daerah Dan Tanah	Tuan Shamsul Ridzuan Bin Idris
	Muallim	Pegawai Tadbir dan Diplomatik
		Pejabat Daerah Dan Tanah Muallim,
		35800 Slim River, Perak Darul Ridzuan
		Tel:05-452 8014 / 452 8015
		Fax: 05-452 8085

	Emel: shamsul[at]perak.gov.my
Pej Daerah & Tanah Selama	Mohamed Akmal Bin Dahalan
	Pegawai Daerah Larut,Matang Dan Selama
	Pej Daerah & Tanah Selama,
	34100 Selama.
	Tel: 05-8081963 /05-8394963
	Fax:05-8394044
	EMEL: akmalpdtlms@gmail.com
Pej Daerah & Tanah Pengkalan Hulu	Safuan Bin Saleh
	Ketua Penolong Pegawai
	Pej Daerah & Tanah Pengkalan Hulu,
	33100 Pengkalan Hulu.
	Tel:04-4778224
	Fax:04-4778458
	Email : safuansaleh [at]
	perak[dot]gov[dot]my
Pej Daerah & Tanah Perak	Puan Rozalinawati Binti Che Roslee A.M.P
Tengah,Seri Iskandar	Pej Daerah & Tanah Perak Tengah,Seri Iskandar,
	Kompleks Pentadbiran Daerah,
	32610 Bandar Baru Seri Iskandar,Perak.
	Tel:05-3712095/2096
	Fax:05-3712080
	Do_peraktengah[at]perak.gov.my
Pej Daerah & Tanah Hilir Perak	Haji Meor Hezbullah Bin Meor Meor Abd Malik
	Pegawai Daerah
	Pej Daerah & Tanah Hilir Perak,
	Kompleks Kerajaan Negeri,
	Jalan Changkat Jong
	36000 Teluk Intan.
	Tel:05-6221766/ 05-6221767
	Fax:05-6215166

	pdthilirperak@perak.gov.my
Pej Daerah & Tanah Kerian	Tuon Hoii Mohd Cohli Din Dolmi A M D
r ej baeran et ranan kerian	Tuan Haji Mohd Sabli Bin Bakri A.M.P.
	Pegawai Daerah Kerian
	Pej Daerah & Tanah Kerian,
	34200 Parit Buntar.
	Tel:05-7161963
	Fax:05-71
	pdtkerian[at]perak[dot]gov[dot]my
Pej Daerah & Tanah Hulu Perak	Tuan Meor Shahibul Fadilah Bin Zainuddin
	Pegawai Daerah Hulu Perak
	Pej Daerah & Tanah Hulu Perak, Gerik,
	Jalan Sultan Yussuf,
	33300 Gerik.
	Tel:05-7911963
	Fax:05-7921049
	pdtgerik[at]perak[dot]gov[dot]my
Pej Daerah & Tanah Kuala Kangsar	YBrs. Tuan Ahmad Munir bin Ishak
	Pegawai Daerah Kuala Kangsar
	Pej Daerah & Tanah Kuala Kangsar,
	33000 Kuala Kangsar.
	Tel:05-7761055
	Fax:05-7764441
Pej Daerah & Tanah Daerah Kecil Ipoh	Puan Halizah Binti Sipun
	Pegawai Daerah Kinta
	Pej Daerah & Tanah Daerah Kecil Ipoh,
	Lorong Pasar
	Gugusan Manjoi,
	30020 Ipoh.
	Tel:05-5275875
	Fax:05-5275706
	pdtipoh[at]perak.gov
Pej Daerah & Tanah Kampung	En Norhisyam Bin Karno
Gajah	

	Ketua Penolong Pegawai Daerah
	Pej Daerah & Tanah Kampung Gajah,
	Kompleks Pentadbiran Daerah,
	36800 Kampung Gajah.
	Tel:05-6311244/3081
	Fax:05-6311863
	norhisyam77@perak.gov.my
Pej Daerah & Tanah Batang Padang	Shahrul Affendi bin Baharudin
	Pegawai Daerah Batang Padang,
	Pej Daerah & Tanah Batang Padang,
	35000 Tapah.
	Tel:05-4011402
	Fax:05-4013588
	Do_tapah@perak.gov.my
Pej Daerah & Tanah Lenggong	Encik Rosdi bin Mohd Yaacob
	Ketua Penolong Pegawai Daerah,
	Daerah Kecil Lenggong.
	Pej Daerah & Tanah Lenggong,
	33400 Lenggong.
	Tel:05-7677363/ 05-7676561/05-76778446
	Fax:05-7677102
	pdtlenggong@gmail.com
Pej Daerah & Tanah Sungai Siput	Encik Mohd Azhar Bin Alias
	Ketua Penolong Pegawai Daerah M48
	Pej Daerah & Tanah Sungai Siput,
	31100 Sungai Siput(U).
	TEL: 05-5982055 SAMB: 200
	Fax:05-5981963
	Pdtss@Perak.gov.my

3.2.2.15. Kedah

Table 161. DID offices in Kedah

SL. NO.	State/Districs	Details
1.	JPS Kedah	Ir. Haji Md.Khuzai bin Hussain
		Pengarah
		Jabatan Pengairan Dan Saliran
		Negeri Kedah Darul Aman,
		Tingkat 7, Bangunan Sultan Abdul Halim,
		Jalan Sultan Badlishah,
		05000, Alor Setar,
		Kedah, Malaysia
		(T)04-7333 1989
		ppsn_kedah@water.gov.my
		mdkhuzai@water.gov.my
		mdkhuzai@didkedah.gov.my
2.	JPS Kota Setar / Pendang / Yan	SHARDANI BIN SALLEH
		Jurutera Daerah Kota Setar / Pendang /
		Yan
3.	JPS Daerah Kuala Muda / Sik /	BAHARUDIN BIN AHMAD
	Baling	Jurutera Daerah Kuala Muda / Sik / Baling
4.	JPS Daerah Kubang Pasu / Padang	Ir. MOHAMAD AYUB BIN ISHAK
	Terap	Jurutera Daerah Kubang Pasu / Padang
		Terap
5.	JPS Daerah Kulim / Bandar Baharu	Ir. MOHAMAD SUAIMI BIN RAMLI
		Jurutera Daerah Kulim / Bandar Baharu
6.	JPS Daerah Langkawi	MOHD NOORAZIDI BIN YUNUS
		Jurutera Daerah Langkawi

Table 162. DOE offices in Kedah

SL. NO.	State/District/Local Authority	Details
1	IAC Nagari Kadah	NORAZIZI BIN ADINAN
1	JAS Negeri Kedah	
		PENGARAH
		JAS Kedah
		Alamat Aras 1, Menara Zakat
		Jalan Telok Wanjah
		05450 Alor Setar
		Kedah.
		04-7332832
		naa@doe.gov.my
	JAS Sungai Petani	YA MOHAMAD NAZIR SYAH BIN ISMAIL
		C44

	PEGAWAI KAWALAN ALAM SEKITAR
	CAWANGAN SUNGAI PETANI JAS
	Cawangan Sungai Petani
	Alamat Tingkat 1, No. 7 & 8, Jalan
	Bank 09000 Sungai Petani KEDAH
	No. Tel04-4235633
	No. Faks 04-4232832
	Mnazir@doe.gov.my
JAS Langkawi	MAHADI BIN AHMAD C44
	PEGAWAI KAWALAN ALAM SEKITAR
	CAWANGAN LANGKAWI
	Pejabat JAS Cawangan Langkawi
	Alamat TINGKAT 3 LOT
	01,BANGUNAN TABUNG HAJI,LOT 1598
	POKOK ASAM KUAH,07000
	LANGKAWI,KEDAH
	No. Tel04-9664633
	No. Faks 04-9663950
	mahadi@doe.gov.my
JAS Kulim	MOHAMAD FITRI BIN SAID C44
	KETUA CAWANGAN CAWANGAN
	KULIMKETUA CAWANGAN KULIM
	Pejabat Cawangan: JAS Cawangan
	Kulim
	Pejabat JAS Cawangan Kulim
	Alamat Kulim Technology
	Park Businnes Centre, P.O Box 60
	09000 Kulim KEDAH
	No. Tel04-4037675
	No. Faks 04-4036496
	mdfitri@doe.gov.my

Table 163. State Health Department offices in Kedah

SL.	State	Details
NO.		
	JKN Negeri Kedah	YBRS. DR. OTHMAN BIN WARIJO
		PENGARAH KESIHATAN NEGERI KEDAH
		JUSAB
		Jabatan Kesihatan Negeri Kedah
		Simpang Kuala, Jalan Kuala Kedah, 05400 Alor
		Setar, Kedah Darul Aman,
		Tel: 04-7741000 Ext. 1004
		Fax : 04-7741030
		othman.w@moh.gov.my

Table 164. State Water Agency in Kedah

SL.	State	Details
NO.		
	Lembaga Sumber Air Kedah	Lembaga Sumber Air Negeri Kedah, Aras 1,
		Blok E, Wisma Darul Aman, 05503 Alor
		Setar, Kedah Darul Aman
		Pengarah : Noorulhuda Binti Mohammed
		Ali
		AMK.,BCK.
		Tel : +604-702 7667
		Fax: +604-702 7655

Table 165. PLAN Malaysia in Kedah

SL. NO.	State	Details
	PLANMalaysia@Kedah	PLANMalaysia@Kedah
		Aras 10, Bangunan Sultan Abdul Halim, Jalan Sultan Badlishah, 05646 Alor Setar, Kedah 04 733 1077 / 04 733 5900 04 733 2286 / 04 731 2284 jpbd@kedah.gov.my jpbd.kedah.gov.my

Table 166. Unit Perancang Ekonomi in Kedah

SL. NO.	State	Details
140.	Bahagian Perancang Ekonomi Negeri Kedah	Bahagian Perancang Ekonomi Negeri Kedah
		Aras 3, Blok B, Wisma Darul Aman 05530 Alor Setar, Kedah.
		Timbalan Setiausaha Kerajaan (Pembangunan) : YBhg. Dato' Haji Norizan Bin Khazali DSDK., AMK., BCK.
		Emel: norizankhazali@kedah.gov.my
		Tel: 04 702 7000 Tel: 04-702 7000
		Fax: 04-702 7200
		Emel: upen@kedah.gov.my

Table 167. PDRM in Kedah

State	Details
Ibu Pejabat Polis Kontinjen Kedah	Ibu Pejabat Polis Kontinjen Kedah
neuun	Polis Diraja Malaysia
	Jalan Stadium
	05560 Alor Setar
	Kedah
	Telefon :04-7741222
	Faks: 04-7339589
	Emel: IPK Kedah: cccked@rmp.gov.my
	KETUA Polis Kedah : cpo.kedah@rmp.gov.my

Table 168. Angkatan Pertahanan Awam Malaysia (APM) in Kedah

SL. NO.	State	Details
	PEJABAT JABATAN PERTAHANAN AWAM NEGERI KEDAH	Lt. Kol. (PA) Awang Askandar B Ampuan Yaacub
	indo.	Pegawai Pertahanan Awam KP44
		PEJABAT JABATAN PERTAHANAN AWAM NEGERI KEDAH
		Tingkat 6, Wisma Persekutuan Alor Setar, 05000 Alor Setar, Kedah, Malaysia
		agaskandar@civildefence.gov.my

Table 169. RELA in Kedah

SL.	State	Details
NO.		
	RELA Negeri Kedah	Ahmad bin Abdul Wahab
		Pengarah Rela Negeri Kedah
		Aras 4, Bangunan KDN, Kompleks
		Pentadbiran Kerajaan Persekutuan,
		Bandar Mu'adzam Shah, 06550 Alor Setar,
		Kedah
		04-7312163
		prn_kedah@moha.gov.my

Table 170. EXCO environment in Kedah

SL.	State	Details
NO.		
	EXCO Environment Negeri Kedah	YB. Dr. Robert Ling Kui Ee
		Pengerusi Jawatankuasa Alam Sekitar Kedah

Table 171. Local authorities in Kedah

SL. NO.	Local Authority	Details
	Majlis Bandaraya Alor Setar	Jalan Kolam Air
		05675 ALOR SETAR
		mbas@mbas.gov.my
	Majlis Perbandaran Kulim	No, 1
		Lebuh Bandar 2
		09000 KULIM
		info@mpkk.gov.my
	Majlis Perbandaran Sungai Petani	08000 SUNGAI PETANI
		admin@mpspk.gov.my
	Majlis Perbandaran Langkawi	Bandaraya Pelancongan
	Bandaraya Pelancongan	07000 LANGKAWI
		ydp@mplbp.gov.my
	Majlis Perbandaran Kubang Pasu	Komplek Pentadbiran Daerah
		06000 JITRA
		admin@mdkubangpasu.gov.my
	Majlis Daerah Baling	09100 BALING
		ydp@mdbaling.gov.my
	Majlis Daerah Bandar Baharu	06300 KUALA NERANG
	·	ydp@mdptk.gov.my
	Majlis Daerah Padang Terap	06300 KUALA NERANG
		ydp@mdptk.gov.my
	Majlis Daerah Pendang	Aras 3 Wisma MDP
		06700 PENDANG
		ydp@mdpendang.gov.my
	Majlis Daerah Sik	08200 SIK
		ydp@mdsik.gov.my
	Majlis Daerah Yan	06900 YAN
		mdy@mdy.gov.my

Table 172. District offices in Kedah

SL. NO.	Local Authority	Details
	PEJABAT DAERAH DAN TANAH KOTA SETAR	YBhg. Dato' Haji Mohd. Asri Redha Bin Abdul Rahman,
		Pegawai Daerah Kota Setar
		PEJABAT DAERAH DAN TANAH KOTA SETAR
		Kompleks Pentadbiran Daerah dan Tanah Kota Setar
		Persiaran Jubli Emas, Jalan Suka Menanti
		05150 Alor Setar, Kedah Darul Aman
		phone
		04-702 8080 (D) / 04-702 8118 (T)
		fax
	DELADAT DAEDAH DAN TANAH	04-702 8049 (D) / 04-702 8117 (T)
	PEJABAT DAERAH DAN TANAH KUALA MUDA	Tuan Haji Abdullah Bin Hashim,
		Pegawai Daerah Kuala Muda
		PEJABAT DAERAH DAN TANAH KUALA MUDA
		Pejabat Pentadbiran Daerah dan Tanah Kuala Muda,
		08000 Sungai Petani, Kedah Darul Aman
		phone
		04-702 8555 (D) / 04-702 8666 (T)
		fax
		04-702 8558 (D) / 04-702 8668 (T)
	PEJABAT DAERAH DAN TANAH	Tuan Haji Abdul Bari Bin Abdullah.
	KULIM	Pegawai Daerah Kulim
		PEJABAT DAERAH DAN TANAH KULIM
		Pejabat Pentadbir Daerah dan Tanah Daerah Kulim
		09000 Kulim, Kedah Darul Aman
		phone
		04-702 9080 (D) / 04-702 9090 (T)
		fax
		04-702 9060 (D) / 04-702 9088 (T)

PEJABAT DAERAH DAN TANAH KUBANG PASU	YBhg. Dato' Haji Mohd. Fisol Bin Md. Noh, Pegawai Daerah Kubang Pasu PEJABAT DAERAH DAN TANAH KUBANG PASU Pejabat Pentadbir Daerah dan Tanah Kubang Pasu 06000 Jitra, Kedah Darul Aman phone 04-702 8282 (D) / 04-702 8383 (T) fax 04-702 8292 (D) / 04-702 8393 (T)
PEJABAT DAERAH DAN TANAH BALING	Tuan Haji Mohd. Shahadan Bin Haji Abdullah, Pegawai Daerah Baling PEJABAT DAERAH DAN TANAH BALING Pejabat Pentadbiran Daerah dan Tanah Baling, 09100 Baling, Kedah Darul Aman phone 04-702 8966 (D) / 04-702 8999 (T) fax 04-702 8955 (D) / 04-702 8989 (T)
PEJABAT DAERAH DAN TANAH SIK	Encik Mahamad Suhaimi Bin Man, Pegawai Daerah Sik PEJABAT DAERAH DAN TANAH SIK Pejabat Pentadbir Daerah dan Tanah Sik 08200 Sik, Kedah Darul Aman phone 04-702 8866 (D) / 04-702 8899 (T) fax 04-702 8855 (D) / 04-702 8898 (T)
PEJABAT DAERAH DAN TANAH PADANG TERAP	Tuan Haji Hakim Ariff Bin Mohd. Noor, Pegawai Daerah Padang Terap PEJABAT DAERAH DAN TANAH PADANG TERAP

	Pejabat Pentadbir Daerah dan TanahPadang Terap, 06300 Padang Terap, Kedah Darul Aman phone 04-702 8686 (D) / 04-702 8696 (T) fax
DELABATEDA ED ALI DANITANALI	04-702 8727 (D) / 04-702 8747 (T)
PEJABAT DAERAH DAN TANAH LANGKAWI	Tuan Haji Muhamad Arof Bin Darus
	Pegawai Daerah Langkawi PEJABAT DAERAH DAN TANAH LANGKAWI
	Pejabat Pentadbir Daerah dan Tanah Langkawi,
	07000 Langkawi, Kedah Darul Aman
	phone
	04-702 9228 (D) / 04-702 9265/ 9266 (T)
	fax 04-702 9229 (D) / 04-702 9267 (T)
PEJABAT DAERAH DAN TANAH	
YAN	Yang Mulia, Tunku Iskandar Shah Bin Tunku Muszaffar Shah,
	Pegawai Daerah Yan
	PEJABAT DAERAH DAN TANAH YAN
	Pejabat Pentadbir Daerah dan TanahYan,
	06900 Yan, Kedah Darul Aman
	phone
	04-702 8808 (D) / 04-702 8833 (T)
	fax 04-702 8818 (D) / 04-702 8838 (T)
PEJABAT DAERAH DAN TANAH	Encik Muhammad Subhi bin Abdullah,
BANDAR BAHARU	Pegawai Daerah Bandar Baharu
	PEJABAT DAERAH DAN TANAH BANDAR BAHARU
	Pejabat Pentadbir Daerah dan Tanah Bandar Baharu, 09800 Serdang,Kedah Darul Aman

PEJABAT DAERAH DAN TANAH	Encik Ilias Bin Shuib,
PENDANG	AMK., BCK.
	Pegawai Daerah Pendang
	PEJABAT DAERAH DAN TANAH PENDANG
	Pejabat Pentadbir Daerah dan Tanah
	Pendang,
	06720 Pendang, Kedah Darul Aman
	phone
	04-702 8444 (D) / 04-702 8448 (T)
	fax
	04-702 8442 (D) / 04-702 8447 (T)
PEJABAT DAERAH DAN TANAH	Tuan Haji Ahmad Bawadir Bin Haji Abdul
POKOK SENA	Ghani,
	Pegawai Daerah Pokok Sena
	PEJABAT DAERAH DAN TANAH POKOK SENA
	Pejabat Pentadbir Daerah dan Tanah Pokok Sena,
	06600 Pokok Sena, Kedah Darul Aman
	phone
	04-702 8188 (D) / 04-702 8222 (T)
	fax
	04-702 8185 (D) / 04-702 8223 (T)

3.2.2.16. Perlis

Table 173. DID offices in Perlis

SL.	State/Districs	Details
NO.		
1.	JPS Perlis	Ir. Asnol Adzhan bin Abd. Manap,
		Pengarah
		Jabatan Pengaliran dan Saliran Negeri
		Perlis,
		Kompleks JPS Perlis, Pengkalan Asam,
		01000 Kangar, Perlis.
		Tel: 04-9769975
		Email: asnol@water.gov.my
2.		Asnol Adzhan bin Abd. Manap
		J52 JURUTERA AWAM

Table 174. DOE offices in Perlis

SL.	State/District/Local Authority	Details
NO.		
1	JAS Perlis	AZMAN SHAH BIN ISMAIL
		PENGARAH
		JAS Perlis
		Tingkat 2, Bangunan KWSP, Jalan Bukit
		Bukit Lagi, 01000, Kangar, Perlis
		04-9793100 ext 101
		azman@doe.gov.my

Table 175. State Health Department offices in Perlis

SL. NO.	State	Details
	JKN Perlis	Dr. Sirajuddin bin Hashim
	,	Pengarah Kesihatan Negeri Perlis
		Jabatan Kesihatan Negeri
		Perlis
		Jalan Raja Syed Alwi, 01000 Kangar, Perlis
		Indera Kayangan.
		Tel : 04-9773333 EXT. 2232
		Fax: 04-9760764/9774855
		drsirajuddin@moh.gov.my

Table 176. State Water Agency in Perlis

SL.	State	Details
NO.		
	Syarikat Air Perlis	Haji Abd Hamid Bin Sahid
		Ketua Pegawai Eksekutif
		Syarikat Air Perlis Sdn Bhd
		d/a Kompleks JKR Negeri Perlis,
		KM 3, Jalan Raja Syed Alwi,
		01000 Kangar,
		Perlis Indera Kayangan.
		abdhamid@airperlis.com.my

Table 177. PLAN Malaysia in Perlis

SL.	State	Details
NO.		
	PLANMalaysia@Perlis	PLANMalaysia@Perlis
		Tingkat 2, Blok A,
		Bangunan Dato' Mahmud Mat,
		01000 Kangar, Perlis
		04 976 1957
		04 976 3763
		planmalaysia@perlis.gov.my
		www.perlis.gov.my

Table 178. Unit Perancang Ekonomi in Perlis

SL. NO.	State	Details
NO.	Unit Perancang Ekonomi Negeri Perlis	Unit Perancang Ekonomi Negeri Perlis Unit Perancang Ekonomi Negeri Perlis, Tingkat 3, Blok A, Bangunan Dato' Mahmud Mat 01000 Kangar, Perlis. Tel: 04-973 1861 Emel: liyana.cheumar@perlis.gov.my @ Wan Kamarul Faisal bin Wan Kamardin Timb. Setiausaha Kerajaan (Pembangunan) Pejabat Setiausaha Kerajaan Negeri Perlis

	Aras 1, Kompleks Dewan Undangan Negeri Perlis
	01000, Kangar, Perlis, Malaysia
	wankamarul@perlis.gov.my
	049731855

Table 1792. PDRM in Perlis

SL. NO.	State	Details
NO.	Ibu Pejabat Polis Kontinjen	Ibu Pejabat Polis Kontinjen Perlis
	Perlis	Polis Diraja Malaysia
		Persiaran Jubli Emas
		01000 Kangar
		Perlis
		Telefon :04-9872222
		Faks: 09-9761330
		Emel: IPK Perlis: cccpls@rmp.gov.my
		KP Perlis : cpo.perlis@rmp.gov.my

Table 1803. Angkatan Pertahanan Awam Malaysia (APM) in Perlis

SL.	State	Details		
NO.				
	PEJABAT JABATAN PERTAHANAN AWAM NEGERI	Lt. Kol. (PA) Ishak b. Mohd Radzi		
	PERLIS	Pengarah (KP44)		
		PEJABAT JABATAN PERTAHANAN AWAM NEGERI PERLIS		
		Lot 8337, Persiaran Wawasan Mukim Seriab, 01000 Kangar, Perlis.		
		ishakradzi@civildefence.gov.my		
		04-9762510		
		04-9762991		
		04-9760991		

Table 1814. RELA in Perlis

SL.	State	Details				
NO.						
	PERLIS	Ahmad Muazzan Shah bin Mohd Salleh				
		Pengarah Rela Negeri Perlis				
		Aras Bawah, Kompleks KDN, Persiaran Wawasan, Mukim Seriab, 01000 Kangar,Perlis				
		04-9770972				
		prn_perlis@moha.gov.my				

Table 1825. EXCO environment in Perlis

SL.	State	Details
NO.		
	EXCO Environment Perlis	YB TUAN TEH CHAI AAN
		P.M.P., P.J.K.
		Portfolio:
		Sumber Asli & Alam Sekitar
		Bioteknologi & Teknologi Hijau
		Kesihatan
		No. Tel : 04-973 8813
		E-mail: teh.chaiaan@perlis.gov.my

Table 1836. Local authorities in Perlis

SL. NO.	Local Authority	Details
	Majlis Perbandaran Kangar	No, 192 Jalan Kangar 01000 Kangar wan.fazli@mpkangar.gov.my

${\bf 3.2.3.}\ \ Analysis\ of\ Stakeholders\ for\ IWRM$

Table 1847. Stakeholder's (Ministries and Agencies) Analysis for AACB WST 2040

SI.	Ministry	Function of Water Management	Institutional Capacity	Financial Capacity	Monitoring Capacity (Pollution & Encroachment)	Networking Capacity with Multi-stakeholders	Elements that can be linked with River Basin Management Authority
1.	Minister in Prime Minister's Department (Economy Planning Unit)	Infrastructure and Utilities (Water and Sewerage) Division: Water Supply Ensure an adequate and sustainable supply of clean water. Water Supply Management: -Construction of new infrastructureUpgrade and rehabilitate existing systemsConservation of water resourcesImprove efficiency of water supply distribution. Water Demand Management: -Reduce water loss and wastage n Federal Government to plan, manage and coordinate programmes on water supply. Sewerage -Extensive capital development to improve quality of effluent discharged.	National SDG Council (NSC) SEASSA Function: To collaborate with departments, agencies and non-governmental organizations in conducting research, seminars and dialogues on issues related to the environment and natural resources. (UPDATE: 11 DECEMBER 2019) PREPARATION OF STRATEGY PAPER 19 OF RMK12: WATER SECTOR TRANSFORMATION	Development Allocation For Infrastructure And Utilities, 2001–2005 (RM Million) -Water Supply Allocation for RMK8 was 4,810.0 -Sewerage Allocation for RMK8 was 1,666.1	Environment and Natural Resources Economic Division (SEASSA): assesses the need, effectiveness and monitor the implementation of development projects to ensure that it achieves the country's sustainable development objectives -Water Resources Management is one of the main subsectors	SEASSA Function: To participate in environmental and natural resource consultation on sustainable development, climate change and biodiversity such as the environmental conventions such as the HLPF, the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Convention on Biological Diversity (UNCBD) and the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) to ensure that the country's economic interests are not compromised; Enabling environment under SDG17:	SEASSA Function: -To coordinate negotiations between federal and state agencies in making better decisions on environmental economic issues and natural resource management;

Sl.	Ministry	Function of Water Management	Institutional Capacity	Financial Capacity	Monitoring Capacity (Pollution & Encroachment)	Networking Capacity with Multi-stakeholders	Elements that can be linked with River Basin Management Authority
		-Priority to cities, towns and tourist areasCentralised sewerage system: reduce number of localised treatment plants, optimise resources in operations and maintenance, individual systems in hilly and isolated areas, communal septic tanksR&D to improve treatment, disposal and sludge reuse.					
2.	Ministry of Environment	Department of	Environment Institute of	There are eight (8)	Divisions	Environmental Quality	
	and Water (KASA)	Environment (DOE) -to prevent, eliminate, control pollution and improve the environment, consistent with the purposes of the Environmental Quality Act 1974 and the regulations thereunder. -Divisions Water & Marine Division	Malaysia Environment awareness programs: - National Environment Day -Earth Day -World Environment Day -Strategic Partnership Programme -Friends of Environment ('Rakan Alam Sekitar') -Environmental Awareness Camp -Sustainable School-Environmental Award -Public Speaking Competition on Environment -Sustainable Pre-school -Environmental Debate Between Institutions of Higher Learning	principles listed under DASN to harmonise economic development goals with environmental imperatives: Stewardship of the Environment Conservation of Nature's Vitality and Diversity Continuous Improvement in the Quality of the Environment Sustainable Use of Natural Resources Integrated Decision- Making Role of the Private Sector Commitment and Accountability Active Participation in the International Community	-Enforcement Division -Hazardous Substances Division Environmental Quality Council River Management -River Monitoring (Continuous Water Quality stations) -Groundwater Monitoring (Specific monitoring stations based on land use e.g. agricultural site) -Pollution lead inventory -Special programd	Council -10 stakeholders from -related government agencies -Sabah and Sarawak officials -Petroleum industries -Palm industries -Rubber industries -Representatives of manufacturers -Academician -NGOs Rakan Alam Sekitar Environmental Crime Unit (DOE, PDRM, LUAS) International Affairs e.g. ASEAN Working Group	

Sl.	Ministry	Function of Water Management	Institutional Capacity	Financial Capacity	Monitoring Capacity (Pollution & Encroachment)	Networking Capacity with Multi-stakeholders	Elements that can be linked with River Basin Management Authority
			-Langkawi Award- Environmental Sustainability -DOE's Publication -Environmental Knowledge Management Centre				
3.		Department of Irrigation and Drainage -Flood Management Division; immediate response in facing flood - River Basin Management (Provide expertise services in river management in an integrated manner including policy making and legislation and to ensure river basin managed perfectly for the conservation of water resources quantity and quality (Clean, Living & Vibrant River) Water Resources Management and Hydrology Division; To collect and process hydrological data for the development and management of water resources for now and future. Stormwater Management; To provide expertise in storm water management	Human Capital Development Division -JPS Training Centre		One State One River Programme -rubbish removal with installation of rubbish trap - treatment system of 'Food, Oil & Grease' (FOG) and Gross Pollutant Trap (GTP) by local authority - silt screen control Flood Monitoring System Drought Monitoring System	-One State One River Program -JPS@Community	River Basin Management – IRBM Implementation plan in 2016-2020 recorded already done 12 out of 37 of selected rivers in Malaysia -Laws and regulations of a river management encompasses the mining, environmental, forest, fisheries, water and sewerage acts

Sl.	Ministry	Function of Water Management	Institutional Capacity	Financial Capacity	Monitoring Capacity (Pollution & Encroachment)	Networking Capacity with Multi-stakeholders	Elements that can be linked with River Basin Management Authority
		through preventive measures for the efficient and effective operation for flood					
4.		Conducting basic and applied research within water sector such as river basin, water resources and climate change, coastal and oceanography, hydrogeology and water quality and environment; Providing expert consultancy services pertaining to water and its environment for the public and private sector; Providing advisory role in the water related fileds; As a referal centre for water and environment related research at the national level as well as participating actively in bilateral research at international level.	Hydraulic Lab and Instrumentation Water Quality and Environment Research Centre River Basin Research Centre		Water Quality and Environment Research Centre		River Basin Research Centre

SI.	Ministry	Function of Water Management	Institutional Capacity	Financial Capacity	Monitoring Capacity (Pollution & Encroachment)	Networking Capacity with Multi-stakeholders	Elements that can be linked with River Basin Management Authority
5.		To advise the Minister on all matters in relation to the national policy objectives of water supply and sewerage services laws and to implement and promote the national policy objectives; To implement and enforce the water supply and sewerage services laws and to consider and recommend reforms to the water supply and sewerage services laws; To ensure the productivity of the water supply and sewerage services industry and the monitoring of operators compliance with stipulated standards, contractual obligations and relevant laws and guidelines; To increase concerted efforts towards improving the operational efficiency of the industry in particular the reduction of nonrevenue water through short-term, medium-term and long-term programmes;		-Licenses under WSIA - Permit structure In WSIA: Damage to public water supply system and sewerage system to be made good "48. (1)has caused damage to any public water system or public sewerage system, that person shall, in addition to any penalty that may be imposed for that offence, be liable to make good the damage and pay compensation to the license" Renewal of individual license Responsibilities for communal septic tank Compensation	The Water Services Industry Act 2006 (WSIA) -Federal government to have executive authority - Water quality "41 ensure that at the time of supply of quality of water supplied complies with the minimum quality standards"		

Sl.	Ministry	Function of Water Management	Institutional Capacity	Financial Capacity	Monitoring Capacity (Pollution & Encroachment)	Networking Capacity with Multi-stakeholders	Elements that can be linked with River Basin Management Authority
		To ensure the national development goals pertaining to coverage, supply and access to water supply and sewerage services are achieved;					
		To ensure long-term sustainability of quality of water and sewerage services through continued capital works development;					
		To formulate and implement a plan to ensure all reasonable demands for sewerage services are satisfied and in consultation with the relevant authorities, prepare a sewerage catchment plan formulating the policy and general proposals in respect of the development of any new sewerage					
		system and measures for improvement of any existing sewerage system; To carry out any function conferred upon it under any other law; and					
		To advise Minister generally on matters relating to water supply and sewerage services.					

SI.	Ministry	Function of Water Management	Institutional Capacity	Financial Capacity	Monitoring Capacity (Pollution & Encroachment)	Networking Capacity with Multi-stakeholders	Elements that can be linked with River Basin Management Authority
6.		Malaysian Meteorological Department Strategic thrust: -to improve effectiveness of weather services in order to reduce disaster risk -to empower the earthquake and tsunami services to reduce disaster risk caused by earthquake and tsunamiServices; observation on surface which are rain, temperature visibility and relative humidity			Compile and create a database of climate, atmospheric content, seismology and tsunamis that surpass quality control while providing statistics.	Collaborate and participate in regional and international programs in research, data collection and exchange and various meteorological, climate activities and geophysics. Stakeholders: Kementerian Dalam Negeri (KDN) - Jabatan Alam Sekitar (JAS) - Pihak Berkuasa Penerbangan Awam Malaysia (CAAM) - Jabatan Pengairan Dan Saliran (JPS) - Kementerian Kewangan Malaysia (MOF) - Agensi Pengurusan Bencana Negara (NADMA) - Kerajaan Negeri Dan Tempatan - Kementerian Pertahanan Malaysia - Kementerian Perumahan Dan Kerajaan Tempatan - Unit Perancang Ekonomi (EPU) - ASEAN Sub-Committee on Meteorology and Geophysics (SCMG) - UNESCO - Intergovernmental Ocean Tsunami Warning and Mitigation System - UNESCO - Intergovernmental	

Sl.	Ministry	Function of Water Management	Institutional Capacity	Financial Capacity	Monitoring Capacity (Pollution & Encroachment)	Networking Capacity with Multi-stakeholders	Elements that can be linked with River Basin Management Authority
						Oceanographic Commission/Pacific Tsunami Warning and Mitigation System -International Civil Aviation Organization (ICAO) -World Meteorological Organization (WMO)	
7.		-implementer of national sewerage projects and as an advisor to KASA on sewerage related issues -Under the RMK allocation for the sewerage sector to Sabah and Sarawak, the SSD has been appointed as the sewerage technical advisor, conducts technical audits, provides advisory services and confirms the Federal Government loan repayment claim from the state governmentsto regulate existing sewerage services and systems and be operated by either the government or the private sector nationwide -Indah Water Konsortium Sdn. Bhd. (IWK) to operate and maintain sewerage systems	Planning and development of the staff competencies through registration as a Certified Professional Engineer Courses -Planning of sewerage system (Mac 2018) -Transfer technology, for CSTP Langat Development and Connection Sewer Pipe Network in Catchment Area Design and Build in Langat River Basin	-River of Life allocation for Greater KL in 2008 was 232,778,893 and 100% used for the ROL project -Total acquisition in 2018 was 1,274,902.54	Project Management Unit: -Manage the implementation of projects sewerage (treatment plant sewage and piping) covers monitoring work and control (monitoring & controlling) so that according to the time set, adhere to quality and contract specifications Enforcement action on invasion issues in the gazetted land for sewerage		Proposal on development of Langat Centralized Sewage Treatment Plant (CSTP) and connecting the sewerage pipe network in the langat river basin network by build and design
8.		Pengurusan Aset Air Berhad (PAAB)	In 2018, PAAB provided more in-house training that is job related, developmental	The water assets are then leased to water operators licensed by the industry regulator, Suruhanjaya	Constant monitoring -Under the WSIA licensing framework, operators of water assets	Changes under the National Water Services Industry Restructuring Initiatives	Project updates: -PAAB's Langat 2 Project in Selangor,

Sl.	Ministry	Function of Water Management	Institutional Capacity	Financial Capacity	Monitoring Capacity (Pollution & Encroachment)	Networking Capacity with Multi-stakeholders	Elements that can be linked with River Basin Management Authority
		-Construct, refurbish, improve, upgrade, maintain and repair water infrastructure and all other assets in relation to the water systems. -to develop the nation's water infrastructure in Peninsular Malaysia and the Federal Territory of Labuan, using competitive financing sourced and obtained from private financial market	programs that concentrate on broader skills, decision making and leadership, as well as training or awareness programs In 2018: Company organised six (6) in-house training programmes for the development of staff: -Integrity at The Workplace -Value Management in Water Supply Construction -Awareness on Goods and Service Tax (GST) Changes -In-house Session on Sales & Service Tax (SST) Implementation -Leadership Development Program (LDP) -Young Leadership Development Program (YOULEAD)	Perkhidmatan Air Negara (SPAN) for operations and maintenance. Source and obtain competitive financing for the development of the nation's water assets and lease such assets to water operators licensed by Suruhanjaya Perkhidmatan Air Negara (SPAN) for operations and maintenance. Develop water asset infrastructure to be funded at competitive market rates	are required to apply to SPAN for a Service License. To qualify for this license, operators will have to meet the Key Performance Indicators and strict requirements	-the establishment of Water Forum, provide feedback and recommendations to SPAN on matters concerning the interest of consumers of water supply and sewerage services	adding 1130 million litres per day (MLD) treated water supply to those living in Klang Valley
9.		Malaysian Green Technology and Climate Change Centre (MGTC)	Training at MGTC -Certified Professional in Measurement and Verification (CPMV) -Certified Energy Manager Training Course (EMTC) -Registered Electrical Energy Manager (REEM) -Energy Management Gold Standard (EMGS): Internal Assessor Training Course -Energy Auditor Training Course (EATC)	Green Growth: Green Incentives and Certification -Green Incentives -Green Financing -Green Labelling and Certification Green Advisory and Capacity Building -Green Advisory and Consultancy -Roadmap/Action Plan Development	Climate Change Mitigation and Climate Change Adaption: - National Programmes Coordination (Climate Change Mitigation Climate Change Adaptation) Malaysia's Road map towards Zero Single- Use Plastics, 2018-2030	Strategic alliances with renowned companies and local authorities: - PLUS Malaysia Berhad (PLUS) - MOH - Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) - BMW Malaysia - PETRONAS Dagangan Berhad (PDB) - ASEAN Centre for Energy (ACE)	BUILDING A LOW CARBON METROPOLIS As of 2018, 52 Local Authorities (out of a total of 154) have been introduced to Low Carbon Cities Framework (LCCF) Benefits of LCCF -cleaner environment from reduction waste that goes to landfills

Sl.	Ministry	Function of Water Management	Institutional Capacity	Financial Capacity	Monitoring Capacity (Pollution & Encroachment)	Networking Capacity with Multi-stakeholders	Elements that can be linked with River Basin Management Authority
			-Certified Energy Auditor (CEA) Training -AEMAS Energy Management Course (AEMC) -Energy Conservation for Air Conditioning System -Professional Energy Manager (PEM) Guideline -Have we done enough to save energy bills? -Pengurusan Tenaga & Air	-Green Skills and Competency Development Green Promotion and Investment -Green Investment -Business Matching -Green Business Promotion and Exhibition		Collaborated with United Nations Indistrial Development Organization (UNIDO) Johor Port Authority (JPA)	- Majlis Perbandaraan Seberang Perai (MPSP) Quest for Low Carbon -Majlis Bandaraya Shah Alam (MBSA) dopted carbon-reducing initiatives by hrough waste reduction, water conservation and energy efficient initiatives. -Majlis Perbandaraan Klang (MPK) made major strides in energy efficiency, nature conservation and waste management at their HQ boundary
10.	Ministry of Science and Technology (MOSTI)	Center of Analysis for Drinking Water, Food and Environmental Safety Services provided via four sections of the Division: -Environmental Chemical DivisionFood Chemical DivisionWater Quality DivisionBiotechnology Division Center of Analysis for Industry and Custom Tariff -Tariff Classification Division -Halal Analysis Division -Chemical Safety Division	Centre of Chemistry Training Malaysia -development programme of human resources for the Department's staff Courses: 1) Technical Training Courses / Generic 2) Official Duty Overseas 3) Postgraduate courses 4) Industrial training 5) Services Examination of Department Subject 6) Mentoring / Coaching Programme 7) Programme Transformasi Minda			International symposiums and workshops Society and Science Communication with schools, communities	

Sl.	Ministry	Function of Water Management	Institutional Capacity	Financial Capacity	Monitoring Capacity (Pollution & Encroachment)	Networking Capacity with Multi-stakeholders	Elements that can be linked with River Basin Management Authority
11.		Agensi Nuklear Malaysia/ Malaysian Nuclear Agency -effort to promote the use of isotope techniques in water resource and hydrology as well as environmental management sectors - R&D on Water resources evaluation and environment; 1- Assessment of groundwater resource potential for water supply 2- Groundwater salinisation 3- Surface water / groundwater pollution 4- Interconnection of different water-bodies 5- Tracing the source and migration of pollution 6-Water balance 7- Water transit time, dispersion and discharge measurements 8- Identification of leakages and seepages related problems in natural or man-made structures	Training and Education - TRAINING CENTRES - Executing training programmes for multiple national and international sectors -PGEC - Post-Graduate Education Course Training Services for radiation workers	To generate new products and technologies through research and innovation based on the national development agenda To achieve an income, at minimum 30% of the annual operating budget, through transfer and commercialisation of technology-revenue from professional services in 2018 was RM12.05 million		Organisational Function - Coordinate and manage nuclear affairs nationally and internationally as a liaison agency for the International Atomic Energy Agency (IAEA)	
12.	Ministry of Agriculture and Food Industry	Agricultural Irrigation and Drainage Division - Develop water infrastructure and management to uphold the agricultural sector	Integrated Agricultural Development Area (IADA) - Coordinate advisory services and development services to the target group through human	Thrust 4: Promote domestic and foreign investment in the agromatic sector. In 2018, RM 1,361.5 billion for GDP	-	Various international agro- based programs e.g: - The 11th Indonesia - Malaysia - Thailand Growth Triangle	Integrated Agricultural Development Area (IADA) -Improving agricultural infrastructure, especially irrigation and drainage systems for

Sl.	Ministry	Function of Water Management	Institutional Capacity	Financial Capacity	Monitoring Capacity (Pollution & Encroachment)	Networking Capacity with Multi-stakeholders	Elements that can be linked with River Basin Management Authority
		-Prepare and develop inventory system as well as agricultural irrigation and drainage database.	development / training programmes - Strengthen the services of implementation agencies in the development of agricultural institutions and farmers Agricultural Skills Training Division (BLKP) - coordination and implementation of agricultural technical skills training to trainers and upskill officers - provide training packages, learning facilities and skilled and experienced instructors based on NOSS			(IMT-GT) Working Group On Agriculture & Agro- Based Industry (WGAA) Meeting di Putrajaya	certain agricultural areas
			for field of agriculture				
13.	Ministry of Housing and Local Government	Environmental Health Consultation Division (EHCD) City council focuses on urban development that stresses sustainable development and focus to efforts on tackling also environmental conservation	KPKT Institut Latihan Perumahan dan Kerajaan Tempatan (I- KPKT) -its core business is provide training to officers/staffs of Local Government on urban management and urbanization, landscape management, local government, housing management, solid waste management, and understanding and law enforcement	The City Council is fiscally sustainable with steady income from financial resources with annual outcome not less than RM100 million and afford a steady expenditure The Muncipal is also sustainable in financial resoirces with RM20 million of annual outcome	EHCD monitors the environmental health activities such as incidences of communicable and vector borne diseases Maintenance and Disease Control Prevention Control Unit provide technical guidelines related to Maintenance and Disease Prevention Control Station.	KPKT Bahagian Kesejahteraan Bandar: Creating a strategic partnership with Government/ private agencies/ NGOs/ communities Plan, organise and coordinate cleanliness campaigns, education and awareness on market and slaughtering centre control (Including abandoned animal eg. Dogs, cats, cattle) carried out by the Department of Local Government, State Authorities and Local Authorities.	KPKT ahagian Kesejahteraan Bandar Functions: - Planning, implementing, monitoring and evaluating Community Empowerment Programme (PMK)

Sl.	Ministry	Function of Water Management	Institutional Capacity	Financial Capacity	Monitoring Capacity (Pollution & Encroachment)	Networking Capacity with Multi-stakeholders	Elements that can be linked with River Basin Management Authority
14.		National Solid Waste Management Department - To formulate plans for solid waste management including location, type and size of new treatment facilities, coverage areas of solid waste management facilities, the solid waste management schemes to supply controlled solid waste to the solid waste management facilities and the time-scale for the implementation of the plans;			To exercise regulatory function specified in Act 672 and any regulation made under the Act To grant licences and approval under Act 672 To carry out such other activities for the purpose of carrying the implementation of the Act	Objective: To coordinate the cooperation between Federal Government agencies, State Government, local Authority, private and the communities so as to ensure smooth implementation of solid waste and public cleansing management.	
15.		Solid Waste Corporation (SWCorp) - To recommend policies, plans and strategies of solid waste management and public cleansing services to the National Solid Waste Management Department.	Education Development and Publication Section -planning and developing guidelines and modules related to solid waste management and environmental hygiene involving various target groups - organise and develop various educational materials and awareness of solid waste management and environmental hygiene - To implements and promote public participation and awareness through various programmes on solid waste		To monitor the performance of the concessionaires providing solid waste management and public cleansing services. Quality and Risk Management Section: Manages MS ISO 9001: 2015 Quality Management System at SWCorp Prepare, implement, analyse and improve regulatory action plans Prepare, implement, analyse and improve guidelines, Standard Operating Procedure (SOP), code of ethics	Programs and External Collaboration Section -planning, managing and monitoring the implementation of 3R practices and cultural activities and environmental hygiene activities at the national and state levels Construction Waste Division - Development section- Planning and OSC unit-ive briefing to the Local Authority, NGOs, and agencies that involved in solid waste construction and demolition	

Sl.	Ministry	Function of Water Management	Institutional Capacity	Financial Capacity	Monitoring Capacity (Pollution & Encroachment)	Networking Capacity with Multi-stakeholders	Elements that can be linked with River Basin Management Authority
			management and public cleansingIdentifies environment-friendly, safe and cost-effective technologies and conducts research on the development of solid waste management and public cleansing services. Inventory and Data Analysis Section under Public Cleansing and Domestic waste Unit		related to enforcement and regulation under Act 672 Administrative and Monitoring Section under Public Cleansing and Domestic waste Unit		
16.	Ministry of Energy and Natural Resources	Mission: -Leading an integrated natural resources governance based on efficient and optimal use of resources in line with national policies, laws and international commitments		Mission: -Economic enrichment through sustainable management activities of electricity supply industry and natural resources			
17.		Department of Mineral and Geoscience Malaysia -To undertake systematic investigations in various geoscience disciplines such as groundwater resources -Core thrust: -Hydrogeology-Exploration and developing the water resources at the critical site	Function: Preparing analysis services geochemistry and testing physical rock material, minerals and water	Preparing services expertise when requested in the run set time or agreed with customers, especially for the following fields: -Groundwater investigation -Laboratory analysis of minerology of water	JMG Underground water Program: -Monitoring, Conservation, and Geoforensic	Customers of JMG: -Federal Agency -Local Authorities -Federal Statutory Bodies -Statutory Bodies country -Higher Education Institutions and Private -Ration -Employers and Miners -Traveler -Common people -Non-Governmental Organizations -JMG Members Domestic and International Collaboration	Core thrust: Valuing the potential underground water in each basin/state to complete the underground water data repository

Sl.	Ministry	Function of Water Management	Institutional Capacity	Financial Capacity	Monitoring Capacity (Pollution & Encroachment)	Networking Capacity with Multi-stakeholders	Elements that can be linked with River Basin Management Authority
						-ASEAN -Coordinating Committee for Geoscience Programmes in East and Southeast Asia (CCOP) -Asia Pacific Economic Cooperation (APEC) -and other countries collaboration such as Uzbekistan, South Korea, China and Indonesia	
18.		Sustainable Energy Development Authority To advise the Minister and relevant Government Entities on all matters relating to sustainable energy including recommendations on policies laws and actions to be applied to promote sustainable energy; To implement measures to promote public participation and to improve public awareness on matters relating to sustainable energy;	To conduct, promote and support, in such manner as SEDA Malaysia deems fit, training or other programmes relating to the development of human resources and capacity building in the sustainable energy sector;		To implement, manage, monitor and review the feed-in tariff system including to carry out investigations, collect, record and maintain data, information and statistics concerning the feed-in tariff system, and to provide such data information and statistics to the Minister as he may from time to time require;		
19.	Ministry of Health		Institute for Public Health				
20.	Ministry of Rural Development		FELCRA College Training and Welfare Section (SLK) – Jabatan Kemajuan Orang Asli (JAKOA) / Department of Indigenous Development		Post Visit of Slope Mitigation Project in Kg. Sg. Tiang, Cameron Highlands by JAKOA		

SI.	Ministry	Function of Water Management	Institutional Capacity	Financial Capacity	Monitoring Capacity (Pollution & Encroachment)	Networking Capacity with Multi-stakeholders	Elements that can be linked with River Basin Management Authority
			Pusat Intelek Pelajar Orang Asli (PIPOA) / Intellectual Center Of Indigenous Students Pusat Latihan Paya Bungor				
21.	Ministry of Higher Education		by JAKOA IPT (Higher Education Institute)	PTPTN (Educational Loan)			
22.	Ministry of Domestic Trade and Consumer Affairs		Function: Plan and implement accounting and financial training programmes for the staff of KPDNHEP. Research and Policy: Conduct studies and research to assist in the formulation of policies and regulations relating to consumerism;	Function: -Develops business opportunities and socio- economic standing of the Malaysian citizen through the profiles of wholesalers and retailers, co-operatives, franchise, direct-selling, hawkers and petty traders as well as downstream sectors of petroleum;	Water is considered as of the major product under Consumer Price Index (CPI) Petroleum (Safety Measures) (Transportation of Petroleum by Water) Regulations 1985	Consumer Education and Awareness Programme: -Student Consumer Movement (GPS) -School's Consumer Club (one of the aspects are environmental protection) -Student Discount Card	Function of Research and Policy division: Coordinate and implement consumer education and awareness programs as well as undertake activities to disseminate consumer information; and
23.	Ministry of Tourism, Arts and Culture	Water related activities or programs: - Labuan National Water Festival 2015		Infrastructure Development Division -Function: To plan, implement and monitor the physical and financial performance of tourism projects/ products under the ministry and projects financed by the ministry but carried out by implementing agencies at state level.		Asiawater Expo & Forum 2020 Program: Visiting Clearwater Cave in conjunction with ASEAN Tourism Resource Management and Development Network Programme for Ecotourism	

3.3. Data & Information Mapping for IWRM

3.3.1. Sustainability Science for IWRM

Sustainability science has emerged as a new academic discipline in the last decade. It provides a new approach to deal with complex, long-term global issues, such as human-induced climate and ecosystem changes, from broad perspectives. It also aims to promote solutions that contribute to rebuilding a sound relation between human society and the environment (i.e. coupled social-ecological systems).

An enhanced interface between academia and practitioners is vital to develop and implement such solutions. Strengthening connections between a various stakeholders - including governments, think tanks, the private sector, NGOs and other civil society actors - is required to support good governance for a sustainable society and reach the full potential of sustainability science. The international UNESCO project "Broadening the Application of the Sustainability Science Approach" was initiated in October 2015 with the support of the Japanese Ministry of Education, Culture, Sports, Science and Technology (Japan/MEXT) to identify good practices and develop guidelines to help Member States harness the potential of sustainability science in their sustainable development strategies (UNESCO, 2021a).

Policy guidelines on research and education

The shift towards a sustainable society is one of the central challenges of our times. Science has a significant role to play in achieving the Sustainable Development Goals (SDGs) defined by the recently adopted 2030 Agenda for Sustainable Development. Science must focus on problem solving through interdisciplinary research that integrates social dimensions to make concrete contributions to sustainable development. Through research and education, transdisciplinary sustainability science is a fundamental component of this approach. It faces the challenge of not only analysing and supporting the indispensable transformative processes, but also dynamically modelling them. To that end, sustainability science is required within transdisciplinary research and education to support sustainable development with wide-ranging expertise and to educate sustainability experts.

As emphasise in the guidelines: "Sustainability Science is research and education that results in new knowledge, technology, innovation and holistic understanding which will allow societies to better address global and local sustainability challenges". This field includes disciplinary, interdisciplinary and transdisciplinary science. It is also geared towards the generation of basic knowledge, applied technology, sociocultural innovation as well as towards new governance or social and economic models. Sustainability Science is an expression of both academic freedom and responsibility towards societal issues (UNESCO, 2021b).

Transdisciplinary research

Achieving the goal of sustainability requires understanding and managing unprecedented and interconnected challenges. Prominent research programmes pertaining to economics, environmental sciences and transition theory are explored through diverse case studies, revealing challenges and advancements for transdisciplinary research. A transdisciplinary

approach is a key component of sustainability science. Transdisciplinary research acts as a driver for sustainable innovations in society. The solution to global problems requires radical transformations of the society. In order to be able to meet these new types of challenges, some of which concern the survival of humankind, we need new information about how the problems arise, what kind of solutions are appropriate, and how they should be implemented (UNESCO, 2021b).

Transdisciplinary education

Sustainability research and education should draw from the three pillars of sustainable development: environmental, economic, and social. To address the current paradox between economic and sustainable development, we must find a way to balance the two and allow them to coexist. This balance may be possible not only by developing alternative approaches to issues specific to conventional economic sectors of society, based on conventional disciplines, but also by pursuing transdisciplinary research and education. New practice based on science-society-research partnerships, experiential learning in higher education and interactive and participatory modelling has become manifest (UNESCO, 2021b).

3.3.2. SETI and SSH into Decision-Making Process for IWRM

Scientific and social science information is generating and flowing but the information is not significant just yet and the flow of information is not smooth (Mokhtar et al., 2018). Therefore, the sources of SETI (science, engineering, technology, and innovation) as well as social science and humanities (SSH) information and its smooth flow into the decision-making processes are essential for significant water resources management in Malaysia (Figure 63).

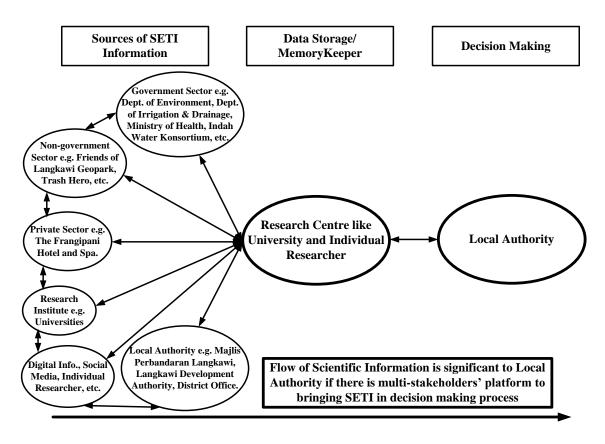


Figure 63. SETI information into decision-making for IWRM (Mokhtar et al., 2018)

The following issues should be highlighted for the implementation of integrated water resources management:

- The scientific studies in terms of water pollution are not adequate and available to public.
- The constructed wetland and the rehabilitation of natural wetland should be well address in the policies and acts.
- Academicians, researchers and experts must have opinion in the decision-making process of the government.
- Inadequate officials and staffs in local authority with the knowledge of sustainability.
- Inadequate training and education as well as officials are coming from old school where the idea on environmental conservation is absent.

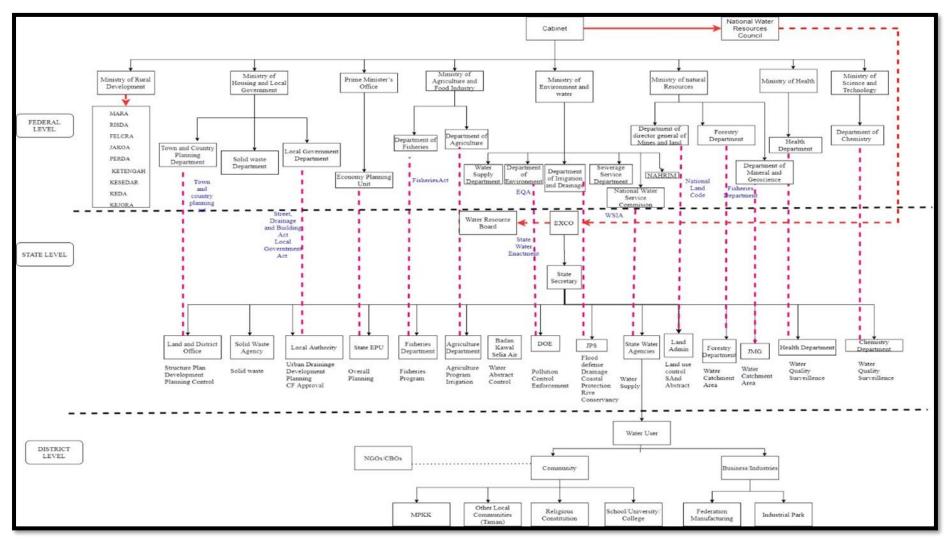


Figure 64. Water management chart of Malaysia showing the many different levels of stakeholders

3.3.3. Local and Indigenous Knowledge for IWRM

3.3.3.1. Water Issues Faced by Orang Asli Community Living in the Forest

Water Issues Faced by Orang Asli Community Living in the Forest

Dr. Vivien Yew Wong Chin, Universiti Kebangsaan Malaysia (UKM)

Context

Water is the basic or fundamental requirement for humankinds. Under the Universal Declaration of Human Rights (UDHR) and the International Covenant on Economic, Social and Cultural Rights (ICESCR), right to water, it is highlighted that "states should make water available, accessible, acceptable and of good quality for everyone, and to take necessary steps to ensure access to water". Also, the Human Rights Council advocated human right to safe drinking water and sanitation (United Nations, 2002).

In a marginalised Orang Asli community living in the forest, having sufficient and quality water not only enhanced the living standard and health, it has a profound financial impact to the community, especially for agricultural activities, it is known that the productivity of irrigated land is nearly 3 times greater than rain-fed land (FAO, 2010). The elimination of water fetching tasks for household use, will divert the womenfolk in seeking other work to supplement family income. Thus, water is the enabler for life transformation.

Objective

Many Orang Asli community in the forest faced water problems, especially in terms of quality and availability issues. Therefore, the present and immediate concern will be:

- Provision of safe water.
- Water for agricultural and husbandry use (subsistence farming).

Water Projects

Malaysia is rich in water resources, with an annual average rainfall of 3,000mm. However, steps must be taken to make water available and accessible for the Orang Asli community living in the forest. This can be accomplished through:

- Digging new well or drilling of bore-wells.
- Building water storage tank or digging ponds for storm-water collection.
- Construct water filtration system.
- Drawing water from river, stream, spring or lake.

Proposal

In the United States of America, there are many public water systems that catered for its indigenous people. Two-third of the water systems serving fewer than 500 people and one-third of them serving fewer than 100 people. These are known as the tribal public water system. Likewise, a coordinated and well-managed small-scaled water project can be put in place through Public-Private Partnership approach in providing financial, technical and training assistance. Nevertheless, water project mentioned above requires the community participation and members of the local community will take charge of the maintenance and operation of the facilities.

3.3.3.2. Coordination of Stakeholders by Local Authority in Sabah

Some Awareness Efforts on the Water Management in Sabah By

Dr. Elia Godoong, Universiti Malaysia Sabah (UMS)

Recognising the importance of rivers to human well-being and the environment is very important by various government efforts, non-governmental agencies and local communities who implemented the water management activities in the state of Sabah (Figure 65).

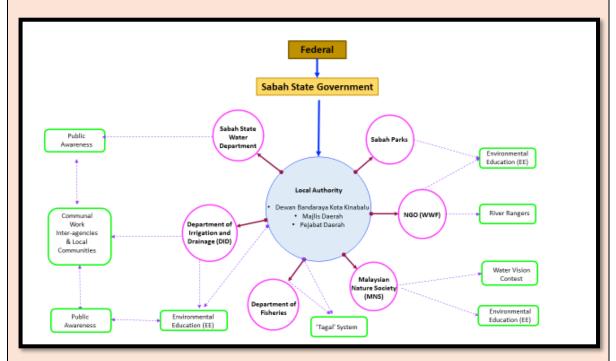


Figure 65. Coordination of stakeholders by local authority for IWRM in Sabah

Many initiatives such as the river love campaign are re-empowered for the sustainability of water supply resources and management that can ensure the well-being of community life. Looking at this importance it is clear that everyone needs to preserve the river for the common good. Polluted rivers will be detrimental to life. Therefore, it is appropriate that the river is preserved for future generations for the continuity of life on this Earth.

On par with the efforts of other states in the country, the Sabah State Government is also very serious about the management of clean water resources that has led to the formation of the Sabah Water Resources Enactment in August 1998. Following this enactment, the Sabah State Government has decided to appoint a Director Irrigation and Drainage who will act and enforce this enactment. It serves as the Director of the Water Resources Division that was established in 1999 based on recommendations in the Sabah Water Resources Master Plan that was officially adopted by the Government in 1995. This development caused the Hydrology Division to be absorbed into the Water Resources Management Division.

The Sabah state government's mission in the care and conservation of water resources is welcomed and received support from various other state government agencies, non-governmental organisations (NGOs) and the local community.

Among the activities implemented are as follows:

- 1. Create a community-based Tagal Sungai System that directly serves to manage the ecosystem, conserve natural and cultural heritage. Either this activity is on the initiative of the local community or there are many areas with the Tagal System that are managed and monitored by the Sabah fisheries department.
- 2. Disseminate information and create awareness on the importance and appreciation of water resources through Education programmes. Apart from campaigns and Education on the importance of water at the school level, also other government agencies are actively organising various activities. Amongst them is the River-Based Environmental Education Programme (REEP) was first implemented in Taman Banjaran Croker in 2011 with the joint organisation of departments and agencies under the Sabah Environmental Education Network (SEEN).
- 3. Starting in 2019, this programme is expanded to Taman Kinabalu under the Sabah Parks area. The main purpose of the implementation of this REEP is to produce a young generation who have an awareness of the importance of rivers, understand the river system and water catchment areas, and thus understanding the relation between rivers and human life.
- 4. Celebrate World Water Day by carrying out gotong-royong activities organised by the Department of Irrigation and Drainage with local authorities and the local community. Such activities always get response from the community and even the number of rivers that adopt the tagal system is also increasing from time to time.
- 5. Initiatives from organisations such as non-governmental organisations (NGOs), the Community-Led Environmental Awareness for our River (CLEAR) that was established on 12 February 2012, took the initiative to promote community awareness on river conservation. CLEAR has received funding from the United Nations Development Programme (UNDP) to initiate clean-up activities, educate the community to manage household waste more effectively as well as organise World River Day and Raft Festival along the Moyog River (River selected by the community based on pollution status the highest).
- 6. Recently, the *involvement of Oxbow Lake (Ladam Lake)*, *Kinabatangan*, *Sabah as one of the areas included in the National River Trail Program (DSK)*. DSK is one of the initiatives implemented under the Ministry of Environment and Water (KASA) to change the image of industrial factories in the country as river polluters in the eyes of the people. It is a program designed with a pollution prevention strategy through a nature-based solution-based approach to control. The result of the collaboration of

NGOs and community corporate bodies, schools, local leaders who are interested in becoming strategic partners of 'SAHABAT SUNGAI'.

- 7. The ongoing Sungai Petagas-Putatan rehabilitation programme between the state government, local government and experts from Universiti Malaysia Sabah.
- 8. Apart from that, Sabah is actively working to upgrade the existing drainage system and deepen rivers as well as flood mitigation projects in the areas of Bandaraya, Kota Kinabalu, Penampang, Sepanggar, Putatan, Kota Belud and Tawau under the 11MP budget.
- 9. Water, Sanitation and Hygiene Project (WASH) initiative by UMW Holdings Bhd and Mercy Malaysia in Kampung Suang Duyong, Pitas located 210 kilometers (km) from Kota Kinabalu, creating a rainwater harvesting system in every house. A total of 38 houses with a population of over 160 people will enjoy tank facilities with a capacity of 800 gallons from two rain catchment tanks. The project provides clean water for daily use, and even involves oral health and hygiene education. There is not much that can be done in this village because the area is so flat that there is no potential to get gravity water. Existing ponds should not be used as water reservoir ponds because they are contaminated with *E. Coli* bacteria. The distribution of treated water sources has not yet reached this area.
- 10. Reported by Sabah State Water Department Director Datuk Amarjit Singh, (2020), a total of five projects involving clean water supply estimated to be worth RM1.4 billion will be implemented this year throughout Sabah. It involves Telibong Water Treatment Plant Phase Two in Tuaran, Kundasang Water Treatment Plant, Kota Marudu Water Treatment Plant, Lahad Datu Water Treatment Plant and Tawau Water Dam. All the projects were implemented based on financial allocation from the central government for Sabah.
- 11. Involvement Etiqa is a Local Takaful & Insurance Company which is also a member of the Maybank Group has helped provide solutions to the water crisis faced by the villagers, such as building dams to install water filters and pipelines to channel water to village houses. Among the villages involved are Kampung Talungan, Telipok, Sabah.

Apart from the above examples, there are many awareness programmes on the importance of keeping rivers and water resources clean implemented by the government.

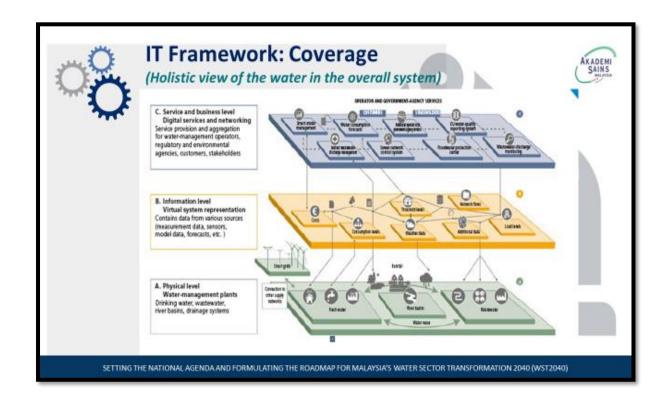
3.3.4. Data Bank/Repository for IWRM

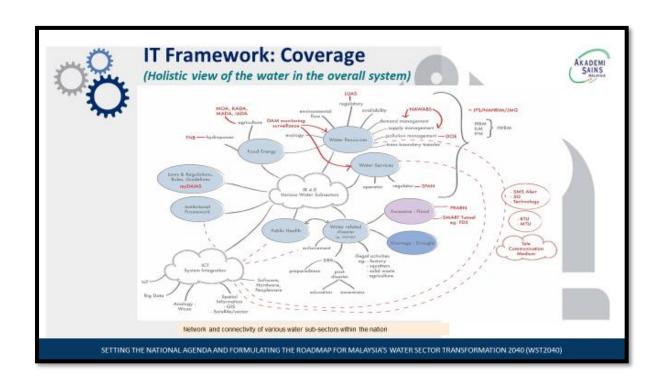
3.3.4.1. IR 4.0 for AACB WST

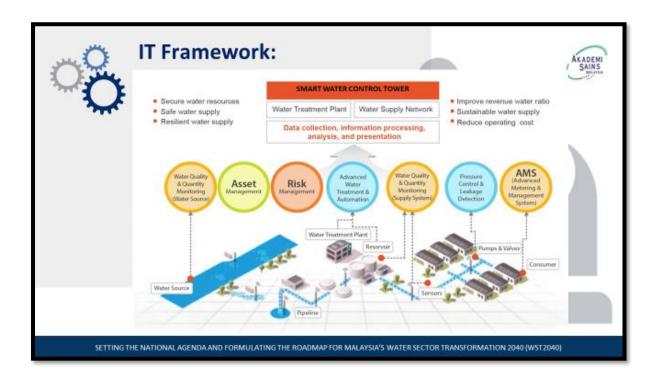
Datuk Ir Abdul Kadir Mohd Din, FASc

- First 1. How & what info IR4.0 would like to convey to government officials Capacity building and ToT are mandatory for integration between experts avoiding working in silos via knowledge transfer process. Information to be conveyed to Government officials shall include the must-haves, need to have options based on the surveys and data provided by our WGCs and stakeholders.
 - 2. How IR4.0 would like to involve in the government training module at the RMK12 phase We shall propose the system framework and simulation model into the training module, depending on the contents proposed by AACB. Training shall include the involvement of specific community groups/targets and stakeholders involved in the development of IT infrastructure and infrastructure.

Second round How the use of tools under IR 4.0 (e.g. IoT, cyber monitoring, etc.) can be channelled to local government in collaboration with other agencies and institutions in Malaysia? (a diagram would be very helpful for us)







3.3.4.2. Virtual Water and Water Footprint (VW&WF) for AACB WST

By Prof Dr Zulkifli Yusop, FASc



What is Water Footprint?

Water footprint is defined as human appropriation of natural capital in terms of the total freshwater volume required (blue, green, grey) for human consumption.

- Hoekstra, 2002

The water footprint measures the amount of water used to produce each of the goods and services we use. It can be measured for a single process, such as growing rice, for a product, such as a pair of jeans, for the fuel we put in our car, or for an entire multi-national company. It can also tell us how much water is being consumed by a particular country or globally in a specific river basin or from an aquifer.

- Water Footprint Network



Water Footprint Concept

- Water footprint is an indicator of water use that looks at both direct and indirect water use of a consumer or producer.
- · Water use is measured in terms of:
 - Water volumes consumed (evaporated or not returned)
 - Polluted per unit of time
- · Geographically explicit
- · Water footprint can be calculated for:
 - Process
 - Product
 - Consumer
 - Group of consumers (e.g. municipality, province, state, nation)
 - Producer (e.g. a public organization, private enterprise)

Water Footprint Component



Green water footprint

Volume of rainwater evaporated or incorporated into product.



Blue water footprint

Volume of surface or groundwater evaporated, incorporated into product or returned to other catchment or the sea.

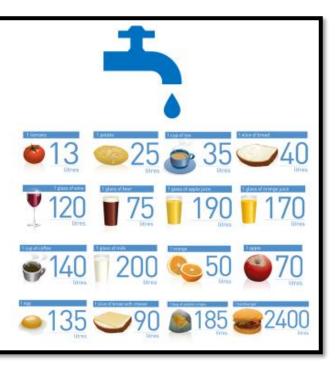


Grey water footprint

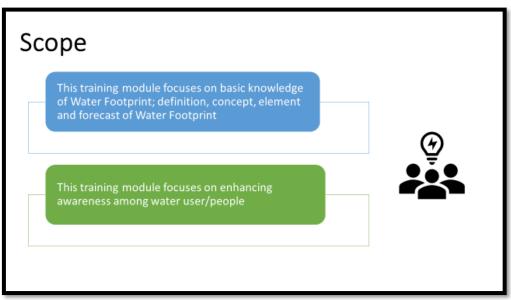
Volume of polluted water.

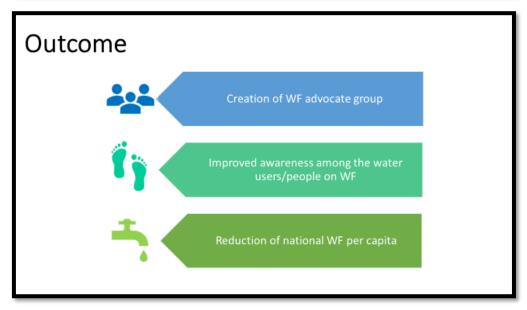
Global Average of Water Footprint for Selected Products

Source: Mekonnen, M.M. and Hoekstra, A.Y. (2010, 2011)









3.3.4.3. Alternative Water Financing (AWF) for AACB WST

By Dato' Seri Ir Dr Zaini Ujang, FASc

AWF proposed financing models

The AWF proposed six improved and novel financing mechanisms to be used to support water projects. This could be food for thoughts, to the government officials at different levels on ways to source for financing in the future. Currently, the funding for water projects mainly come from the Federal Government's development expenditure (DE) and state government funding. Therefore, there is a need to have a financial model for WST 2040.

In December 2020, The Ministry of Environment and Water (KASA) had launched the Wakaf Air, together with Yayasan Wakaf Malaysia to fund the small-scale rural water projects below RM50,000. The fund is open for application by individual, non-governmental organisations and so on.

The financing mechanisms are summarised in the below:

Mechanisms	Details of proposed mechanisms	Sectors funded
Public Funding (development budgets)	Strategic sectors, non-profit	Food security, flood mitigation, rural water supply (Felda, Orang Asli etc.)
PFI (BOT/Concession)	A private party funds water projects on a long-term concession agreement, but under regulation of SPAN on KPIs and profit margin. License period depends on the amount invested.	Urban water supply & sewerage To be realised in RMKe- 12.
PPP (Hybrid Annuity Model)	Sharing of investment and risks between govt. and private parties (40%:60%). The government will pay the remaining 60% of the project cost through the annuity for 10–15 years. It could couple with an operation and management/ concession agreement. The annuity payment will be tied with the performance of the public sector. Relevant to capital intensive and national strategic sectors.	

Mechanisms	Details of proposed mechanisms	Sectors funded
PFI (land swap for wastewater projects)	Government uses exchanged land in return for investment from private developers. No investment from the government. Infrastructure build based on government requirements.	Sewerage Already implemented - 3 on-going projects.
Performance- based Contract (PBC)	Private parties fund water projects and recoups their investment by using a profit-sharing agreement with the government. Relevant in urban/high density water account that will guarantee revenues to pay project proponents	NRW/pipe replacement projects. To be realised in 12 th MP
Cash Waqf Sukuk	Cash Waqf Sukuk combines the crowdfunding feature of <i>Waqf</i> and the Islamic <i>Sukuk</i> . It could be designed as retail product for the public to subscribe.	Big water and sewerage projects. To be realized in 13 th MP.
Water Bank	Water Bank is a bank that lend specifically to water projects. Complement the role of PAAB. Lead by experts in the water sectors who knows the risk of water projects – high upfront capital and long return period. Requires tedious legal, banking and technical requirements.	Water and sewerage projects. Flood mitigation and adaptation Food security – paddy irrigation. Environmental protection – Water Reclamation Plant (WRP), Integrated Waste Treatment Facilities etc. To be realised in 14 th MP onwards

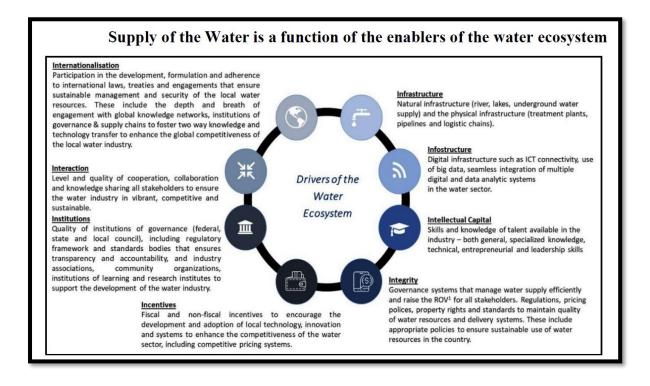
3.3.4.4. Water as an Economic Sector (WES) for AACB WST

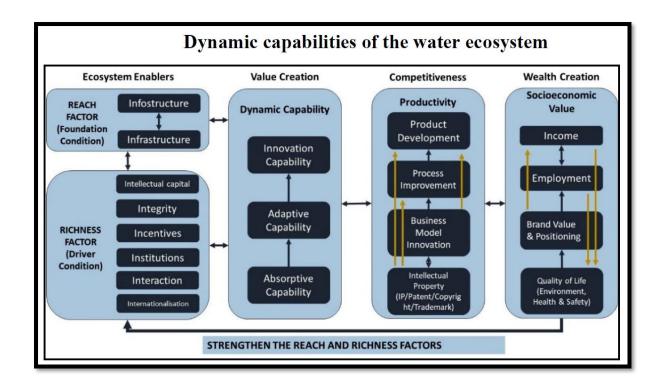
By Prof Dr Mahendhiran Nair, FASc

The concept of water as an economic good has important value to multiple stakeholders (users). Like any other good, we assume that users are willing to pay a particular price for the water, from which they derive a benefit, and there is a cost for using the water. This cost should reflect the cost of extracting and distributing the water. Below we present a water sector model that captures dynamics in the water industry and the types of strategies to transform the sector into a vibrant economic sector that contributes to the country's wealth. Key assumptions used in characterising the water industry are given below.

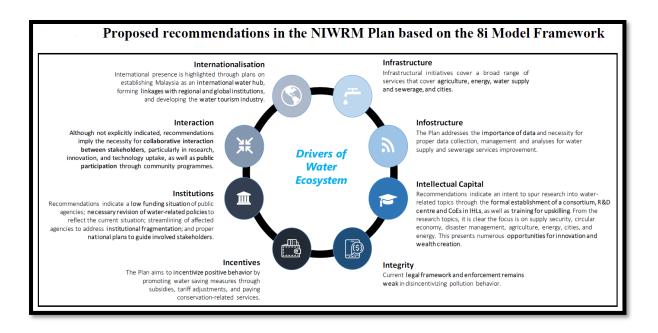
Characterizing the water supply function

The supply of water is assumed to depend on the enablers of the water ecosystem, which consists of the 8i-ecosystem enablers – that is the supply of water function can be characterised as S: P = f(Q: 8i), whereby 8is are defined in below Figure. The Supply function measures the marginal cost of producing the water at different levels of water production. As shown in the figure below, a well-managed water ecosystem increases both the quantum and quality of water supply. The strength of the enablers of the water ecosystem determines the dynamic capabilities (absorptive, adaptive and innovative capabilities), competitiveness and wealth creation opportunities of the industry.





While the broad goals of IWRM are mentioned in the NIWRM plan, a clear framework and hard targets and timelines to achieve the objective of transforming the water sector into a vibrant economic sector was not clearly articulated. A breakdown of the NIWRM Plan based on the 8i Model framework provides a summary of the current challenges in developing an IWRM. Some of the gaps within the water ecosystem include a poor funding situation; weak legal framework and enforcement, particularly in water pollution; necessary investment in targeted research; and the need for national policies to reflect contemporary demands of society in a fast changing economy.



3.3.5. Public Participatory Platform (PPP) & and Stakeholders Engagement

3.3.5.1. Existing PPPs of Government Sector

A government agency platform involves members of the community as `hands-on' and to be eyes and ears to assist government agencies responsible for combating activities that damage or pollute the environment. The platforms are operated by government agencies for the benefit of awareness programmes for the public, for example, the 'Off River Storage' (ORS) Downstream Reservoir in Kampung Hang Tuah, Kuala Selangor district, managed by Lembaga Air Selangor (LUAS). Another platform is the Rakan Alam Sekitar run by the Department of Environment under the Ministry of Environment and Water.

Table 1858. Available Public Participatory Platforms of Government Sector

SL. No.	GOVERNMENT
01.	Rakan Alam Sekitar
02.	Lembaga Kemajuan Pertanian Muda (MADA)
03.	Majlis Pengurusan Komuniti Kampung (MPKK) Kampung Sungai Jagung
04.	IWK Friends of River (Indah Water)
05.	Impact Malaysia (Rebranded from IM4U)
06.	Majlis Pelancaran Kempen Kesedaran Keselamatan Di Air 2018 (KPKT)
07.	Water Conservation Programme in Schools, Melaka
08.	Water Environment Partnership Asia(Japan)
09.	Smart Community, Perbadanan Putrajaya
10.	The Malaysian Water Association
11.	UN Water

Table 1869. Analysis of Public Participatory Platforms (Govt. sector)

No	Platforms	Functions
1	Rakan Alam Sekitar	 Appriximately 350,000 members of Rakan Alam Sekitar nationwide Initiated by the Ministry of Natural Resource and Environment (NRE) (currently under Ministry of Environment and Water) To involve the local community on hands-on activity and citizen science to help government agencies identify and reporting pollution cases to address environmental issues. Conducted many activities, competition and campaigns to raise public awareness Open to public
2	Lembaga Kemajuan Pertanian Muda (MADA)	Aims to improve living and income of farmers and develop the sector into a competitive economic entity of farmers' community in Muda's area
3	Majlis Pengurusan Komuniti Kampung (MPKK) Kampung Sungai Jagung	 The local community, farmers The farms are highly dependent on rains and rivers for water supply
4	IWK Friends of River (Indah Water)	 Cleaning up the river and planting some Ixora New trees. Engaged with key water agencies and local community Involved 21 rivers across the nation
5	Impact Malaysia (Rebranded from IM4U)	An initiative under Impact Malaysia Integrated that envisions a sustainable and measurable social impact ecosystem driven by youth to bring meaningful and lasting change in their communities works within a multistakeholder model
6	Majlis Pelancaran Kempen Kesedaran Keselamatan Di Air 2018 (KPKT)	 Activities: awareness (schools, hospitals), advocacy (MOHE: reviewing appropriate laws and enacting by-laws for enforcement) Safety in aerial and recreational bodies, capacity building
7	Water Conservation Programme in Schools, Melaka	 A community project that involves rainwater harvesting system installation in the school building located in Melaka for water conservation. Raises awareness on water resources protection and water conservation Involves schools in Melaka, UPM, Green Growth Asia Foundation, WWF-MY and UTEM
8	Water Environment Partnership Asia (Japan)	First Phase (developing a web-based information platform (WEPA database) for partner countries, Second Phase (knowledge sharing to reach solutions), and third phase (develop and implement wastewater management)
9	Smart Community, Perbadanan Putrajaya	 To connect with citizens and spread information, received feedback and suggestion through technologies Enabling the infrastructure to build up a smart community towards sustainability Providing opportunities for citizens to provide feedback and suggestions to address issues as well as develop new opportunities for themselves Provide opportunities for city residents to get a better education as well as to enrol in schools online Spread information and awareness through digital technologies
10	The Malaysian Water Association	 Promotes training in management in the water supply Provides advice and information on water supply and wastewater to the publics Publicise new technologies and promotes the use of appropriate technology in the water supply and wastewater industries Enhances the knowledge and skills of its member and promote awareness of water issues among the public
11	UN-Water	 Informs policies on sustainably-managed water and sanitation services, monitoring and reporting on key water trends and issues, and inspire actions (World Water Development Report)

3.3.5.2. PPPs including Roles of Media for IWRM

Table 187. Government's IWRM methods for capacity building

No.	Activity	Date	Medium	Collaboration Agencies		
Suruh	anjaya Perkhidmatan Air Negara (SPAN)	1		1 Igenetes		
1	NRW reduction campaign	Occasional	Newspaper (BH & NST)	-		
2	Water Conservation Campaign	Occasional	Jayerawara	Kerajaan Negeri Kedah RTM		
3	Clean Water Conservation Campaign	Occasional	Electronic media (RTM, TV1)			
4	Sludge Removal Campaign	Occasional	Video/Graphic (social media)	ML Studios		
5	Clean Water Conservation Campaign	Occasional	Electronic media (Bernama TV)	Bernama		
6	Sustain Environmental Conservation Campaign (Water)	Occasional	Billboard	-		
7	NRW Reduction Awareness Campaign	Occasional	Video/Graphic (social media)	ML Studios		
8	Clean Water Conservation Campaign	Occasional	Electronic media (TV Al Hijrah)	TV Al Hijrah		
9	Enforcement Activities (water theft)	Occasional	National Media	Pengurusan Air Selangor		
10	Enforcement Activities (water theft)	Occasional	National Media	Pengurusan Air Selangor		
11	Enforcement Activities (waterway pollution)	Occasional	National Media	LUAS & Air Selango		
12	Stop River Pollution Campaign	Occasional	Press (BH & NST)	-		
13	Campaign to Stop Scheduled Waste Disposal into Public Sewerage Channels	Occasional	Social media	-		
14	Product Use Campaign with Water Efficient Labels	Occasional	Social media	-		
15	Enforcement Activities (odor pollution)	Occasional	National Media	JAS & LUAS		
16	Enforcement Activities (waterway pollution)	Occasional	Social media	-		
17	Enforcement Activities (pollution of water resources)	Occasional	National Media	-		
18	Collaboration on SPAN with Mara TVET Students - Online	Occasional	Facebook	MARA		
19	OPS AIR RAYA (pollution of sewers and watercourses)	Occasional	Social media	-		
20	Enforcement Activities (water theft)	Occasional	National Media	Air Selangor Management		
21	Enforcement Activities (water theft)	Occasional	National Media	Air Selangor Management		
22	Talk about Water Pollution	Occasional	Electronic media (Bernama TV)	Bernama		
23	Enforcement Activities (water theft)	Occasional	Social media	RSAJ		
24	Malaysia Prihatin : Consumer Water Resources (interview)	Occasional	Electronic media (RTM, TV1)	RTM		
25	Enforcement Activities (water theft)	Occasional	Social media	SATU		
26	Enforcement Activities (water theft)	Occasional	Social media	SAINS		
27	Enforcement Activities (water theft)	Occasional	Social media	SAINS		
28	Enforcement Activities (water theft)	Occasional	National Media	Air Selangor Management		
29	Enforcement Activities (water theft)	Occasional	National Media	Air Selangor Management		
30	Water Conservation is our Responsibility	Occasional	Electronic media (RTM, TV1)	RTM		

No.	Activity	Date	Medium	Collaboration Agencies
31	Talk about the Implications of River Pollution	Occasional	Electronic media (Bernama TV)	Bernama
32	Video Campaign: Save Water	Occasional	Social media/ Electronic media	RTM
33	Video Campaign: The Impact of Climate Change	Occasional	Social media/ Electronic media	RTM
34	Environmental Conservation Discussion	Occasional	Webinar	
35	Video Campaign: Don't Contaminate Water Resources	Occasional	Social media/ Electronic media	RTM
36	Gotong-royong Community Water Pipe	Occasional	Social media	Kerajaan Negeri Kedah
37	Video Campaign: Water Treatment Process	Occasional	Social media/ Electronic media	RTM
38	Enforcement Activities (odor pollution)	Occasional	National Media	JAS, LUAS, IWK, MPS
39	Interview on Water Pollution	Occasional	Electronic media (RTM, TV1)	RTM
40	Radio Campaign - The Role of SPAN	Occasional	Manis FM	Manis FM
41	Prosecution Case Workshop to Certification Agency (Sewerage) under Section 20 & Section 45 of Act 655	Yearly		SPAN dan Operator Sewerage
42	Product Compliance Audit Training	Yearly		SPAN and related agencies
43	Enforcement Workshop Programme Under	Yearly		SPAN dan Operator
	Act 655 And Anti -Corruption Programme			Air dan Sewerage
Depar	tment of Environment	•	1	
1	22 April - Hari Bumi	Yearly	Physical/Online	
2	5 Jun – Hari Alam Sekitar Sedunia	Yearly	Physical/Online	
3	16 September – Hari Ozon Sedunia	Yearly	Physical/Online	
4	21 Oktober – Hari Alam Sekitar Negara	Yearly	Physical/Online	
5	Kem Kesedaran Alam Sekitar	Yearly	Physical/Online	
6	Program Rakan Alam Sekitar; f. Denai Sungai Kebangsaan g. Friend of River h. Aktiviti gotong royong di kawasan sungai i. River Rangers bersama NGO j. Rakan Saintis Sungai	Yearly	Physical/Online	
7	Anugerah Sekolah Lestari Anugerah Alam Sekitar Modul pengurusan / kepentingan sumber air	Yearly	Physical/Online	
8	Pameran bertemakan alam sekitar	Yearly	Physical/Online	
9	Pidato Alam Sekitar	Yearly	Physical/Online	
10	Anugerah Langkawi Kelestarian Alam Sekitar	Yearly	Physical/Online	
11	Pertandingan 3 Minit Tesis Alam Sekitar Bahasa Melayu	Yearly	Physical/Online	

3.3.6. Steps to Participate Effectively in PPPs

Stakeholders Engagement for IWRM

Five-step guide to stakeholder engagement was first developed in 2011 by Business for Social Responsibility (BSR, 2019), a USA based sustainable business organisation. In 2019, the landscape of digital communication, international agreements and investor expectations makes stakeholder engagement more important than ever. The digital and social media amplify voices of the public, including civil society organizations. International agreements such as the UN Guiding Principles and Sustainable Development Goals have been established and globally accepted. And investors are significantly more focused on company approaches to environmental, social, and governance (ESG) issues, which in turn necessitate consideration of all stakeholders, not just shareholders (BSR, 2019). Therefore, the following five steps guide for stakeholder's engagement (Figure 66) is very important for the success of any project, including the IWRM.

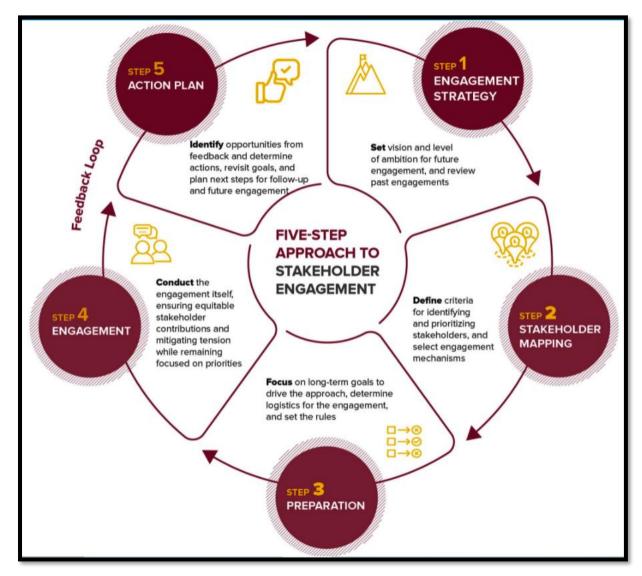


Figure 66. Five-Step approach of stakeholders engagement (BSR, 2019)

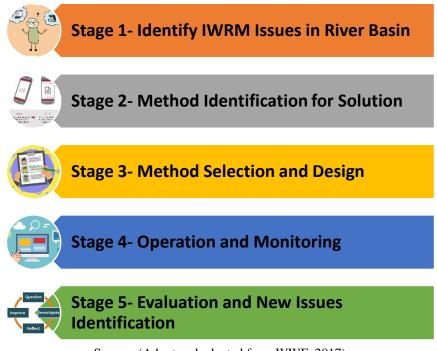
Five-Step Approach of Stakeholders Engagement

- **1. Engagement Strategy:** Set vision and level of ambition for future engagement, and review past engagements.
- **2. Stakeholder Mapping:** Define criteria for identifying and prioritising stakeholders, and select engagement mechanisms.
- **3. Preparation:** Focus on long-term goals to drive the approach, determine logistics for the engagement, and set the rules.
- **4. Engagement:** Conduct the engagement itself, ensuring equitable stakeholder contribution and mitigating tension while remaining focused on priorities.
- **5. Action Plan:** Identify opportunities from feedback and determine actions, revisit goals, and plan next steps for follow-up and future engagement.

4. Advance Level 1- Advocator to Become Trainer

4.1. Stakeholders' Engagement in Entire Stages of IWRM

Stakeholders' engagement in each stage of IWRM provides supporting tools to help the user gather and organise information to move through the IWRM cycle and make informed decisions about the selection and use of IWRM methods (Figure 67). Each stage within the IWRM process involves multiple steps, including process steps. The AACB WST Training Module is not designed as a decision tree or decision support system (DSS) with specific quantifiable outcomes. Instead, it details key steps and information requirements users should study and consider when selecting appropriate methods for a given IWRM project.



Source: (Adopt and adapted from WWF, 2017)
Figure 67. Stakeholders' engagement in the entire stages of IWRM

4.1.1. Stage 1- Identify IWRM Issues in River Basin

Step 1- Understand the river basin and social issues

The enforcement official/ local government should conduct a contextual analysis to understand key foundational issues in the river basin of interest. A contextual analysis should enable the officials to understand key issues, including the primary types of point and non-point sources of pollution, the physical characteristics of the watershed; local weather and climate trends; the social characteristics of the river basin, including gender-related issues; the potential for stakeholder's engagement; and the relevant actors. In addition, the officials should develop an understanding of key institutional, governance, financial and political issues that are relevant to IWRM (WWF, 2017).

Step 2- Understand the natural and man-made risks

The officials should develop an understanding of the river basin's primary types of natural and man-made disasters. This AACB WST training module suggests ways to interpret critical parameters related to hazard mapping and analysis, vulnerability and capacity analysis, institutional capacity analysis and managing climate uncertainty. This training module does

not provide instructions on conducting full risk assessments, as multiple resources exist to support conducting or commissioning risk and vulnerability assessments. Instead, this AACB WST Training Module provides discussion on understanding risk assessments to assist with choosing appropriate methods to manage the risk of IWRM. This training module does not include the discussion regarding the costs of risk assessments (WWF, 2017).

Process Step- Set preliminary IWRM risk management objectives

Before identifying the potential methods for IWRM, officials should decide on the preliminary objectives. Objectives refer to the specific and measurable goals for IWRM, for example, "reducing inundation of area A in a 50-year flood from river B."

Officials should set IWRM objectives collaboratively and with the participation of multiple stakeholders. Usually, IWRM objectives may fall into three categories based on the type of intervention:

- 1. Reducing and managing the point and non-point sources of pollution in the river basin.
- 2. Improving flood drainage and increasing flood protection in a floodplain.
- 3. Improving adaptation and preparedness to disaster risks in a given river basin.

The scale of intervention will depend to some extent on the objectives and may include activities at one or more scales including-

- national or transnational
- watershed
- floodplain
- community
- household levels

Disaster risks, watershed characteristics, and vulnerabilities and capacities (social/institutional) identified in the risk and context analyses should help determine the IWRM objectives. However, in practice, objectives are often influenced by ongoing discussions and negotiations amongst stakeholders based on broad economic and political factors and institutional norms. It is beyond the scope of this AACB WST Training Module to provide specific guidance for setting the preliminary objectives, as that would potentially oversimplify a complex process. The AACB WST Training Module also assumes that the officials will follow established principles of public participation, social inclusion and democratic governance (WWF, 2017).

4.1.2. Stage 2- Method Identification for Solution

Once the preliminary objectives have been set, officials/ users should identify possible methods for risk related to IWRM. At this stage, users need to understand that several different combinations of methods can be used to achieve the same objectives. Identifying appropriate methods for a given set of objectives relies on the findings from Stage 1, which is often revisited as issues about context and risk arise. Once potential methods are identified, they should be analysed for social, political, environmental, economic and financial suitability in the local context (WWF, 2017).

The main steps in this stage are the following:

Step 1- Identify appropriate methods

Identify methods related to water risk management that broadly fit the preliminary objectives and the context (WWF, 2017). The IWRM methods, discussed earlier in this training module, selected should meet three basic criteria:

- 1. Appropriate for the types of interventions considered in the preliminary objectives.
- 2. Applicable to the scales of interventions considered in the preliminary objectives.
- 3. Suitable for the IWRM problems identified in the risk analysis and appropriate for the intended location of the river basin.

Step 2- Compare the methods

After appropriate methods have been selected based on the three criteria, the officials/ users can begin comparing the methods, based on economic, operational, social and environmental advantages and disadvantages and structural method issues. Whenever possible, the training module users are encouraged to acquire more in-depth information about these issues. Comparisons will help users refine their list of methods and eliminate those with more disadvantages than advantages. (For example, a method that may have significant economic and operational advantages may have unacceptable environmental disadvantages.) Therefore, the AACB WST Training Module recommends the user comprehensively consider any trade-offs during the comparison and incorporate participatory decision-making with a multidisciplinary team (WWF, 2017).

Process Step-Review and revise IWRM risk management objectives

The officials/ users should revisit Stage 1 after completing the method comparisons and creating a shortlist of appropriate IWRM methods. At this point, the AACB WST Training Module Framework calls for revisiting preliminary objectives either to adjust them so they are consistent with the methods or to adjust methods so they are consistent with the risks related to IWRM objectives. Preliminary objectives are set according to the risk and local context; however, factors such as cost, operational maintenance requirements, government regulations and social norms can limit the practicality of meeting the set objectives. The method identification stage may also identify a need for further data from the risk and contextual analysis, which in turn will affect the determination of specific objectives. Therefore, reviewing and, if necessary, revisiting the objectives after identification methods are important steps in the overall process. The main steps in the next stage (methods selection and design) include cost estimation and feasibility studies, which require expert input and may incur significant costs. Therefore, carefully revisiting the objectives to limit the number of short-listed methods is an important cost optimisation measure (WWF, 2017).

4.1.3. Stage 3- Method Selection and Design

After the IWRM objectives are finalized and the potential methods are short-listed, officials/ users can select a final combination of IWRM methods, and conduct feasibility studies and detailed project designs (WWF, 2017).

The main steps of this stage are:

Step 1- Consider preliminary specifications, management issues and cost estimates

Users should prepare basic specifications (e.g., non-structural capacity building via training, campaign and as such) and approximate cost estimates for each short-listed method. "Basic specifications" does not mean detailed designs or precise estimates. It is important that users clearly understand the relevant issues related to each short-listed method (design, implementation, maintenance and closure). To comprehensively understand the design, cost and management implications and eliminate methods that may pose problems within the given context, the training module user should seek advice from professionals with expertise in specific methods (WWF, 2017).

Step 2- Combine the methods

The importance of selecting a diverse combination of IWRM risk management methods is emphasized throughout this training module. Methods combined in ways that complement each other will be most successful in achieving IWRM objectives along with social and environmental co-benefits. The AACB WST Training Module recommends the user seek advice from experts in these methods to combine and locate them strategically within the river basin to meet IWRM objectives (WWF, 2017).

Step 3- Review of the selected methods

Once a final set of methods has been selected, users should review them to ensure they meet the technical, environmental and social criteria emphasised in the training module. The AACB WST Training Module is designed to help users review the selection (WWF, 2017).

Process Step- Conduct feasibility studies, environmental assessments and review designs

A feasibility study is an important step in any project and is essential to establishing the technical and financial feasibility of the selected IWRM methods. As appropriate, users should select a qualified team of professionals to conduct feasibility studies on the IWRM project. Ideally, the team's expertise should cover the full range of selected methods under consideration hard, soft and non-structural. Typically, an Environmental Impact Assessment (EIA) or Initial Environmental Examination (IEE) is also required in any IWRM risk management project. In most countries, the law requires an EIA or IEE before undertaking a large or medium-scale project, and procedures are well established by statutory guidelines and professional standards. Regardless of statutory requirements, the AACB WST module recommends conducting an environmental impact study for both development and disaster management situations. As with feasibility studies, qualified professionals should conduct an EIA or an IEE based on the method selected. Feasibility studies and environmental impact studies should be carried out with maximum stakeholder participation. Mast IWRM risk management methods should be carefully designed and planned by a qualified professional, regardless of the type conventional, natural and nature-based or non-structural. Managers should carefully select professionals for the technical design. The design of most methods will require multidisciplinary professional input (e.g. engineer, ecologist, social scientist, community organiser). Design principles for each method, however, are very specific to the established science of that method and the local context. Therefore, uses should obtain detailed technical designs for each method selected, including operational and monitoring plans by appropriate professionals (WWF, 2017).

4.1.4. Stage 4- Operation and Monitoring

IWRM project implementation includes appropriate methods in collaboration with stakeholders. Officials/ users must ensure that when a project is implemented, it is properly operated (controlled and maintained). It is also important to regularly monitor the project against operational, safety, social, environmental and financial indicators. Data collected by monitoring should be examined to detect any issues (especially safety and environmental issues) that need immediate remedial action before it is recorded and archived for periodic evaluation (WWF, 2017).

Each method has specific tasks related to implementation, operation, maintenance and monitoring. Generally, these tasks are completed or supervised by qualified professionals or trained staff and volunteers. Therefore, the AACB WST Training Module does not go into details of implementation, operation or monitoring for any method. The AACB WST Training Module does; however, provide instruction for developing basic monitoring and operational plans for the overall IWRM (WWF, 2017).

Step 1- Develop detailed operational and monitoring plans

The AACB WST Training Module recommends that users develop operation and monitoring plans during the design stage. These plans are essential for the effective operation and maintenance of the IWRM project and are helpful in the evaluation stage. AACB WST Training Module helps uses' plan for the key operational requirements of the selected methods. It is important to identify, document, and allocate resources and finances required to operate each method. These needs encompass materials, equipment, human resources, documentation and other logistical needs. Having this information up-front will help the user plan operational procedures, maintenance protocols and regulatory standing orders (piling of dams, when to use flood warnings) (WWF, 2017).

Process Step- Prepare evaluations

The user should regularly review operation and monitoring plan reports and make required adjustments (WWF, 2017). The user also should prepare a plan, including terms of reference, for periodic evaluation by an independent evaluation team.

4.1.5. Stage 5- Evaluation and New Issues Identification

Step 1- Periodically evaluate the method and whole IWRM management process

A periodic evaluation schedule should be decided during the design stage. Evaluation is not the same as monitoring. Monitoring is done more frequently to consistently record the key IWRM project indicators. Evaluation involves longer intervals and is used to interpret monitoring data and understand the patterns of IWRM project outcomes (WWF, 2017).

Typically, evaluations are designed to help managers-

- Assess the effectiveness, efficiency, safety and social-environmental acceptability of the IWRM project as a whole and each method separately
- Highlight new issues (such as social, environmental, and climatic issues), threats and opportunities as the IWRM project evolves
- Provide the necessary inputs for IWRM project revision and planning for the next cycle

Evaluations can be conducted in fixed periods (e.g. five-year reviews) or when external factors (e.g. population change, new planning regimens, climate changes) necessitate changes to the project operations or objectives. The AACB WST Training Module provides basic guidelines for a project evaluation that can be conducted as an initial step by the officials/ users. Evaluation is a participatory process that should be completed with input from all staff, stakeholders and communities connected to the project. If the evaluation indicates that the objectives are met and the condition/ operation of individual methods is appropriate, and there are no major shifts in watershed characteristics or climate patterns, the user may decide to continue with the project as it is for the next period. In most projects, however, the evaluation will indicate that changes or updates are required for the project to continue (WWF, 2017).

Process Step- Evaluate with experts and proceed to closure or revise the process for new issues

If some notable issues are identified regarding outcomes, conditions or context of an IWRM risk management project, the users should consult a team of experts to get initial advice on what kinds of changes are needed (WWF, 2017). Based on this review process, users can decide which methods should be upgraded or expanded and which can be downsized, decommissioned or discontinued. Sometimes, based on the evaluation outcomes, the user may decide to dose the entire project. The AACB WST Training Module does not discuss how these decisions should be made, as they are context-specific and subject to political and economic factors. However, if an IWRM project is discontinued, the user should go back to the beginning of the stakeholder engagement in all the stages of IWRM and start the planning process over from the analysis stage.

Use of available Public Participatory Platforms to engage stakeholders in IWRM

Local authority needs a proper scientific knowledge hub for the effective decision-making processes for integrated water resources management in Malaysia (Figure 68). Therefore, the local government requires better coordination with the stakeholders to ensure the quality control and quality assurance for the better monitoring of stakeholders, as well as managing water quality and quantity.

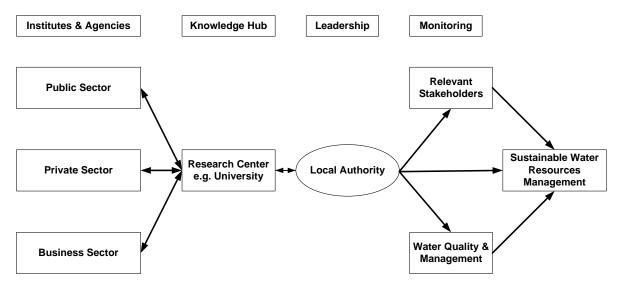


Figure 68. Leadership roles of Local Authority to engage stakeholders in water resources management (Mokhtar et al., 2018)

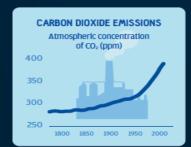
4.2. Planetary and Environmental Health

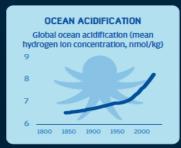
The Rockefeller Foundation-Lancet Commission on Planetary Health recognises that human health and the health of our planet are inextricably linked, and that our civilisation depends on human health, flourishing natural systems, and the wise stewardship of natural resources. With natural systems being degraded to an extent unprecedented in human history, both our health and that of our planet are in peril. With this in mind, The Rockefeller Foundation and UNFCCC secretariat launched a new, three-year project that will shine a light on solutions to balance the need for both human health and a healthy planet starting in 2017 (UNFCCC, 2021).

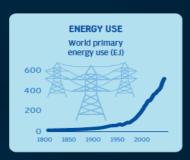


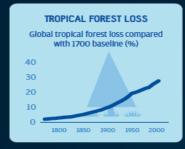


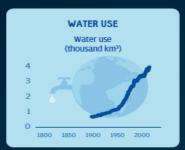
BUT TO ACHIEVE THIS WE'VE EXPLOITED THE PLANET AT AN UNPRECEDENTED RATE













The period of environmental changes induced by human exploitation of the planet defines a new geological era: the Anthropocene epoch



DAMAGING THE PLANET DAMAGES HUMAN HEALTH











These environmental threats could also exacerbate each other

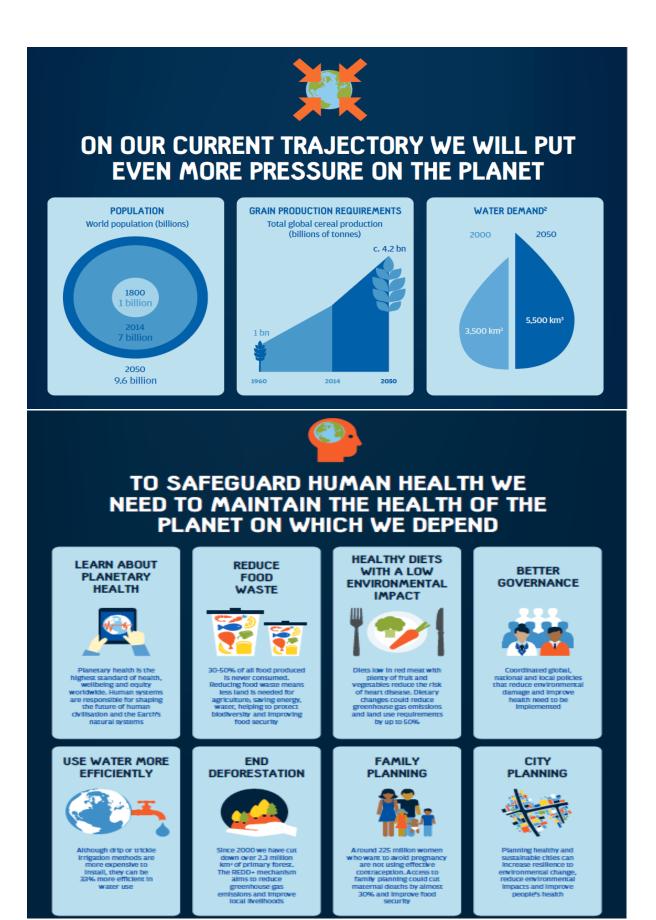


Figure 69. Understanding planetary health will also contribute in total ecosystem management including water (The Lancet, 2015)

4.2.1. Momentum for Change: Planetary Health

Momentum for Change: Planetary Health will recognize and showcase novel solutions by communities, cities, companies, NGOs and other institutions that balance the need for healthy communities with stewardship of natural ecosystems. The Paris Climate Change Agreement explicitly links climate action with a healthier environment – from cleaner air and reduced risks of extreme heatwaves to keeping in check the spread of diseases.

One well-known impact of human behaviour is the changing climate, which is altering the pattern of diseases, mortality, human settlements, food, water, and sanitation. Climate change brings increasing temperatures, rising seas, and more frequent incidence of severe storms. Known human impacts include flooding that can increase risks of water-related illnesses as well as vector-borne illnesses; an impact on food production – both in terms of increased drought cycles and diminished micronutrients in staple crops; and the pollutants that are tied to carbon emissions (and climate change) are also detrimental to human health. Today, there is greater mortality globally due to air pollution than because of HIV, malaria, and tuberculosis combined.

Planetary health is a new field, and one that needs ideas and solutions that span multiple sectors and disciplines to guide the creative stewardship of our planet to protect our own health. Momentum for Change: Planetary Health will show how communities are creating new ways use the planet's resources wisely to protect their health – ways that can serve as a model for others.

 $\label{lem:decomposition} Details \ about \ Momentum \ for \ Change: \ Planetary \ Health \ at \ \ \underline{https://unfccc.int/climate-action/momentum-for-change/planetary-health}$

4.2.2. National Environmental Health Action Plan Malaysia 2012 (NEHAP)



WHAT IS NEHAP?

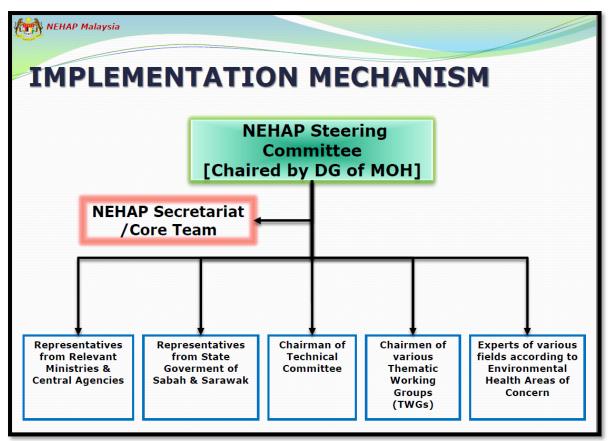
- NEHAP represents a comprehensive, holistic and intersectoral way of planning and implementing environmental health action at the national level.
 - Involves the processes of planning, developing, adopting and implementing environmental health actions in a holistic and comprehensive manner that requires multi-disciplinary and inter-sectoral collaboration at the national level.
 - > NEHAP presents strategies on how to improve environmental health within the country and defines the roles and responsibilities of various stakeholders.

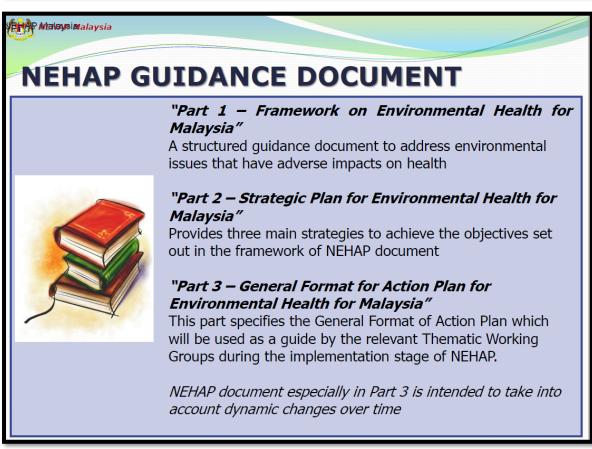


OBJECTIVES OF NEHAP

- To develop and maintain human health and sustainable development through the management of environmental health with a systematic and holistic manner in the country.
- To strengthen collaboration and cooperation between various sectors for effective use of resources in improving human health and sustainable development.

Source: (MOH, 2013)





Source: (MOH, 2013)

4.2.3. Environmental Performance Index (EPI)

The 2020 Environmental Performance Index (EPI) provides a data-driven summary of the state of sustainability around the world. Using 32 performance indicators across 11 issue categories, the EPI ranks 180 countries on environmental health and ecosystem vitality. These indicators provide a gauge at a national scale of how close countries are to established environmental policy targets. The EPI offers a scorecard that highlights leaders and laggards in environmental performance and provides practical guidance for countries that aspire to move towards a sustainable future. The metrics on which the 2020 rankings are based come from a variety of sources and represent the most recent published data, often from 2017 or 2018. Therefore, the analysis does not reflect recent developments, including the dramatic drop in air pollution in 2020 in the wake of the COVID-19 pandemic or the greenhouse gas emissions from the extensive Amazonian fires in 2019.

These indicators provide a way to spot problems, set targets, track trends, understand outcomes, and identify best policy practices. Good data and fact-based analysis can also help government officials refine their policy agendas, facilitate communications with key stakeholders, and maximise the return on environmental investments. The EPI offers a powerful policy tool in support of efforts to meet the targets of the UN Sustainable Development Goals and to move society toward a sustainable future.

Overall EPI rankings indicate which countries are best addressing the environmental challenges that every nation faces. Going beyond the aggregate scores and drilling down into the data to analyze performance by issue category, policy objective, peer group, and country offers even greater value for policymakers. This granular view and comparative perspective can assist in understanding the determinants of environmental progress and in refining policy choices (Wendling et al., 2020).

For the 2020 EPI, 32 indicators of environmental performance (Figure 70) for 180 countries have been assembled (Figure 71). The data come from trusted third-party sources like international governing bodies, nongovernmental organisations, and academic research centres.



Note: The framework organizes 32 indicators into 11 issue categories and two policy objectives, with weights shown at each level as a percentage of the total score.

Figure 70. The 2020 EPI Framework (Wendling et al., 2020)

Table 201. Environmental Performance Index by Yale University amongst 180 Countries

Year	Global & Regional Rank (Score)	Highest Rank (Score)
2020	Malaysia ranked 68 th (47.9) & 6 th in Asia-Pacific.	Denmark ranked 1 st (82.5)
2018	Malaysia ranked 75 th (59.22) & 7 th in Asia-Pacific.	Switzerland ranked 1 st (87.42)
2016	Malaysia ranked 63 rd (74.23)	Finland ranked 1st (90.68)
2014	Malaysia ranked 51 st (59.31)	Switzerland ranked 1 st (87.67)

RANK	COUNTRY	SCO RE	REG	RANK	COUNTRY	SCORE	REG	RANK	COUNTRY	SCORE	REG
1	Denmark	825	-1	61	Uruguay	49.1	9	120	Samoa	37.3	12
2	Luxembourg	823	2	62	Albania	49.0	16	122	Qatar	37.1	15
3	Switzerland	81.5	3	63	Antigua and Barbuda	49.5	10	123	Zimbabwe	37.0	11
4	United Kingdom	81.3	4	64	Cuba	48.4	11	124	Central African Republic	36.9	12
5	France	80.0	- 5		St. Vincent and Grenadines	48.4	11	125	Dem. Rep. Congo	36.4	13
6	Austria	79.6	6	66	Jamaica	49.2	13	126	Guyana	35.9	30
7	Finland	78.9	7	67	Iran	48.0	- 6	127	Maldives	35.6	3
8	Sweden	78.7	8	68	Malaysia	47.9	6		Uganda	35.6	14
9	Norway	77.7	9	69	Trinidad and Tobago	47.5	14	129	Timor-Leste	35.3	14
10	Germany	77.2	10	70	Panama	47.3	15	130	Laos	34.8	15
11	Netherlands	75.3	111	71	Tunisia	46.7	7		Sudan	34.8	16
12	Japan	75.1	1	72	Azerbaijan	46.5	5	132	Kernya	34.7	15
13	Australia	74.9	12	73	Paraguay	46.4	16		Zambia	34.7	15
14	Spain	743	13	74	Dominican Republic	46.3	17	134	Ethiopia	34.4	17
15	Belgium	73.3	14		Montenegro	46.3	17		Fiji	34.4	16
16	Ireland	72.8	15	76	Gabon	45.8	2	136	Mozambique	33.9	18
17	Iceland	72.3	16	77	Barbados	45.6	18	137	Eswatini	33.8	19
18	Slovenia	720	-1	78	Bosnia and Herzegovina	45.4	18		Rwanda	33.8	19
19	New Zealand	71.3	17		Lebanon	45.4	8	139	Cambodia	33.6	17
20	Canada	710	18		Thailand	45.4	7		Cameroon	33.6	21
	Czech Republic	710	2	81	Suriname	45.2	19	141	Viet Nam	33.4	18
	Italy	710	18	82	Mauritius	45.1	3	142	Pakistan	33.1	4
23	Malta	70.7	20		Tonga	45.1	8	143	Micronesia	33.0	19
24	United States of America	69.3	21	84	Algeria	44.8	9	144	Cabo Verde	328	22
25	Greece	69.1	3	85	Kazakhstan	44.7	6	145	Nepal	327	5
26	Slovakia	683	4	86	Dominica	44.6	20	146	Papua New Guinea	32.4	20
27	Portugal	67.0	22	87	Moldova	44.4	7	147	Mongolia	32.2	21
28	South Korea	66.5	2	88	Bolivia	443	21	148	Comoros	32.1	23
29	Israel	65.8	1		Uzbekistan	443	8	149	Guatemala	318	31
30	Estonia	65.3	5	90	Peru	44.0	22	150	Tanzania	31.1	24
31	Cyprus	64.8	6	,,,	Saudi Arabia	44.0	10	151	Nigeria	31.0	25
32	Romania	64.7	7	92	Turkmenistan	43.9	9	152	Marshall Islands	30.8	22
33	Hungary	63.7	8	93	Bahamas	43.5	23	132	Niger	30.8	26
34	Croatia	63.1	9	94	Egypt	43.3	23		Republic of Congo	30.8	26
35	Lithuania	62.9	10	95	B Salvador	43.1	24	155		30.7	28
	Latvia			75	Grenada			156	Senegal Eritrea		
36		61.6 60.9	11		Grenada Saint Lucia	43.1	24			30.4	29
37 38	Poland	58.2	12		South Africa	43.1 43.1	24	157	Benin	30.0 29.7	30
	Seychelles			99			4	158	Angola		31
39	Singapore	5B.1	3		Turkey	42.6	19	159	Togo	29.5	32
40	Taiwan	57.2	4	100	Morocco	423	12	160	Mali	29.4	33
41	Bulgaria	57.0	13	101	Belize	41.9	27	161	Guinea-Bissau	29.1	34
42	United Arab Emirates	55.6	2	102	Georgia	41.3	10	162	Bangladesh	29.0	6
43	North Macedonia	55.4	14	103	Botswana	40.4	5	163	Vanuatu	28.9	23
44	Chile	55.3	1	104	Namibia	40.2	6	164	Djibouti	28.1	35
45	Serbia	55.2	15	105	Kyrgyzstan	39.8	11	165	Lesotho	28.0	36
46	Brunei Darussalam	54.8	5	106	Iraq	39.5	13	166	Gambia	27.9	37
47	Kuwait	53.6	3	107	Bhutan	39.3	1	167	Mauritania	27.7	38
48	Jordan	53.4	- 4	108	Nicaragua	39.2	28	16B	Ghana	27.6	39
49	Belarus	53.0	1	109	Sri Lanka	39.0	2		India	27.6	7
50	Colombia	52.9	2	110	Oman	38.5	14	170	Burundi	27.0	40
51	Mexico	52.6	3	111	Philippines	38.4	9		Haiti	27.0	32
52	Costa Rica	52.5	4	112	Burkina Faso	38.3	7	172	Chad	26.7	41
53	Armenia	523	2		Malawi	38.3	7		Solomon Islands	26.7	24
54	Argentina	52.2	5	114	Tajikistan	38.2	12	174	Madagascar	26.5	42
55	Brazil	51.2	6	115	Equatorial Guinea	38.1	9	175	Guinea	26.4	43
56	Bahrain	51.0	- 5	116	Honduras	37.8	29	176	Côte d'Ivoire	25.8	44
	Ecuador	51.0	7		Indonesia	37.8	10	177	Sierra Leone	25.7	45
58	Russia	50.5	3	118	Kiribati	37.7	11	178	Afghanistan	25.5	8
59	Venezuela	50.3	8	119	São Tomé and Príncipe	37.6	10	179	Myanmar	25.1	25
60	Ukraine	49.5	4	120	China	37.3	12	180	Liberia	22.6	46
	Asia-Pacific Eastern Europe			Former Sovi Global West	_	Greater M	iddle Eas rica & Ca		Southern Asia Sub-Saharan Afi		

Figure 71. The 2020 EPI Country Rankings (Wendling et al., 2020)

4.2.4. Environmental Democracy

In 2008, Association of Chartered Certified Accountants launched ACCA Malaysia Sustainability Reporting Awards (MaSRA) to make the public understand 'greenwash' and 'cherry-picking' from true sustainability efforts (MREM, 2009). Malaysia 2nd worst country in terms of environmental democracy (Figure 72), according to the latest environmental democracy report by World Resources Institute (EcoWatch, 2015).

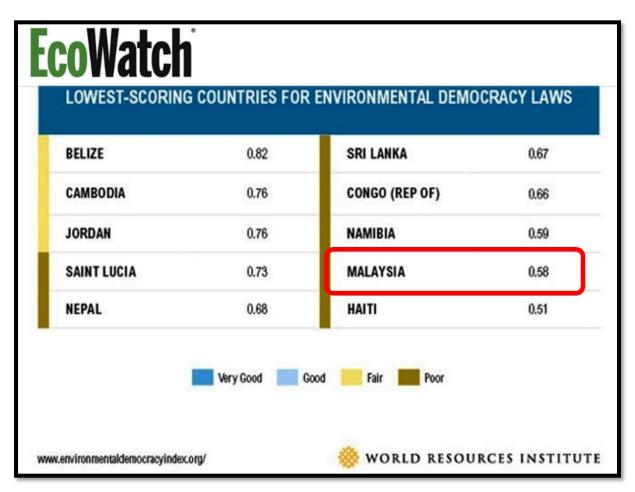


Figure 72. Environmental Democracy Index 2015 by World Resources Institute (EcoWatch, 2015)

Transparency, Participation and Access to Justice are the main three pillars of Environmental Democracy Index (EDI) (Figure 73).

EDI consists of 75 legal indicators that are concerned with the development and implementation of legislation. Besides the legal indicators, EDI includes 24 supplemental indicators that assess whether there is evidence that environmental democracy is being implemented in practice. The EDI legal indicators assess laws, constitutions, regulations and other legally binding, enforceable rules at the national level. Nearly every indicator is accompanied by a guidance note.

Practice Indicator Scoring

The practice indicators are scored qualitatively on a three-point scale:

- 1. Yes (practice is observed in full)
- 2. Limited (practice is observed irregularly or partially)
- 3. No (no observation of practice)

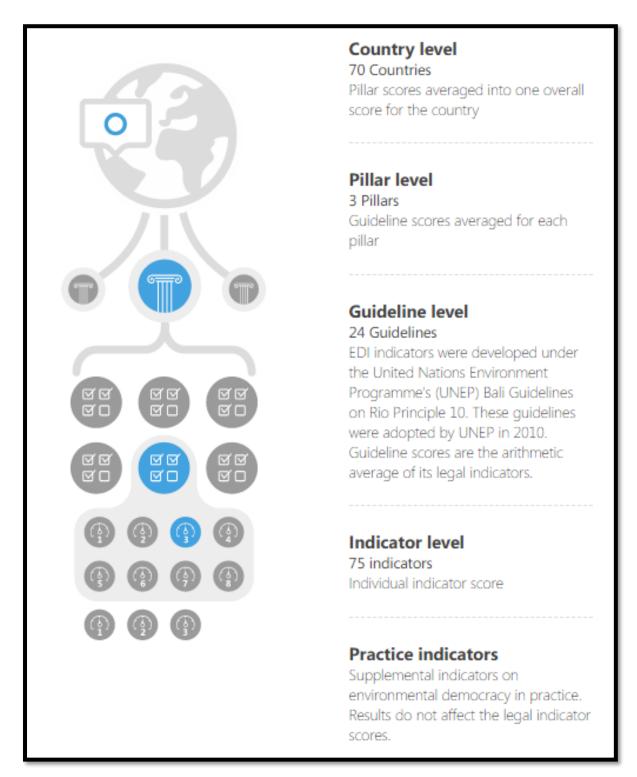
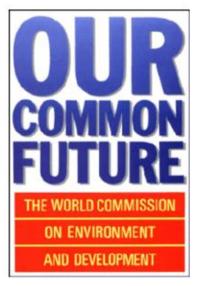


Figure 73. Indicators of environmental democracy index (World Resources Institute, 2015)

4.2.5. Sustainable Development

Sustainable Development



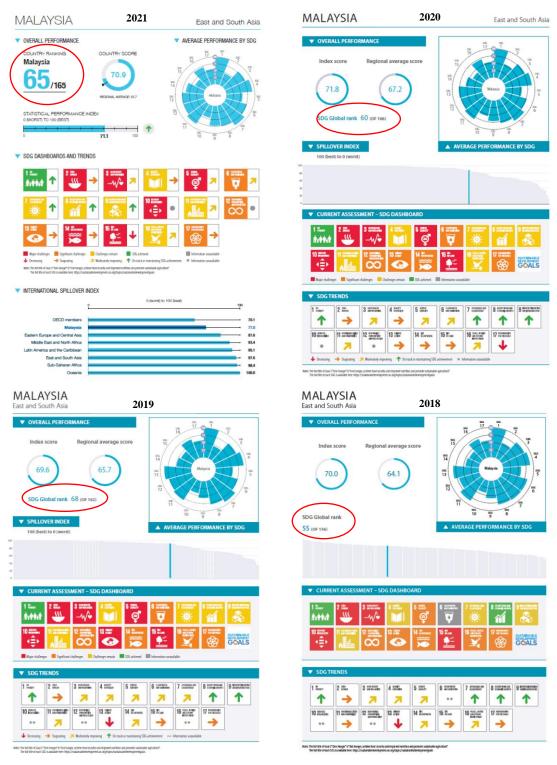
Report of the World Commission on Environment and Development: Our Common Future defines-

"Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Source: (WCED, 1987)



4.2.5.1. SDG Scorecard of Malaysia 2018-2021



Source: (Sachs et al., 2021, 2020, 2019, 2018)

4.2.5.2. SDG Ranking of the ASEAN Countries from 2019-2021

SDG Ranking of ASEAN Countries (2021)

- 1. Thailand: SDG Global rank is 43 out of 165 countries (Index score is 74.2).
- 2. Vietnam: SDG Global rank is 51 out of 165 countries (Index score is 72.8).
- 3. Malaysia: SDG Global rank is 65 out of 165 countries (Index score is 70.9).
- 4. Singapore: SDG Global rank is 76 out of 165 countries (Index score is 69.9).
- 5. Brunei Darussalam: SDG Global rank is 84 out of 165 countries (Index score is 68.3).
- 6. Philippines: SDG Global rank is 97 out of 165 countries (Index score is 66.3).
- 7. Myanmar: SDG Global rank is 101 out of 166 countries (Index score is 64.9).
- 8. Cambodia: SDG Global rank is 102 out of 165 countries (Index score is 64.5).
- 9. Indonesia: SDG Global rank is 103 out of 165 countries (Index score is 64.5).
- Lao PDR: SDG Global rank is 110 out of 165 countries (Index score is 63.0).

Source: (Sachs et al., 2021)

SDG Ranking of ASEAN Countries (2020)

- 1. Thailand: SDG Global rank is 41 out of 166 countries (Index score is 74.5).
- 2. Vietnam: SDG Global rank is 49 out of 166 countries (Index score is 73.8).
- 3. Malaysia: SDG Global rank is 60 out of 166 countries (Index score is 71.8).
- 4. Brunei Darussalam: SDG Global rank is 88 out of 166 countries (Index score is 68.2).
- 5. Singapore: SDG Global rank is 93 out of 166 countries (Index score is 67.0).
- 6. Philippines: SDG Global rank is 99 out of 166 countries (Index score is 65.5).
- 7. Indonesia: SDG Global rank is 101 out of 166 countries (Index score is 65.3).
- 8. Myanmar: SDG Global rank is 104 out of 166 countries (Index score is 64.6).
- 9. Lao PDR: SDG Global rank is 106 out of 166 countries (Index score is 64.4).
- 10. Cambodia: SDG Global rank is 116 out of 166 countries (Index score is 62.1).

Source: (Sachs et a., 2020)

SDG Ranking of ASEAN Countries (2019)

- 1. Thailand: SDG Global rank is 40 out of 162 countries (Index score is 73.0).
- 2. Vietnam: SDG Global rank is 54 out of 162 countries (Index score is 71.1).
- 3. Singapore: SDG Global rank is 66 out of 162 countries (Index score is 69.6).
- 4. Malaysia: SDG Global rank is 68 out of 162 countries (Index score is 69.6).
- 5. Philippines: SDG Global rank is 97 out of 162 countries (Index score is 64.9).
- 6. Indonesia: SDG Global rank is 102 out of 162 countries (Index score is 64.2).
- 7. Myanmar: SDG Global rank is 110 out of 162 countries (Index score is 62.2).
- 8. Lao PDR: SDG Global rank is 111 out of 162 countries (Index score is 62.0).
- 9. Cambodia: SDG Global rank is 112 out of 162 countries (Index score is 61.8).
- 10. Brunei Darussalam: No available data.

Source: (Sachs et a., 2019)

4.3. Water Connecting Across the SDGs

There are several examples of how the global community has come together to reach consensus on values and principles regarding water that reflect a world ethic or 'culture'. For example, the rights to safe and clean drinking water and sanitation have been recognised to be fundamental to the realization of all human rights and to human dignity (UNESCO, 2021). The Special Rapporteur on the human rights to safe drinking water and sanitation of the United Nations has documented at the intergovernmental level how human rights are directly impacted by ill-considered water management projects, water uses or activities deteriorating water around the world. The Special Rapporteur also stressed the need to respect local cultural values and the free, prior and informed consent of indigenous groups. The 2030 Agenda for Sustainable Development, defining the Sustainable Development Goals (SDGs), is perhaps the broadest and most integrated international framework. It recognises the importance of water in its SDG 6 ("Ensure availability and sustainable management of water and sanitation for all"), with the various dimensions of the values of water reflected through its six targets covering drinking water, sanitation, water quality, water use efficiency, Integrated Water Resources Management (IWRM), and ecosystems, as well as cooperation and capacity-building, and the participation of local communities in improving water and sanitation management. Water also has transversal value across all the SDGs (Figure 74).

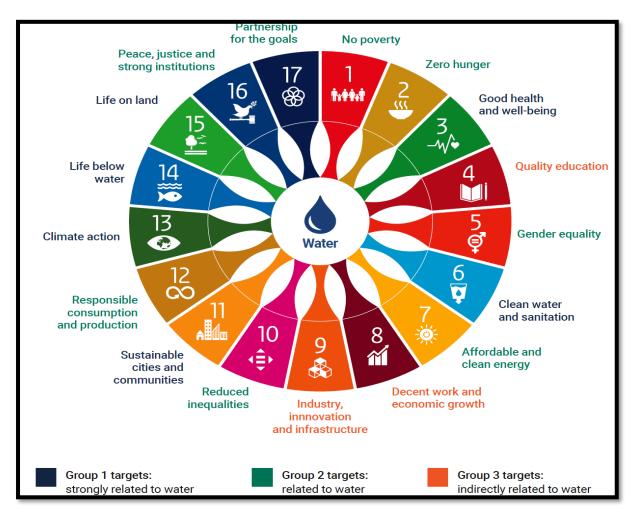


Figure 74. Water connecting across the SDGs (UNESCO, 2021)



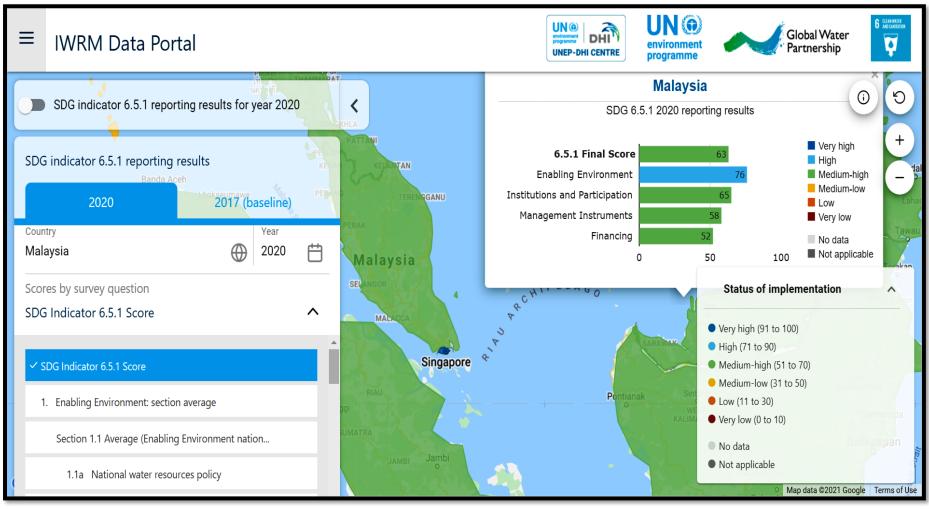
ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL

SDG 6- TARGETS AND INDICATORS

	bbo v mindens mid midiemons
6 CLEAN WATER AND SANETATION	Target 6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all
	Indicators •
	6.1.1 Proportion of population using safely managed drinking water services
6 GEAN WICES	Target 6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
	Indicators •
	6.2.1 Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water
6 CLEAN WHITE AND LANGUAGE	Target 6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
	Indicators •
	6.3.1 Proportion of wastewater safely treated 6.3.2 Proportion of bodies of water with good ambient water quality
6 CLIAN WHITE AND LANGES	Target 6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity
	6.4.1 Change in water-use efficiency over time 6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources
6 GLANITATER AND SANITATION	Target 6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate
	Indicators -
	6.5.1 Degree of integrated water resources management implementation (0-100) 6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation
6 CLEANAGE AND SAMEATION	Target 6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
	Indicators -
	6.6.1 Change in the extent of water-related ecosystems over time
6 GLANNATER AND LANGLAGEN	Target 6.a By 2030, expand international cooperation and capacity-building support to developing countries in water and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies
	Indicators —
	6.a.1 Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan
6 BELANKSTER AND LANGLATION	Target 6.b Support and strengthen the participation of local communities in improving water and sanitation management
	Indicators -
	6.b.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management

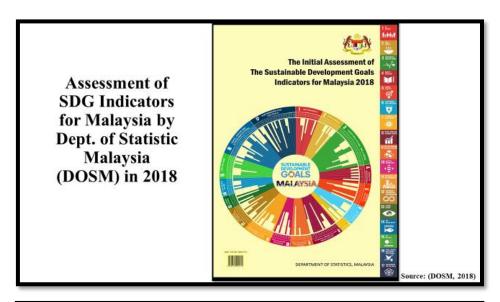
Source: (UNDESA, 2021)

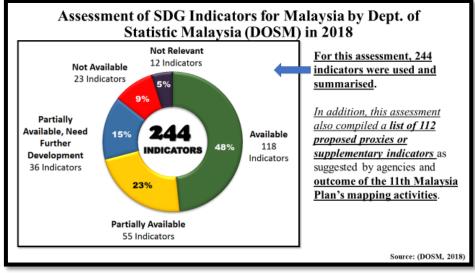
4.3.1. Degree of Integrated Water Resources Management (IWRM) Implementation in Malaysia

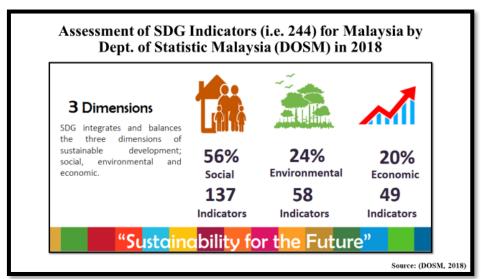


Source: (UNEP, 2021)

4.3.2. Sustainable Development Goals Indicator by Dept. of Statistics, Malaysia







4.3.3. 11th to 15th Malaysia Plan

Institutional Mechanisms for SDG Implementation

At the apex of the SDG governance structure is the National SDG Council, chaired by the Prime Minister of Malaysia. This Council plans and monitors the SDG implementation. The Council is supported by a National Steering Committee (NSC), chaired by the Director General of the EPU. The National SDG Council reports to the UN via the High-level Political Forum. The NSC consists of five SDG Cluster Working Committees (CWCs), under which are Task Forces for each of the Goals. The CWCs are tasked with identifying indicators for each SDG, as well as with developing and implementing programmes and reporting progress to the NSC. Each CWC is led by a Section Head in EPU and includes representatives of government ministries/agencies, civil society, the private sector, academics, United Nations agencies and youth representatives. In this regard, the central agency, EPU, has an overall view and is able to monitor implementation. Critically, the inclusive and participatory approach used in this governance structure is in line with the 11th MP, which focuses on a paradigm shift towards more participatory government by citizens, including NGOs/ CSOs, as partners in service design and delivery. Greater engagement of NGOs/CSOs, and thus is envisaged. The SDG governance structure in Malaysia is shown in Figure 75.

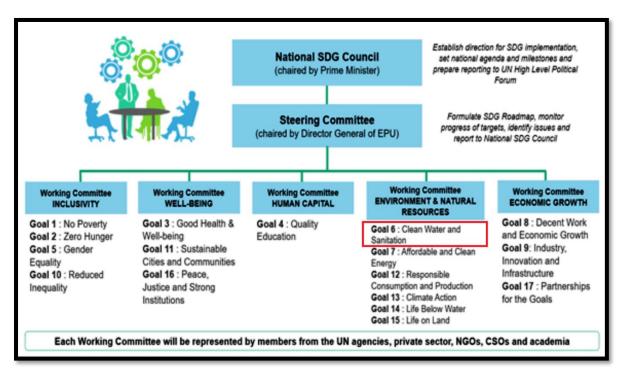


Figure 75. The SDG governance structure in Malaysia (EPU, 2020)

11th Malaysia Plan (2016-2020) connecting water across the SDGs

Malaysia recognizes that a comprehensive implementation of SDGs will require the mobilization of resources, including manpower, capacity building, and physical spaces as well as funding. Since Malaysia's national development plan has always been geared towards economic, social and environmental agenda, the implementation of SDGs in Malaysia are aligned with the five-year national development plan, which utilises the government development budget. Thus, allocation of resources and funding are readily made available.

The alignment of SDG and national development is realised through a mapping exercise involves the integration of the national development plan's action plans, initiatives and outcomes to the SDGs' goals, targets and indicators. The mapping exercise begins with the Eleventh Malaysia Plan (11MP), 2016-2020, then continue with the Mid-Term Review (MTR) of 11MP, 2018-2020, and subsequently with the Twelfth Malaysia Plan (12MP), 2021-2025 and the Thirteenth Malaysia Plan (13MP), 2026-2030. The mapping of SDGs with 11th Malaysia Plan strategic thrust and six policy pillars under the MTR of 11MP is shown in Figure 76 and 77 (EPU, 2020).



Figure 76. Mapping of 11th Malaysia Plan and the SDG (EPU, 2020)

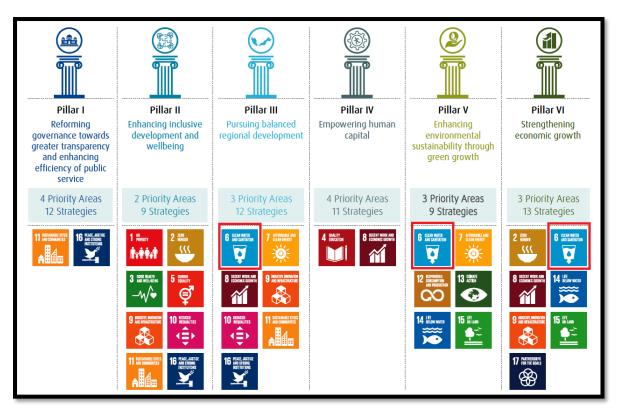


Figure 77. Mapping of Mid Term Review of 11th Malaysia Plan and SDG (EPU, 2020)

4.3.4. 12th and 13th Malaysia Plans, IWRM and Shared Prosperity Vision

Shared Prosperity Vision (SPV) 2030 was announced in 2019. The 12MP, covering three development dimensions – economic empowerment, environmental sustainability and social reengineering will further crystallise the implementation of the SPV 2030. The underlying principle o SPV 2030 is economic growth through "equitability of outcome" and outlined eight enablers, seven strategic thrust with 15 guiding.

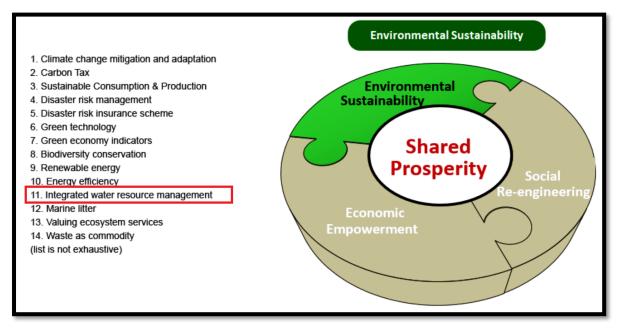


Figure 78. Environmental Sustainability in SPV (EPU, 2019)

Shared Prosperity Vision 2030 is a commitment to make Malaysia a nation that achieves sustainable growth along with fair and equitable distribution, across income groups, ethnicities, regions and supply chains. The commitment is aimed at strengthening political stability, enhancing the nation's prosperity and ensuring that the rakyat are united whilst celebrating ethnic and cultural diversity as the foundation of the nation state. The primary aim of the Shared Prosperity vision is to provide a decent standard of living to all Malaysians by 2030. (MOEA, 2019).

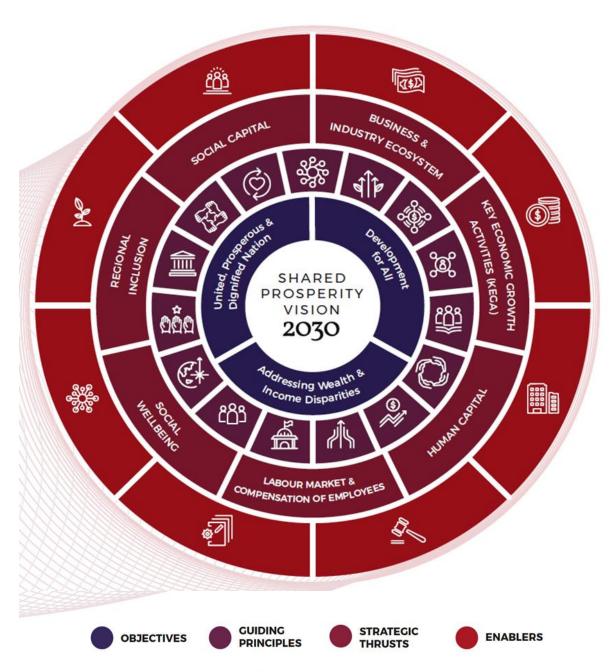
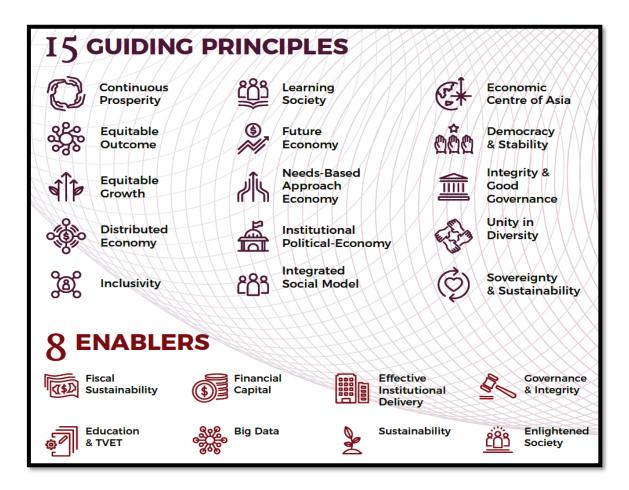
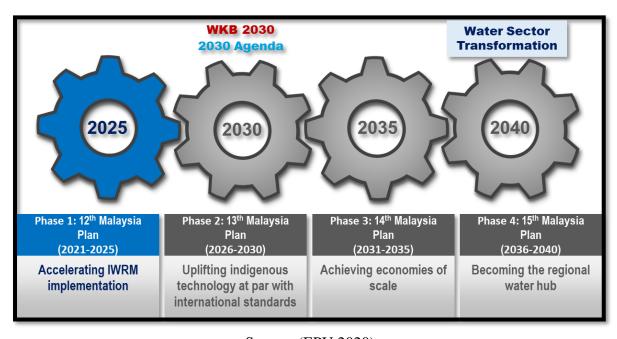


Figure 79. Framework of Shared Prosperity Vision 2030 (MOEA, 2019)

Principles and Enablers of Shared Prosperity Vision 2030 (MOEA, 2019)



4.3.5. WST 2040 via 12th, 13th, 14th, and 15th Malaysia Plan



Source: (EPU 2020)

5. Advance Level 2- Advocator to Train Future Water Leader

5.1. Accelerating IWRM and Crosscutting Issues

The main objective of AACB government sector in the road map of WST2040 is to enhance leadership skills of local government in order to accelerate the implementation of IWRM via the business unusual training module of AACB. Therefore, the roadmap scopes include all the civil servants in Malaysia, i.e. approximately 1.71 million as well as all the existing platforms related to the government sector for water management. Hence, the expected output will be the training of the local authorities (i.e. 154) and district office (i.e. 171) along with civil servants from various ministries and agencies on IWRM where the district officials in 94 district offices of Dept. of Irrigation and Drainage Malaysia (Table 1) will be one of the key resource persons to train other civil servants for training of trainers (ToT). Therefore, the expected outcome will be the proactive and effective leadership roles of civil servants for the participatory decision-making processes to accelerate the implementation of Integrated Water Resources Management (IWRM).

Sl. No.	Institutions	Total Number
01.	Local Authorities	154
02.	District Offices	171
03.	JPS District Offices	94

Table 1882. Key Institutions at local level to accelerate the Implementation of IWRM

The total position of government servants in Malaysia is approximately 1,711,702 that consist of 1,536,422 at Federal Government Level and 175,280 at the state government level (Figure 80). The ratio of civil servants to the total population of the country recorded is 1: 20.89, exceeding the target set in the 11MP (1:20) (JPA, 2019).



Figure 80. Number of Government Officials at the Federal and State Government in Malaysia (JPA, 2019)

Therefore, to achieve the proactive and effective leadership roles of civil servants for the participatory decision-making processes for Integrated Water Resources Management in Malaysia, the current status of government sector has been explored based on the literature review, interview, webinar, and focus group discussion sessions with the relevant stakeholders (Figure 81). The findings were arranged following the five focus areas i.e. people, governance, information and RDCI, infrastructure and technology, and finance of WST2040 study in order to suggest appropriate strategies and budget (Table 203).

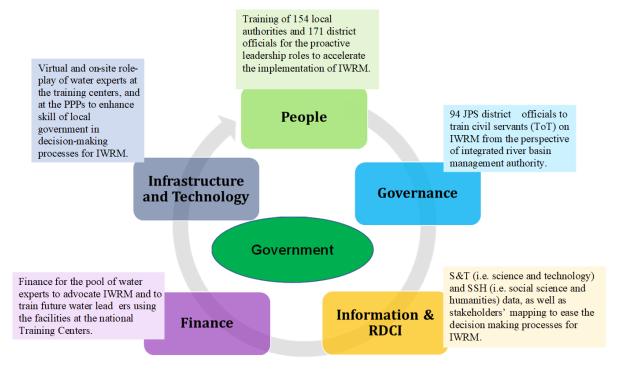


Figure 81. Focus Areas for Government Sector in AACB & PPPs WST 2040

Table 203189. Status of Government Sector with Proposed Principal Targets and Strategies for AACB & PPPs WST 2040

FOCUS AREAS	CURRENT SITUATION	TARGETS	STRATEGIES	IMPLEMENTING AGENCIES
PEOPLE	• Existing number of PPPs linked with government are inadequate and PPPs have not been institutionalized.	To enhance participation of civil servants in PPPs in order to ease decision- making for IWRM via AACB training program.	• Training of 154 local authorities and 171 district officials along with relevant ministries and agencies for the proactive leadership roles to accelerate the implementation of IWRM.	• Inter-Ministerial consortium chaired by KASA to undertake AACB training programme nationwide incorporating chief secretary of the Federal Territories and State Government.
GOVERNANCE	• National policies are inadequate to support AACB. Some states have legal instruments for water resources, however, other states have yet to adopt.	To enhance enforcement capacity of civil servants via AACB training program.	• 94 JPS district officials to train civil servants for ToT on IWRM from the perspective of integrated river basin management authority along with appropriate 'Water Framework Directives'.	 Inter-Ministry consortium chaired by KASA, as well as JPS district office, MSANg, JAS, PBT, & DO.
INFORMATION AND RDCI	• Data sharing is still a challenge, although there are policies for integrated and comprehensive data management, e.g. Solid Waste Management Policy.	To ensure flow of reliable data and information from relevant agencies to the local govt. for IWRM.	• Stakeholders' mapping for Science and Technology (S&T), as well as Social Science and Humanities (SSH) data and information in 13 States and three Federal Territories to ease the decision-making processes for IWRM.	 Inter-Ministry consortium chaired by KASA, as well as JPS district office, MSANg, JAS, PBT, & DO.

FOCUS AREAS	CURRENT SITUATION	TARGETS	STRATEGIES	IMPLEMENTING AGENCIES
INFRASTRUCTU RE AND TECHNOLOGY	• IWRM training centers such as Pusat Informasi Sungai and other should have adequate facilities considering the uncertainties.	• To advocate IWRM by the civil servants via ToT using AACB training programme.	• Virtual and on-site role-play of water experts at the training centers in 13 States and 3 Federal, and at the relevant PPPs at 189 major river basins to enhance skill of local government in decision-making processes for IWRM.	 Inter-Ministry consortium chaired by KASA as well as SEPU, JPS district office, MSANg, JAS, PBT, & DO.
FINANCE	• Much allocation by govt. for water supply, sewerage, and license, however, not adequate funds for non-structural capacity building.	• To implement comprehensive AACB program at the PPPs.	• Finance for the pool of water experts to advocate IWRM and to train future water leaders using the facilities at the National Training Centers of 13 States and 3 Federal.	 Inter-Ministry consortium chaired by KASA as well as SEPU, JPS district office, MSANg, JAS, PBT, & DO.

Based on the findings from the literature review, country comparison case studies on IWRM, subject matter expert's view, interview, webinar, and focus group discussion sessions with the relevant stakeholders, the following roadmap has been produced for the government cluster of AACB WST2040 (Table 204) to accelerate the implementation of IWRM (Figure 82).

Table 1904. Status of Government Officials' (100%) IWRM Training with Proposed Targets

ype Parameters	2022	2023	2024	2025	Total (pax)	2026-30	2031-35	2036-2040	
Parameters	2022	2023	2024	2025	(2022-25)	2020-30	2031-35	2030-2040	
Trainee (pax)	1,530 (0.09%)	16,290 (0.91%)	162,810 (9.08%)	1,611,810 (89.92%)	1,792,440 (100%)	570,567 (33.3%)	570,567 (33.3%)	570,567 (33.3%)	
Basic (pax)	765 (50%)	8,145 (50%)	81,405 (50%)	805,905 (50%)	896,220 (50%)	5,555 (6%)	5,555 (6%)	5,555 (6%)	
Intermediate (pax)	459 (30%)	4,887 (30%)	48,843 (30%)	483,543 (30%)	537,732 (30%)	9,258 (10%)	9,258 (10%)	9,258 (10%)	
Advance (pax)	306 (20%)	3,258 (20%)	32,562 (20%)	322,362 (20%)	358,488 (20%)	477,984 (84%)	477,984 (84%)	477,984 (84%)	
Trainer (pax)	7 + AACB	5,026	40,295	63,559	77,823				
Training Events (no.)	51 (by AACB)	45 x 12 months = 540	452 x 12 months =	4522 x 12 months =	5026 x 12 months = 60,312	1585 x 12 months =	1585 x 12 months =	1585 x 12 months = 19,020	
	Trainee (pax) Basic (pax) Intermediate (pax) Advance (pax) Trainer (pax) Training	Trainee (pax) 1,530 (0.09%) Basic (pax) 765 (50%) Intermediate (pax) 459 (30%) Advance (pax) 306 (20%) Trainer (pax) 7 + AACB Team Training 51 (by	Trainee (pax) 1,530 (0.09%) 16,290 (0.91%) Basic (pax) 765 (50%) 8,145 (50%) Intermediate (pax) 459 (30%) 4,887 (30%) Advance (pax) 306 (20%) 3,258 (20%) Trainer (pax) 7 + AACB Team 45 Training 51 (by 45 x 12	Trainee (pax) 1,530 (0.09%) 16,290 (0.91%) 162,810 (9.08%) Basic (pax) 765 (50%) 8,145 (50%) 81,405 (50%) Intermediate (pax) 459 (30%) 4,887 (30%) 48,843 (30%) Advance (pax) 306 (20%) 3,258 (20%) 32,562 (20%) Trainer (pax) 7 + AACB Team 45 452 x 12 Training 51 (by 45 x 12 452 x 12 months =	Trainee (0.09%) (0.91%) (0.91%) (162,810 (1,611,810 (1,924)) (1,924) (Trainee (pax) (0.09%) (0.91%) (9.08%) (89.92%) (1,792,440 (100%) (9.08%) (89.92%) (1,792,440 (100%) (9.08%) (89.92%) (1,792,440 (100%) (9.08%) (1,792,440 (100%) (9.08%) (1,792,440 (100%) (1,792,440	Trainee (0.09%) (0.91%) (0.91%) (9.08%) (89.92%) (1,792,440 (100%) (33.3%) Basic (pax) 765 (50%) 8,145 (50%) 81,405 (50%) 805,905 (50%) 896,220 (50%) 5,555 (6%) Intermediate (pax) 459 (30%) 4,887 (30%) 48,843 (30%) 483,543 (30%) 537,732 (30%) 9,258 (10%) Advance (pax) 306 (20%) 3,258 (20%) 32,562 (20%) 322,362 (20%) 358,488 (20%) 477,984 (84%) Trainer (pax) 7 + AACB Team 45 452 4,522 5,026 40,295 Training 51 (by AACB) months = 540 452 x 12 months = months = 60 312 months = 60 312	Trainee (pax) (0.09%) (0.91%) (9.08%) (89.92%) (1,792,440 (100%) (33.3%) (33.3%) (33.3%) Basic (pax) 765 (50%) 8,145 (50%) 81,405 (50%) 805,905 (50%) 896,220 (50%) 5,555 (6%) 5,555 (6%) Intermediate (pax) 459 (30%) 4,887 (30%) 48,843 (30%) 483,543 (30%) 537,732 (30%) 9,258 (10%) 9,258 (10%) Advance (pax) 306 (20%) 3,258 (20%) 32,562 (20%) 322,362 (20%) 358,488 (20%) 477,984 (84%) 477,984 (84%) Trainer (pax) 7 + AACB Team 45 452 4,522 5,026 40,295 63,559 Training 51 (by AACB) 45 x 12 months = month	

Note:

- 1. Total Trainee (pax) is consist of Basic (50%), Intermediate (30%), and Advance (20%) Trainee for each year from 2022 to 2025.
- 2. Trainer 7 pax in 2022 is based on the 9 traing events by AACB Team (i.e. 30 pax/training x 9 training = 270 pax, 2.5% of 270 pax is 7 pax)
- 3. The 7 Trainers will conduct 6 sessions (i.e. 30 pax/training x 6 events x 7 Trainers = 1260 pax (Trainee) with the help of AACB Team.)
- 4. Total Trainee in 2022 is 1,530 pax (i.e., 270 pax by AACB + 1260 pax by 7 Trainers = 1,530 pax)
- 5. 2.5% of 1,530 Trainee in 2022 is 38 pax (i.e. 38 Trainer). Therefore, in 2023 the Trainer no. is 45 (i.e., 38 pax + 7 pax in 2022 = 45 pax)
- 6. 2.5 % of Total Trainee 16,290 pax in 2023 is 407 pax (i.e., 407 Trainers). So, total Trainer in 2023 is 452. Similar calculation has been done until 2025
- 7. Total basic and intermediate levels' trainee in 12MP is 1,433,952 pax, & it is distributed equally (i.e. 477,984 pax (84%)) for advnce training (i.e. retraining) in 13MP, 14MP & 15MP.
- 8. Total Trainee 570,567 pax (33.3% of 1.7 million govt. officials) in 13MP, 14MP & 15MP, respectively is consist of Basic 6%, Intermediate 10% and Advance 84%.
- 9. Basic 6% and Intermediate 10% Trainee in 13MP to 15MP are the new govt. Officials.
- 10. Training events in 2022 is 51 nos (i.e., 9 events by AACB + 42 events by 7 Trainers (7 pax X 6 months))
- 11. Training events in 2023 is 540 nos (i.e., 45 Trainers x 1 Traing event/month x 12 months = 540 nos). Similar calculation for the rest of the years.
- 12. 30 pax (i.e., Trainee) per trainnig by 1 Trainer.

Focused Area	Sl.	Capacity Building	2022	2023	2024	2025	2026-30	2031-35	2036-40	Total (pax)
	1	Training of Officials in each 154 Local Authorities	3900	3900	3900	3900	7700	7700	7700	38,700
	2	Training of Officials in each 171 District Offices	4300	4300	4300	4300	8550	8550	8550	42,850
<u>ə</u>	3	Training of Officials in each 94 JPS District Offices for ToT.	2400	2400	2400	2400	4700	4700	4700	23,700
People	4	Training of EXCOs in each 14 States	700	700	1400	1400	700	700	700	6300
Pe	5	Training of Officials in each 14 SEPU	700	700	1400	1400	700	700	700	6300
	6	Training of 27 Ministry Officials at Federal and State Levels	2700	2700	2700	2700	6750	6750	13500	37,800
	7	Training of 222 Parliamentarians & Associates	5600	5600	5600	5600	2800	2800	2800	30,800
	8	Training of Officials in each 14 State Secretary Offices	1400	1400	1400	1400	700	700	700	7700
ıce	9	Training for IWRM Expert in each 27 Ministries at Federal level	-	-	-	-	1350	1350	1350	4050
Governance	10	Training for IWRM Expert in each 27 Ministries at State level	-	-	-	-	6750	6750	6750	20,250
ver	11	Training for IWRM Expert in each 154 Local Authorities	-	-	-	-	1950	1950	3900	7800
Ĝ	12	Training for IWRM Expert in each 171 District Offices	-	-	-	-	2150	2150	4300	8600
	13	IWRM expert in each 16 National AACB WST Training Centers	-	-	-	-	800	800	800	2400
Information & RDIC	14	Digitalization of AACB WST 2040 Training Module (i.e. 5 components of WST2040 Training Module)	1	00% Di	gitalizat	ion	100% Review & Upadte	100% Review & Upadte	100% Review & Upadte	
Inform	15	GIS Based Pollution Source Mapping of 189 Major River Basins		50% [Mapping		100% Mapping	100% Review & Upadte	100% Review & Upadte	
Finance	16	Training of SMEs for Licensing at 154 Local Authorities	-	25000	26000	103000	26,000	26,000	26,000	232,000
£3	17	Developing A Portal & Digital AACB Content for 189 River Basins		10	00%		100% Review & Upadte	100% Review & Upadte	100% Review & Upadte	
olouq	18	Establishment of 16 AACB WST 2040 Water Hub Nationwide & Linking other facilities such as Pusat Sg. Informasi		2	:5%		50%	75%	100%	
k Tecl	19	Four Training Events/year (1 event = 4 days, total 400 events/year; 25 events/state (i.e. 16 states))		10	00%		100%	100%	100%	
ture 8	20	IWRM Training Coordinator with an FASc based at LESTARI, UKM (i.e. Conducting 400 training events/year)		10	00%		100%	100%	100%	
Infrastructure & Technology	21	5 Assistants to facilitate IWRM Training based at LESTARI, UKM (i.e. Facililating 400 training events/year)		10	00%		100%	100%	100%	
Infra	22	Honorarirum for 27 Resource Persons (RP) to Faciliate IWRM Training (i.e. 400 events)	27	10 R	P in each	State	20 RP in each State	30 RP in each State	50 RP in each State	1,760

Figure 82. AACB Government Sectors' Strategies & Roadmap 2022 – 2040 (An Example with numbers)

Table 205. AACB Government Sectors' training budget at local, state and federal levels (2022 – 2040) (An Example)

Govt. Level	Training of Civil Servants	12 MP	13 MP	14 MP	15 MP	Total Officials (pax) & Budget (RM)
	JPS Officials	9600 8M 24,000,000	4700 RM 11,750,000	4700 RM 11,750,000	4700 RM 11,750,000	23700 RM 59,250,000
	Local Authorities	* 15600 \$ RM 39,000,000	7700 RM 19,250,000	7700 RM 19,250,000	7700 RM 19,250,000	38700 RM 96,750,000
Local Govt.	District Officials	* 17200 \$ RM 43,000,000	8550 RM 21,375,000	8550 RM 21,375,000	8550 RM 21,375,000	42850 RM 107,125,000
Local Govt.	SMEs	154000	26000 RM 65,000,000	26000 RM 65,000,000	26000 RM 65,000,000	232000 RM 577,500,000
	IWRM Experts at Local Authority Level		1950	1950 RM 4,875,000	3900 RM 9,750,000	7800 RM 19,500,000
	IWRM Experts at District Office Level		2150 RM 5,375,000	2150 RM 5,375,000	4300 RM 10,750,000	8600 RM 21,500,000
	State Secretary Officials	5600 RM 14,000,000	700 RM 1,750,000	700 RM 1,750,000	700 RM 1,750,000	7700 RM 19,250,000
	EXCOs	4200 8M 12,600,000	700 RM 2,100,000	700 RM 2,100,000	700 RM 2,100,000	6300 RM 18,900,000
State Govt.	EPU Officials	4200	700 RM 1,750,000	700 RM 1,750,000	700 RM 1,750,000	6300 RM 15,750,000
	IWRM Experts for 16 State AACB Training Centres		800 \$ RM 8,000,000	800 RM 8,000,000	800 RM 8,000,000	2400 RM 24,000,000
	IWRM Experts at State Level		6750 S RM 16,875,000	6750 RM 16,875,000	6750 RM 16,875,000	20250 RM 50,625,000
	Parliamentarian & Associates	22400	2800 RM 8,400,000	2800 RM 8,400,000	2800 RM 8,400,000	30800 RM 92,400,000
Federal Govt.	Ministry Officials at Federal & State	10800 \$\oldsymbol{\oldsymbol	6750 RM 16,875,000	6750 RM 16,875,000	135000 RM 33,750,000	37800 RM 94,500,000
	IWRM Experts at Federal Level		1350 6 RM 3,375,000	1350 RM 3,375,000	1350 RM 3,375,000	4050 RM 10,125,000
Total (RM)		243,600 RM 619,800,000	71,600 RM 186,750,000	71,600 RM 186,750,000	82,450 RM 213,875,000	496,250 RM 1,207,175,000
	400 Training Events/Year (Lump sum)	§ RM 545,200,000	RM 681,500,000	RM 681,500,000	RM 681,500,000	RM 2,589,700,000
Grand Total (RM)		243,600 § RM1,165,000,000	71,600 RM 868,250,000	71,600 RM 868,250,000	8245 RM 895,375,000	25001 RM 3,796,875,000

Note: LA = Local Authority, DO = District Office, JPS = Jabatan Pengairan dan Saliran Malaysia, SME = Small and medium-sized enterprises

Table 1916. Budget for IWRM Training (100% government officials, about 1.7 million)

Туре	Parameters	2022	2023	2024	2025	Total (pax) (2022-25)	2026-30	2031-35	2036-2040	Total (pax)
	Trainee (RM)	RM3,825,0 00	RM40,725, 000	RM407,025, 000	RM4,029,525, 000	RM4,481,100, 000	RM1,426,41 8,333	RM1,426,41 8,333	RM1,426,41 8,333	RM8,760,355, 000
	Trainer (RM)	RM1,020,0 00	RM5,400,0 00	RM54,240,0 00	RM542,640,0 00	RM603,300,0 00	RM190,189, 111	RM190,189, 111	RM190,189, 111	RM1,173,867, 333
et	Events/ logistic (RM)	RM6,941,1 00	RM73,494, 000	RM738,206, 400	RM7,385,330, 400	RM8,203,971, 900	RM2,588,47 3,802	RM2,588,47 3,802	RM2,588,47 3,802	RM15,969,39 3,307
Budget	Extra hours at 13 States & 3 F.T. if required by AACB (RM30,000/trainin g x 2 pax. X 16 states)		RM960,000	RM960,000	RM960,000	RM2,880,000	RM4,800,00 0	RM4,800,00 0	RM4,800,00 0	RM17,280,00 0
	Total	RM11,786, 100	RM120,579 ,000	RM1,200,43 1,400	RM11,958,45 5,400	RM13,291,25 1,900	RM4,209,88 1,247	RM4,209,88 1,247	RM4,209,88 1,247	RM25,920,89 5,640

Note: 1. Trainee (RM 2,500/ Training);

2. Trainner in 2022 (RM 20,000/ Training) with the help of AACB Team. Trainer 2023 onwards (RM 10,000/ Training);

3. Logistic RM 136,100/ Training

Honorarium Package for IWRM Training (An Example)

Personal/Expert	Total Budget/	Honorarium	Field Visit for	Travel	Accommodation
	training (4 days)		IWRM Roleplay	Allowance	
Official of Ministry, Agency &	RM 2,500	-	RM 500	500	(RM 500/night x 3 nights)
Local Government					= RM 1,500
Parliamentarian & State	RM 3,000	-	RM 1,000	500	(RM 500/night x 3 nights)
EXCO					= RM 1,500
Training Lecturer/Facilitator	RM 10,000	RM 7,500	RM 500	500	(RM 500/night x 3 nights)
					= RM 1,500

Table 1927. AACB Government Sectors' Budget 2022 – 2040 based on 5 Focus Areas (An Example)

Draft WST2040 Budget Requirements

	NI	WRMP Strate	egies			11MI	P Strategies					WST2040 St	rategies			
rea						Water as	a Resource/W	ater Security	and Sustainak	oility						Focus
Focus Area			Programmes/	Lead Ministry/				1	Budget (RM '0	00,000)				Target	Remark	us Area
Fo	Strategy	Initiatives	Activities	Organisati on	20 21	2022	2023	2024	2025	Total 12MP	13MP	14MP	15MP	Comple tion	S	еа
People	Institutional ization of public participator y platform (PPP) for the effective decision-making processes of IWRM	To enhance participat ion of civil servants in PPPs in order to ease decision making for IWRM via AACB training program	Training of 1 Focal Official in each 94 JPS District Offices for ToT. (RM 2,500/pax/training x 2400 units) Training of 222 Parliamentaria n & Associates (Lump sum RM 3,000/pax/training x 5600 units)	KASA.KPKT /MOH		RM6,000, 000	RM6,000, 000 RM16,800 ,000	RM6,000, 000	RM6,000, 000 RM16,800 ,000	RM24,000 ,000 RM67,200 ,000	RM11,750 ,000	RM11,750 ,000	RM11,750 ,000	12MP and Beyond	Inter- Minister ial as well as line agencie s Consorti um to underta ke appropr iate measur es for the	People
			Training of 14 states' EXCO (RM 3,000/pax/trai ning x 700 units) Training of 1 official in each 14 SEPU at			RM2,100, 000	RM2,100, 000	RM4,200, 000	RM4,200, 000	RM12,600 ,000 RM10,500 ,000	RM2,100, 000	RM2,100, 000	RM2,100, 000		particip ation of civil servants in PPPs	
			Federal & State levels. (RM 2,500/pax/trai													

			ning x 700 units) Training of 1 official in each 154 Local Authorities (RM 2,500/pax/trai ning x 3900 units) Training of 1 official in each 171 District Offices. (RM 2,500/pax/trai ning x 4300 units) Training of 27 Ministries' Officials at Federal and State Levels		RM9,750, 000 RM10,750 ,000	RM9,750, 000 RM10,750 ,000	RM9,750, 000 RM10,750 ,000	RM9,750, 000 RM10,750 ,000	RM39,000 ,000 RM43,000 ,000	RM19,250 ,000 RM21,375 ,000	RM19,250 ,000 RM21,375 ,000	RM19,250 ,000 RM21,375 ,000			
Governance	Training module to enhance leadership roles of civil servants in order to facilitate the enforcemen t of policies and laws for better water governance.	To enhance enforcem ent capacity of civil servants via AACB training program.	(RM 2,500/pax/trai ning x 2700 units) Training of 1 official each 14 Shief Secretary offices (266 pax) at State and Federal levels. (RM 2,500/pax/trai ning x 1400 units) IWRM Expert in each 27 ministries at Federal (1350 pax) level under their	KASA/KPKT /MOH	RM3,500, 000	RM3,500, 000	RM3,500, 000	RM3,500, 000	RM14,000 ,000	RM1,750, 000	RM1,750, 000	RM1,750, 000	12 MP and Beyond	Inter- Ministry consorti um chaired by KASA as well as JPS district office, MSANg, JAS, PBT, & DO.	Governance

jurisdiction for								
better								
coverage,								
monitoring and								
decision-								
making. (Lump								
sum RM								
2,500/pax/trai								
ning x 1350								
units)								
IWRM Expert in				RM16,875	RM16,875	RM16,875		
each 27				,000	,000	,000		
ministries at				,000	,000	,000		
pax) level								
under their								
jurisdiction for								
better								
coverage,								
monitoring and								
decision-								
making. (Lump								
sum RM								
2,500/pax/trai								
ning x 6750								
units)								
IWRM Expert in				RM4,875,	RM4,875,	RM9,750,		
each 154 Local				000	000	000		
Authority								
(1950 pax)								
level under								
their								
jurisdiction for								
better								
coverage,								
monitoring and								
decision-								
making. (Lump								
sum RM								
2,500/pax/trai								
ning x 1950								
units)								

			IWRM Expert in each 171 District Office (2150 pax) level under their jurisdiction for better coverage, monitoring and decision-making. (Lump sum RM 2,500/pax/trai ning x 2150 units) IWRM expert to coordinate each of the 16 National AACB WST Training Centers (800 pax). (Lump sum RM 10,000/pax/training x 800 units)							RM5,375, 000	RM5,375, 0000	RM10,750 ,000			
Information & RDCI	Integrated and comprehens ive data sharing and managemen t	To ensure flow of reliable data and informati on from relevant agencies to the local govt. for IWRM.	Digitalization of WST 2040 AACB training module (Lump sum) GIS based polluiton sources' mapping of 154 local authorities along with available river information (Lump Sum	KASA/KPKT /MOH	RM7,700, 000	RM3,080, 000	RM3,080, 000	RM3,080, 000	RM16,940 ,000	RM50,000 RM15,400 ,000	RM50,000 RM15,400 ,000	RM50,000 RM15,400 ,000	13 MP and Beyond 12MP and Beyond	Inter- Ministry consorti um chaired by KASA as well as JPS district office, MSANg, JAS, PBT, & DO.	Information & RDCI

			RM50,000/Loc al Authority)												
Finance	Adequate funds for non-structural capacity building towards IWRM.	To implemen t compreh ensive AACB program at the PPPs.	Training of SMEs (i.e. small and medium enterprises, (154,000 pax)) for licensing and relicensing from 154 Local Authorities (2023 and onwards) (Lump sum RM 2,500/pax/training x 154,000 units)	KASA/KPKT /MOH		RM62,500 ,000	RM62,500 ,000	RM257,50 0,000	RM382,50 0,000	RM65,000 ,000	RM65,000 ,000	RM65,000 ,000	12MP and Beyond	Inter- Ministry consorti um chaired by KASA as well as SEPU, JPS district office, MSANg, JAS, PBT, & DO.	Finance
Infrastructure & Technology	IWRM training centres such as Pusat Informasi Sungai and other should have adequate online/on- site facilities considering the uncertaintie s.	To advocate IWRM by the civil servants via ToT using AACB training program.	Developing a portal and digital AACB content such as video clips, posters, infographics and podcasts for 154 Local Authorities (LS RM750,000) Establishment of WST 2040 AACB Water Hub in 13 States and 3 F.T. for public participatory and effective decisionmaking processes of IWRM. (Lump	KASA/KPKT /MOH	RM750,00 0	RM750,000 0	RM750,00 0	RM750,00 0	RM3,000, 000	RM750,00 0	RM750,00 0	RM750,00 0	12MP and Beyond	Inter- Ministry consorti um chaired by KASA as well as SEPU, JPS district office, MSANg, JAS, PBT, & DO.	Infrastructure & Technology

5.1.1. People- Networking and Collaboration

Table 1938. Advocacy, awareness, and capacity building programme for Water Resources Management by the agencies

Agency	Program	Details	Involvement
KPKT	Trash to cash program	Collection of recycle item at designated collection centre	Community
			Government
	Strategic Collaboration (International)	Solid waste management	Community
		MOA with Ministry of Environment Japan	Government
		Smart City	
		MOU Kementerian Tanah, Infrastruktur dan Pengangkutan (MOLIT) Republik Korea	
	Smart City	Pilot projects of Smart water management at Kota Kinabalu and Johor Bahru	Community
		Pilot project of Smart flood management system and disaster response	Government
	Campaign	Let's Do It Right	Community
			Government
	Community Platform	Pembinaan 15 Pusat Komuniti Lestari di Kedah	Community
			Government
	Program 3R	Involving Pre-school, school, Government office, community and Industry	Community
		Schools Recycling Competition (PerKISS)	Government
		3R Fun Run programme	Industry
			Academia
	Waste to Art Competition	Involving public participation	Community
			Industry
			Academia
	Inisiatif Komuniti Sifar Sisa (ZeComm)	ZeComm is SWCorp's initiative to encourage communities to carry out waste segregation at home	Community
		with a system of rewards by trash to cash.	Government
			Industry
			Academia
	Technology development	Sistem Pengurusan dan Penggunaan Semula Air Hujan (SPAH)	Community
			Government
			Academia
MESTECC	Forum Iklim Kebangsaan Monsun	Forum 2018/2019	Community
	Timur Laut 2018/2019		Government
			Industry
			Academia
KPKT	Launching of Single-Use Plastic	Forum (IGEM 2018)	Community
	Roadmap / Forum (IGEM 2018)		Government
			Industry

Agency	Program	Details	Involvement
			Academia
DOE/ MEWA	Yearly campaign	Competition – Public/Specific participation	Community
	National Environment Day	Radio programs	Government
	Earth Day	Tree planting campaign	Industry
	World Environment Day	Webinar	Academia
	Environmental Awareness Camp	Gotong-Royong	
	Strategic Partnership Programme	Memorandum Persefahaman Kerjasama di antara Jabatan Alam Sekitar ini melibatkan dua (2) skop	Community
		utama yang difokuskan iaitu:-	Government
		Memorandum Persefahaman Kerjasama Dalam Pelaksanaan Program Kesedaran Alam Sekitar di	Industry
		antara Jabatan Alam Sekitar dengan Syarikat Berkaitan Kerajaan (GLC), Syarikat Multinasional	Academia
		(MNC), Syarikat Swasta dan Pertubuhan Bukan Kerajaan (NGO); dan	
		Memorandum Persefahaman Kerjasama Dalam Pelaksanaan Program Rakan Alam Sekitar di antara	
		Jabatan Alam Sekitar dengan Institusi Pengajian Tinggi dan Institusi Pendidikan / latihan	
		Jabatan Alam Sekitar telah menjalinkan hubungan kerjasama pintar (smart and strategic partnership)	
		dengan agensi kerajaan, Institut Pengajian Tinggi (IPT), pihak industri (Swasta/ GLC) dan	
		pertubuhan bukan kerajaan (NGO) menerusi Memorandum Persefahaman (MOU) dalam	
		pelaksanaan program kesedaran alam sekitar dan program Rakan Alam Sekitar sebagai salah satu	
		langkah proaktif bagi menangani isu-isu alam sekitar.	
	Tree planting program	Program Penanaman Pokok Majlis Perbandaran Subang Jaya & MALAKOFF	Government
		Program Pembersihan Pantai di Pantai Remis, Jeram, Selangor	Community
			Industry
			Academia
	Langkawi Award- Environmental	ANUGERAH LANGKAWI - KELESTARIAN ALAM SEKITAR 2017/2018 dan menerima sijil, plak	Community
	Sustainability	perhargaan serta wang tunai RM10,000. Anugerah Langkawi-Kelestarian Alam Sekitar merupakan	Government
		anugerah paling berprestij bagi menghargai warganegara Malaysia dan organisasi yang telah	Industry
		memberikan sumbangan yang signifikan dalam kelestarian alam sekitar. Penganugerahan ini adalah	Academia
		salah satu dan pada pengisian sempena Sambutan Hari Alam Sekitar Malaysia (HASN) pada setiap	
		tahun yang bermula pada tahun 1991, selaras dengan Deklarasi Langkawi yang telah ditandatangani	
		oleh Ketua-ketua Negara Komanwel pada tahun 1989.	
		Tiga kriteria utama dalam penilaian anugerah ini ialah:-	
		calon dinilai melalui tahap kecemerlangan dan sumbangan mereka dalam bidang yang spesifik atau	
		kombinasi bidang-bidang yang berkaitan alam sekitar.	
		calon dinilai dan segi sumbangan berbentuk penulisan pendapat-pendapat, keahlian jawatan kuasa	
		dalam pertubuhan, sumber kewangan, harta benda, tenaga dan masa yang disumbangkan.	
		penilaian adalah berdasarkan kegiatan calon ke arah meningkatkan penyertaan orang awam dalam	
		perlindungan alam sekitar.	
	Trees Planting Sponsorship Programme	FTS On-the-Go is a mobile educational awareness outreach programme launched in February 2019.	Community
	Workshop 2018	It incorporates world-class environmental, educational programmes built on conservation goals,	Government

Agency	Program	Details	Involvement
Agency	Friends of Environment ('Rakan Alam Sekitar')	community involvement and the sharing of knowledge targeting schools, and school related environmental areas of concern. In the long-term, participants of the project will influence changes in societal values and attitudes toward environmental stewardship. Our specially crafted educational programmes incorporate knowledge, resources, and hands-on models of learning specifically geared for students of different ages. These special fun-filled workshops and talks at the schools will have students and teachers caring for the environment resulting in greener schools and communities! The education of our community and the shift to an environmental mindset alongside the planting of trees are key elements in tackling the climate crisis. Free Tree Society believes that the social impact from this type of investment is invaluable for the sake of our planet. Aktiviti Rakan Alam Sekitar Program Jelajah Jejak Mesra Rakan Alam Sekitar (JJMRAS) Program Yrojek Wira Alam' Program Sambutan Hari Bumi (Bersempena Hari Bumi pada 22 April setiap tahun) Program Sambutan Hari Alam Sekitar Sedunia (Bersempena Hari Alam Sekitar Sedunia pada 5 Jun setiap tahun) Program Sambutan Hari Alam Sekitar Negara (Bersempena Hari Alam Sekitar Negara yang jatuh pada 21 Oktober setiap tahun) Program Sekolah Lestari Anugerah Alam Sekitar (SLAAS) Program Debat Alam Sekitar Antara Institusi Pengajian Tinggi Program Pra-Sekolah Lestari Program Promosi dan Kesedaran Alam Sekitar kepada Orang Awam dan Industri (Seminar, Ceramah dan lain-lain)	Involvement Industry Academia Community Government Industry Academia
		Pameran Alam Sekitar Program Kesedaran Alam Sekitar (Penanaman pokok, konservasi alam dan lain-lain) Sukarelawan Rakan Alam Sekitar dalam Penganjuran Program Pendidikan dan Kesedaran Alam Sekitar	
	Academia program	Environmental Debate Between Institutions of Higher Learning Sustainable School- Program Sekolah Lestari Anugerah Alam Sekitar (SLAAS) Public Speaking Competition on Environment Sustainable Pre-school Wira Alam Program	Community Government Industry Academia
	River of Life (RoL) Mentransformasikan Sg. Klang menjadi sebuah sungai ikon bagi bandaraya Kuala Lumpur	River of Life (RoL), is one of the government-identified Entry Point Projects (EPP) under the Greater Kuala Lumpur / Klang Valley (KL / KV), as set out under the National Key Economic Areas (NKEA), Economic Transformation Program (ETP). The project aims to transform the Sg. Klang into an iconic river for the viable and rapidly developed city of Kuala Lumpur, as well as the riparian rivers giving high economic value to the State. In achieving this target, three components of the transformation	Community Government Industry Academia

Agency	Program	Details	Involvement
		programme have been set up for Sg. Klang and the main tributaries within RoL area namely river	
		cleaning, river beautification, and property development.	
		The river cleaning component is led by the Department of Irrigation and Drainage Malaysia. The	
		objective is to improve the quality of the 110 km river water of Sg. Klang and the main tributaries	
		within RoL area, from Class III to V to Class IIB (suitable for recreational use with body contact) by	
		2020	
		12 inisiatif	
		Sewerage Services Department	
		Upgrade existing sewerage facilities as it is the most impactful and important initiative to reduce Klang	
		river pollution	
		Expand existing regional sewage treatment plants to cater for future growth	
		Kuala Lumpur City Hall	
		Install wastewater treatment plants at 5 wet markets to reduce rubbish and pollutants	
		Department of Irrigation and Drainage Selangor & Kuala Lumpur City Hall	
		Install additional gross pollutant traps to improve the river aesthetics and water quality	
		Department of Irrigation and Drainage Kuala Lumpur	
		Utilise retention pond to remove pollutants from sewage and sullage	
		Selangor Chief Minister's	
		Office/Ampang Jaya Municipal Office (MPAJ)	
		Relocation of squatters to reduce sewage, sullage, and rubbish in the Klang River	
		Department of Irrigation and Drainage	
		Implement the Drainage and Stormwater Management Master Plan to upgrade drainage systems	
		Department of Irrigation and Drainage	
		Conduct hydrological study and rehabilitation of the river for flow control	
		Department of Irrigation and Drainage	
		Promote, enforce, and manage river cleanliness and health – erosion from urban development	
		Department of Housing and Local Government	
		Promote, enforce, and manage river cleanliness and Health – restaurants, workshops, and other	
		commercial outlets	
		Department of Environment	
		Promote, enforce, and manage river cleanliness and Health – industries that generate wastewater/	
		National Solid Waste Management Department	
		Promote, enforce, and manage river cleanliness – general rubbish disposal	
	Publication	Publications related to environmental awareness are as follows:	
	1 uoneanon	1. Brochure	
		2. Prohibition of River Pollution	
		3. Protect Our Oceans Posters	

Agency	Program	Details	Involvement
MESTECC	National Energy Awards 2020 (NEA 2020)	An award that acknowledges outstanding achievements and best practices in driving the country's sustainable energy sector. This award will be divided into two categories of energy management and energy-efficient building as well as renewable energy initiatives in the country	Government Industry
	Satu Negeri Satu Sungai JPS Negeri Selangor	Penchala GIS Installation of garbage trap structures such as GPT (Gross Pollutant Trap) and Log-Boom The awareness programme will include activities related to Bio-indicator, River Ranger, communal work, exhibition and briefing. Initially: School level Later: Expanded to teachers, NGOs, JKKK, local community, businesses and government agencies.	Community Government Industry Academia
		Seminar on Green Industry to Promote Cleaner Production for Small and Medium Enterprises (SMEs) under the 11th initiative of "River of Life" (RoL) programme	Community Government Industry Academia
Malaysian Water Partnership	Water, Climate and Development Programme (WACDEP) Project	WACDEP is operationalized by the Global Water Partnership (GWP) and part of AMCOW's workplan. It runs over five years from May 2011 – April 2016 with an estimated budget of 12.7 million Euros. 1. Project 1 – Strategic Stakeholder Forum for Incorporating Climate Resilience in the National Water Resources Policy Action Plans 2. Project 2 – Community flood-proofing for climate resilience 3. Project 3 – Community rainwater-harvesting for enhancing flood and drought resilience	Multi- stakeholders
	Seminar and Workshop	Seminar Kesedaran dan Pendekatan Komuniti dalam Menghadapi Senario Banjir' akan dianjurkan oleh Global Water Partnership dengan kerjasama Malaysia Water Partnership (MyWP), Majlis Perbandaran Klang (MPK), dan Global Environment Centre (GEC) dengan sokongan Jabatan Pengairan dan Saliran Malaysia (JPS) dan LESTARI-UKM.	Multi- stakeholders
		TRAINING NEEDS ASSESSMENT WORKSHOP - Universiti Kebangsaan Malaysia	Multi- stakeholders
		Workshop on Conservation of Natural Resources in Coastal Ecosystems for the Benefit of Humankind and Global Balance Universiti Sains Malaysia (USM) is collaborating with their UK counterpart in organising a workshop on Conservation of Natural Resources in Coastal Ecosystems for the Benefit of Humankind and Global Balance.	
		Malaysia National Integrated Flood Management Programme The Department of Irrigation and Drainage Malaysia and Malaysian Water Partnership (MyWP) together with MyCBNet will be organising the Integrated Flood Management Programme at the national level with the theme 'The role of local community'Build awareness among the participants on the action before, during and after the flood.	Multi- stakeholders
		Stakeholder Consultative Workshop on River Pollution	Multi- stakeholders

Agency	Program	Details	Involvement
		MyWP is embarking on a new strategy to achieve that: by proposing changes at the highest level of committees chaired by the Prime Minister/Deputy Prime Minister and attended by Menteri	
		Besar/Chief Minister e.g. Majlis Sumber Air Negara (MSAN) or Majlis Negara Kerajaan Tempatan (MNKT).	
	IFM Community Program	1.National Program on IFM – Role of the Community	Multi-
		2.Pengurusan Bencana di Malaysia, MKN	stakeholders
		3.Perisapan Menghadapi Banjir – JPS Muar	
		4.RedR Programme	
		Malaysia Water Resources Management (MyWRM) Forum 2012 Biennial Forum is organised by MyWP in close collaboration with the key federal agency responsibe	
		for water resources management in Malaysia – the Department of Irrigation and Drainage Malaysia.	
		Water Education and Awareness, UTM	
		Workshop	
		Resource Material for Post 7th World Water Forum Seminar	
		Science, Technology and Innovation in River Ecosystem Protection	
		2. Successfully Managing Transitions for Food Security	
		3. Water Demand Management for Sustainable Future	
		Water for Cities of Tomorrow Water for Energy Security	
		6. Water for Our Future	
		7. Water Related Disaster Management	
		8. Water Security & Sustainable Growth	
		9. Woman and Water – Agent of Change for a New Culture	
		10. WWF7 – Outcomes	
Malaysian Water	The Malaysian Water Association	1. Collaborative research and knowledge transfer to support sustainable growth of water industry in	Multi-
Association (MWA)	(Mwa) Inks Mou With Universiti	Malaysia.	stakeholders
	Teknologi Malaysia To Mark	Development of human resources Employment and training,	
	Distinguish Water Cooperation	4. Promotion of science and technology,	
	Training/Workshop on Water Security	Malaysian Capacity Development Network for Sustainable Water Management (MyCDNet) in	Multi-
	& Safety Planning – 8 to 9 December	collaboration with Akademi Sains Malaysia (ASM), Malaysian Water Association (MWA), Jabatan	stakeholders
	2015, Akademi Sains Malaysia.	Pengairan dan Saliran Malaysia (JPS) and Sime Darby, with full support from CapNet UNDP, is	
		organising a Training of Trainers (ToT) cum Workshop on Water Security and Safety Planning.	
		Create awareness and capacity-build participants to safeguard sustainable access to adequate	
		quantities of water that is of acceptable quality for sustaining livelihoods, human well-being and socio-	
		economic development, for ensuring protection against water-borne pollution, water-related diseases,	
		and for preserving ecosystems in a climate of peace and political stability.	

Agency	Program	Details	Involvement
	Training of Trainers on Water Safety Plan, Akademi Sains Malaysia.	Module 1, Prof. Victor Hoe Abdullah talked about Water Pollution and Health Risks. Module 2: Identify Hazards and Assess the Risks Module 3: Determine and Validate Control Measures to Re-assess and Prioritise the Risks Module 4: Develop, Implement and Maintain a Management Procedure and Improvement Plan Module 5: Define and Monitoring of the Control Measures. Module 6: Documentation and Record Keeping	Multi- stakeholders
	First Stakeholder Engagement Workshop for Open Science	Topic 1: Formulation of National Policy and Guidelines for Open Science in Malaysia Topic 2: Building responsibilities, support and policy for the development of appropriate skills for data stewards and data curators Topic 3: Security and trust issues: Towards building a trusted data-sharing platform Topic 4: Ownership and re-use in data sharing practices Topic 5: When researchers say, what are the carrots they will get when sharing research data, how the policymakers should respond? Topic 6: Imagining the look of Malaysia Open Science Platform architecture and formulating approaches to develop a sustainable framework	Multi- stakeholders
	Capacity Development Programme on Integrated Urban Water Management (IUWM)	The Malaysian Capacity Development Network for Sustainable Water Management (MyCDNet) and ASM co-hosted a 1 Day Capacity Development Programme on Integrated Urban Water Management (IUWM)	Multi- stakeholders
		Environmental Impact of Solid Waste & Its Management in Malaysia Effective Waste Management Waste Management Going Green - Sustainability & Profitability Waste Management Ultimate Analysis of Potential Non-Conformity in Industrial Effluent Treatment System And Its Counter Measures Sustainable Approach to Waste Management - Utilizing 4r And Clean Technology Green Technology for Waste Management And Control Training Sustainable Waste Management and Minimisation Training	Government Industry
		Pentauliahan Solid Waste Training College sebagai Pusat Sistem Latihan Dual Nasional.	Government Industry
		i) Bengkel Pengukuhan Bagi Kursus Certified Environmental Professional In Water Pollution Control ii) Course on Certified Environmental Professional In Sewage Treatment Plant Inspection (CePSTPI) iii) Course on Certified Environmental Professional In IETS Inspection (CePIETSI) Part I iv) Course on Certified Environmental Professional In IETS Inspection (CePIETSI) Part II - Lab Session v) Kursus Kompetensi Protokol Persampelan, Pengawetan dan Pengendalian Sampel Efluen Bagi Tujuan Penguatkuasaan vi) Kursus Certified Environmental Professional In Industrial Effluent Treatment System Design Review	Government Industry

Agency	Program	Details	Involvement
		vii) Kursus Pengurusan Kawalan Pencemaran Air	
		The Malaysian Technical Cooperation Programme (MTCP) was first initiated at the First Commonwealth Heads of Government Regional Meeting (CHOGRM) for Asia Pacific Region in Sydney in February 1978. It was officially launched on 7 September 1980 at the 2nd CHOGRM in New Delhi, India, to signify Malaysia's commitment to SouthSouth Cooperation, in particular	Government Industry
		Technical Cooperation among Developing Countries (TCDC). In line with the spirit of South-South Cooperation, Malaysia through the MTCP shares its development experiences and expertise with other developing countries. Since its inception in 1980, more than 33,000 participants from 144 recipient countries have benefited from the various programmes offered under MTCP	
		Course for Certified Environmental Professional in the Operation of Industrial Effluent Treatment Systems (Physical Chemical Processes) Course for Certified Environmental Professional in The Operation Of Industrial Effluent Treatment Systems (Biological Processes – Activated Sludge Process) Course for Certified Environmental Professional in Sewage Treatment Plant Operation – CePSTPO Course on Certified Environmental Professionals in The Leachate Treatment Plant Operation (CePLTPO) Course for Certified Environmental Professional in the Treatment of Palm Oil Mill Effluent (Pond Processes) (CePPOME)	Government Industry
		Total Technical Control of Industrial Effluent Treatment System (IETS) Effective Waste Management Optimisation and Improvement in The Management of Environmental Pollution Control Technologies Preventing Pollution & Controlling Wastes Through Life Cycle Perspective Effective Control of Air & Water Pollution Wastewater Performance Monitoring Identification and Assessment of Environmental Aspects, Impacts (Product Lifecycle) Identifying and Evaluation of Environmental Risks and Opportunities Including Aspects and Impacts Sustainable Treatment of Sewage and Industrial Effluent Training 6th Annual Industrial Wastewater Treatment & Management How to Formulate Contingency Plan in Environmental Facilities (EF) to Prevent Environmental Pollution Water and Wastewater Treatment Technical Refresher, Discussion on Current Issues & Improving Performance Effective Data Management in IETS Operation Sewage & Effluent Treatment Processes - Practical Experiments on Wastewater Characteristics Innovative Techniques in Industrial Environmental Pollution Control Training Environmental Aspect, Impact & Risk Assessment	Government Industry

Agency	Program	Details	Involvement
		A Good Approach for Palm Oil Mill Effluent (POME) Ponding Desludging Industry Effluent Engineering Chemistry (IEEC) Industrial Effluent Treatment System (IETS) Common Problem & Troubleshooting - Level 2 (Process Approach) Effective Anaerobic Methods for Palm Oil Effluent Treatment System Effective Anaerobic Methods for Palm Oil Effluent Treatment System Marine water monitoring	Covernment
		Alami alamku Kursus Kesedaran Kawalan Tumpahan Minyak Dan Pembersihan Pantai Negeri Pulau Pinang Laporan Pelaksanaan Pemodelan Kualiti Air Sungai Menggunakan Model Qual2k di Sungai Tok Pawang, Kedah	Government Industry Community
	Certification and CPD training	Certified Professional in Measurement and Verification (CPMV) Certified Energy Manager Training Course (EMTC) Registered Electrical Energy Manager (REEM) Energy Management Gold Standard(EMGS): Internal Assessor Training Course Energy Auditor Training Course (EATC) Certified Energy Auditor (CEA) Training AEMAS Energy Management Course (AEMC) Energy Conservation for Air Conditioning System Professional Energy Manager (PEM) Guideline Have we done enough to save energy bills? Pengurusan Tenaga & Air Director, Managing Director, Head of Department, Manager, Assistant Manager, Engineer, Supervisor, Chargeman, Technician, Maintenance Contractor and Entrepreneur This program aims to assist the organization in effectively managing energy and water consumption by establishing a Utility Management Committee (JPU). This JPU plays an important role in carrying out energy management activities such as establishing energy policies, energy management committees, formulating energy saving activities, developing work procedures and others	Staff Business/Industry Academia
Indah Water Konsortium	Technical training	 Foundation of Project Management Foundation of Contract Management Construction Management Introduction To Environmental Obligation And Climate Change Introduction To Filtration Module-Design Fault Finding And Troubleshooting- Beginner Fault Finding And Troubleshooting- Intermediate Instrumentation And Control Mechanical & Electrical Work Management Renewable Energy And Energy Efficiency Surge Protection System Treatment Module 1 And 2: Introduction To Sewage 	Staff Business/Industry

Agency	Program	Details	Involvement
		10. Treatment O&M Requirements And Process Monitoring And Control	
		11. Treatment Module 3: Stp Design	
		12. Evaluation And Audit Treatment Module 4: Microscopic Technique For	
		13. Activated Sludge Diagnosis And Process Treatment Module 5: Sludge Management For	
		Manned Plant	
		14. Ergonomic Awareness	
		15. Equipment Maintenance Strategies/Technology	
		Network Pump Station- Operation & Maintenance	
		Malaysian Industrial Sewerage Guidelines - Planning, Design and Operation	Staff
		2. Malaysia Civil Engineering Standard Method of Measurement (MyCESMM) CIDB	Business/Industry
		CERTIFICATION	
		3. Asset Risk Management Framework	
		4. HAZOPS for sewerage systems	
		Environmental impact assessment (EIA) FOR Sewerage Systems Sewerage Construction Manager :	
		CIDB (MODULE A : MANAGEMENT) CIDB CERTIFICATION	
		Construction of Sewerage Treatment Plants	Staff
		2. Construction of Sewer	Business/Industry
		3. Sewer Rehabilitation and Property Connection	
		4. Design of Pump Station	
		5. Hydraulic Energy and Flow Resistance in Sewer Design Pump and Pumping System	
		6. Sludge Dewatering and Disposal	
		7. Introduction to Mechanical & Electrical Design for Sewerage Systems	
		8. Testing & Commission of Sewerage Systems	
		Sewerage Construction Manager : CIDB(Module D : Civil &Structural) CIDB Certification	
		Desludging Work and Know Your Tanker	Staff
		2. Operation & Maintenance of Jettor & Sewer Cleaning Vehicle	Business/Industry
		3. Operation & Maintenance of Sludge Reception Facility and Mechanised Dewatering Unit Fixed	
		Film Systems	
		4. Introduction to Treatment Plant Operations-New Entry	
		5. Introduction to Operations & Maintenance of Sewerage Systems	
		6. NIOSH Authorised Entry/Stand-By Person (AE/SP) (Certified)	
		7. Niosh Authorised Entry/Stand-By Person (AE/SP) (Refresher) (Certified)	
		8. Authorized Gas Tester (AGTES)	
		9. Authorized Gas Tester Refresher (AGTESR)	
		10. Hazard Identification Risk Assessment & Risk Control & Workplace Inspection (Hirarc-Wi)	
		11. Accident Reporting and Investigation	
		12. Vacuum Sewer System	
		13. Introduction to STP Equipment / Pipes And Valves	

Agency	Program	Details	Involvement
Jabatan Pengairan dan Saliran Malaysia (JPS)	Trogram	14. Basic Hydraulics of Sewage Treatment Plant 15. Flow Measurement Systems & Applications (Level 3) 16. Extended Aeration System 17. On-Site Measurement and Testing Of Process Control Parameters 18. Troubleshooting and Process Control for Sewage Treatment 19. Introduction to Sludge Management Design 20. Renewable Energy & Energy Efficiency / Process Optimization and Energy Conservation 21. Sewage Sampling Techniques and Records (Level 2) 22. Sampling for Sludge Disposal Site 23. Sewer Network Maintenance 24. Operation of Sequencing Batch Reactor (Sbr) Cpd Hours (Eimas) 25. Biological Nutrient System Cpd Hours (Eimas) 26. Sewer Closed-Circuit Television (Cetv) Condition Classification 27. Pipeline Rehabilitation Training 28. Sewerage Construction Manager: Cidb (Module B: Treatment Process Concepts) CIDB Certification 29. Sewerage Construction Manager: CIDB (Module C: Mechanical & Electrical) Cidb Certification 20. Lerosion and silt Control Plan (ESCP) 21. Pump System Testing 31. Basics of Data Insights Using Unmanned Vehicle (UAV/USV) 42. Introduction of RMK-12 Development Project Application and Monitoring of Project Financial Progress 43. Dam Safety 44. Watergate System Design 45. Registration of Immovable Asset Components 46. Registration of Work Tenders 47. Introduce Slide Presentation using Microsoft Power Point 47. Introduce Slide Presentation using Microsoft Power Point 47. Hydraulic Power System Design Understanding for JPS Diving Pump 47. Soil Investigation and Data Interpretation 48. Coastal Erosion and River Muara Conservation	Staff
		19. Strengthening Integrity in the Public Service	

Agency	Program	Details	Involvement
			Industry
Global	GEC - RIVER CARE MODULE 2019		Government
Environmental	GEC - River Report Card		Community
Centre (GEC)	GEC Booklet - RIVER Ranger		Industry
	Programme		Academia
	GEC - RIVER RANGER WATER		
	CONSERVATION MODULE		
	(SCHOOL) 2016		
	GEC poster - Apa yang telah anda		
	BUANG hari ini?		
	GEC brochure -River Water Quality		
	Monitoring and Classification – made		
	easy-		
	GEC Poster - Water auditing		
	GEC- River Report Card		
	GEC poster – River ranger Klang River		
	GEC booklet – River Auditing 'let's get		
	to know our rivers!'		
	River of Life Map		
	ASEAN Secretariat and GEC -		
	Peatlands and Climate Change in		
	Southeast Asia GEC - Peat for life? Peatlands & climate		
	change adaptation GEC – Lake report card		
	GEC – Lake report Card GEC – Hutan Bakau, Kuala Gula, Perak		
	GEC - Kad Laporan Sungai		
	ASEAN Secretariat and GEC –		
	Addressing Peatland Degradation in		
	South East Asia ASEAN's Regional		
	Efforts		
	GEC poster – Fiery Southeast Asia -Our		
	resources, lives, future under threat-		
	GEC – biological monitoring -have you		
	ever wondered what's living inside a		
	river?		
	GEC – Buku Akaun Bank Kitar Semula		
	SMART RANGER		

Agency	Program	Details	Involvement
	GEC - The Tsunami and Coastal		
	Wetlands - Recommendations for		
	Action		
	GEC – Assessment on peatlands,		
	biodiversity and climate change -main		
	report-		
	GEC – Assessment on peatlands,		
	biodiversity and climate change -key		
	interim findings related to climate		
	change-		
	GEC – Assessment on peatlands,		
	biodiversity and climate change-		
	executive summary ASEAN and GEC – Asean Peatland		
	Management Strategy		
	ASEAN and GEC – Asean Peatland		
	Management Initiative		
	ASEAN Peatland Forests Project		
	(APFP) – Rehabilitation and Sustainable		
	Use of Peatlands Forests Southeast Asia		
	GEC - Peatland Forest Ranger Module		
	GEC – Hutan Paya Laut Manjung		
	Selatan – Southern Manjung Mangrove,		
	Kampung Nelayan, Fishing Village		
	GEC - River of Life "Asingkan Sisa		
	Pepejal"		
	GEC – River of Life -Public Outreach		
	Programme Phase 5		
	GEC – River of Life Public Outreach		
	Programme		
	GEC – 2017 Bunting on Komuniti		
	Tempatan		
	GEC – 2017 Bunting on Institusi		
	Pendidikan		
	GEC – 2017 Bunting on Sisa pepejal		
	GEC – 2017 Sisa pepejal Industri		

Agency	Program	Details	Involvement
	GEC – Bunting on Amalan Pengurusan		
	Aalam Sekitar Terbaik: Apa yang boleh		
	kita lakukan		
	GEC – Bunting River of Life		
	"Communities' Activities"		
	GEC pamphlet – Sahabat Hutan Bakau		
	Kuala Gula		
	GEC – River of Life Public Outreach		
	Programme		
	GEC – Sahabat Hutan Gambut Selangor		
	GEC pamphlet– Bakau Manjung Selatan		
	GEC Poster - Water Saving Tips		
	GEC Poster - River of Life –Public		
	Outreach Programme (POP)		
******	GEC Poster - 4R, 2C way of life		
WWF- Malaysia	Successful WWF-Malaysia Events	Celcom, Samsonite, Salesworks and SG Global Support Services, as well as Earth Hour in Penang	
	Earth Hour	collaborators Yes Media and Santa Fe, along with Earth Hour in Kedah collaborators Alor Setar LM	
	WWF- Earth Hour Poster Design	Bikers Club, Aman Central and Happy Star Entertainment Production Sdn Bhd.	
	WWF-Education for Sustainable	One Planet City Challenge: Moving towards a climate-friendly future.	
	Development	Engaging young leaders in environmental sustainability.	
	Marine Programme	Education for sustainable development e-learning platform	
	Conservation Partnership Scheme-		
	Universiti Putra Malaysia (UPM):	Sabah wildlife taskforce for illegal wildlife trade reduces egg trade and turtle poaching.	
	Rainwater harvesting with schools in		
	Malacca.	The Peninsular Malaysia Terrestrial Conservation (PMTC) Programme covers three landscapes and	
	Peninsular Malaysia Terrestrial	strives to ensure that Peninsular Malaysia's forests, wildlife and freshwater ecosystems are valued,	
	Conservation	conserved and sustainably managed for the long-term benefits of humans and nature.	
	WWF - The Sustainable Markets		
	Programme		

5.1.2. Governance- Water Framework Directive & Capacity Building Program

Water Framework Directive from Governance Perspectives (EU, 2019) European Commission report

- EU law had a positive effect: Urban Waste Water Treatment, Nitrates, and Industrial Emissions Directives, Drinking Water (DWD) and Nitrates Directives, and EU law on chemicals
- Appropriate governance at river basin level; Stakeholder consultations, analysis of River Basin District (RBD) characteristics (a review of the impact of human activity and an economic analysis of water use),
- The Groundwater Directive complements WFD, identify the gap for better status of individual pressures and water bodies.
- Common Agriculture Policy (CAP) for control on impacts from agriculture, mandatory requirements for farmers.
- Upgrading water-pricing policies; steps such as defining water services, calculating
 financial costs, metering, performing economic analysis and assessing both
 environmental and resource costs when calculating the cost recovery amounts for
 water services.
- Protected areas for drinking water and for nature protected areas; ensure the polluter pays and precautionary principles.
- Flood risk management plans (FRMPs); included floods as a main risk in their national risk assessments, member states used a cost-benefit analysis (CBA).

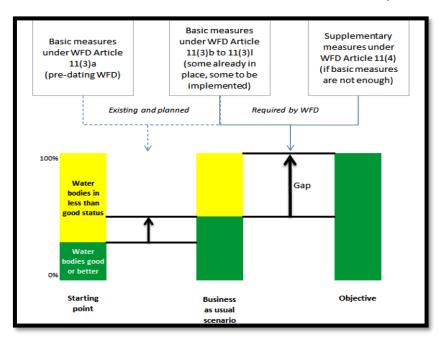


Figure 83. Simplified illustration of a process to identify and fill in the gap between businesses as usual and the 2015 objective of good water status (EC, 2015)

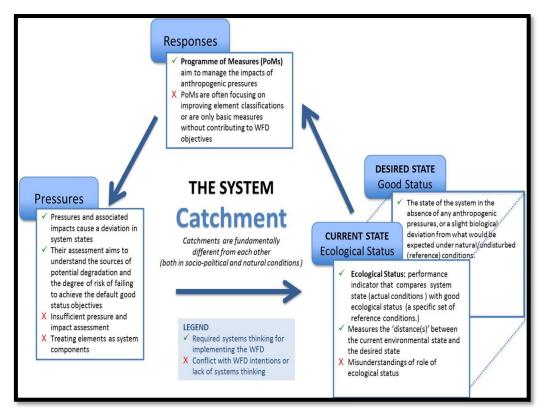


Figure 84. EU Water Framework Directive: From great expectations to problems with implementation (Voulvoulis et al., 2017)

European Overview - River Basin Management Plans

• Czech Republic, Finland, Croatia, Italy, Luxembourg, Latvia, Malta and Poland, and, to a large extent, Spain, uses the Environmental Quality Standards (EQSs) developed under the common implementation.

• Strategy

- Good surface water chemical status; concentrations of pollutants cannot exceed the environmental quality standards established in the Environmental Quality Standards Directive.
- o Grouping techniques and expert judgement; to classify water bodies.
- The majority of Member States monitored all of the Priority Substances identified as discharged into their RBDs.

• Monitoring and Assessment of Groundwater Chemical Status

o Sufficient monitoring sites should be selected for bodies identified as being at risk and for bodies that cross a Member State border.

Programmes of Measures (PoMs)

- Relevant actions for extending metering, water abstraction controls, reviewing licences and improved water abstraction datasets.
- o Gap assessment on agricultural pressure to achieve the WFD targets.
- Authorizing the control on wastewater point source of discharge, operation of wastewater discharges, prohibition of direct discharges to groundwater, elimination of pollution of priority substances.
- Operational Key Types to address on significant hydro-morphological pressures (fish ladders, removal of structures).
- o Incentive pricing, cost recovery and application of polluter pays principle.
- Methodologies to calculate costs on water use activities such as hydropower generation, navigation and flood protection or self-abstraction for irrigation and industrial purposes.
- Evaluation of the drinking water quality through the Drinking Water Directives of the WFD.

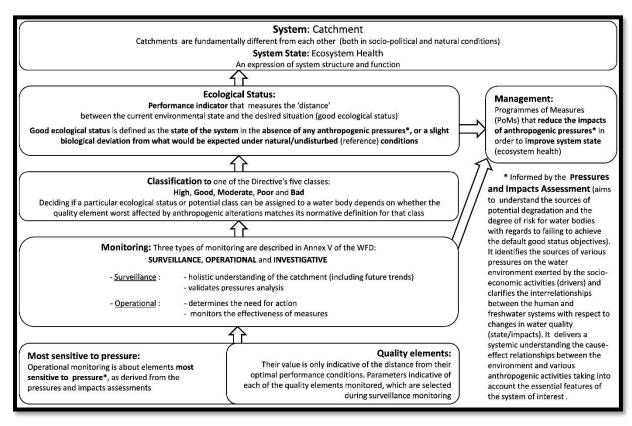


Figure 85. The Water Framework Directive in the language of systems thinking (Voulvoulis et al., 2017)

Table 1949. Awareness raising, Advocacy, and Capacity Building Programmes and Activities related to IWRM in Malaysia

Sl.	Theme	Example of Programmes/Activities
		 River Awareness and Education Programme (WWP and Salcon Berhad 2014–2015) Water Information Access Carnival "Water: Know to Care" (UKM and MPKj 2014) Water Conservation and Environmental Programme for Schools in Malaysia (HSBC and GEC 2014 –2017) National Forum on Sustainability Science in River Basin Management (UKM 2014) Workshop on Sustainability Science Demonstration Site: Framework for Action "Water and Environmental Sustainability in Langkawi" (LESTARI-UKM and UNESCO Office Jakarta 2015) National World Water Day Dialogue on Water and Jobs (LESTARI-UKM, UNESCO-IHP Malaysia and DID 2016)
2.	Advocacy	 Formation of National Water Resources Council (NWRC 1998) National Water Vision and the Formation of state apex water resources management organisation in Selangor and Sabah (LUAS and SWRE 1999/2000) Conducting various Research and Development (R&D) Projects related to IWRM & special focus on Ecosystem Health of Langat River Basin (LESTARI-UKM since 1999 – now) Urban Stormwater Management Manual for Malaysia (MSMA) 1st Edition (DID 2001) The formation of MyToolbox (MyWP 2001) National sewerage project and National strategic plan for solid waste management (2002) National Study on Effective Implementation of IWRM in Malaysia (2005) Water Services Industry Act and formation of the National Water Services Commission (2007) Establishment of Integrated Water Resources Management Research Group in UKM (UKM 2007) Implementation of IWRM BMP pilot projects (2009) Review and updating of the 1982 National Water Resources Study (2009/2010) National Water Resources Policy (NRE 2012) Urban Stormwater Management Manual for Malaysia (MSMA) 2nd Edition (DID 2012)
3.	Capacity Building	 Non-formal Education Course: Water and River Basin Management related Studies offered in various faculties and institutes in UKM, as well as in co-curriculum subjects (UKM 2000–now) National training workshop to introduce GWP ToolBox and train Malaysians in developing IWRM case studies (MyWP 2002–2009) Formal Education Course: Master of Environmental Science (IWRM) at Open University of Malaysia (OUM 2005–2010) IWRM Training Course for senior executives in the public sector (MyWP and MyCapNet 2005) Training courses on community-based river management and assessment (GEC 2005) Training programme for government agency and community leaders on community-based river management (GEC 2006–2008) SMART (Start Managing All Resources Today) Ranger Training (GEC since 2008-now)

Sl.	Theme	Example of Programmes/Activities
No.		
		 MyIWRM, what can I do? Developing Capacity for the Practical Implementation of Integrated Water Resources Management in Malaysia (LESTARI-UKM and CapNet 2007–2010) Developing Capacity of NGOs for the Practical Implementation of Integrated
		Water Resources Management in Malaysia (LESTARI-UKM, MyCapNet, CapNet, MyWP, WWF and MENGOs 2008)
		 Developing Capacity of Academia for the Practical Implementation of Integrated Water Resources Management in Malaysia (LESTARI-UKM, MyCapNet, CapNet, MyWP, WWF and MENGOs 2009)
		• Training Workshop on IWRM in River Basin (MyWP 2009)
		Series of Water Watch Programme for Young Leaders (UNESCO-IHP Malaysia and partners since 2009–now) NUED Barrary Training (CEC and DID since 2000 news)
		 RIVER Ranger Training (GEC and DID since 2009-now) Training of Trainers for Community participation in River Management under DID 1 State 1 River programme (GEC and DID since 2009-now)
		Workshop on river auditing (GEC since 2009-now)
		Workshop on water auditing (GEC since 2010-now)
		 Developing Capacity of Government Officers for the Practical Implementation of Integrated Water Resources Management in Malaysia (LESTARI-UKM and UNESCO-IHP Malaysia 2010)
		Workshop on Water and Media: Rising Up to the Challenge (LESTARI-UKM and UNESCO-IHP Malaysia 2011)
		 Training of Trainers Course: Managing Water Pollution (LESTARI-UKM, MyWP and GEC 2012)
		Training of Trainers Course: Ecosystem Services and Integrated Water Resources Management (GEC, MyWP and LESTARI-UKM 2012)
		 Learning for Change Workshop: Education for Sustainable Development in Malaysia (LESTARI-UKM, Gotland University, GAP, UNESCO-IHP Malaysia 2012)
		• Short Course on Integrated Lake Basin Management Plan (PPj, MWA and NAHRIM 2013–2015)
		 Training Needs Assessment Workshop for Water Education (LESTARI-UKM, GWP, MyWP, UPM and EcoKnights 2014)
		 Southeast Asia (SEA) Water Footprint Training Course (UNESCO-IHP Malaysia, UNESCO Jakarta, WFN, MyCDNet, LESTARI 2015)
		 Training of Trainers on Water Security and Safety Planning (MyCDNet, ASM and DID 2015)
		 Training of Trainers on Sustainable Sanitation and Water (MyCDNet and IWK 2015)
		 Workshop on Integrated Water Resources Management Success Stories and Lessons Learned: Case Studies in Malaysia (LESTARI-UKM, GWP, MyWP and HTCKL 2015)

5.1.3. Information-Basin Information Systems and Monitoring

Water Ecosystem Management following the 8i Model

Water management from the perspective of AACB and PPPs experienced significant pressures from various dimensions considering the environmental, economic and socio-cultural aspects. Therefore, water management i.e. water as natural resources and water as a livelihood should be addressed from the total water ecosystem management perspective for a flourished dynamic economic sector to contribute significantly in sustainable development (Figure 86). Therefore, the AACB and PPPs issues can be sorted under the each components of 8i model for accelerating the implementation of IWRM. Therefore, Figure 86 describes the strategies of government sector of AACB WST 2040 road map following the 8i model of whole ecosystem management.

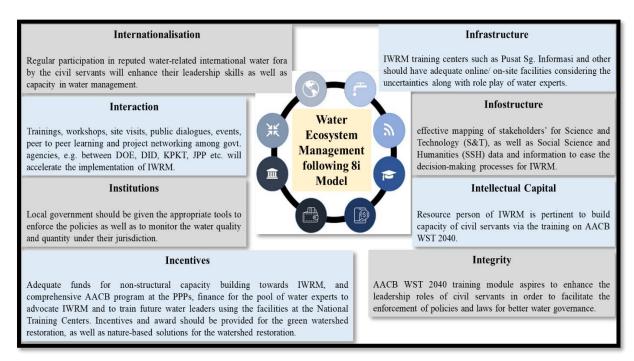


Figure 86. 8i Model for water ecosystem management

i. Infrastructure

IWRM training centers such as Pusat Informasi Sungai and other should have adequate online/on-site facilities considering the uncertainties. Therefore, there should be adequate advocacy for IWRM by the civil servants via ToT using AACB training programme. Considering the uncertainties such as man-made and natural disasters, including the pandemic Covid-18, there should have both virtual and on-site role-play of water experts at the training centers, and at the PPPs to enhance the skill of local government in decision-making processes for IWRM.

ii. Info-structure

IWRM should have Integrated and comprehensive data sharing framework to accelerate its implementation in Malaysia. Therefore, to ensure the flow of reliable data and information from relevant agencies to the local govt. for IWRM, there should be effective mapping of

stakeholders' for Science and Technology (S&T), as well as Social Science and Humanities (SSH) data and information to ease the decision-making processes for IWRM. Moreover, developing and promoting common platforms for govt. officials should also include all the relevant stakeholders for IWRM. The development of a common website/podcast, establishing or promoting community based River Care Centre, nationwide road show, existing local community centers, identifying successful NGOs/CBOs as IRBM local champion and trainers and as such will be useful to share information related to IWRM, IRBM & WST2040.

Continuous RDCI (i.e. research, development, commercialisation and innovation) for National Integrated Data Bank will be the key driver to accelerate the implementation of IWRM. These RDCI will effectively facilitate the real time decision making of civil servants especially at the local level to promote decision-making processes quickly. In this regard, the stakeholders mapping, series of dialogue and consultations amongst the federal, state and local level stakeholders will also justify the use of real time data and information coming from RDCI for IWRM.

iii. Intellectual Capital

Resource person of IWRM is very crucial to build capacity of civil servants via the training on AACB WST. This resource person will train the civil servants using the training module of AACB and it will become the ToT. Therefore, the civil servant will effectively advocate IWRM via training programme as well as will institutionalise the public participatory platforms (PPPs) for the effective decision-making processes of IWRM. The IWRM training via AACB training programme will enhance the participation of civil servants in PPPs in order to ease decision-making for IWRM. Therefore, the training of 154 local authorities and 171 district officials will have the proactive leadership roles to accelerate the implementation of IWRM.

Capacity building and continuous improvement of civil servants can be strengthened via enhancing their communication skills, river care knowledge, environmental subjects such as ecology, general organisation and management skills and others in related subjects. Soft skills training on public outreach such as series of workshops, site visits will enhance the awareness and capacity of all stakeholders: Politicians; Government staff, private sectors as well public/local communities. Moreover, enhancing the River basin understanding of the govt. officials will be effective via developing awareness material to educate govt. officials on river basin concept in line with IWRM, IRBM, ICZM and as such. Enhancement and promoting river address, developing simple brochure, video, etc. will also enhance the awareness of the civil servants on IWRM.

iv. Integrity

AACB WST 2040 training module aspires to enhance the leadership roles of civil servants in order to facilitate the enforcement of policies and laws for better water governance. To enhance enforcement capacity of civil servants via the AACB training programme, Dato' Ir. Nor Hisham bin Mohd. Ghazali, Director General- Department of Irrigation and Drainage Malaysia has offered 164 JPS district officials will train civil servants for ToT on IWRM from the perspective of integrated river basin management authority.

AACB training module will also motivate civil servants in managing water resources from the perspective of disaster risk reduction in order to minimise the future disaster from man-made and natural sources. Therefore, promotion materials have been developed to aware civil servants on number of water catchment areas gazetted for protection, number of Integrated River Basin Management (IRBM) Studies undertaken, % National Water Balance System (NAWABS) for river basins, number of Integrated Shoreline Management Plans developed, number of National Coastline Erosion Studies completed, no. of states with National Flood Forecasting Warning Program developed, no. of Drainage Master Plans for major cities developed, no. of flood storage ponds constructed, and as such.

v. Incentives

There should have adequate funds for non-structural capacity building towards IWRM, comprehensive AACB program at the PPPs, finance for the pool of water experts to advocate IWRM and to train future water leaders using the facilities at the National Training Centers. Incentives and award should be provided for the green watershed restoration, as well as nature-based solutions for the watershed restoration. Green incentives, and certification and awards should be given to the SMEs (i.e. small and medium enterprises) by the local government for attending the AACB WST Training program before water servicing licensing and relicensing.

Continuous Federal funding is also very vital for the rehabilitation and restoration of river basin management. And the AACB training program will enhance the leadership roles of civil servant for rehabilitation and restoration of river basin management. Federal funding is main strength to adopt the green economic approaches for IWRM in Malaysia. Therefore, adequate green funding along with training will encourage civil servants for sustainable water resources management while applying green economic approaches such as 'payment for ecosystem services', application of 'polluter pays' principle, and uniform pricing model for water resources, and as such. Moreover, water-based recreation and tourism activities via AACB training program will also encourage local authorities to promote local level income generation while incorporating the local communities.

vi. Institutions

Institution such as local government is very important to enforce the rules and regulation for IWRM. Therefore, local government should be given the appropriate tools to measure the quality and quantity of the waters under their jurisdiction. Local government should also have tools/applications and familiar to use software to monitor water quality and quantity for IWRM while local people will be the first person to report the water issues.

vii. Interaction

Partnerships between agencies and joint programs between government sectors are the keys for successful IWRM. Collaboration and smart partnership also help to build linkage to enhance knowledge and help foster connectivity between agencies to develop common sense of ownership. Initiatives through trainings, hand-on workshops, and site visits, public dialogues, and workshop as well as events, peer to peer learning and project networking among govt. agencies e.g. between DOE, DID, KPKT, JPP etc. will also accelerate the implementation of IWRM.

viii. Internationalisation

International networking and collaboration is important to enhance the leadership skills of government officials in IWRM via knowledge sharing and country comparisons on IWRM. Therefore, the National Research and Capacity Building institutes' endeavor to enter into strategic alliances with renowned regional and international water research and training centers will bring mutual benefit. Moreover, regular participation in reputed water-related international water fora by the civil servants will enhance their leadership skills as well as capacity in water management.

Table 210. Water Resources Management following the 8i Model by the Government Sector of AACB WST2040

		AACB W	ST2040 Strategy Plan and Im	plementation	on Road Map followin	g 8i Model				
		AACB Strategies		12 th MP Strategies WST2040 Strategies					Strategies	
			Water Resources M	Ianagemen	t in 8i Model					
ea			12th MP/13th M	IP/14 th MP/	15 th MP					Fc
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarc hical Level	Lead Authority/ Collaborating Partners	Implemen ting Authority	Curr ent Statu s	Target Completi on	Remarks	Focus Area
Infrastructure	IWRM training centres such as Pusat Informasi Sungai and other should have adequate online/onsite facilities considering the uncertainties.	To advocate IWRM by the civil servants via ToT using AACB training program.	Virtual and on-site role- play of water experts at the training centres, and at the PPPs to enhance skill of local government in decision-making processes for IWRM.	River Basin	KASA	State govt./JPS/J AS/PBT/D O	New	12 th MP and beyond	Inter-Ministry consortium chaired by KASA as well as SEPU, JPS district office, MSANg, JAS, PBT, & DO.	Infrastructure
Info-structure	Integrated and comprehensive data sharing framework to accelerate the implementation of IWRM.	To ensure flow of reliable data and information from relevant agencies to the local govt. for IWRM.	Stakeholders' mapping for Science and Technology (S&T), as well as Social Science and Humanities (SSH) data and information to ease the decision-making processes for IWRM.	River Basin/ District/ Local Authorit y level	KASA/KPKT/MO H	MSANg/J PS/JAS/PB T/DO	New	12 th MP and beyond	Inter-Ministerial as well as line agencies Consortium to undertake appropriate measures for the participation of civil servants in PPPs	Info-structur
Info-str	Develop and promote common platform for govt. officials including all stakeholders	Develop a common website/podcast to share information related to IWRM, IRBM & WST2040 Establish or promote community based River Care Centre	Conduct nationwide road show Identify existing local community centre/site Identify and appoint successful NGOs/CBOs as IRBM local champion and trainers.	National as well as River Basin Level	KASA/KETSA//KP KT/MOH	State govt./JPS/J AS/PBT/D O	New	12 th MP and beyond	Inter-Ministry consortium chaired by KASA as well as JPS district office, MSANg, JAS, PBT, & DO.	ture

		AACB W	ST2040 Strategy Plan and Im	plementation	on Road Map followin	g 8i Model				
		AACB Strategies			12 th MP Strategies			WST2040	Strategies	
			Water Resources N	Managemen	t in 8i Model					
Area			12 th MP/13 th M	/IP/14 th MP/	15 th MP					Fo
Focus Ar	Strategy	Initiatives	Programmes/ Activities	Hierarc hical Level	Lead Authority/ Collaborating Partners	Implemen ting Authority	Curr ent Statu s	Target Completi on	Remarks	Focus Area
	Continuous RDCI for National Integrated Data Bank to accelerate the implementation of IWRM	To facilitate the real time decision making of civil servants especially at the local level.	Stakeholders mapping. Series of dialogue and consultations among the federal, state and local level stakeholders.	River Basin/ District/ Local Authorit y level	KASA/KPKT/MO H	MSANg/J PS/JAS/PB T/DO	New	12 th MP and beyond	Inter-Ministerial as well as line agencies Consortium to undertake appropriate measures for the participation of civil servants in PPPs	
ital	Resource person of IWRM to build capacity of civil servants via training	To advocate IWRM via training program	To implement AACB program via ToT following the training module	National	KASA/KPKT/MO H	MSANg/J PS/JAS/PB T/DO	New	12 th MP and beyond	Facilitate by JPS district office as well as MSANg	Int
Intellectual Capital	Institutionalization of public participatory platform (PPP) for the effective decisionmaking processes of IWRM	To enhance participation of civil servants in PPPs in order to ease decision making for IWRM via AACB training program.	Training of 154 local authorities and 171 district officials for the proactive leadership roles to accelerate the implementation of IWRM.	River Basin	KASA/KPKT/MO H	MSANg/J PS/JAS/PB T/DO	New	12 th MP	Inter-Ministerial as well as line agencies Consortium to undertake appropriate measures for the participation of civil servants in PPPs	ellectual Capital

		AACB W	ST2040 Strategy Plan and Im	plementation	on Road Map followin	g 8i Model				
		AACB Strategies		12 th MP Strategies WST2040 Strategies				Strategies		
		Water Resource								
Area			12 th MP/13 th M	IP/14 th MP/	15 th MP			ı		Focus
Focus Ar	Strategy	Initiatives	Programmes/ Activities	Hierarc hical Level	Lead Authority/ Collaborating Partners	Implemen ting Authority	Curr ent Statu s	Target Completi on	Remarks	cus Area
	Capacity building and continuous improvement of civil servants to enhance their communication skills, river care knowledge, environmental subjects such as ecology, general organisation and management skills and others in related subjects.	Conduct series of trainings and workshops for all stakeholders: Politicians; government staff, private sectors as well public/local communities Contributors and facilitators through assisting the target groups on the various local initiatives such as IRBM/IWRM, river care, river monitoring, pollution management and outreach programmes along various stretches of the rivers.	Internal project team Soft skills training on public outreach Participation Organise site visit and study tour	River Basin	KASA/KPKT/MO H	MSANg/J PS/JAS/PB T/DO	New	12 th MP and beyond	Inter-Ministerial as well as line agencies consortium to undertake appropriate measures for the participation of civil servants in PPPs	
	Enhance River basin understanding by govt. officials and public	Develop awareness material to educate govt. officials and public on river basin concept; IWRM & IRBM.	Enhance and promote RIVER ADDRESS. Develop simple brochure, video, etc.	River Basin	KASA/KPKT/MO H	MSANg/J PS/JAS/PB T/DO	New	12 th MP and beyond	Inter-Ministerial as well as line agencies Consortium to undertake appropriate measures for the participation of civil servants in PPPs	

		AACB W	/ST2040 Strategy Plan and Im	plementatio	on Road Map followin	g 8i Model				
		AACB Strategies			12 th MP Strategies			WST2040	Strategies	
			Water Resources N	Ianagement	in 8i Model					
ea			12 th MP/13 th M	3 th MP/14 th MP/15 th MP						
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarc hical Level	Lead Authority/ Collaborating Partners	Implemen ting Authority	Curr ent Statu s	Target Completi on	Remarks	Focus Area
	Enhance awareness for IWRM	Develop training modules on IWRM awareness program Training of Trainers Specialise training on use of models and tools related to IWRM and IRBM	Training for administrators and water managers related to management of natural resources (land, water, forest, etc.) Training for technical personnel Awareness programme for other govt. staff/public Training on the application and management of tools and models related to IWRM and IRBM for technical personnel	National	KASA/KPKT/MO H	State govt./JPS/J AS/PBT/D O	New	12 th MP and beyond	Inter-Ministerial consortium chaired by KASA to undertake AACB training programme nationwide.	
Integrity	Training module to enhance leadership roles of civil servants in order to facilitate the enforcement of policies and laws for better water governance.	To enhance enforcement capacity of civil servants via AACB training programme.	Dato' Ir. Nor Hisham bin Mohd. Ghazali, Director General- Department of Irrigation and Drainage Malaysia has offered 164 JPS district officials will train civil servants on IWRM from the perspective of integrated river basin management authority.	River Basin/ District/ Local Authorit y level	KASA/KPKT/MO H	MSANg/J PS/JAS/PB T/DO	New	12 th MP and beyond	Inter-Ministerial as well as line agencies Consortium to undertake appropriate measures for the participation of civil servants in PPPs	Integrity

		AACB W	ST2040 Strategy Plan and Im	plementatio	on Road Map followin	g 8i Model				
		AACB Strategies			12 th MP Strategies			WST2040	Strategies	
			Water Resources N	Janagement	t in 8i Model					
Area			12 th MP/13 th M	/IP/14 th MP/	15 th MP					Fo
Focus Ar	Strategy	Initiatives	Programmes/ Activities	Hierarc hical Level	Lead Authority/ Collaborating Partners	Implemen ting Authority	Curr ent Statu s	Target Completi on	Remarks	Focus Area
	Improvised and publicised key legislations and regulations related to IWRM/IRBM.	Local authority: Legislations and by-laws; Environment: Legislation and regulations related to environmental protection in Malaysia. Water and sewage: Legislation, particularly Water Services Industry Act 2006 (Act 655) Solid waste: Legislation, particularly Solid Waste and Public Cleansing Management Act 2007 (Act 672)	Review to determine their effectiveness in prevention of pollution of rivers and to highlight any significant gaps and weaknesses for the attention of the relevant agencies, such as, DBKL, DOE, KASA and MFT (KWP) to enhance the efficacy and efficiency as well to avoid any duplication. Develop promotion materials on this and distribute to target groups especially local authorities and communities.	National	KASA/KPKT/MO H	State govt./JPS/J AS/PBT/D O	New	12 th MP and beyond	Inter-Ministry consortium chaired by KASA as well as JPS district office, MSANg, JAS, PBT, & DO.	
	Water-related disaster risk management	To motivate civil servants in managing water resources from the perspective of disaster risk reduction in order to minimise the future disaster from man-made and natural sources.	Number of water catchment areas gazetted for protection Number of Integrated River Basin Management (IRBM) Studies undertaken National Water Balance System (NAWABS) for river basins	National	KASA/Sabah/Sara wak	KASA/Sab ah/Sarawa k	On- going	12 th MP and beyond	From 11 th MP	

		AACB W	ST2040 Strategy Plan and Im	plementation	on Road Map followin	g 8i Model				
		AACB Strategies			12 th MP Strategies			WST2040	Strategies	
			Water Resources M	Managemen	t in 8i Model					
g			12 th MP/13 th M	/IP/14 th MP/	15 th MP					¥
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarc hical Level	Lead Authority/ Collaborating Partners	Implemen ting Authority	Curr ent Statu s	Target Completi on	Remarks	Focus Area
			No. of Integrated Shoreline Management Plans developed No. of National Coastline Erosion Studies completed No. of states with National Flood Forecasting Warning Programme developed No. of Drainage Master Plans for major cities developed No. of flood storage ponds constructed	National	KASA/Sabah/Sara wak	KASA/JPS Sabah/JPS Sarawak	On- going	12 th MP and beyond	From 11 th MP	
Incentives	Adequate funds for non-structural capacity building towards IWRM.	• To implement comprehensive AACB program at the PPPs.	• Finance for the pool of water experts to advocate IWRM and to train future water leaders using the facilities at the National Training Centres.	National	KASA	State govt./JPS/J AS/PBT/D O	New	12 th MP and beyond	Inter-Ministry consortium chaired by KASA, as well as SEPU, JPS district office, MSANg, JAS, PBT, & DO.	Incen
Incer	Green watershed restoration	• To adopt nature-based solutions for the watershed restoration.	Training before Water Service Licensing. Green Incentives and Certification and awards.	River Basin	KASA/KPKT/MO H	MSANg/J PS/JAS/PB T/DO	New	12 th MP and beyond	AACB Training Module will suggest the possible sources of Data and Information for IWRM	itives

		AACB W	ST2040 Strategy Plan and Im	plementatio	on Road Map followin	g 8i Model				
		AACB Strategies			12 th MP Strategies			WST2040	Strategies	
			Water Resources N	Management	in 8i Model					
g			12 th MP/13 th M	1P/14 th MP/	15 th MP					¥
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarc hical Level	Lead Authority/ Collaborating Partners	Implemen ting Authority	Curr ent Statu s	Target Completi on	Remarks	Focus Area
	Continuous Federal funding for rehabilitation and restoration of river basin management	To enhance leadership roles of civil servant for rehabilitation and restoration of river basin management.	Water resources assessment; Information management; River basin and Coastal zone management planning; Integrated water R&D Awareness raising, advocacy and capacity building; Mitigation of water related hazards (such as floods, droughts, tsunamis, coastal erosion, and landslides); and Ecosystem rehabilitation and restoration	National	KASA/KeTSA	All State Governme nts	Ongo ing	12 th MP and beyond	Funding from yearly OPEX and allocation from 11 th MP and beyond	
	Adoption of green economic approaches	To encourage civil servants via training for sustainable water resources management while	Payment for ecosystem services	National	KASA	MSANg or Equivalent	Ongo ing	12 th MP and Beyond	KASA/State Water Authorities to develop PES Models and appropriate legislation for respective States	
	for IWRM	applying green economic approaches.	Application of "polluter pays" principle	National	KASA	MSANg or Equivalent	Ongo ing	12 th MP and Beyond	KASA/State Water Authorities to develop appropriate legislation for respective States	

		AACB W	ST2040 Strategy Plan and Im	plementatio	on Road Map followin	g 8i Model				
		AACB Strategies			12 th MP Strategies			WST2040	Strategies	
			Water Resources M	Management in 8i Model						
Area			12 th MP/13 th M	1P/14 th MP/	15 th MP					Fo
Focus Ar	Strategy	Initiatives	Programmes/ Activities	Hierarc hical Level	Lead Authority/ Collaborating Partners	Implemen ting Authority	Curr ent Statu s	Target Completi on	Remarks	Focus Area
			Uniform Pricing Model for Water Resources	National	MAN and KASA	MSANg or Equivalent	New	12 th MP and Beyond	KASA/State Water Authorities to develop uniform Pricing Models and appropriate legislation for respective States	
	Water-based recreation and tourism	•To encourage local authorities via training to promote water based recreation and tourism activities for local level	Water tourism products Conservation of high- value tourism areas Hosting of water-related events, competitions and	National	KASA and KPKT	MOTAC, KWP and Local Authorities	Ongo ing	12 th MP and Beyond	Inter-Ministry consortium chaired by KASA and KPKT, and line agencies	

		AACB Strategies			12 th MP Strategies			WST2040	Strategies
			Water Resources M	I anagement	in 8i Model				
ea			12 th MP/13 th M	IP/14 th MP/	15 th MP				
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarc hical Level	Lead Authority/ Collaborating Partners	Implemen ting Authority	Curr ent Statu s	Target Completi on	Remarks
	Manage river basin for recreational and tourism activities.	To create awareness about the value of water.	Strengthening the available established platform such as: Closing the Loop Management Plastic Waste in Kuala Lumpur by Urbanice Jawatankuasa Pelaksana Pemuliharaan SungaiSungai Negeri Selangor chaired by the EXCO Infra Denai Sungai Kebangsaan by KASA Program Sungai dan Pantai Angkat Negeri Selangor, Qua-Qua Programme by LUAS One District One River Program Majlis Sumber Air Negeri (MSANg)	River Basin	KASA/KPKT/MO H	MSANg/J PS/JAS/PB T/DO	New	12 th MP and beyond	Inter-Ministerial as well as line agencies Consortium to undertake appropriate measures for the participation of civil servants in PPPs

	AACB WST2040 Strategy Plan and Implementation Road Map following 8i Model									
		AACB Strategies			12 th MP Strategies			WST2040	Strategies	
			Water Resources M	Janagement	t in 8i Model					
Area			12 th MP/13 th M	MP/14 th MP/15 th MP						
Focus Ar	Strategy	Initiatives	Programmes/ Activities	Hierarc hical Level	Lead Authority/ Collaborating Partners	Implemen ting Authority	Curr ent Statu s	Target Completi on	Remarks	Focus Area
Institutions	Local government be given the appropriate tools to measure the quality and quantity of the waters under their jurisdiction	To adopt appropriate tools to measure the quality and quantity of the waters under their jurisdiction	To monitor water quality and quantity via using software. Locals to be the first person to report the water issues.	River Basin	KASA/KPKT/MO H	MSANg/J PS/JAS/PB T/DO	New	12 th MP and beyond	AACB Training Module will suggest the possible sources of Data and Information for IWRM	Institutions
Interaction	Partnerships between agencies and Joint Programmes between government sectors	Collaboration and smart partnership to build linkage to enhance knowledge and help foster connectivity between agencies to develop common sense of ownership.	Initiatives through trainings, hand-on workshops, and site visits, public dialogues, and workshop as well as Events, peer to peer learning and project networking amongst govt. agencies e.g. between DOE, DID, KPKT, JPP etc.	National	KASA/KPKT/MO H	State govt./JPS/J AS/PBT/D O	New	12 th MP and beyond	Inter-Ministry consortium chaired by KASA, as well as JPS district office, MSANg, JAS, PBT, & DO.	Interaction

		AACB Strategies	ST2040 Strategy Plan and Im	ринентапо	12 th MP Strategies			WST2040	Strategies	
			Water Resources M	Janagement						
Area			12 th MP/13 th M	1P/14 th MP/	15 th MP					E _O
Focus Ar	Strategy	Initiatives	Programmes/ Activities	Hierarc hical Level	Lead Authority/ Collaborating Partners	Implemen ting Authority	Curr ent Statu s	Target Completi on	Remarks	Focus Area
	Linkages to other ongoing programmes/initiative s for enhancing local	National River Care Fund (NRCF) Linkage with work of existing associations and NGOs/CBOS	GEC provides grants for community initiatives through the NRCF. Looking at opportunities to increase grants with the support of govt. and private sectors Friends of River network for peer to peer learning & networking LA21 initiatives, community garden, World Water Award by DID, Sekolah Lestari by DOE	River Basin/ District/ Local Authorit y level	KASA/KPKT/MO H	MSANg/J PS/JAS/PB T/DO	New	12 th MP and beyond	Inter-Ministerial as well as line agencies Consortium to undertake appropriate measures for the participation of civil servants in PPPs	
	level sustainable income generation activities.	Work with related ongoing government initiatives	World Water Day Celebration Organised with co- operation of each participating local councils and district offices	State	LUAS	Various governmen t agencies and stakeholde rs	Ongo ing	12 th MP and beyond	1 programme yearly	
			Qua-Qua Programme Educating participants on the easiest way to measure the quality of river water	State	LUAS	NGO, IHLs, Schools, Public	Ongo ing	12 th MP and beyond	3 programmes yearly	

		AACB V	VST2040 Strategy Plan and Im	plementation	on Road Map followir	ng 8i Model				
		AACB Strategies			12 th MP Strategies			WST2040	Strategies	
			Water Resources N	s Management in 8i Model						
es.			12 th MP/13 th M	/IP/14 th MP/	15 th MP					Fo
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarc hical Level	Lead Authority/ Collaborating Partners	Implemen ting Authority	Curr ent Statu s	Target Completi on	Remarks	Focus Area
			River Cleaning Programme Conducted together with Qua- Qua Programme	State	LUAS	NGO, IHLs, Schools, Public	Ongo ing	12 th MP and beyond	3 programmes yearly	
			Mangrove Replanting Programme Educating participants on the importance of Mangrove as buffer on coastal area	State	LUAS	NGO, IHLs, Schools, Public	Ongo ing	12 th MP and beyond	3 programmes yearly	
			Beach Cleaning Programme Conducted together with Mangrove Replanting Programme	State	LUAS	NGO, IHLs, Schools, Public	Ongo ing	12 th MP and beyond	3 programmes yearly	
			River Adoption Programme To instil sense of belonging towards river preservation on the nearby communities	State	LUAS	Local councils, district offices, local communiti	Ongo ing	12 th MP and beyond	1 programme yearly	

		AACB V	WST2040 Strategy Plan and Im	plementatio	on Road Map followin	g 8i Model				
		AACB Strategies			12 th MP Strategies			WST2040	Strategies	
			Water Resources M	Ianagement	in 8i Model					
ea			12 th MP/13 th M	MP/14 th MP/15 th MP						Fo
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarc hical Level	Lead Authority/ Collaborating Partners	Implemen ting Authority	Curr ent Statu s	Target Completi on	Remarks	Focus Area
			Beach Adoption Programme To instil sense of belonging towards beach preservation on the nearby communities	State	LUAS	Local councils, district offices, local communiti	Ongo ing	12 th MP and beyond	1 programme yearly	
			Human Resource Strategic Plan 2013–2016 Human Resource Training Policy for Public Sector (Secular No. 6 of 2005) seven day per year. (Internal or external training)	State	LUAS	JPA, SUK Selangor (BPSM), internation al collaborati on	Ongo ing	(Done)	1 programme yearly	
			Conducting a review of the organisational structure very two years. Career development and leadership for LUAS staff according to Regulations Public Officers (Appointment, Promotion and Termination of Service) 2012 / P.U. (A) 1/2012	State	LUAS	BPO JPA, SUK Selangor (BPSM)	Ongo ing	12 th MP and beyond		

		AACB W	ST2040 Strategy Plan and Im	d Implementation Road Map following 8i Model						
		AACB Strategies			12 th MP Strategies			WST2040	Strategies	
			Water Resources N	I anagement	in 8i Model					
Area			12 th MP/13 th M	MP/14 th MP/15 th MP						
Focus An	Strategy	Initiatives	Programmes/ Activities	Hierarc hical Level	Lead Authority/ Collaborating Partners	Implemen ting Authority	Curr ent Statu s	Target Completi on	Remarks	Focus Area
			Strategic Plan for the Prevention of Corruption Educating and increasing awareness of integrity	State	LUAS	SPRM, SUK Selangor (Unit Integriti)	Ongo ing	12 th MP and beyond		
			Organisation Integrity Plan Educating and increasing awareness of integrity	State	LUAS	SPRM, SUK Selangor (Unit Integriti)	Ongo ing	12 th MP and beyond		Intern
Internationalisation	International Networking and Collaboration	To enhance leadership skills in IWRM via knowledge sharing and country comparisons on IWRM.	National research and Capacity Building institutes endeavour to enter into strategic alliances with renowned regional and international water research and training centres for mutual benefit	National	KASA and State Governments	Line Agencies	Ongo ing	12 th MP and Beyond	KASA and State Governments to enhance international networking and linkages	ationalisation
			Regular participation in reputed water-related international water fora related to resource management	National	KASA and State Governments	Line Agencies	Ongo ing	12 th MP and Beyond	KASA and State Governments to enhance international networking and linkages	

5.1.4. Infrastructure- Training Centres

Table 195 The existing suitable water training facilities in Malaysia.

No.	Agencies	Roles, Functions and	Location
1.	Indah Water Training Centre, Indah Water Konsortium (IWK)	Responsibilities Indah Water established a Training Centre in February 2006. The training centre is a dedicated location for technical training on the sewerage system that focuses on theory and practice for the staff and the wider public.	Indah Water Training Centre Sg. Besi Regional Sewage Treatment Works Lebuhraya KL-Seremban, 57000 Bukit Jalil, Kuala Lumpur.
2.	Institut Pembangunan Modal Insan (IPMI), Department of Irrigation and Drainage (JPS)	Training facility for the Department of Irrigation and Drainage	Institut Pembangunan Modal Insan (IPMI) Zon Utara JPS, Jalan Sri Kinta 1, 31650 Ipoh, Perak Institut Pembangunan Modal Insan (IPMI) Zon Timur, Jabatan Pengairan Dan Saliran Malaysia, Taman Desa Kujid, Pauh Panji, 15200 Kota Bharu, Kelantan Institut Pembangunan Modal Insan (IPMI) Zon Tengah, Jabatan Pengairan Dan Saliran Malaysia, Cawangan Ampang, Kompleks JPS Ampang, KM 7, Jalan Air Bukit Off Jalan Ampang, 68000 Ampang, Kuala Lumpur
3.	Environment Institute of Malaysia (EiMAS)	Establishment of EiMAS is an important milestone for the Department of Environment (DOE) as the need to enhance staffs' knowledge and skills in the public and private sectors in dealing with environmental management.	Environment Institute of Malaysia (EiMAS) Department of Environment Kampus Universiti Kebangsaan Malaysia Beg Berkunci No 24 43600 Bangi Selangor Darul Ehsan.
4.	Malaysia Water Academy (Malaysia Water Association) (https://www.mw a.org.my/malaysia n-water- academy/)	The national association regarding networking and technological advancement for water professionals involved in the complete water cycle. Membership comprises of professionals from policy makers, water operators, consultants, contractors and suppliers.	24-2, Second Floor, Jalan Sri Hartamas 8, Taman Sri Hartamas, Kuala Lumpur, 50480, Kuala Lumpur, WP Kuala Lumpur, 50480
5.	Penang Water Services Academy (PWSA) (http://www.pwsa. com.my/)	The Penang Water Services Academy (PWSA) was jointly founded by PBA Resources Sdn Bhd (PBAR) and the Penang Skills Development Centre (PSDC) in December 2007. On 1 November 2013, the academy was officially certified as an 'Authorised Training Provider' by the National Water Services Commission (SPAN). With this certification, PWSA is now authorised to offer the Water Distribution Competency Course (WDCC) Level 1 and Level 2, and Water Treatment Competency Course (WTCC) Levels 1 and Level 2. At the same time, the PWSA also conducts Malaysian Skills Certification.	Penang Water Services Academy (PWSA) 2nd Floor, Kompleks PBAPP Padang Tembak, No. 36, Jalan Padang Tembak, 11400 Air Itam, Pulau Pinang.
6.	Water Academy, Rahnill SAJ	Training facility for Ranhill SAJ Holdings	Ranhill Utilities Berhad (201401014973) 1091059-K (formerly known as Ranhill Holdings Berhad) Bangunan Ranhill SAJ Jalan Garuda, Larkin 80350 Johor Bahru, Johor

Table 196 Proposed 16 AACB WST 2040 training centres.

No	States	Training Centres						
1.	Perak	Institut Pembangunan Modal Insan (IPMI) Zon Utara JPS						
2.	Kedah	INTAN Northern Regional Campus (INTURA)						
3.	Perlis	Institut Latihan Perindustrian Kangar						
4.	Penang	MPC Northern Region						
5.	Kelantan	Institut Pembangunan Modal Insan (IPMI) JPS Zon Timur						
6.	Terengganu	INTAN Eastern Regional Campus (INTIM)						
7.	Melaka	Perbadanan Kemajuan Negeri Melaka (MITC)						
8.	Johor	UTM TTC (Pusat Latihan UTM)						
9.	Negeri Sembilan	Institut Latihan Fama (ILFPD)						
10.	Selangor	Malaysian National Hydraulic Research Institute (NAHRIM)						
11.	Kuala Lumpur	National Institute of Public Administration (INTAN)						
12.	Pahang	Pahang Skills Development Centre						
13.	Sabah	Universiti Malaysia Sabah						
14.	Labuan	Institut Latihan Perindustrian, Labuan						
15.	Sarawak	Universiti Malaysia Sarawak (Unimas)						
16.	Sarawak	National Institute of Public Administration (INTAN) INTAN SARAWAK Campus						

- 1. INTAN Northern Regional Campus (INTURA)
- 2. Institut Latihan Perindustrian Kangar
- 3. MPC Northern Region
- 4. Institut Pembangunan Modal Insan (IPMI) JPS Zon Timur
- 5. INTAN Eastern Regional Campus (INTIM)
- 6. Pahang Skills Development Centre
- 7. Perbadanan Kemajuan Negeri Melaka (MITC)
- 8. Institut Latihan Fama (ILFPD)
- 9. INTAN Kampus Wilayah Selantan (IKWAS)
- 10. Institut Pembangunan Modal Insan (IPMI) Zon Utara JPS
- 11. INTAN SABAH Campus
- 12. INTAN SARAWAK Campus
- 13. INTAN PUTRAJAYA Satellite Campus
- 14. Institut Tadbiran Awam Negara (INTAN) Kuala Lumpur
- 15. Malaysian National Hydraulic Research Institute (NAHRIM)
- 16. INTAN Northern Regional Campus (INTURA)
- 17. Institut Latihan Perindustrian Kangar
- 18. MPC Northern Region
- 19. Institut Pembangunan Modal Insan (IPMI) JPS Zon Timur
- 20. INTAN Eastern Regional Campus (INTIM)
- 21. Pahang Skills Development Centre
- 22. Perbadanan Kemajuan Negeri Melaka (MITC)
- 23. Institut Latihan Fama (ILFPD)
- 24. INTAN Kampus Wilayah Selantan (IKWAS)
- 25. Institut Pembangunan Modal Insan (IPMI) Zon Utara JPS
- 26. INTAN SABAH Campus
- 27. INTAN SARAWAK Campus
- 28. INTAN PUTRAJAYA Satellite Campus

- 29. Institut Tadbiran Awam Negara (INTAN) Kuala Lumpur
- 30. Malaysian National Hydraulic Research Institute (NAHRIM)
- 31. Akademi Pembangunan Belia Malaysia (Kepimpinan) Port Dickson
- 32. Institut Kemahiran Belia Negara (Ikbn)
- 33. Agensi Anti Dadah Kebangsaan
- 34. Akademi Imigresen Malaysia
- 35. Akademi Koreksional Malaysia Langkawi
- 36. Pusat Latihan Aadk
- 37. Pusat Latihan Rela
- 38. Institusi Latihan Kementerian Kesihatan Malaysia
- 39. Akademi Kastam Diraja Malaysia
- 40. Institut Penilaian Negara (Inspen)
- 41. Institut Perakaunan Negara
- 42. Institut Penyiaran Dan Penerangan Tun Abdul Razak (Ipptar)
- 43. Institut Kemahiran Mara
- 44. Institut Kemajuan Desa (Infra)
- 45. Akademi Pembangunan Belia Malaysia (Kepimpinan) Port Dickson
- 46. Institut Kemahiran Belia Negara (Ikbn)
- 47. Agensi Anti Dadah Kebangsaan
- 48. Akademi Imigresen Malaysia
- 49. Akademi Koreksional Malaysia Langkawi
- 50. Pusat Latihan Aadk
- 51. Pusat Latihan Rela
- 52. Institusi Latihan Kementerian Kesihatan Malaysia
- 53. Akademi Kastam Diraja Malaysia
- 54. Institut Penilaian Negara (Inspen)
- 55. Institut Perakaunan Negara
- 56. Institut Penyiaran Dan Penerangan Tun Abdul Razak (Ipptar)
- 57. Institut Kemahiran Mara
- 58. Institut Kemajuan Desa (Infra)

5.1.5. Finance- Water as Resource and Livelihood

5.1.5.1. Water as a Resource

IWRM covers the whole cycle of water management that includes the planning, developing, distribution, and managing the optimum uses of water resources. Hence, in IWRM people are the key to drive the water resources management. Therefore, advocacy, awareness, capacity building (AACB) and public participatory platforms (PPPs) play a significant role in water management from the perspective of non-structural capacity building. Table 214 describes the strategies of water as a resources for the government sector of AACB WST 2040 roadmap.

1) **People**

Institutionalization of public participatory platform (PPP) will be effective for the decision-making processes of IWRM by civil servants. Therefore, AACB training program will motivate the civil servants as well as encourage them to enhance their participation in PPPs in order to ease the decision-making processes for IWRM.

• Training of 154 local authorities and 171 district officials for the proactive leadership roles to accelerate the implementation of IWRM. Capacity building and continuous improvement of leadership skills of civil servants including 154 local authorities and 171 district officials will be to enhance via the AACB training program. Therefore, their communication skills, river care knowledge, environmental subjects such as ecology, general organization and management skills and others in related subjects will also be enhanced for IWRM.

2) Governance

AACB training module will enhance leadership roles of civil servants in order to facilitate the enforcement of policies and laws for better water governance. To enhance enforcement capacity of civil servants via AACB training program, Dato' Ir. Nor Hisham bin Mohd. Ghazali, Director General- Department of Irrigation and Drainage Malaysia has offered 164 JPS district officials will train civil servants for ToT on IWRM from the perspective of integrated river basin management authority.

3) Information and RDCI

AACB training module will guide the civil servants for the integrated and comprehensive datasharing framework to accelerate the implementation of IWRM. Therefore, to ensure the flow of reliable data and information from relevant agencies to the local govt. for IWRM, stakeholders' mapping for Science and Technology (S&T), as well as Social Science and Humanities (SSH) data and information is very important to ease the decision-making processes for IWRM.

4) Infrastructure and Technology

IWRM training centers such as Pusat Informasi Sungai and other should have adequate online/on-site facilities considering the uncertainties. Therefore, to advocate IWRM by the civil servants using AACB training program, virtual and on-site role-play of water experts at the training centers, and at the PPPs are crucial to enhance the leadership skills of local government in decision-making processes for IWRM. Moreover, developing and promoting common

platforms for govt. officials should also include all the relevant stakeholders for IWRM. The development of a common website/podcast, establishing or promoting community based River Care Centre, nationwide road show, existing local community centers, identifying successful NGOs/CBOs as IRBM local champion and trainers and as such will be useful to share information related to IWRM, IRBM and WST2040.

5) Finance

Continuous Federal funding is very vital for the rehabilitation and restoration of river basin management. The AACB training program will also simultaneously enhance the leadership roles of civil servant for rehabilitation and restoration of river basin management. Federal funding is main strength to adopt the green economic approaches for IWRM in Malaysia. Therefore, adequate green funding along with training will encourage civil servants for sustainable water resources management while applying green economic approaches such as 'payment for ecosystem services', application of 'polluter pays' principle, and uniform pricing model for water resources, and as such. Moreover, water-based recreation and tourism activities via AACB training program will also encourage local authorities to promote local level income generation while incorporating the local communities.

Table 1984. Strategies of the government sector on water as a resources for the AACB WST2040 Road map

	Draft WST2040 Strategy Plan and Implementation Road Map												
	AACB Strategies				12 th MP Strategies			WST2040 Strategies					
Focus Area	Water as a Resource/Water Security and Sustainability												
	12 th MP/13 th MP/15 th MP												
	Strategy	Initiatives	Programmes/ Activities	Hierarchic al Level	Lead Authority/ Collaborating Partners	Implementing Authority	Curre nt Status	Target Completio n	Remarks	Focus Area			
People	Institutionalizati on of public participatory platform (PPP) for the effective decision-making processes of IWRM	• To enhance participation of civil servants in PPPs in order to ease decision making for IWRM via AACB training program.	• Training of 154 local authorities and 171 district officials for the proactive leadership roles to accelerate the implementation of IWRM.	River Basin	KASA/KPKT/MOH	MSANg/JPS/JAS/PBT/ DO	New	12 th MP	Inter-Ministerial as well as line agencies Consortium to undertake appropriate measures for the participation of civil servants in PPPs	People			

Capacity building and continuous improvement of civil servants to enhance their communication skills, river care knowledge, environmental subjects such as ecology, general organisation and management skills and others in related subjects.	Conduct series of trainings and workshops for all stakeholders: Politicians; Government staff, private sectors as well public/local communities Contributors and facilitators through assisting the target groups on the various local initiatives such as IRBM/IWRM, river care, river monitoring, pollution management and outreach programmes along various stretches of the rivers.	Internal project team Soft skills training on public outreach Participation Organise site visit and study tour	River Basin	KASA/KPKT/MOH	MSANg/JPS/JAS/PBT/ DO	New	12 th MP and beyond	Inter-Ministerial as well as line agencies Consortium to undertake appropriate measures for the participation of civil servants in PPPs	
Enhance River basin understanding by govt. officials and public	 Develop awareness material to educate govt. officials and public on river basin concept; 	Enhance and promote RIVER ADDRESS. Develop simple brochure, video, etc.	River Basin	KASA/KPKT/MOH	MSANg/JPS/JAS/PBT/ DO	New	12 th MP and beyond	as well as line agencies Consortium to undertake appropriate measures for the participation of	

			Draf	t WST2040 St	rategy Plan and Implementa	ation Road Map				
		AACB Strategi	ies		12 th MP Strategi	es		WST2040 S	Strategies	
			v	Vater as a Res	ource/Water Security and S	ustainability				
ea				12 th	MP/13 th MP/14 th MP/15 th M	P				Fo
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchic al Level	Lead Authority/ Collaborating Partners	Implementing Authority	Curre nt Status	Target Completio n	Remarks	Focus Area
		IWRM & IRBM.							civil servants in PPPs	
	Enhance awareness for IWRM	Develop training modules on IWRM awareness program Training of Trainers Specialise training on use of models and tools related to IWRM and IRBM	Training for administrators and water managers related to management of natural resources (land, water, forest, etc.) Training for technical personnel Awareness program for other govt. staff/public Training on the application and management of tools and models related to IWRM and IRBM for technical personnel	National	KASA/KPKT/MOH	State govt./JPS/JAS/PBT/DO	New	12 th MP and beyond	Inter-Ministerial consortium chaired by KASA to undertake AACB training program nationwide.	

			Draf	t WST2040 St	rategy Plan and Implementa	ntion Road Map				
		AACB Strategi	ies		12 th MP Strategie	es		WST2040 S	Strategies	
			V	Vater as a Reso	ource/Water Security and So	ustainability				
ea				12 th]	MP/13 th MP/14 th MP/15 th M	P				Fo
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchic al Level	Lead Authority/ Collaborating Partners	Implementing Authority	Curre nt Status	Target Completio n	Remarks	Focus Area
Governance	Training module to enhance leadership roles of civil servants in order to facilitate the enforcement of policies and laws for better water governance.	• To enhance enforcement capacity of civil servants via AACB training program.	Dato' Ir. Nor Hisham bin Mohd. Ghazali, Director General- Department of Irrigation and Drainage Malaysia has offered 164 JPS district officials will train civil servants on IWRM from the perspective of integrated river basin management authority.	River Basin/ District/ Local Authority level	KASA/KPKT/MOH	MSANg/JPS/JAS/PBT/ DO	New	12 th MP and beyond	Inter-Ministerial as well as line agencies Consortium to undertake appropriate measures for the participation of civil servants in PPPs	Governance

Improvised and publicised key legislations and regulations related to IWRM/IRBM.	Local authority: Legislations and by-laws; Environment: Legislation and regulations related to environmental protection in Malaysia. Water and sewage: Legislation, particularly Water Services Industry Act 2006 (Act 655) Solid waste: Legislation, particularly Solid Waste and Public Cleansing Management Act 2007 (Act 672)	Review to determine their effectiveness in prevention of pollution of rivers and to highlight any significant gaps and weaknesses for the attention of the relevant agencies, such as, DBKL, DOE, KASA and MFT (KWP) to enhance the efficacy and efficiency as well to avoid any duplication. Develop promotion materials on this and distribute to target groups especially local authorities and communities.	National	KASA/KPKT/MOH	State govt./JPS/JAS/PBT/DO	New	12 th MP and beyond	Inter-Ministry consortium chaired by KASA as well as JPS district office, MSANg, JAS, PBT, & DO.	
Partnerships between agencies and Joint Programmes between government sectors	Collaboration and smart partnership to build linkage to enhance knowledge and help foster connectivity between agencies to	Initiatives through trainings, hand-on workshops, and site visits, public dialogues, and workshop as well as Events, peer to peer learning and project networking amongst govt. agencies e.g. between DOE, DID, KPKT, JPP etc.	National	KASA/KPKT/MOH	State govt./JPS/JAS/PBT/DO	New	12 th MP and beyond	Inter-Ministry consortium chaired by KASA as well as JPS district office, MSANg, JAS, PBT, & DO.	

			Draf	t WST2040 St	rategy Plan and Implementa	ntion Road Map				
		AACB Strategi	es		12 th MP Strategie	es		WST2040 S	Strategies	
			v	Vater as a Reso	ource/Water Security and So	ustainability				
ea				12 th]	MP/13 th MP/14 th MP/15 th M	P				Fo
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchic al Level	Lead Authority/ Collaborating Partners	Implementing Authority	Curre nt Status	Target Completio n	Remarks	Focus Area
		develop common sense of ownership.								
	Water-related disaster risk management	• To motivate civil servants in managing water resources from the perspective of disaster risk reduction in order to minimise the future disaster from man-	Number of water catchment areas gazetted for protection Number of Integrated River Basin Management (IRBM) Studies undertaken National Water Balance System (NAWABS) for river basins	National	KASA/Sabah/Sarawak	KASA/Sabah/Sarawak	On- going	12 th MP and beyond	From 11 th MP	

			Draf	t WST2040 St	rategy Plan and Implementa	ntion Road Map				
		AACB Strateg	ies		12 th MP Strategie	es		WST2040 S	Strategies	
			v	Vater as a Reso	ource/Water Security and So	ustainability				
ea.				12 th]	MP/13 th MP/14 th MP/15 th M	P				Fo
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchic al Level	Lead Authority/ Collaborating Partners	Implementing Authority	Curre nt Status	Target Completio n	Remarks	Focus Area
		made and natural sources.	No. of Integrated Shoreline Management Plans developed No. of National Coastline Erosion Studies completed No. of states with National Flood Forecasting Warning Programme developed No. of Drainage Master Plans for major cities developed No. of flood storage ponds constructed	National	KASA/Sabah/Sarawak	KASA/JPS Sabah/JPS Sarawak	On- going	12 th MP and beyond	From 11 th MP	
	Holistic and integrated approaches for IWRM	• To promote ecosystem based sustainable water governance.	Rules for specific purpose management of: • Catchment Areas • Rivers and Lakes • Groundwater • Coastal Zone • Estuaries • Navigation	State	MSANg or Equivalent	State Line Agencies	On- going	12 th MP	Agencies responsible need to develop appropriate rules to govern/manage these areas	

			Draf	t WST2040 St	rategy Plan and Implementa	ntion Road Map				
		AACB Strateg	ies		12 th MP Strategio	es		WST2040 S	Strategies	
			V	Vater as a Res	ource/Water Security and S	ustainability				
ea				12 th	MP/13 th MP/14 th MP/15 th M	P				Fo
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchic al Level	Lead Authority/ Collaborating Partners	Implementing Authority	Curre nt Status	Target Completio n	Remarks	Focus Area
			Enforcement of water related laws and regulations: • gazetting of reserves and protected areas; • the issue of licenses for various uses; and • imposition of penalties for breaches and offences committed	State	MSANg or Equivalent	Implementing Arm of MSANg or Equivalent	On- going	12 th MP and Beyond	KASA/Peninsu lar States/Sabah/ Sarawak authorities to ensure strict enforcement nationwide	
			• Foresight studies on IWRM and its subsets	National	KASA	Line Agencies	New	12 th MP and Beyond	KASA to lead such studies nationwide	
			Development of management guidelines	National	KASA	Line Agencies	Ongoin g	12 th MP and Beyond	KASA/DID to prepare management guidelines through stakeholder consultations	

			Draf	t WST2040 St	rategy Plan and Implementa	ntion Road Map				
		AACB Strateg	ies		12 th MP Strategie	es		WST2040 S	Strategies	
			v	Vater as a Res	ource/Water Security and Su	ustainability				
ea				12 th	MP/13 th MP/14 th MP/15 th M	P				Fc
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchic al Level	Lead Authority/ Collaborating Partners	Implementing Authority	Curre nt Status	Target Completio n	Remarks	Focus Area
			River Basin Studies and Management Plans	National	KASA	Line Agencies	Ongoin g	12 th MP and Beyond	KASA/DID to undertake such studies and prepare RB management Plans nationwide	
		• To enhance leadership skills of civil	Networking and links with regional and international institutions based on common subject matter and focus areas	National	KASA and State Governments	Line Agencies	Ongoin g	12 th MP and Beyond	KASA and State Governments to enhance international networking and linkages	
	International Networking and Collaboration	servants about IWRM via knowledge sharing and country comparisons on IWRM.	National research and Capacity Building institutes endeavour to enter into strategic alliances with renowned regional and international water research and training centres for mutual benefit	National	KASA and State Governments	Line Agencies	Ongoin g	12 th MP and Beyond	KASA and State Governments to enhance international networking and linkages	

			Draf	t WST2040 St	rategy Plan and Implementa	ntion Road Map				
		AACB Strateg	ies		12 th MP Strategie	es		WST2040 S	Strategies	
			V	Vater as a Res	ource/Water Security and S	ustainability				
ea				12 th :	MP/13 th MP/14 th MP/15 th M	P				Fo
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchic al Level	Lead Authority/ Collaborating Partners	Implementing Authority	Curre nt Status	Target Completio n	Remarks	Focus Area
			• Regular participation in reputed water-related international water fora related to resource management	National	KASA and State Governments	Line Agencies	Ongoin g	12 th MP and Beyond	KASA and State Governments to enhance international networking and linkages	
Information and RDCI	Integrated and comprehensive data sharing framework to accelerate the implementation of IWRM.	• To ensure flow of reliable data and information from relevant agencies to the local govt. for IWRM.	• Stakeholders' mapping for Science and Technology (S&T), as well as Social Science and Humanities (SSH) data and information to ease the decision- making processes for IWRM.	River Basin/ District/ Local Authority level	KASA/KPKT/MOH	MSANg/JPS/JAS/PBT/ DO	New	12 th MP and beyond	Inter-Ministerial as well as line agencies Consortium to undertake appropriate measures for the participation of civil servants in PPPs	Information and RDCI

			Draf	t WST2040 St	rategy Plan and Implementa	ntion Road Map				
		AACB Strategi	ies		12 th MP Strategie	es		WST2040 S	Strategies	
			v	Vater as a Res	ource/Water Security and S	ustainability				
ea.				12 th	MP/13 th MP/14 th MP/15 th M	P				Fo
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchic al Level	Lead Authority/ Collaborating Partners	Implementing Authority	Curre nt Status	Target Completio n	Remarks	Focus Area
	Develop and promote common platform for govt. officials including all stakeholders	Develop a common website/podc ast to share information related to IWRM, IRBM & WST2040 Establish or promote community based River Care Centre	Conduct nationwide road show Identify existing local community centre/site Identify and appoint successful NGOs/CBOs as IRBM local champion and trainers.	National as well as River Basin Level	KASA/KETSA//KPKT/M OH	State govt./JPS/JAS/PBT/DO	New	12 th MP and beyond	Inter-Ministry consortium chaired by KASA as well as JPS district office, MSANg, JAS, PBT, & DO.	
Infrastructure and	IWRM training centres such as Pusat Informasi Sungai and other should have adequate online/on-site facilities considering the uncertainties.	• To advocate IWRM by the civil servants via ToT using AACB training program.	Virtual and on-site role-play of water experts at the training centres, and at the PPPs to enhance skill of local government in decision-making processes for IWRM.	River Basin	KASA	State govt./JPS/JAS/PBT/DO	New	12 th MP and beyond	Inter-Ministry consortium chaired by KASA, as well as SEPU, JPS district office, MSANg, JAS, PBT, & DO.	Infrastructure and

			Draf	t WST2040 St	rategy Plan and Implementa	tion Road Map				
		AACB Strategi	es		12 th MP Strategie	es		WST2040 S	Strategies	
			v	Vater as a Reso	ource/Water Security and So	ıstainability				
rea.				12 th]	MP/13 th MP/14 th MP/15 th M	P				Fo
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchic al Level	Lead Authority/ Collaborating Partners	Implementing Authority	Curre nt Status	Target Completio n	Remarks	Focus Area
	Resource person of IWRM to build capacity of civil servants via training	• To advocate IWRM via training program	• To implement AACB program via ToT following the training module	National	KASA/KPKT/MOH	MSANg/JPS/JAS/PBT/ DO	New	12 th MP and beyond	Facilitate by JPS district office as well as MSANg	
	Public participatory platform (PPP) for the effective decision-making processes of IWRM	• To strengthen the existing PPPs for effective IWRM	• To ensure the participation of civil servants via AACB programme by using IoT and as such.	River Basin	KASA/KPKT/MOH	MSANg/JPS/JAS/PBT/ DO	New	12 th MP and beyond	Inter-Ministerial as well as line agencies Consortium to undertake appropriate measures for the participation of civil servants in PPPs	
	Local government be given the appropriate tools to measure the quality and quantity of the waters under their jurisdiction	To adopt appropriate tools to measure the quality and quantity of the waters under their jurisdiction	 To monitor water quality and quantity via using software. Locals to be the first person to report the water issues. 	River Basin	KASA/KPKT/MOH	MSANg/JPS/JAS/PBT/ DO	New	12 th MP and beyond	AACB Training Module will suggest the possible sources of Data and Information for IWRM	

			Draf	t WST2040 St	rategy Plan and Implementa	ation Road Map				
		AACB Strategi	ies		12 th MP Strategio	es		WST2040 S	trategies	
			V	Vater as a Res	ource/Water Security and S	ustainability				
ea				12 th :	MP/13 th MP/14 th MP/15 th M	P				Fo
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchic al Level	Lead Authority/ Collaborating Partners	Implementing Authority	Curre nt Status	Target Completio n	Remarks	Focus Area
	SSH for the effective decision making processes	• To ensure flow of SSH from the relevant agencies to the local govt. for IWRM	To monitor water quality using platform such as: MURNINE ts (Malaysian Urban- Rural National Indicators Network for Sustainable Developme nt) - Spatial monitoring and reporting tool (SMART)	River Basin	KASA/KPKT/MOH	MSANg/JPS/JAS/PBT/ DO	New	12 th MP and beyond	AACB Training Module will suggest the possible sources of Data and Information for IWRM	

			Draf	t WST2040 St	rategy Plan and Implementa	tion Road Map				
		AACB Strategi	ies		12 th MP Strategie	es		WST2040 S	strategies	
			v	Vater as a Res	ource/Water Security and Su	ıstainability				
ea				12 th]	MP/13 th MP/14 th MP/15 th M	P				Fo
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchic al Level	Lead Authority/ Collaborating Partners	Implementing Authority	Curre nt Status	Target Completio n	Remarks	Focus Area
	Local government to monitoring water quality and quantity for IWRM towards sustainable development	• To ensure water quality and quantity via joint inspection by agencies at the local level.	To form monitoring unit for on-site visit about water quality and quantity e.g. KASA and SPAN formed Unit Cegah Jenayah Alam Sekitar .	National	KASA/KPKT/MOH/MAF I	MSANg/JPS/JAS/PBT/ DO	New	12 th MP and beyond	Inter-Ministerial as well as line agencies Consortium to undertake appropriate measures for the participation of civil servants in PPPs	
	Local government to monitoring groundwater quality and quantity for IWRM	Groundwater as potential alternative source of drinking water	Development of groundwater resources technology i.e. River Bank Filtration system with zero contamination at source (collaboration with NAHRIM)	River Basin	KASA/KPKT/MOH	MSANg/JPS/JAS/PBT/ DO	New	12 th MP and beyond	AACB Training Module will suggest the possible sources of Data and Information for IWRM	

			Draf	t WST2040 St	rategy Plan and Implementa	tion Road Map				
		AACB Strategi	ies		12 th MP Strategie	es		WST2040 S	Strategies	
			v	Vater as a Reso	ource/Water Security and Su	ıstainability				
ea				12 th]	MP/13 th MP/14 th MP/15 th M	P				Fo
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchic al Level	Lead Authority/ Collaborating Partners	Implementing Authority	Curre nt Status	Target Completio n	Remarks	Focus Area
Finance	Adequate funds for non- structural capacity building towards IWRM.	• To implement comprehensiv e AACB program at the PPPs.	Finance for the pool of water experts to advocate IWRM and to train future water leaders using the facilities at the National Training Centres. Finance from local government and university for up-to-date RDCI.	National	KASA	State govt./JPS/JAS/PBT/DO	New	12 th MP and beyond	Inter-Ministry consortium chaired by KASA, as well as SEPU, JPS district office, MSANg, JAS, PBT, & DO.	Finance

			Draf	t WST2040 St	rategy Plan and Implementa	ation Road Map				
		AACB Strateg	ies		12 th MP Strategio	es		WST2040 S	Strategies	
			v	Vater as a Res	ource/Water Security and S	ustainability				
ea.				12 th	MP/13 th MP/14 th MP/15 th M	P				Fo
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchic al Level	Lead Authority/ Collaborating Partners	Implementing Authority	Curre nt Status	Target Completio n	Remarks	Focus Area
	Continuous Federal funding for rehabilitation and restoration of river basin management	• To enhance leadership roles of civil servant for rehabilitation and restoration of river basin management.	Water resources assessment; Information management; River basin and Coastal zone management planning; Integrated water R&D Awareness raising, advocacy and capacity building; Mitigation of water related hazards (such as floods, droughts, tsunamis, coastal erosion, and landslides); and Ecosystem rehabilitation and restoration	National	KASA/KeTSA	All State Governments	On- going	12 th MP and beyond	Funding from yearly OPEX and allocation from 11 th MP and beyond	

5.1.5.2. Water as a Livelihood

IWRM does not only be seen water as natural resources but also as a potential utility for income generation and livelihood. Therefore, Table 215 describes the strategies of water as a livelihood for the government sector of AACB WST 2040 roadmap.

1) People

AACB Training module will enhance the awareness of the civil servants about the value of water. Therefore, the civil servants will be more willing to take care of water resources while promoting and managing river basin based on recreational and tourism activities. Therefore, the function of available existing platforms such as closing the loop management plastic waste in Kuala Lumpur by Urbanice; Jawatankuasa Pelaksana Pemuliharaan Sungai-Sungai Negeri Selangor chaired by the EXCO Infra, Denai Sungai Kebangsaan by KASA, Programme Sungai dan Pantai Angkat Negeri Selangor, Qua-Qua Program by LUAS, One District One River Program, Majlis Sumber Air Negeri (MSANg) and as such should be strengthened for IWRM.

2) Governance

Partnerships between agencies and joint programmes between government sectors are the keys for successful IWRM. Collaboration and smart partnership also help to build linkage to enhance knowledge and help foster connectivity between agencies to develop common sense of ownership. Initiatives through trainings, hand-on workshops, and site visits, public dialogues, and workshop as well as events, peer to peer learning and project networking among govt. agencies e.g. between DOE, DID, KPKT, JPP etc. will also accelerate the implementation of IWRM.

3) Information and RDCI

Continuous RDCI (i.e. research, development, commercialisation and innovation) for National Integrated Data Bank will be the key driver to accelerate the implementation of IWRM. These RDCI will effectively facilitate the real time decision-making of civil servants especially at the local level to promote decision-making processes quickly. In this regard, the stakeholders mapping, series of dialogue and consultations amongst the federal, state and local level stakeholders will also justify the use of real time data and information coming from RDCI for IWRM.

4) Infrastructure and Technology

There should have adequate funds for non-structural capacity building towards IWRM, comprehensive AACB programme at the PPPs, finance for the pool of water experts to advocate IWRM and to train future water leaders using the facilities at the National Training Centers. Incentives and award should be provided for the green watershed restoration, as well as nature-based solutions for the watershed restoration. Green incentives, and certification and awards should be given to the SMEs (i.e. small and medium enterprises) by the local government for attending the AACB WST Training programme before water servicing licensing and relicensing. Land affected/near dead rivers should be given full priority for pollution issues and if necessary should be gazetted. One District One River Programme by

JPS should adopt suitable structural and non-structural measures to reduce water pollution and avoid shutdowns of water treatment plants.

5) Finance

There should have adequate funds for non-structural capacity building towards IWRM, comprehensive AACB program at the PPPs, finance for the pool of water experts to advocate IWRM and to train future water leaders using the facilities at the National Training Centers. Incentives and award should be provided for the green watershed restoration, as well as nature-based solutions for the watershed restoration. Green incentives, and certification and awards should be given to the SMEs (i.e. small and medium enterprises) by the local government for attending the AACB WST Training program before water servicing licensing and relicensing.

Table 1995. Strategies of the government sector on Water as Livelihood for the AACB WST2040 road map

			Draft V	WST2040 Strate	egy Plan and Implemen	ntation Road Map				
	AA	CB Strategies			12 th MP Strat	tegies		WST2040 Stra	ategies	
				W	ater as a Livelihood					
ea				12 th MP	/13 th MP/14 th MP/15 th	MP				Fo
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchical Level	Lead Authority/ Collaborating Partners	Implementing Authority	Current Status	Target Completion	Remarks	Focus Area
People	Promote and manage river basin based on recreational and tourism activities.	To create awareness about the value of water.	Strengthening the available established platform such as: Closing the Loop Management Plastic Waste in Kuala Lumpur by Urbanice Jawatankuasa Pelaksana Pemuliharaan Sungai-Sungai Negeri Selangor chaired by the EXCO Infra Denai Sungai Kebangsaan by KASA Program Sungai dan Pantai Angkat Negeri Selangor, Qua-Qua Program by LUAS One District One River Program Majlis Sumber Air Negeri (MSANg)	River Basin	KASA/KPKT/MOH	MSANg/JPS/JAS/PBT/DO	New	12 th MP and beyond	Inter- Ministerial as well as line agencies Consortium to undertake appropriate measures for the participation of civil servants in PPPs	People

			Draft V	WST2040 Strate	egy Plan and Implemen	ntation Road Map				
	AA	CB Strategies			12 th MP Strat	egies		WST2040 Stra	ntegies	
				W	ater as a Livelihood					
ea				12 th MP	/13th MP/14th MP/15th	MP				Fo
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchical Level	Lead Authority/ Collaborating Partners	Implementing Authority	Current Status	Target Completion	Remarks	Focus Area
Governance	Linkages to other ongoing programmes/initiatives for enhancing local level sustainable income generation activities.	National River Care Fund (NRCF) Linkage with work of existing associations and NGOs/CBOS Work with related ongoing government initiatives	GEC provides grants for community initiatives through the NRCF. Looking at opportunities to increase grants with the support of govt. and private sectors Friends of River network for peer to peer learning & networking LA21 initiatives, community garden, World Water Award by DID, Sekolah Lestari by DOE	River Basin/ District/ Local Authority level	KASA/KPKT/MOH	MSANg/JPS/JAS/PBT/DO	New	12 th MP and beyond	Inter- Ministerial as well as line agencies consortium to undertake appropriate measures for the participation of civil servants in PPPs	Governance

			Draft V	WST2040 Strate	gy Plan and Implemen	ntation Road Map				
	A	ACB Strategies			12 th MP Strat	tegies		WST2040 Stra	ategies	
				W	ater as a Livelihood					
æ				12 th MP	/13th MP/14th MP/15th	MP				-
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchical Level	Lead Authority/ Collaborating Partners	Implementing Authority	Current Status	Target Completion	Remarks	Focus Area
			World Water Day Celebration Organised with co-operation of each participating local councils and district offices	State	LUAS	Various government agencies and stakeholders	Ongoing	12 th MP and beyond	1 programme yearly	
			Qua-Qua Program Educating participants on the easiest way to measure the quality of river water	State	LUAS	NGO, IHLs, Schools, Public	Ongoing	12 th MP and beyond	3 programme yearly	
			River Cleaning Programme Conducted together with Qua- Qua Programme	State	LUAS	NGO, IHLs, Schools, Public	Ongoing	12 th MP and beyond	3 programme yearly	

			Draft V	WST2040 Strate	gy Plan and Implemen	ntation Road Map				
	AA	ACB Strategies			12 th MP Strat	tegies		WST2040 Str	ategies	
				W	ater as a Livelihood					
æ				12 th MP	/13 th MP/14 th MP/15 th	MP				-
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchical Level	Lead Authority/ Collaborating Partners	Implementing Authority	Current Status	Target Completion	Remarks	Focus Area
			Mangrove Replanting Programme Educating participants on the importance of Mangrove as buffer on coastal area	State	LUAS	NGO, IHLs, Schools, Public	Ongoing	12 th MP and beyond	3 programme yearly	
			Beach Cleaning Programme Conducted together with Mangrove Replanting Programme	State	LUAS	NGO, IHLs, Schools, Public	Ongoing	12 th MP and beyond	3 programme yearly	
			River Adoption Programme To instil sense of belonging towards river preservation on the nearby communities	State	LUAS	Local councils, district offices, local communities	Ongoing	12 th MP and beyond	1 programme yearly	

			Draft V	WST2040 Strate	gy Plan and Implemen	ntation Road Map				
	A	ACB Strategies			12 th MP Strat	egies		WST2040 Stra	ategies	
				W	ater as a Livelihood					
ea				12th MP/	/13th MP/14th MP/15th	MP				Fo
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchical Level	Lead Authority/ Collaborating Partners	Implementing Authority	Current Status	Target Completion	Remarks	Focus Area
			Beach Adoption Programme To instil sense of belonging towards beach preservation on the nearby communities	State	LUAS	Local councils, district offices, local communities	Ongoing	12 th MP and beyond	1 programme yearly	
			Human Resource Strategic Plan 2013–2016 Human Resource Training Policy for Public Sector (Secular No. 6 of 2005) seven day per year. (Internal or external training)	State	LUAS	JPA, SUK Selangor (BPSM), international collaboration	Ongoing	(Done)	1 programme yearly	

			Draft \	WST2040 Strate	gy Plan and Impleme	ntation Road Map				
	A	ACB Strategies			12 th MP Strat	tegies		WST2040 Stra	ntegies	
				W	ater as a Livelihood					
B				12 th MP	/13 th MP/14 th MP/15 th	MP				4
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchical Level	Lead Authority/ Collaborating Partners	Implementing Authority	Current Status	Target Completion	Remarks	Focus Area
			Conducting a review of the organisational structure very two years. Career development and leadership for LUAS staff according Regulations Public Officers (Appointment, Promotion and Termination of Service) 2012 / P.U. (A) 1/2012	State	LUAS	BPO JPA, SUK Selangor (BPSM)	Ongoing	12 th MP and beyond		
			Strategic Plan for the Prevention of Corruption Educating and increasing awareness of integrity	State	LUAS	SPRM, SUK Selangor (Unit Integriti)	Ongoing	12 th MP and beyond		

			Draft V	WST2040 Strate	egy Plan and Implemen	ntation Road Map				
	AA	CB Strategies			12 th MP Strat	egies		WST2040 Str	ategies	
				W	ater as a Livelihood					
Area				12 th MP	/13 th MP/14 th MP/15 th	MP				Fo
Focus Ar	Strategy	Initiatives	Programmes/ Activities	Hierarchical Level	Lead Authority/ Collaborating Partners	Implementing Authority	Current Status	Target Completion	Remarks	Focus Area
			Organisation Integrity Plan Educating and increasing awareness of integrity	State	LUAS	SPRM, SUK Selangor (Unit Integriti)	On- going	12 th MP and beyond		
Information and RDCI	Continuous RDCI for National Integrated Data Bank to accelerate the implementation of IWRM	• To facilitate the real time decision making of civil servants especially at the local level.	Stakeholders mapping. Series of dialogue and consultations among the federal, state and local level stakeholders.	River Basin/ District/ Local Authority level	KASA/KPKT/MOH	MSANg/JPS/JAS/PBT/DO	New	12 th MP and beyond	Inter- Ministerial as well as line agencies Consortium to undertake appropriate measures for the participation of civil servants in PPPs	Information and RDCI

			Draft V	WST2040 Strate	egy Plan and Impleme	ntation Road Map				
	AA	CB Strategies			12 th MP Strat	tegies		WST2040 Str	ategies	
				W	ater as a Livelihood					
ea				12 th MP	/13th MP/14th MP/15th	MP				Fc
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchical Level	Lead Authority/ Collaborating Partners	Implementing Authority	Current Status	Target Completion	Remarks	Focus Area
Infrastructure and Technology	Watershed restoration	• Land affected/near dead rivers should be given full priority for pollution issues and if necessary should be gazetted.	One District One River Program by JPS Adoption of suitable structural and nonstructural measures to reduce water pollution and avoid shutdowns of water treatment plants.	River Basin	KASA/KPKT/MOH	MSANg/JPS/JAS/PBT/DO	New	12 th MP and beyond	AACB Training Module will suggest the possible sources of Data and Information for IWRM	Infrastructure and Technology
Finance	Green watershed restoration	• To adopt nature-based solutions for the watershed restoration.	Training before Water Service Licensing. Green Incentives and Certification and awards.	River Basin	KASA/KPKT/MOH	MSANg/JPS/JAS/PBT/DO	New	12 th MP and beyond	AACB Training Module will suggest the possible sources of Data and Information for IWRM	Finance

			Draft \	WST2040 Strate	egy Plan and Implemen	ntation Road Map				
	AA	CB Strategies			12 th MP Strat	tegies		WST2040 Str	ategies	
				W	ater as a Livelihood					
ea				12 th MP	/13 th MP/14 th MP/15 th	MP				Fo
Focus Area	Strategy	Initiatives	Programmes/ Activities	Hierarchical Level	Lead Authority/ Collaborating Partners	Implementing Authority	Current Status	Target Completion	Remarks	Focus Area
		• To encourage	Payment for ecosystem services	National	KASA	MSANg or Equivalent	On- going	12 th MP and Beyond	KASA/State Water Authorities to develop PES Models and appropriate legislation for respective States	
	Adoption of green economic approaches for IWRM	civil servants via training for sustainable water resources management while	Application of "polluter pays" principle	National	KASA	MSANg or Equivalent	On- going	12 th MP and Beyond	KASA/State Water Authorities to develop appropriate legislation for respective States	
		applying green economic approaches.	• Uniform Pricing Model for Water Resources	National	MAN and KASA	MSANg or Equivalent	New	12 th MP and Beyond	KASA/State Water Authorities to develop uniform Pricing Models and appropriate legislation for respective States	

Draft WST2040 Strategy Plan and Implementation Road Map										
	AACB Strategies			12 th MP Strategies			WST2040 Strategies			
	Water as a Livelihood									Fo
Focus Area	12 th MP/13 th MP/15 th MP									
	Strategy	Initiatives	Programmes/ Activities	Hierarchical Level	Lead Authority/ Collaborating Partners	Implementing Authority	Current Status	Target Completion	Remarks	Focus Area
	Water-based recreation and tourism	•To encourage local authorities via training to promote water based recreation and tourism activities for local level income generation.	Water tourism products Conservation of high-value tourism areas Hosting of water-related events, competitions and festivals	National	KASA and KPKT	MOTAC, KWP and Local Authorities	On- going	12 th MP and Beyond	Inter-Ministry consortium chaired by KASA and KPKT, and line agencies	

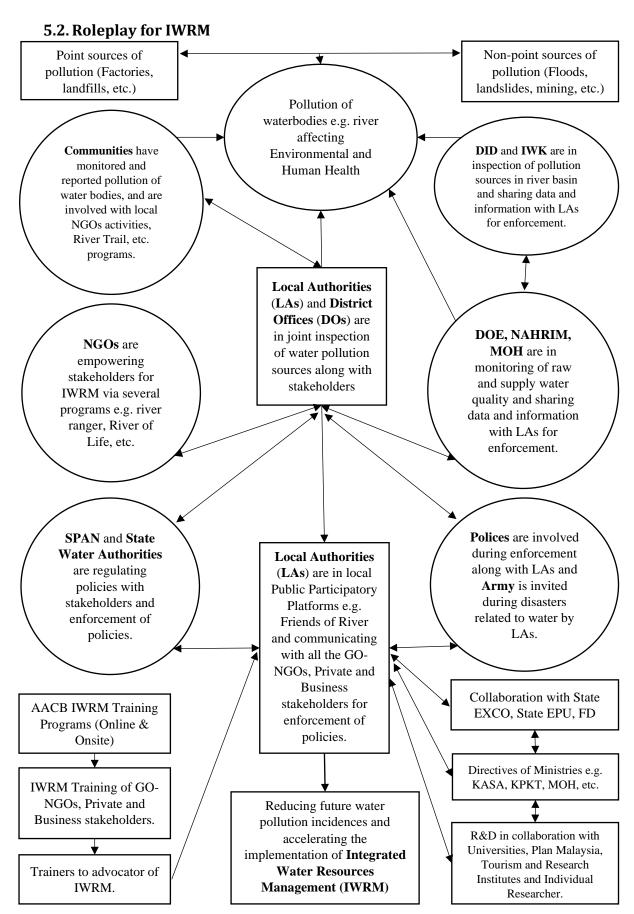
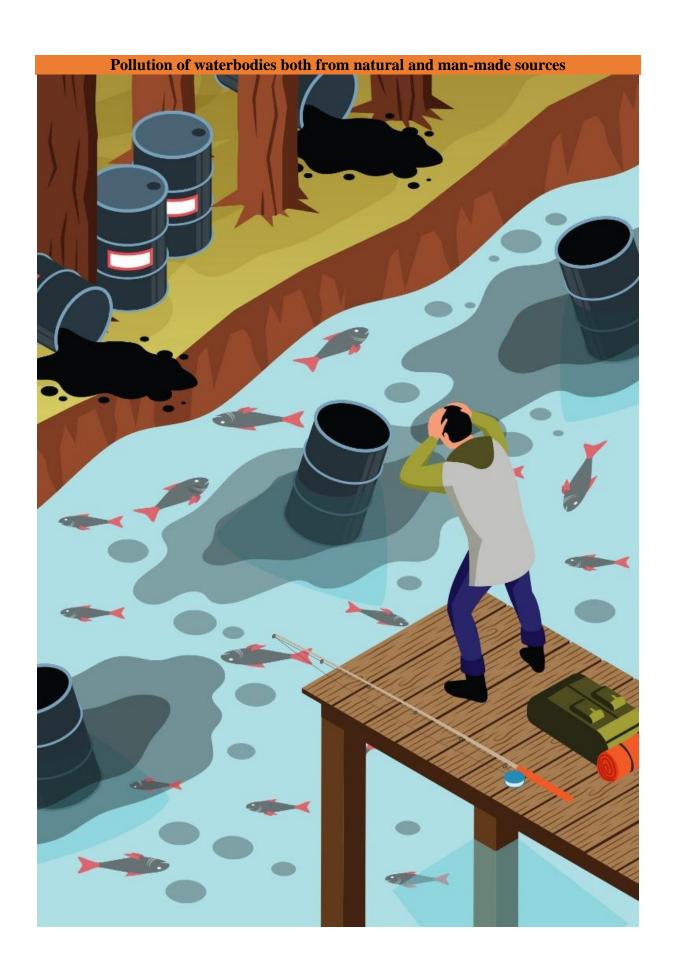
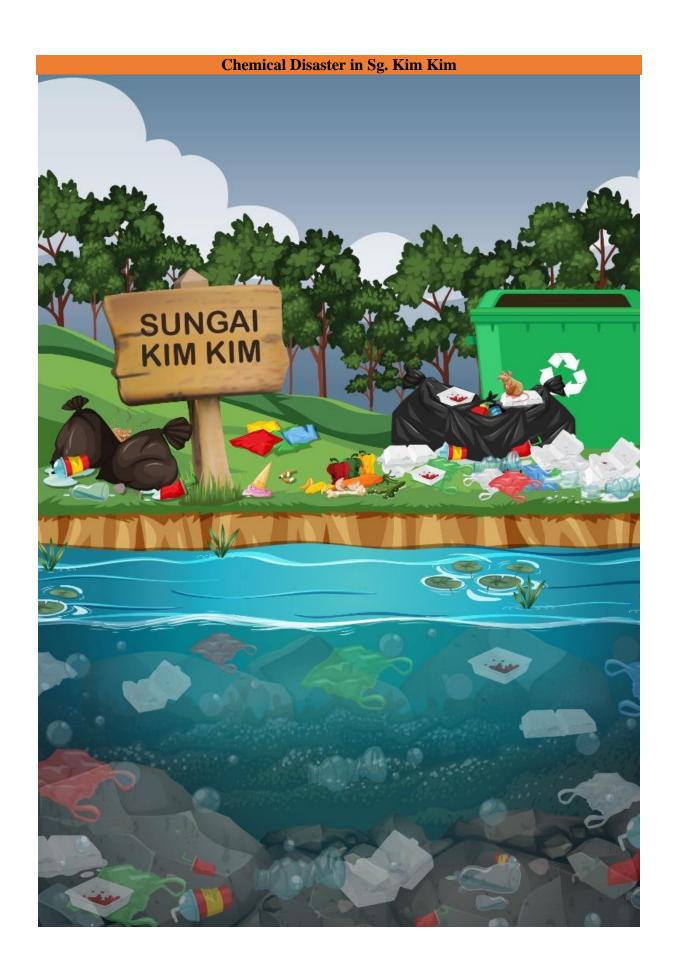


Figure 87. Reducing water related disasters for better environmental and public health







Lead in Blood and Hair of Population near an Operational and a Proposed Area for Copper Mining, Malaysia

Mazlin B. Mokhtar, 1 Almah Bt. Awaluddin, 1 Chin Wai Fong, 1 and Wan Mazlan B. Hj. Mohd. Woojdy2

¹Faculty of Science and Natural Resources, Universiti Kebangsaan Malaysia, Locked Bag No. 62, 88996 Kota Kinabalu, Malaysia and ²Department of Medical and Health Services, Sabah, Malaysia

Lead toxicity is one of the known human health problems. Lead accumulates in biological systems and its mechanism of action is slow. Generally, lead could cause protoplasm poisoning (Berman 1980). The toxicity of lead at high levels of exposure is well known, but a major concern of today is the possibility that continual exposure to relatively low level of lead may entail adverse health effects. Lead impairs the renal, hemopoietic and nervous systems and it has been suggested that lead is causally related to deficiency in cognitive functioning (Bergback et al. 1992).

Hair has been used indicator filaments for lead accumulation in human because lead concentration in hair is probably correlated to lead storage in bones (Eltayeb and Grieken 1990). Lead circulates in human body system through the blood circulation. Lead concentration in blood (PbB) is an important parameter in the assessment of lead exposure and its toxicity effects to humans. Blood is a good indicator of the current level of lead in human body but not a good indicator of the total lead body burden (Ahmed and Elmubarak 1990). Lead concentration in blood depicts the dynamic equilibrium between exposure level, rates of take, distribution and excretion (Racliffe 1981).

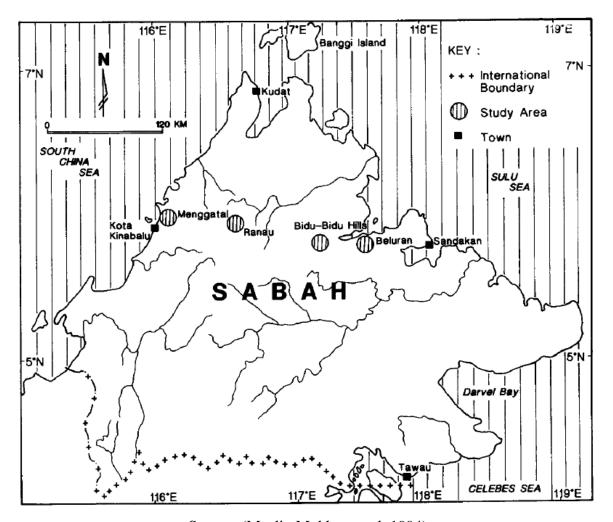
In this study the concentration of lead in blood and lead in hair from a selected population living in the vicinity of a copper mine in Ranau district and population living in the vicinity of a proposed copper mine in Bidu Bidu was measured. Figure 1 shows the location of study areas. The copper mine in Ranau has been operational since 1975. It is situated upstream of Labuk and Sugut rivers in Lohan Valley, an agricultural area which is drained by Labuk, Sugut, Liwagu, Mamut, Merali, Langanan, Pangakatan, Lohan and Bongkud rivers. Lohan, Mamut and Merali rivers are tributaries of Sugut River. The upstream area of Sugut River is made up of igneous and metamorphic rocks which are rich with minerals containing gold, silver, zinc, copper and chromium (Rakmi et al. 1984). A mine tailings dam called Lohan Dam is situated within one km of Bongkud Village (KB) and about 16 km from the open cut mine. The waste failings are transported to this dam via pipes.

Previous physicochemical studies around the copper mine area reported elevated levels of heavy metals in water, sediment, plants and aquatic organisms samples suggesting a possible contamination due to mining activities (Rakmi et al. 1984, Murtedza and Hanapi 1984, Jumat and Maimunah 1989), Mokhtar and Hazan (1990) reported their preliminary findings of elevated trace metals (including lead) in hair samples of the population living in the vicinity of the copper mine in Ranau.

MATERIALS AND METHODS

A total of 424 blood samples and 360 hair samples were obtained from populations of Singgaron Baru Village (KSB) and Bongkud Village (KB), both situated near the operational copper mine in Ranau (Fig. 1); Sualog Village (KS), Kiabau Village (KK), Perancangan Village (KP), Bambangan Village

Send reprint requests to Dr. Mazlin B Mokhtar at the above address



Source: (Mazlin Mokhtar et al. 1994)

Figure 88. Study conducted at the copper mining areas in Sabah Malaysia

ORIGINAL PAPER



Environmental geochemistry of the abandoned Mamut Copper Mine (Sabah) Malaysia

Antony van der Ent · Mansour Edraki (5)

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Abstract The Mamut Copper Mine (MCM) located in Sabah (Malaysia) on Bomeo Island was the only Cu-Au mine that operated in the country. During its operation (1975-1999), the mine produced 2.47 Mt of concentrate containing approximately 600,000 t of Cu, 45 t of Au and 294 t of Ag, and generated about 250 Mt of overburden and waste rocks and over 150 Mt of tailings, which were deposited at the 397 ha Lohan tailings storage facility, 15.8 km from the mine and 980 m lower in altitude. The MCM site presents challenges for environmental rehabilitation due to the presence of large volumes of sulphidic minerals wastes, the very high rainfall and the large volume of polluted mine pit water. This indicates that rehabilitation and treatment is costly, as for example, exceedingly large quantities of lime are needed for neutralisation of the acidic mine pit discharge. The MCM site has several unusual geochemical features on account of the concomitant occurrence of acidforming sulphide porphyry rocks and alkaline serpentinite minerals, and unique biological features because of the very high plant diversity in its

A. van der Ent (☑) · M. Edraki Centre for Mined Land Rehabilitation, Sustainable Minerals Institute, The University of Queensland, St Lucia, QLD 4072, Australia e-mail: a.vanderent@uq.edu.au

A. van der Ent Laboratoire Sols et Environnement, UMR 1120, Université de Lorraine – INRA, Nancy, France

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immediate surroundings. The site hence provides a valuable opportunity for researching natural acid neutralisation processes and mine rehabilitation in tropical areas. Today, the MCM site is surrounded by protected nature reserves (Kinabalu Park, a World Heritage Site, and Bukit Hampuan, a Class I Forest Reserve), and the environmental legacy prevents degazetting and inclusion in these protected area in the foreseeable future. This article presents a preliminary geochemical investigation of waste rocks, sediments, secondary precipitates, surface water chemistry and foliar elemental uptake in ferns, and discusses these results in light of their environmental significance for rehabilitation.

Keywords Biodiversity · Floc · Kinabalu · Mamut Copper Mine · Malaysia · Sabah

Introduction

The environmental legacy of abandoned mines depends on geology and climate, as well as past mining and mineral processing practices. Mines operating porphyry Cu-Au systems can potentially pose significant post-mining environmental impacts, because: (i) disseminated ore and large volume of these deposits require extensive open-cut operations with high tonnages of waste rock; (ii) with high throughput rates, large amounts of tailings are consequently produced; (iii) mining wastes contain reactive





Fig. 2 a Serpentinite rock dump; b mixing of the pit drainage water with the Mamut River; c main waste rock (overburden) dump; d drainage from the pit; e Mg-floc occurring where alkaline drainage meets acid mine water; f Al-floc an associated

co-precipitates in the pit; g Nepenthes stenophylla (Nepenthaceae) growing on Cu precipitates; h pyrrhotite-rich waste rock

Source: (der Ent & Edraki, 2016)

5.2.1. Role-play of Government Agencies for IWRM

Water Related Disasters

Local Authority (LA)

- ➤ We have observed water related disasters and we have to take action immediate measures to reduce the impact within our and neighbor's jurisdictions.
- Let's communicate with all the relevant stakeholders for cross checking of the incidents via our enforcement unit.

District Office (DO)

The water related disaster the happened within this specific area and we are sharing the socio-economic and demographic information with LA.

Community

➤ We observed that the river watercolor has changed and there are bad odour. We have informed it to the enforcement officials of LA and DOE in ground as well as called their hotline.

NGO

We have informed all the relevant stakeholders about the incidents and we are documenting the impact.

Dept. of Irrigation and Drainage (DID)

- ➤ We are investigating the reason of incident and considering possible measures to reduce it.
- ➤ We are in communication with LA, DO, DOE, SPAN, State Water Authority, and MOH to share information and data.

Dept. of Environment (DOE)

- ➤ We are investigating the reason of incident and considering possible measures to reduce it.
- ➤ We are in communication with LA, DO, DID, IKW, SPAN, and State Water Authority to share information and data.

State Water Authority

- ➤ We are investigating the reason of incident and considering possible measures to reduce it.
- ➤ We are in communication with LA, DO, DID, DOE, IWK, SPAN, and MOH to share information and data.

Indah Water Konsortium (IWK)

➤ We are investigating the reason of incident and considering possible measures to reduce it.

➤ We are in communication with LA, DO, DID, SPAN, State Water Authority and MOH to share information and data.

Suruhanjaya Perkhidmatan Air Negara (SPAN)

- ➤ We are investigating the reason of incident and considering possible measures to reduce it
- ➤ We are in communication with LA, DO, DID, IWK, State Water Authority and MOH to share information and data.

Engineering Division, Ministry of Health (MOH)

- ➤ We are investigating the reason of incident and considering possible measures to reduce its impact on both environmental health and public health.
- ➤ We are in communication with LA, DO, DID, SPAN, State Water Authority and IWK to share information and data.

Local Authority (LA)

- ➤ We have invited all the relevant stakeholders including police, army and voluntary organisation to conduct a formal meeting and to take actions at the ground.
- ➤ If necessary, the law enforcement agencies will be deployed at the ground.

Jabatan Sukarelawan Malaysia (RELA)

We are ready to facilitate the activate of LA to reduce the impact of water related disaster.

Police

We are ready to facilitate the activate of LA to reduce the impact of water related disaster.

Army

We are ready to facilitate the activates of LA to reduce the impact of water related disaster.

Prevent Future Water related Disasters

Local Authority (LA)

➤ We have to enhance our capacity to prevent the future water related disaster via IWRM Training of AACB WST 2040.

AACB WST 2040 Task Force

- ➤ We have developed IWRM training module for the relevant stakeholders to build their capacity.
- We can conduct both online and onsite training on IWRM via resource persons.
- ➤ We have prepared water experts' directory to facilitate the decision-making processes of Local Authority.
- ➤ We have identified suitable IWRM training centres in all the states.

District Office (DO)

➤ After the IWRM Training by AACB WST 2040, we are more capable of networking and collaborating with State and Federal agencies as well as other relevant stakeholders for IWRM.

Local Authority (LA)

➤ After the IWRM Training by AACB WST 2040, we are more capable of networking and collaborating with State and Federal agencies as well as other relevant stakeholders for IWRM.

DID

- After the IWRM Training by AACB WST 2040, we are more capable of networking and collaborating with Local, State and Federal agencies as well as other relevant stakeholders for IWRM.
- ➤ After the IWRM AACB training, we have better IWRM directives to line agencies.

DOE

- After the IWRM Training by AACB WST 2040, we are more capable of networking and collaborating with Local, State and Federal agencies as well as other relevant stakeholders for IWRM.
- After the IWRM AACB training, we have better IWRM directives to line agencies.

State Water Authority

- ➤ After the IWRM Training by AACB WST 2040, we are more capable of networking and collaborating with Local, State and Federal agencies as well as other relevant stakeholders for IWRM.
- After the IWRM AACB training, we have better IWRM directives to line agencies.

SPAN

- After the IWRM Training by AACB WST 2040, we are more capable of networking and collaborating with Local, State and Federal agencies as well as other relevant stakeholders for IWRM.
- After the IWRM AACB training, we have better IWRM directives to line agencies.

Forestry Dept.

- After the IWRM Training by AACB WST 2040, we are more capable of networking and collaborating with Local, State and Federal agencies as well as other relevant stakeholders for IWRM.
- After the IWRM AACB training, we have better IWRM directives to line agencies.

State EPU

After the IWRM Training by AACB WST 2040, we are more capable of networking and collaborating with Local, State and Federal agencies as well as other relevant stakeholders for IWRM.

After the IWRM AACB training, we have better IWRM directives to line agencies.

State EXCO

- ➤ After the IWRM Training by AACB WST 2040, we are more capable of networking and collaborating with Local, State and Federal agencies as well as other relevant stakeholders for IWRM.
- After the IWRM AACB training, we have better IWRM directives to line agencies.

Parliamentarian

- After the IWRM Training by AACB WST 2040, we are more capable of networking and collaborating with Local, State and Federal agencies as well as other relevant stakeholders for IWRM.
- ➤ After the IWRM AACB training, our knowledge has improved for better IWRM directives to line agencies.

Ministry of Environment and Water (KASA)

- After the IWRM Training by AACB WST 2040, we are more capable of networking and collaborating with Local, State and Federal agencies as well as other relevant stakeholders for IWRM.
- After the IWRM AACB training, we have better IWRM directives to line agencies.

Kementerian Perumahan Dan Kerajaan Tempatan (KPKT)

- ➤ After the IWRM Training by AACB WST 2040, we are more capable of networking and collaborating with Local, State and Federal agencies as well as other relevant stakeholders for IWRM.
- After the IWRM AACB training, we have better IWRM directives to line agencies.

Engineering Division, Ministry of Health (MOH)

- ➤ After the IWRM Training by AACB WST 2040, we are more capable of networking and collaborating with Local, State and Federal agencies as well as other relevant stakeholders for IWRM.
- After the IWRM AACB training, we have better IWRM directives to line agencies.

Local Authority (LA)

- ➤ After the IWRM Training by AACB WST 2040, we are more capable of networking and collaborating with State and Federal agencies as well as other relevant stakeholders for IWRM.
- R&D in collaboration with Universities, Plan Malaysia, Tourism and Research Institutes and Individual Researcher for nature-based solution towards IWRM.

Local Authority (LA)

➤ We are confident to accelerate the implementation of IWRM as well as to reduce the future water related disasters.

Leadership Roles of Government Agencies towards IWRM By

Prof. Dr. Sharifa Ezat Wan Puteh, Universiti Kebangsaan Malaysia (UKM)

1. What should be the decision-making processes/ steps of local government in Malaysia for integrated water resources management (IWRM) where conflicts over jurisdiction are obvious between Federal and State governments as well as amongst the districts?

Answer: There is no definite answer of it, as the Federal rulings may not be thoroughly followed by the state level. Each level is inclined to follow their biggest stakeholders and unfortunately, this might be detrimental to the overall water resource management. As state may provide too much leeway to scrupulous industries and no real, meaningful, tough enforcement are imposed to business owners. Perpetrators are only given a slap on the wrist with some small amount and most companies are able to pay the fine without any issue. They will repeat the same offence later on.

2. What should be the processes/ steps by the local government in Malaysia to ensure the participation of multi-stakeholders', i.e. other government agencies, business and industries, communities and NGOs, and academia in their decision-making processes for IWRM?

Answer: Besides holding formal discussions, the adherence to protocol and enforcements are not thoroughly followed. Networking and working together with local academia, NGOs, communities should be increased. The contributor to major water issues in the country are not the community but industries that have not been reprimanded thoroughly on this matter. We cannot play the blaming game solely on community but look at other factors that are in the community which contributed to the problem. Waste management is run poorly in Malaysia, especially in semi urban and rural areas. Waste management is a major issue in many developing countries and Malaysia is one of them. Sustainable, cheap and environmentally alternatives are not taken up by the government, even state level. There, we waste a lot of money of techniques that are not cheap and not environmentally friendly. Pressure from lobbyist are widely seen and tolerated by the government and this issue is also encroached on proper waste management.

3. In addition, what should be steps of public participation processes in the context of Malaysia for IWRM so that government officials and other stakeholders can harmonise for better decision-making towards IWRM?

Answer: The community must have an outlet that they can partake in collaborative decision in waste management. At the moment, this is more of top-down approach and may not what the community feel is most appropriate with them at the population level. Grouses from the masses are usually not heard loud enough to make an impact. The one tending to their complaints are usually the least trained and lower ranking, contract staffs; that do not have the ability and power to make any significant change.

4. What should be the processes/ steps to ensure that the integrity, discipline and voluntarism are embedded in the leadership skills of local government officials? What should be the processes/ steps of proactive leadership roles for IWRM?

Answer: These qualities are usually imparted during induction training, when the officials are new in training and do not have high enough rank to decide anything yet. However, these qualities subside as time goes by, and opportunities to take 'short cuts', accept 'kick backs' sink in. Therefore, training and retraining, on moral conduct and integrity must be done consistently. Leaders (up to the highest managerial level), must lead by example and higher-ranking officials must show the way. Avoid and break cronyism culture, promote only ethically abiding officials and regular audits may help in this.

Leadership Roles of Government Agencies towards IWRM By Dr Mohd Yusoff Bin Ishak, Universiti Putra Malaysia (UPM)

1. What should be the decision-making processes/ steps of local government in Malaysia for integrated water resources management (IWRM) where conflicts over jurisdiction are obvious between Federal and State governments as well as among the districts?

Answer: Local government must be made aware about the IWRM, followed by capacity buildings which must include people on the ground such as JKKK.

We have had this issue of federal versus state government for so long. Yet people on the ground do not bother to differentiate things – they just wanted a better environment. Thus, we must find what are the stumbling block that could hinder the smooth implementation between federal versus State Government.

A lot of buy in must be offered to them, apart from making compulsory in legislation. We must empower the community in decision making process. This would mean to include all walk of life into decision-making. School children may be rope in by working with environment related subject

2. What should be the processes/ steps by the local government in Malaysia to ensure the participation of multi-stakeholders' i.e. other government agencies, business and industries, communities and NGOs, and academia in their decision-making processes for IWRM?

Answer: Communication channel between LA and stakeholders must be made open at any level at any time. While it may not be possible to have Focus Group Discussion due to MCO, LA should try new way of connecting sch as using social media but bear in mind the different preference of different strata in your community. Facebook would be a good channel to invite input for any decision-making process.

Of course, having a formal channel like what the local government are having now would be good, but they must never rest and in fact LA must compliment this exercise by allowing alternatives ways of input gathering, especially with regards to the new generations in Malaysia. The younger generation prefers social media rather than conventional ways.

3. In addition, what should be steps of public participation processes in the context of Malaysia for IWRM so that government officials and other stakeholders can harmonise for better decision-making towards IWRM?

Answer: Go beyond what is required. Government officials has rules and regulations but it does not mean that we should stop at the merely following the regulations. We should always reflect the best for our stakeholders. Having a good database of your stakeholders and maintaining the good communication with them throughout the process would be good.

A good history of success story for applying IWRM would be great buy in for the stakeholder.

Again, we must open multiple channels of communication to ensure all angle of community are being covered.

4. What should be the processes/ steps to ensure that the integrity, discipline and voluntarism are embedded in the leadership skills of local government officials? What should be the processes/ steps of proactive leadership roles for IWRM?

Answer: Always be open and transparent. An index or target such as SDG would be good to be applied so people can benchmark themselves and also to compare with other good cities around the region. The must be an active succession plan in any organization including local set up and or in local government.

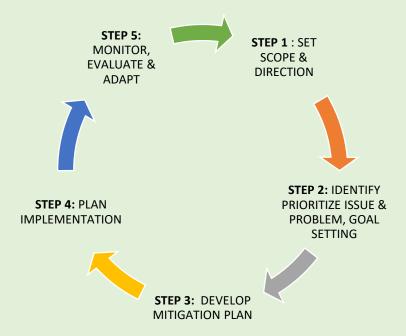
Having people holding one post for too long would not be good for the continuity of any plan or programme.

If the succession plan is already in place, we must proactively target the second and third person in line in order to ensure the characteristic that we wanted would remain in that organisation manpower.

Leadership Roles of Government Agencies towards IWRM By En. Jamil Tajam, UiTM Perlis

1. What should be the decision-making processes/ steps of local government in Malaysia for integrated water resources management (IWRM) where conflicts over jurisdiction are obvious between Federal and State governments as well as amongst the districts?

Answer:



2. What should be the processes/ steps by the local government in Malaysia to ensure the participation of multi-stakeholders' i.e. other government agencies, business and industries, communities and NGOs, and academia in their decision-making processes for IWRM?

Answer: To ensure the participation of multi-stakeholders' in decision-making processes, local government should strengthening on transparency, social inclusion and accountability

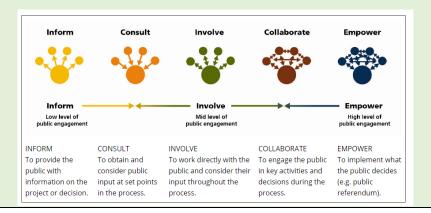


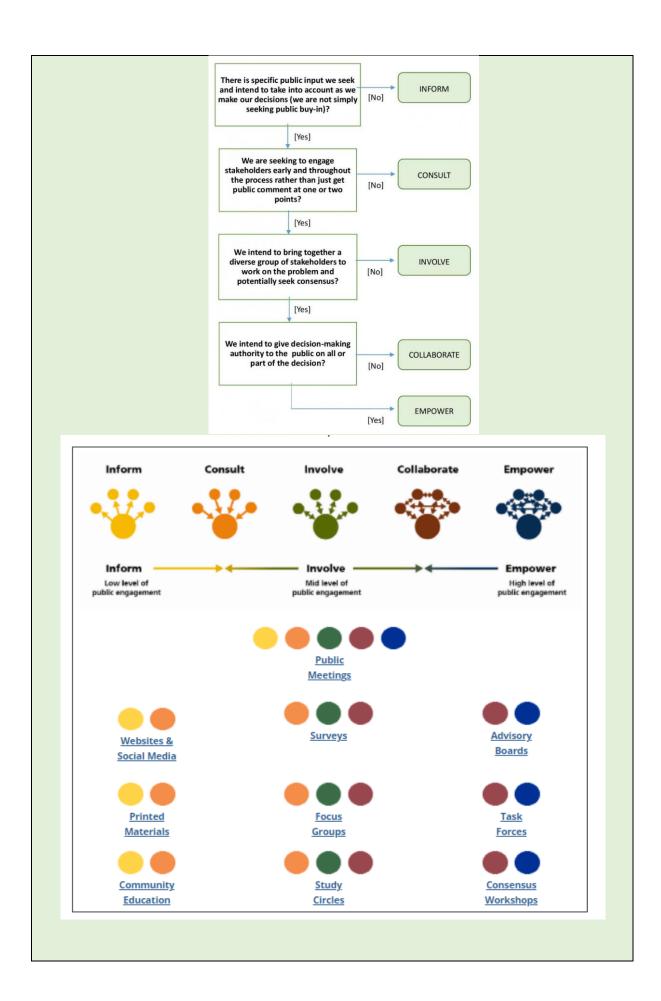
- **Transparency** Access to all information relevant to the water resources decision-making process and the allocation of funding is unrestricted with the exception of only a very few, well defined and justified cases
- **Social Inclusion** Legislation, policies and practice ensure equal access to water resources and services for all members of society including disadvantaged groups
- **Accountability** Those responsible for taking water resources decisions are held accountable for fulfilling their task in compliance with legal frameworks

Adopt from: Philip, R., B. Anton, D. Cox, S. Smits, Caroline A. Sullivan, E. Chonguica, F. Monggae (2008). "Understanding the context-The role of local government in IWRM."

3. In addition, what should be steps of public participation processes in the context of Malaysia for IWRM so that government officials and other stakeholders can harmonise for better decision-making towards IWRM?

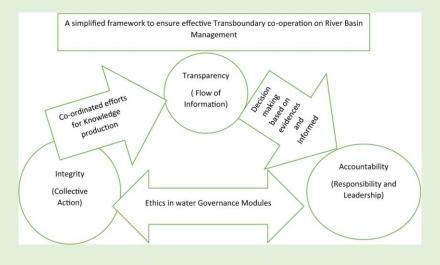
Answer: Public Participation Toolkit | Tompkins County NY





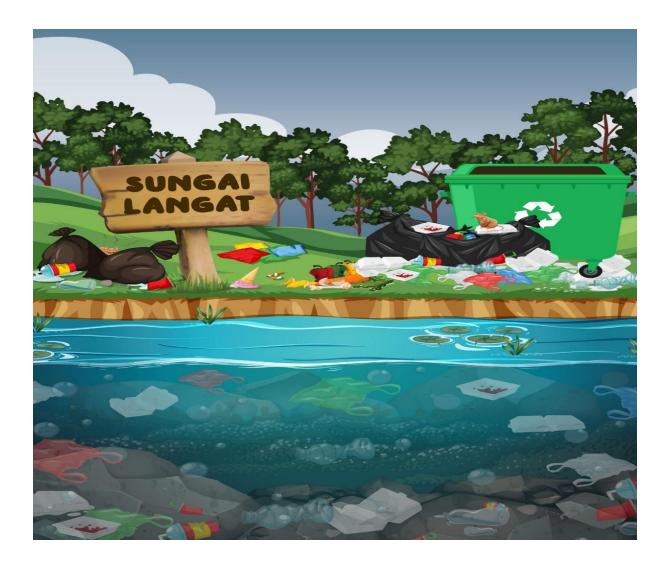
4. What should be the processes/ steps to ensure that the integrity, discipline and voluntarism are embedded in the leadership skills of local government officials? What should be the processes/ steps of proactive leadership roles for IWRM?

Answer: Pragmatic approaches to transboundary river governance: Exploring pathways for co-operation on shared water resources (wiley.com)



Theme 1- Natural and man-made disasters leading to shutdown incidents of water treatment plants (WTPs)

Problems – pollution that goes into the water body



Impacts – flora fauna population decreases/die, degraded water quality, water supply disruption, etc.



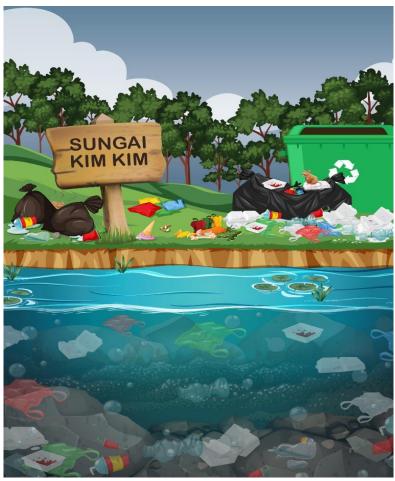


Solution (from the government agencies)— increases monitoring from Suruhanjaya Perkhidmatan Air Negara (SPAN), Department of Environment, Department of Irrigation and Drainage, local authority and also public as the first responder.



Theme 2- Chemical disaster in Sungai Kim Kim, and environmental and human health impact **Problems** – pollution that goes into the water body.





Impacts – flora fauna population decreases/die, degraded water quality, etc.



Solution (from the government agencies) – increases monitoring from SPAN, Department of Environment, Department of Irrigation and Drainage and local authority and also public as the first responder.

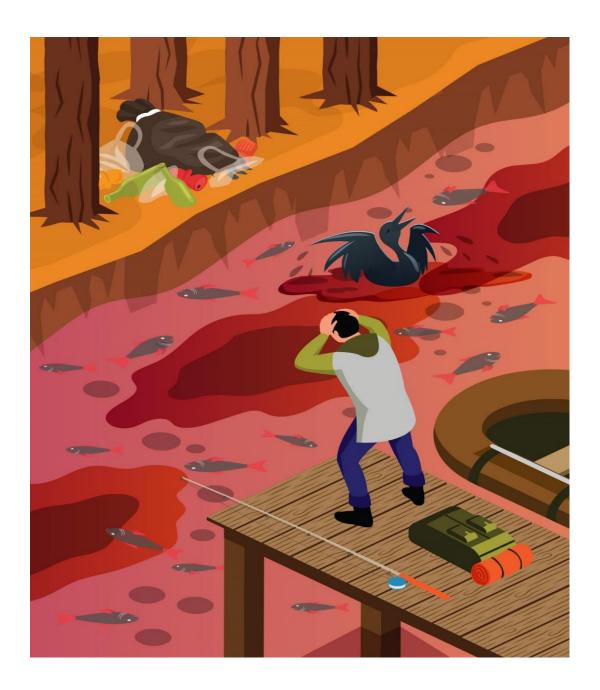


Theme 3- Environmental impact of mining and water security
(For example the bauxite mining in Pahang , Mamut copper mine on the foothills of Mount Kinabalu in Ranau and also rare earth mining in Kedah)

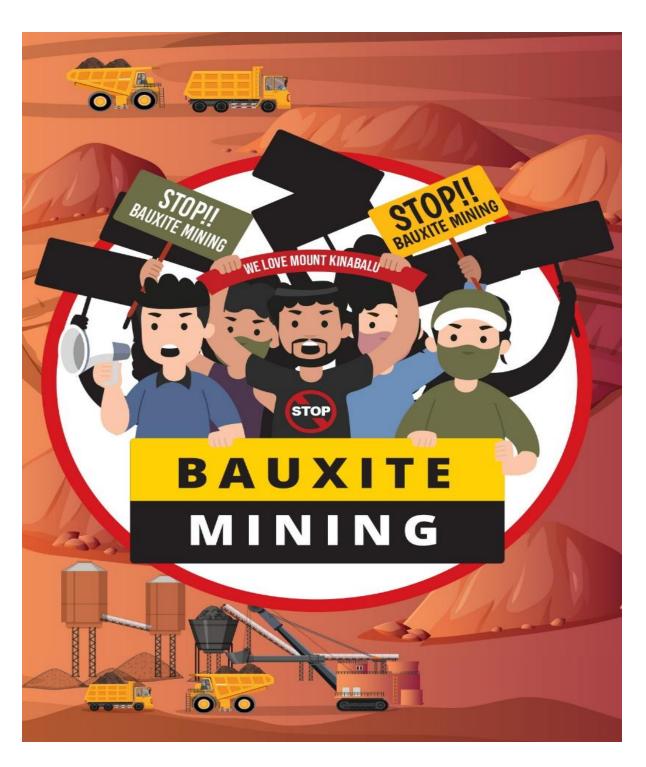
Problems – pollution that goes into the water body.



Impacts – flora fauna population decreases/die, degraded water quality, etc.



Solution (from the government agencies) – increases monitoring from SPAN, Department of Environment, Department of Irrigation and Drainage and local authority and also public as the first responder.



Theme 4- Disaster risk assessment, management and communication with multi-stakeholders by the local government

Local authorities do a site visit for assessment on problematic areas (flood, drought and water born diseases, damages of infrastructure)



Discussion with other stakeholders i.e. local district DOE, local community or Ketua Kampung

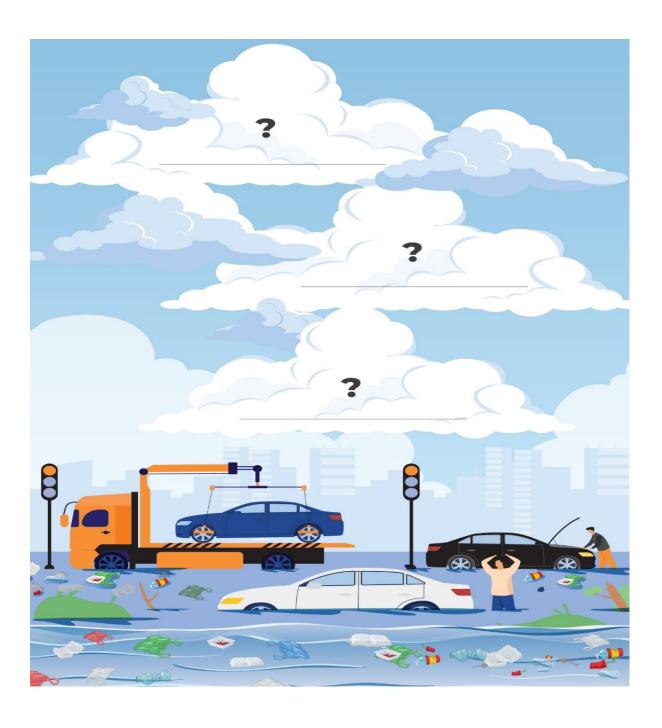


A local master plan/action is produced which include all stakeholders for a long-term collaboration

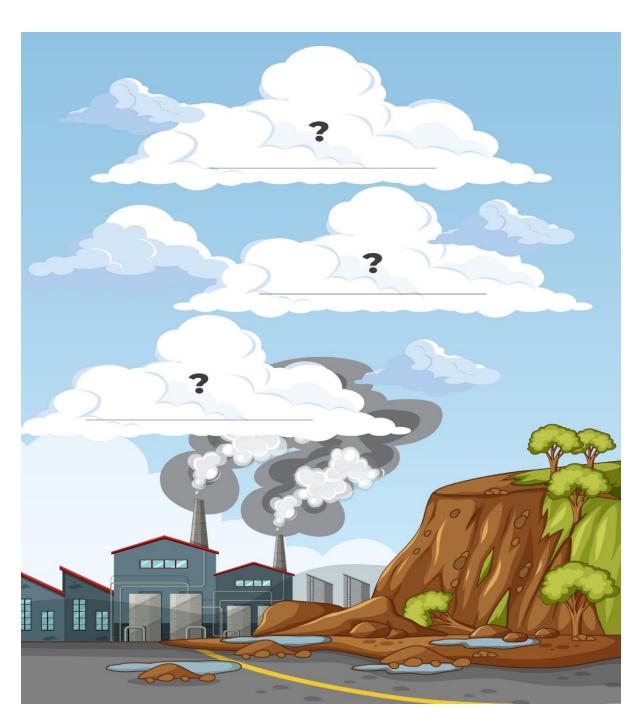


Theme 5- Proactive leadership roles of local government and decision making-processes along with incorporating the participation of multi-stakeholders

What can the participants understand from the below drawings? The keywords are in a 'cloud' i.e. (waste management, flood, and drought) then the participants can put the answers inside an empty answer box.



What can the participants understood from the below drawings? The keywords are in a 'cloud' i.e. (waste management, flood, drought) then the participants can put the answers inside an empty answer box.



Theme 6- Integrated water resources management via using STIE (science, technology, innovation and engineering) and SSH (social science and humanities) information

Water Catchment and Integrated Water Resources Management- A water cycle in a large river basin.



Water Cycle

1.3 Water Cycle

Water moves around the earth forming the water cycle. Water moves up into the atmosphere by evaporation and back down to the earth's surface as precipitation. Water evaporates from the sea, lakes, reservoirs, rivers and stream (surface water) and rises into the atmosphere. As air hits the mountain side, it is forced upwards causing the water vapour to cool and condense, forming rain clouds. When rain clouds become heavy, water falls in form of rain and is transported into rivers and streams. The sun plays major role in the water cycle, especially during the evaporation and transpiration process as shown in **Figure 2**.

A more comprehensive water cycle (**Figure 3**) includes the processes involved when the water was collected for water supply, treated for drinking, domestic and manufacturing as well as when the water turn into wastewater and later treated and returned back to the nature for the cycle to continue.

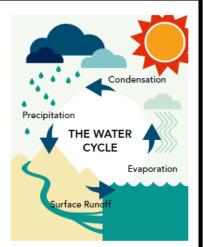
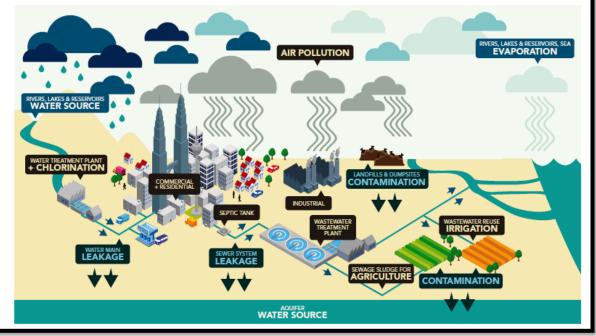


Figure 2: Common Water Cycle





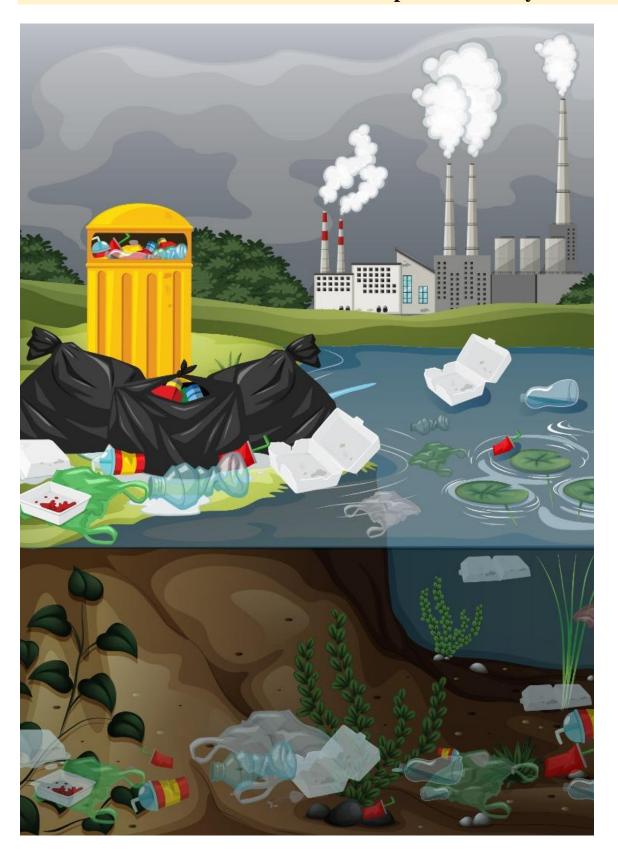
Source: GEC 2019

Communication of all stakeholders

- A roundtable discussion consisting of the local government, public, local enforcer (police), Department of Environment, Department of Irrigation and Drainage, farmer, media, university/academia, environmental NGOs, imam/priest, industries (factories).
- Continuous monitoring of the river citizen science (public in collaboration with university)
- Communication with the public "public become the 'eyes & ears' of the government"
- Communication with tourism agency, and other relevant agencies.



What measures can be taken to reduce the river pollution along with shutdowns of water treatment plants in Malaysia?



What measures can be taken to reduce the chemical pollution in waterbodies and to ensure environmental and public health in Malaysia?



What measures can be taken to reduce the impact of mining related water disasters in Malaysia?



5.2.2. The Importance of Leadership Roles: Government Sector

The leadership roles of government sector for integrated water resources management (IWRM), especially at the developing countries are very important. However, public participation or community participation in integrated water resources management programme are always challenged by the public's poor level of knowledge, by their reluctance to participate as well as by the lack of an organised platform (Rault et al., 2013). However, several studies have reported potential willingness on the part of the public to participate in water management especially in the higher water stress countries (Bjerregaard, 1998; Carr et al., 2012; De Marchi, 2003). Rault et al. (2013) also reported active potential participation of the public, even in the limited number of democratic countries, through expressing and exchanging views and opinions of their surroundings instead of communicating through any media. Therefore, people would have sufficient knowledge of water management problems both at the institutional and household levels.

In Malaysia, the Academy of Sciences Malaysia (ASM) has produced the 'National Integrated Water Resources Management Plan' (2016) in line with the 11th Malaysia Plan (2016–2020), Integrated Water Resources Management (IWRM), Integrated River Basin Management (IRBM), Integrated Lake Basin Management (ILBM), and others. Moreover, the Malaysia Industry-Government Group for High Technology (MIGHT) was established to promote public-private partnerships for sustainable development, including the management of water resources. All these approaches, including the approach of Sustainable Development Solutions Network (SDSN), are trying to involve civil society and local authorities in sustainable water resources management to achieve the SDGs (Sustainable Development Goals), especially SDG target 6.5, which aims to implement integrated water resources management at all levels, and SDG target 17.17, whose goal is to strengthen public, private, academia, NGO and civil society partnerships (Ahmed et al. 2020).

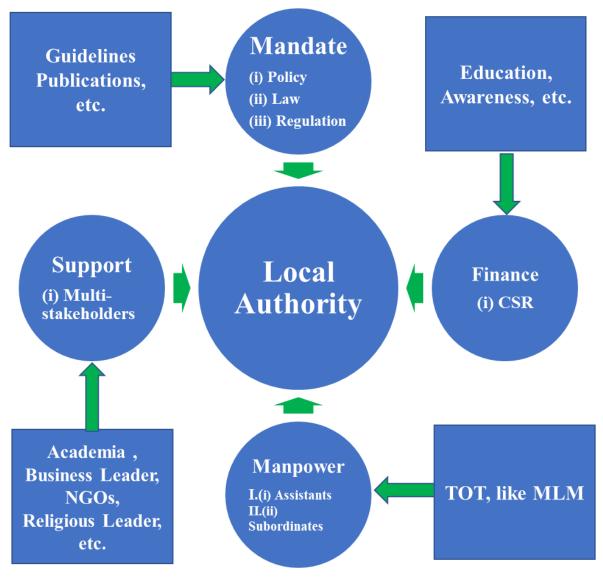
Several studies have claimed that people's attitudes towards and perceptions of water resources are reflected in the government's water resources management programme as people's intentions are the necessary ingredients for political will and action (Burstein, 2010; Stoutenborough and Vedlitz, 2013). Therefore, when they reflect people's perceptions and attitudes in the relevant water management programme, then there will be a healthy and positive relationship between people's perceptions and attitudes as well as their willingness

to engage in water resources management. Lai et al. (2017) reported that educating people is very important and essential to reduce the non-revenue water (NRW) tariff on water resources management in Malaysia.

Although the government is looking for the NRW tariff, education can make people aware of engaging in water resources management and can also promote their interests to reduce the NRW tariff. Accordingly, prediction and control approaches were used as an instrument to manage water resources for a quite long time, especially the management dominated by engineering solutions, such as supply water management through pipeline distribution. However, pollution control should address both the point and non-point sources of pollution including the land-use changes, especially for rapid development activities (Pahl-Wostl et al., 2008). Therefore, sustainable and integrated water resources management require societal search and learning processes for the inclusion of both infrastructural and non-infrastructural measures (Pahl-Wostl, 2002). Therefore, understanding the total ecosystem management by the local government is very important towards contributing sustainable development including the IWRM. In this regard, the world famous medical journal 'The Lancet' has come out with a remarkable Planetary Health Infographics 'Safeguarding human health in the Anthropocene epoch: report of The Rockefeller Foundation—Lancet Commission on planetary health'.

In Malaysia, the shortcomings in sustainable water resources management are reported mainly because of inadequate enforcement of laws, lack of public participation, along with an inadequate emphasis on non-structural measures (Chan, 2009, 2012; Mokhtar et al., 2010, 2011). Moreover, the transboundary pollution of the Langat River mainly from the sewerage and industrial discharges, agricultural runoff and such has been reported by several studies even though the river is one of the prime sources of drinking water in the Selangor State, Malaysia (Ahmed et al., 2020, 2018a, 2018b). Therefore, public engagement with the government, non-government, academia and business sectors could be effective in water resources management (Chan, 2012; Mokhtar et al., 2011). Although there are a few studies in Malaysia concerning public perceptions and involvement in integrated water resources management based on the statistical analysis (Ab Razak et al., 2015; Afroz et al., 2016; Lai et al., 2017), Ahmed et al. (2020) reported that public's perception of and attitude towards river and drinking water as well as their perceived water quality were found to be the significant indicators influencing their participation in water management platforms.

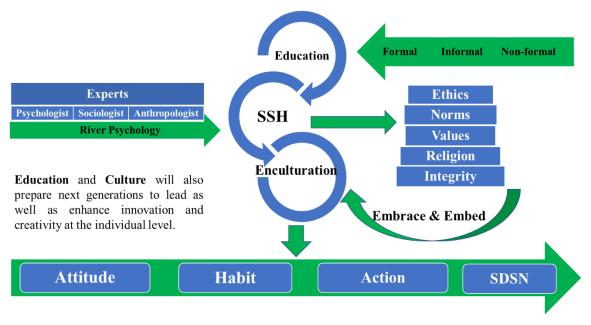
Therefore, the responsible authorities in Malaysia should focus on raising awareness, advocacy and capacity building for people's effective participation in water resources management. For instance, the National Water Resources Policy 2012, the Water Services Industry Act 2006, the Environmental Quality Act 1974, and others mainly focus on raising awareness. However, advocacy and capacity building of the stakeholders in water management are not highlighted significantly in the policies and acts. Therefore, the agencies should take special non-structural measures such as campaigns, advertisements, water fairs, trainings and such to raise the awareness and capacity building of the people to enhance their participation in the effective water resources management platform. The pro-active and effective leadership of Local Authority is an urgent requirement for an integrated and holistic water management along with safe and available drinking water supply to the household level. To be pro-active four elements (i.e., mandate, finance, manpower and support) are required for the Local Authorities (Figure 89). Meanwhile, Local Authorities have the full mandate to manage non-point sources pollution in Malaysia which will assist in ensuring safe drinking water in Malaysia. Finance and manpower are also very important for the Local Authorities, but the finance is not adequate as well as there is lack of training of the lowest rank officials to enhance multitasking capability in taking leadership roles for IWRM. Moreover, the inadequate support from the multi stakeholders is the major problems to manage the river. However, Local Authorities/district officials could be better in arranging multi stakeholders' platform as well as networking with public, private, NGO and civil sectors in managing and monitoring the quality and quantity of raw as well as drinking water (Ahmed et al. 2018a).



Source: (Ahmed et al. 2018a)

Figure 88. Elements needed for the Proactive Leadership Roles by the Local Authority

Local Authorities should be recognised to lead and control other stakeholders. Leadership in both top-down and bottom-up approaches might solve the implementation problems since Local Authorities and District Offices are the lowest government administrative institute at local level. Engagement and participation of all stakeholders will contribute to enhance the leadership skill of Local Authority and/or individuals. Moreover, education (i.e., formal, informal, non-formal) and culture will also prepare next generations in taking leadership as well as enhance innovation and creativity at the individual level (Figure 90) (Ahmed et al., 2018a).



Source: (Ahmed et al. 2018a)

Figure 90. Stewardship towards IWRM via effective Multi-Stakeholder's Platform

Moreover, quality data and information is very vital for the policy makers as well as researchers to produce better policies and modification of existing policies and guidelines. Therefore, quality assurance (QA) and quality control (QC) of science, technology, engineering and mathematics (STEM) data as well as social science and humanities (SSH) data will help to produce better policy as well as updating existing policies through good database (Figure 91). Moreover, QA and QC at many levels will ensure precision and accuracy of data and information for effective decision making processes by the local authorities. Therefore, the local authorities as well as the individual will get the best authentic knowledge which will influence and inspire them to act well and to take leadership in doing good things through using their wisdom (Ahmed et al., 2018a).

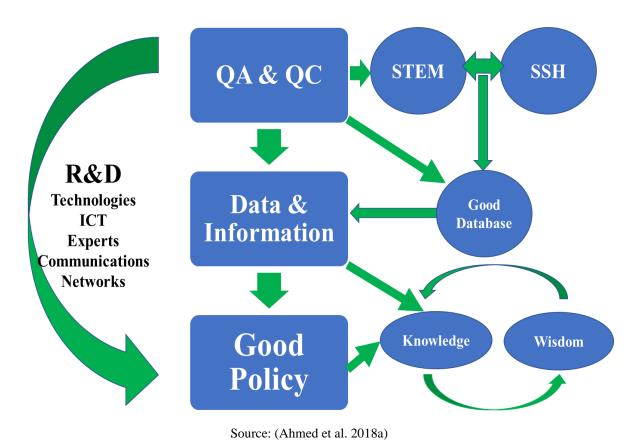


Figure 89. Data and Information to produce Good Policy and to take effective Decision

People in Malaysia are aware of the importance of water quality not only for aquatic life but also for a healthy and high-quality standard of living. They also think that quality water is an essential requirement for economic development. They are willing to participate in water resources management if they are well informed about the benefits of better water quality. Hence, education and awareness-raising activities should be advocated by the appropriate agencies to increase the number of people participating in a water resources management program. People also think that the effective implementation of policies is required for water management. Although there are many sound policies in Malaysia for water resources management, the promotion and enforcement of these policies are a big challenge and might be due to low participation on the part of relevant stakeholders and inadequate leadership roles from the relevant agencies. Therefore, an effective multi-stakeholder platform for water resources management that would be useful for meaningful participation in a management program along with government, non-government, civil society, academic and business entities. Therefore, the local authorities can take proactive leadership roles because they have the power of enforcement via the Local Government Act of 1976 to change the mindset of people about the importance of water management through special training, campaigns, etc. Special training is also required for the training of the trainers (TOT) to enhance their capacity building in water resources management; and thus, campaigns and public meetings are useful tools for active participation of people in natural resources management, and their participation can contribute significantly to sustainable water resources management (Ahmed et al. 2020). The government sector should highly be focused on five focus areas to accelerate the implementation of IWRM in Malaysia (Figure 81).

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Appendix A Resource Persons for IWRM Training

${\bf Agreed\ Resource\ Persons\ form\ Government\ Sector\ to\ Train\ others\ on\ AACB\ IWRM}$

No.	Name	Address	Tel:	Email	Expertise related to water sector	1 Page CV (Yes / No)	Full CV (Yes / No)
1.	Haslina Binti Amer	Lembaga Urus Air Selangor Ting 13, Bangunan Darul Ehsan, No 3, Jalan Indah Seksyen 14, 40000 Shah Alam, Selangor.	03-55111800 ext 1202 H/P: 0129405613	haslina@luas.gov.my	Example: 1. Hydrology and water resources monitoring 2. Water governance and management 3. Water sector data management.	Yes	Yes
2.	Dato'Ir Hj Hanapi bin Mohamad Noor	86, Jalan SS 19/1A, 47500 Subang Jaya	019-2727996	hanapi2020@gmail.com	 Water resources Management IRBM Water policy 	Yes	Yes
3.	Ir. Dr. Asnor Muizan bin Ishak	Bahagian Pengurusan Sumber Air dan Hidrologi , Jabatan Pengairan dan Saliran, KM7, Jalan Ampang,	017-6424626	drasnor@water.gov.my drasnorjps@gmail.com	 Hydrology Water resources 	Yes	Yes

No.	Name	Address	Tel:	Email	Expertise related to water sector	Page CV (Yes / No)	Full CV (Yes / No)
		68000 Kuala Lumpur					
4.	Ir. Dr. Lee Hin Lee	Pusat Kajian Pantai dan Oseanografi, NAHRIM Lot 5377, Jalan Putra Permai, 43300 Seri Kembangan, Selangor.	0389476400/ 013–3739361	hllee@nahrim.gov.my	Hydrodynamic Modelling	No	Yes
5.	Dunstan Anthony Pereira	Pusat Kajian Pantai dan Oseanografi, NAHRIM Lot 5377, Jalan Putra Permai, 43300 Seri Kembangan, Selangor.	0389476400/	dunstan@nahrim.gov.my	Marine Data Management	No	Yes
6.	Nor Aslinda Awang	Makmal Hidraulik dan Instrumentasi, NAHRIM Lot 5377, Jalan Putra Permai,	0389476400/ 0192282495	aslinda@nahrim.gov.my noraslinda.awang@gmail.com	Mangrove Hydrodynamic Modelling	No	Yes

No.	Name	Address	Tel:	Email	Expertise related to water sector	Page CV (Yes / No)	Full CV (Yes / No)
		43300 Seri Kembangan, Selangor.					
7.	P.Geol Ismail Tawnie	Pusat Kajian Hidrogeologi NAHRIM Lot 5377, Jalan Putra Permai, 43300 Seri Kembangan, Selangor.	0389476400/ 019-8280255	ismail@nahrim.gov.my istawnie@gmail.com	1. Hydrogeology	No	Yes
8.	Ir. Liew Yuk San	Pusat Kajian Lembangan Sungai, NAHRIM Lot 5377, Jalan Putra Permai, 43300 Seri Kembangan, Selangor.	0389476400/ 0193494033	ysliew@nahrim.gov.my	River Engineering River Modelling	Yes	Yes
9.	Dr. Zati Sharip	Lot 5377, jalan putra permai, 43300 seri Kembangan, selangor	0199500421	zati@nahrim.gov.my	1. Lake Ecosystem Health, Integrated Lake basin management (ILBM)	yes	Yes

No.	Name	Address	Tel:	Email	Expertise related to water sector	1 Page CV (Yes / No)	Full CV (Yes / No)
10.	Dr. Siti Aisah Shamsuddin	Forest Research Institute Malaysia, Forestry & Environment Division, Kepong, 52109 Selangor	03 62797261 (off) 019 2115929 (hp)	sitiaisah@frim.gov.my	Forest Hydrology		
11.	Raihani binti Che Mamat	Jabatan Kerajaan Tempatan Kementerian Perumahan Dan Kerajaan Tempatan Aras 25-29, No.51 Persiaran Perdana, Presint 4, Pusat Pentadbiran Kerajaan Persekutuan, 62100 Putrajaya, Malaysia	03-88913335	raihani_cm @kpkt.gov.my	 Water pollution Water management and governance Urban drainage management 	NO	NO
12.	Nur Syaferra Binti Mad Yusoff	No.48, Jalan Joran 19/24, Seksyen 19 40300 Shah Alam, Selangor	012-2341057	ferra_yusoff@kpkt.gov.my	Solid waste management	No	No

No.	Name	Address	Tel:	Email	Expertise related to water sector	1 Page CV (Yes / No)	Full CV (Yes / No)
13.	Dr. Susan Pudin	Environment Protection Department Sabah, Locked Bag 2078, 88999 Kota Kinabalu, Sabah	088-251290/1 012 824 9974	susan.pudin@sabah.gov.my	Community engagement and environmental education	-	yes
14.	Dr. Dayang Siti Maryam binti Mohd. Hanan	Environment Protection Department Sabah, Locked Bag 2078, 88999 Kota Kinabalu, Sabah	088-251290/1 016 844 6794	sitimaryam.mohdhanan@sabah.gov.my	Sea-level and coastal environmental changes as a result of climate change	-	yes
15.	Abd Rahim Bin Harun	Headquarters, Level 9, Menara PjH, No. 2 Jalan Tun Abdul Razak, Precint 2, 62100 W.P.Putrajya	+603-8871 6000 (ext 207)	arh@jmg.gov.my	 Groundwater Exploration Groundwater development GW quality and monitoring 	NO	NO
16.	Noor Adilah binti Md Arifin	Bahagian Pengurusan Fasiliti – Seksyen Pembangunan	Tel: 03- 83124145/4528	noor.adilah@swcorp.my			

No.	Name	Address	Tel:	Email	Expertise related to water sector	Page CV (Yes / No)	Full CV (Yes / No)
		Perbadanan Pengurusan Sisa Pepejal dan Pembersihan Awam (SWCorp)					
17.	Ir. Dr. Asmadi bin Ahmad @ Hasan	Ketua Penolong Pengarah Bahagian Pengurusan Sumber Air dan Hidrologi Jabatan Pengairan dan Saliran Malaysia Kompleks JPS Ampang KM7, Jalan Bukit Off Jalan Ampang 68000 Ampang, Kuala Lumpur	019-2206944	asmadi_ahmad@water.gov.my	 Water Resources (Reservoir optimization) Hydrology River water treatment (WQ) 	No	Yes
18.	Dr.Norlida binti Mohd Dom	Humid T Humid Tropics Center (HTC - KL)	03-20958700	norlidamd@water.gov.my	 Water Resources Management Eco-Hydrology 	No	No

No.	Name	Address	Tel:	Email	Expertise related to water sector	1 Page CV (Yes / No)	Full CV (Yes / No)
		Jabatan Pengairan dan Saliran No. 2, Jalan Ledang Off, Jalan Duta, 50480 Kuala Lumpur					
19.	Encik Mohd Hazri bin Moh Khambali	Bahagian Rekabentuk Dan Empangan Jabatan Pengairan dan Saliran Jalan Sultan Salahuddin 50626 Kuala Lumpur	03-26974487	mohdhazri@water.gov.my	1. Dam Management	No	No
20.	Ir. Ts. Rajaselvam a/l Govindaraju	Bahagian Perkhidmatan Mekanikal & Elektrikal JPS Malaysia Aras 4, Blok Podium, Menara Usahawan, Persiaran Perdana	03-33311685	rajaselvam@water.gov.my	Mechanical and Electrical Services	No	No

No.	Name	Address	Tel:	Email	Expertise related to water sector	Page CV (Yes / No)	Full CV (Yes / No)
		Presint 2, 62652 Putrajaya.					
21.	Ir. Ahmad Fauzan bin Mohd Sabri	Bahagian Pengurusan Lembangan Sungai (BPLS), Jabatan Pengairan Dan Saliran (JPS) Malaysia Aras 3, Block C7, Kompleks Kerajaan Parcel C, 62000 Putrajaya	03-26151688	fauzan@water.gov.my	1. River Management	No	No
22.	Ir. Atikah binti Shafie	Bahagian Saliran Mesra Alam Jabatan Pengairan Dan Saliran (JPS) Malaysia Jalan Sultan Salahuddin 50626 Kuala Lumpur	03-26972964	atikah@water.gov.my	Stormwater Management	No	No

No.	Name	Address	Tel:	Email	Expertise related to water sector	Page CV (Yes / No)	Full CV (Yes / No)
23.	Ir. Mahran bin Mahamud	Bahagian Pengurusan Zon Pantai Jabatan Pengairan Dan Saliran (JPS) Malaysia Aras 3, Block C7, Kompleks Kerajaan Parcel C, 62000 Putrajaya	03-26151702	mahran@water.gov.my	1. Coastal Management	No	No
24.	En. Wan Hazdy Azad bin Wan Abdul Majid	Bahagian Pengurusan Banjir Jabatan Pengairan dan Saliran Malaysia Jalan Sultan Salahuddin 50626 Kuala Lumpur	03-26161579	azad@water.gov.my	1. Flood Management	No	No
25.	En. Mohammad Hakim bin Hasnul	Bahagian Korporat Jabatan Pengairan dan Saliran Malaysia	03-26161449	hakim@water.gov.my	1. Policy Management	No	No

N	o. Name	Address	Tel:	Email	Expertise related to water sector	1 Page CV (Yes / No)	Full CV (Yes / No)
		Jalan Sultan Salahuddin 50626 Kuala Lumpur					
26	Izham Harith Bin Ikhwan	Level 4, Block E3, Complex E, Presint 1, Federal Government Administrative Centre, 62590 Putrajaya, Malaysia	OFFICE : +603 88924966 MOBILE : +601 26468955	izham.harith@moh.gov.my	Water Engineering and Sanitation Section, Engineering Services Division MOH	No	Yes
277	Dr. Roslan bin Mohamed	Sektor Kejuruteraan Air dan Sanitasi, Cawangan Regulatori, Bahagian Perkhidmatan Kejuruteraan, Kementerian Kesihatan Malaysia, Aras 4, Blok E7, Parcel E,	03-8892 4964 (O) 019-232 7844 (H/P)	roslan.m@moh.gov.my	 Water Supply System for Rural Area. Environmental Sanitation for Rural Area. Green Building for Healthcare Facilities. 	No	Yes

No.	Name	Address	Tel:	Email	Expertise related to water sector	Page CV (Yes / No)	Full CV (Yes / No)
		62590 PUTRAJAYA.					
28.	Pn. Hafizah binti Hasan	Sektor Sisa dan Hygiene, Cawangan Regulatori, Bahagian Perkhidmatan Kejuruteraan, Kementerian Kesihatan Malaysia, Aras 4, Blok E7, Parcel E, 62590 PUTRAJAYA.	03-8892 4641 (O) 013-332 0687 (H/P)	hafizah.hasan@moh.gov.my / hafeitsa@gmail.com	 Drinking water quality surveillance, covering risk-based policy and regulations. International and national drinking water quality law and governance, within the scope of water, sanitation and hygiene (WASH). 	Yes	Yes

	The End		