STRATEGIC PLAN FOR INTEGRATED RIVER BASIN MANAGEMENT (IRBM) IN MALAYSIA

VOLUME 1

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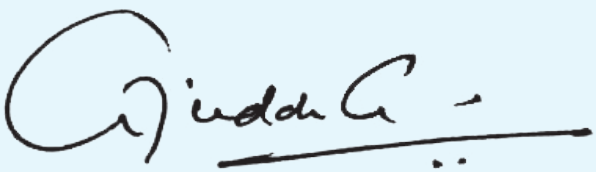
CONTENT

FOREWORD

Academy of Sciences Malaysia (ASM) has been mandated to be a "Thought Leader" in the science, technology and innovation (STI) arena. ASM translates this mission into action by undertaking strategic STI studies and delivering reports using programme that mobilise a wide spectrum of expertise not only within the Academy but also through its network of prominent international and local linkages.

Since 2008, ASM has been undertaking studies pertaining to the water sector in view of the importance of water as a resource and livelihood in the context of economic development and societal well-being. These studies have been overseen by a dedicated ASM Water Committee. Adopting integrated water resources management (IWRM) as the central thrust, specific sub-themes are subjected to in-depth studies culminating in the preparation of a strategic plan or advisory report for consideration, and adoption by relevant authority or agency responsible for its implementation. These studies also include a process of strategic consultations with relevant institutions, community and private sector stakeholders.



Tan Sri Dr Ahmad Tajuddin Ali FASc
President
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ASM has prepared this Strategic Plan for Integrated River Basin Management (IRBM) in Malaysia to complement the National Water Resources Policy (NWRP), amid the Government's effort to address the challenges of managing river basins in an integrated way. Rivers have always played a very important role in Malaysia's development as being the primary source of water for domestic, industrial and agricultural uses, navigation, power generation, recreation and upkeep of the environment. However, due to the rapid pace of development over the last four decades, many of our country's river systems have degraded. Issues such as siltation, deterioration of river water quality and scarcity of potable water are becoming worrying.

As of November 2014, the IRBM has only been implemented in 12 out of the 189 river basins in Malaysia. This Strategic Plan represents a synthesised set of recommendations on how the IRBM Plan can be implemented progressively for the remaining river basins to preserve and restore our freshwater ecosystems.

I would like to take this opportunity to congratulate the IRBM Task Force for their efforts in producing this Strategic Plan and hope that it would serve as a useful reference for all stakeholders.

PREFACE

Since the late 1990s, Malaysia has committed to implement Integrated Water Resources Management (IWRM) for sustainable management of the country's water resources. A NWRP was formally launched in 2012 to further reaffirm the adoption of IWRM which called for the balanced development and management of "water as a resource" and "water for livelihood".

A task force was established by Academy of Sciences Malaysia (ASM) to produce a Strategic Plan on Integrated River Basin Management (IRBM) in Malaysia, taking into consideration a position paper by ASM entitled A Study on the Status and Issues on IRBM in Malaysia. This strategic plan was to be in accordance with the principles of IWRM, and emphasise that an integrated approach for river basin management is crucial because issues like competition for their usage, inappropriate land use and governance involving different parties.

The participation of representatives from various ministries, agencies and industry sectors was instrumental in developing this Strategic Plan. The successful completion of this Strategic Plan would not have been possible without the active participation of these stakeholders in a series of strategic consultations organised by ASM. I would also like to thank all the IRBM Task Force members and ASM Water Committee members for their support and commitment.

We are confident that the tactful implementation of the strategies recommended here, particularly in the 37 priority river basins, selected based on economic activities such as for agriculture and drinking water, would result in maximising the economic and social benefits derived from our river basins.

Datuk Fateh Chand FASc
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ASM Water Committee

YBhg Dato' Ir Hanapi Mohamad Noor
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LIST OF ACRONYMS

ARI	Average Recurrence Interval
ASM	Academy of Sciences Malaysia
BMP	Best Management Practices
DID	Department of Irrigation and Drainage
DMG	Department of Mineral and Geosciences
DOE	Department of Environment
EQA	Environmental Quality Act
ESCP	Erosion, Sediment and Control Plan
FM	Flood Mitigation
GIS	Geographical Information System
ICT	Information and Communication Technology
ICZM	Integrated Coastal Zone Management
IFM	Integrated Flood Management
IM	Information Management
IRBM	Integrated River Basin Management
ISMP	Integrated Shoreline Management Plan
IWK	Indah Water Konsortium
IWRM	Integrated Water Resources Management
KeTTHA	Ministry of Energy, Green Technology and Water
KPKT	Ministry of Housing and Local Government
LTM	Long-term Mean
LUAK	Lembaga Urus Air Kedah
LUAS	Lembaga Urus Air Selangor
MACRES	Malaysian Centre for Remote Sensing
MADA	Muda Agricultural Development Authority
MITI	Ministry of International Trade and Industries
MMD	Malaysian Meteorological Department
MOA	Ministry of Agriculture and Agro-based Industry
MOSTI	Ministry of Science, Technology & Innovation

MSMA	Manual Saliran Mesra Alam
NGO	Non-government Organisations
NRE	Ministry of Natural Resources and Environment
NWR	National Water Resources
NWRC	National Water Resources Council
NWRD	National Water Resources Department
NWRS	National Water Resources Study
PAAB	Pengurusan Aset Air Berhad / Water Asset Management Company
RB-IMU	River Basin Information Management Unit
RBIS	River Basin Information System
RBMC	River Basin Management Committees
RBMU	River Basin Management Units
RPLC	River Pollution Loading Capacity
SCADA	Supervisory Control and Data Acquisition
SME	Small- and Medium-scale Enterprise
SPAN	Suruhanjaya Pengurusan Air Negara/ National Water Services Commission
SWMA	Selangor Waters Management Authority
SWRA	State Water Resource Agency/State Water Resource Authority
SWRC	State Water Resources Council
SWRD	State Water Resources Department
SWRE	Sabah Water Resources Enactment
TF	Task Force
TCPA	Town and Country Planning Act
TCPD	Town and Country Planning Department
TMDL	Total Maximum Daily Load
WRF	Water Resources Functional
WRM	Water Resources Management
WSIA	Water Services Industry Act

EXECUTIVE SUMMARY

1. BACKGROUND

IWRM for the sustainable management of the country's water resources has been adopted since late 1990s. NWRP Policy formally launch in March 2012 reaffirmed its adoption, which called for the balanced development and management of "water as a resource" and "water for livelihood". Since 2008, ASM, an independent think-tank providing strategic advice to the Government on STI matters, has been undertaking studies pertaining to the water sector, considered strategic for the country's economic development. The studies have been overseen by a dedicated ASM Water Committee. One of the studies undertaken by the Academy is the study on IRBM, an application of IWRM at the river basin level.

Rivers have always played an important role in Malaysia's development as being sources for domestic, industrial and agricultural water supply, navigation, power generation, recreation and environmental upkeep. Rivers also play an important role in maintaining ecological balance and as habitat for flora and fauna. The rapid pace of development over the last four decades has degraded many of the country's river systems. Rivers are being silted up, water quality has deteriorated, potable water shortages are more frequent and the incidences of floods have become relatively common.

A river basin is defined naturally by its topography and it includes all the rain water that falls within it. Thus, in order to address all the issues relating to rain water in a basin, for example, competition for their use and the problems caused by inappropriate land use, there is a need for an integrated approach to the management of the river basin. In assessing the water resource within a basin, there is also a need to assess the ground water resource related to the basin. The Global Water Partnership (GWP) has defined IRBM Planning as follows:

> *"A process of coordinating conservation, management and development of water, land and related resource across sectors within a given river basin, in order to maximise the economic and social benefits derived from water resource in an equitable manner while preserving, and where necessary, restoring freshwater ecosystems".*

In support of the Government's efforts to address the challenges of managing river basins in an integrated way, ASM has prepared this Strategic Advisory Report on IRBM for the Government's consideration. The Report is based on the ASM's IRBM Position Paper study report entitled Study on the Status and Issues on Integrated River Basin Management (IRBM) in Malaysia, which was presented and subsequently updated with feedback received from a Strategic Stakeholders Consultation Workshop.

The current status and issues on IRBM in Malaysia are organised and presented in this report under the following thematic focus areas:

1. Policy
2. Legislation
3. Institution
4. Finance
5. Water Assessment and Allocation
6. Pollution Control
7. Flood Management
8. Drought Management
9. River Basin and Land Use Planning
10. River Basin Information System (RBIS)
11. R&D on IRBM
12. River Basin Monitoring
13. Stakeholder Participation

2. KEY LIMITING FACTORS

ASM has identified the following to be the key limiting factors in its effort to address the river basin management issues and IRBM challenges in Malaysia.

a) Lack of a uniform water law to support IRBM implementation

From reviews of the current status of the enabling environment to support IRBM implementation in the country and key IRBM functions, it can be seen that most of the elements needed for IRBM implementation are already in place. What is lacking is a uniform national water law to bring all the components together to support IRBM implementation and to assist the states in formulating complementary state water enactments. For example, the states' water enactments are necessary to enable local authorities to enforce water resource management compliant land use laws that would be essential for effective IRBM implementation.

b) Lack of institutional capacity to implement IRBM implementation

It was also found that there is a very weak institutional capacity at the state level to implement IRBM. Since water resource management comes under the jurisdiction of the state, there is a need to create state water resources bodies to implement the provisions in the proposed State Water Resources Enactment (SWRE).

c) Lack of financial support to states to implement IRBM

Since the states have limited revenue, the formation of the proposed State Water Resources Agencies (SWRE) and subsequent implementation of the proposed SWREs would entail additional funding support from the Federal Government, in addition to whatever revenues that the states may get from the extraction of their water resource.

3. KEY RECOMMENDATIONS

The following are the recommendations of the ASM IRBM Task Force to address the above three key limiting factors among the river basin management issues in Malaysia.

3.1 Enabling Environment

(a) Implementation of the NWRP Policy at state level

Ministry of Natural Resources and Environment (NRE) shall conduct state-level dialogues and workshops to create awareness of the NWRP so as to identify and develop the specific framework for federal/state level partnerships to implement the NWRP in each state. From the framework, the state can then develop its specific state-level water resource management policy which complies with the national NWRP.

Thus, NRE shall implement the strategic actions for the three strategies identified in the NWRP's Strategic Targets 15 and 16 as listed below.

(a) Strategy: Identify stakeholders and clarify roles as well as responsibilities;

(b) Strategy: Develop means and measures for consultation; and

(c) Strategy: Determine means, measures and approaches for collaborative governance.

(b) National Legislature to enact the draft National Water Resources Law (NWRL)

As part of the 2012 National Water Resources Study (NWRS), draft NWRL was prepared and is currently at the consultation stage with the relevant states and stakeholders. The various policies, legal and institutional elements to support the enactment of the draft NWRL have already been piloted, refined and put in place at the national and state-level since 1998. They can be found in the formation of the National Water Resources Council (NWRC) in 1998 and the state WRE of Selangor, Sabah and Kedah. Selangor and Sabah have had more than a decade of experience in implementing the SWRE enacted in 1999 and 1998, respectively. Their number increased in 2008 when Kedah enacted and subsequently implemented the Kedah SWRE. The NWRP had been formulated in 2012 and task forces have been set up to support its compliance. *What is lacking and required at present is the integration of all the various elements, together with the benefits of the lessons learned from the implementation of the State Water Resources Enactment (SWRE) by Selangor and Sabah, via the enactment of the proposed draft NWRL and the subsequent streamlining of the institutional framework to support its implementation.*

(c) State Legislatures to adopt the draft NWRL

With the support of the NWRC via its decision in its 8th meeting in 2013,

Department of Irrigation and Drainage (DID) shall be the Secretariat to all SWRC, NRE and DID Malaysia will work with their respective state DID and relevant state government agencies to get the proposed NWRL adopted by the respective state legislatures, thereby complementing existing laws already enacted in Sabah, Selangor and Kedah.

(d) Appropriation of adequate Federal funds and support in key areas that are catalytically to the sound and sustainable management of river basins

The NWRP 2012 Policy Principles stress on water resources security, water resources sustainability and collaborative governance. A strong Federal-state alliance and commitment is vital for the sound management of river basins nationally, noting that natural resources belong to the states. IRBM requires the development of basin management plans for each river basin and the deployment of competent managers and support personnel who have the necessary skills and knowledge relevant to sustainable and integrated river basin management. In addition, there needs to be a robust and continuing research programme nationally to provide sustainable solutions to resolve the many issues and challenges faced, harnessing the best of science, technology and innovation. Hence, within the spirit of collaborative governance, the appropriation of adequate federal funds to support the following critical areas is a vital prerequisite for the successful implementation of IBRM nationally.

(i) Federal funding support to the states in enacting parallel water resource legislation and related institutional structures

The Federal Government needs to provide additional funding to the states to encourage them to adopt and implement similar water resource laws as the proposed NWRL. As highlighted above, the effective implementation of IRBM requires the agreement and cooperation of the respective states to support the enactment of the proposed NWRL as state law. This is because Water Resource Management (WRM) involves land management, which is a state matter under the Federal Constitution. Thus, there is a need for the Federal Government to provide the states with adequate financial support to enact their respective SWRE, creation and subsequent financing of the state WR Departments.

(ii) Federal funding for the development of IRBM Plans

There is a need for the Federal Government to provide financial allocations for the development of IRBM Plans, estimated to cost RM1 million per IRBM Plan, to facilitate the implementation of IRBM in the 189 river basins in the country, in accordance to priority.

(iii) Federal funding for IRBM-related R&D and capacity building activities

There is also a need for funding support for R&D related to IRBM topics and to complement the IRBM-related capacity building efforts carried out by both local and international organisations such as the Malaysian Water Partnership (MyWP), Malaysian Capacity Development Network (MyCDNet), Global Environment Centre (GEC), Global Water Partnership South-East-Asia (GWP-SEA), AguaJaring SEA Network, Network for River Basin Organisations (NARBO), etc.

3.2 Institutional Set-up

a) New Federal institutional structure for water governance (Federal WR Department and State WR Departments should be created)

A Federal and state-level Water Resources (WR) Departments (except for Selangor and Kedah) should be created to implement the provisions of the proposed Draft NWRL and SWRE when they are enacted by the Parliament and the respective State assemblies. These provide the required institutional capacity to implement IRBM in the respective states, except for Selangor, Sabah and Kedah.

Since the enactment of the proposed draft NWR Law requires the agreement of all the states, in view of the fact that WRM is a state matter, there is a need to address the issues relating to the "legacy" state WRM institutional framework which are holding back the enactment of the draft NWRL. The major institutional issue for those states that have not enacted a SWRE is the designation of the state-level agency that shall be entrusted with the responsibility for WRM functions.

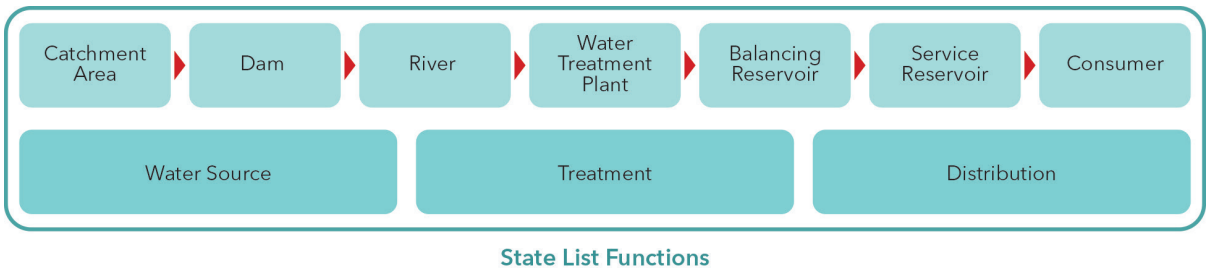
In the past, WRM-related functions were considered to be the responsibility of the state agency which was responsible for sourcing and treating the raw water for supply to the public. However, with the enactment of the Water Service Industry Act (WSIA, 2006) there is a clear separation of the responsibility and functions for WRM which are related to water source, and the treatment and distribution of the treated water to the public, as illustrated in Figure E.1 on the next page.

Thus, after 2006, there is a need for two state-level agencies/departments to manage the two separate sets of functions related to water. They are:

1. An agency/department (the existing *Badan Kawal Selia Air*) that manages all aspects of treated water and co-ordinates its work with the federal agency, the National Water Services Commission (SPAN) that has taken over all the regulatory functions of treated water in Malaysia.

2. An agency/department (the proposed state-level WR Department, with functions

a) Water Sector before WSIA 2006



b) Water Sector after WSIA 2006

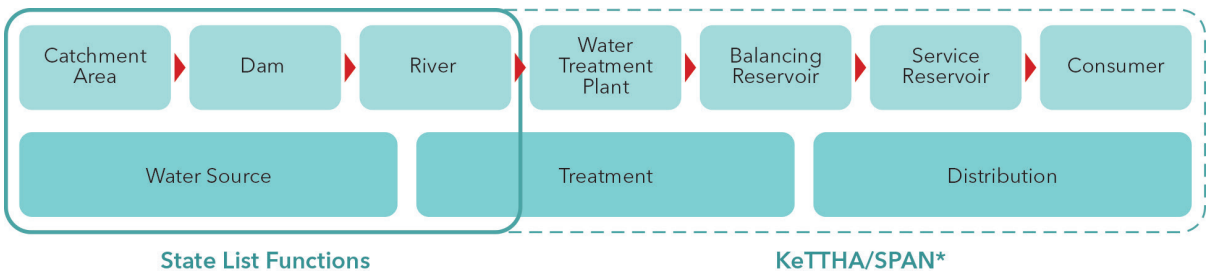


Figure E.1 Separation of Water Resource and Water Services Sector after enactment of WSIA (2006) – [Extracted from NWRS (DID, 2012)] [* Note: Concurrent List]

and responsibilities that are similar to Lembaga Urus Air Selangor (LUAS), Lembaga Urus Air Kedah (LUAK) and the Sabah DID WRM Section) that manages all aspects of WRM related to catchment areas, dams and rivers, including river and groundwater resource management and thus, shall be responsible for implementing IRBM within the state. This state-level agency/department will be supported in its work by the proposed federal-level National Water Resources Department that will be set up upon the enactment of the draft NWR Law.

The NWRS (2012) has recommended that the Federal and State DID be reorganised and renamed as the National and State Water Resources Department (SWRD), except for Selangor and Kedah, in view of the fact that the existing water resource management functions of DID already cover more than 60% of the WRM functions of the proposed WR Department in the draft NWRL. Thus, the enactment of the draft NWRL and subsequent enactments of the State WRM Law (based on the template State WRM Law in the draft NWRL) would provide

DID or other similar WRM agencies (e.g. those that have been created in Selangor and Kedah) with the regulatory powers to implement all of the WRM functions.

The NWRC in its eighth meeting in 2013, has also recognised DID's existing key role in WRM when it decided to assign DID to be the secretariat to all the SWRC, except for Selangor and Kedah. The Secretary-General of NRE is also the Chair of the Committee for the Implementation of the NWRP while the Director-General of DID is the Chair of the NWRP Implementation Task Force.

b) Alignment of functions and responsibilities with the NWRP and proposed NWRL

Almost all of Malaysia's water supplies are derived from river sources. Thus, it is not possible to achieve IWRM without IRBM. The NWRS (2012) has identified six main WRM functions that the proposed NWRD has to fulfil to implement IWRM and IRBM which are:

a) Water Resources Assessment;
b) Water Resources Sustainable Integrated Management;
c) Water Resources Allocation and Regulation;
d) Water Hazard Management;
e) Water Resources Technical and Scientific Support; and
f) Intra- , Inter- and International Technical Water Resource Services.

Thus, upon the enactment of the NWR Law, the existing WRM functions of DID shall be enhanced to cover all the six WRM functions listed above.

3.3 Management Instruments

3.3.1 Water Assessment and Allocation

a) Ad-hoc Studies on Water Resources Assessment

DID should implement a systematic programme of water resource assessment for river basins, and the Department of Mineral and Geosciences (DMG) should also implement a systematic programme to assess the water resource available in the country's aquifers. This will ensure that the available water resource in a river basin and in the aquifers can be known, and compared it with the water demands placed on it by various users to ensure sustainable water resource management for river basins and aquifers, respectively.

b) Fragmented and non-uniform state legislation governing water allocation

States should adopt the proposed NWRL where relevant, when it is enacted by the Federal Government so that there will be relative uniformity between the states in the application of the water allocation rules and regulations.

c) Water allocation is not guided by IWRM principles

Water allocation in a river basin should be guided by a developed IRBM plan. The NRE, with the endorsement of the NWRC, should prepare IRBM plans for all important river basins in the country. They should be used by the states to guide their decision making process

in water allocation. The status on the development of IRBM plans for the 189 river basins in the country that have a basin area of more than 80 km2 is given in Appendix 1.

3.3.2 Uniform Pricing Model for Water Resource

The 2010 NWRS has recommended that a uniform pricing and tariff regime for the water services sector be adopted, after taking into consideration the funding requirements for the management activities that would be required to sustain water resource and the environment in river basins. Although different states have their own supply and service providers, an equitable uniform price and tariff structure for water supply would be much easier to enforce. Thus, the study recommends a set of guiding principles for water pricing that takes into consideration water resource and the environment.

3.3.3 Implement Payment for Ecosystem Service (PES) Schemes

Experiences from around the world show that there are two main approaches for sustainable freshwater governance: the traditional way of command and control; and the use of economic or market-based instruments. The traditional way of deterring environmental degradation is to enact a law coupled with sanctions for non-compliance. Such a command and control policy might be effective in controlling pollution from well-defined point sources, e.g. factories or sewage treatment plants. However, they are less effective in regulating non-point sources of pollution, such as those occurring when numerous upstream landholders dedicate their land to intensive agricultural or other non-sustainable activities. For such cases, the downstream water pollution (or scarcity) is the result of the combination of individual actions carried out by geographically spread out and heterogeneous upstream users. Therefore, economic mechanisms and incentives, especially PES, are a promissory conservation approach and should be implemented.

3.3.4 Pollution Control

a) Control of pollution from sewage effluents

SPAN should work with the relevant state authorities to increase the sewerage coverage areas covered by Indah Water Konsortium (IWK). There is also a need for local authorities to control the discharge of raw sewage from squatters.

b) Control of pollution from small and medium enterprises (SME)

The Ministry of International Trade (MITI) and Industries should provide financial and technical assistance to the SME industries to comply with effluent discharge standards.

c) Control of Sullage (Grey-Water)

All local authorities are required to ensure that sullage water from households is treated before being discharged into rivers through increased enforcement and the awareness programmes amongst the public. There is also a need to control

the discharge of the sullage at source.

d) Control of livestock farming and aquaculture

State authorities should designate specific areas for the livestock and animal farming industry to ensure proper control of their wastewater discharges and for disease control.

e) Pollution control from non-sanitary landfill and open dumps

State authorities should ensure that all landfills are designed as sanitary landfills and that all open rubbish dumps are closed.

f) Pollution control of sedimentation and siltation

The DOE and DID has implemented the requirements of the Erosion and Sediment Control Plan (ESCP) as part of land development submissions. The enforcement and implementation of the ESCP plan requirements would mitigate the negative impacts from non-point sources of pollution.

g) Need for review of effluent discharge standards

DOE should review the current effluent discharge standards to be in line with current acceptable international standards and availability of treatment technology.

h) Need to develop specific River Pollution Loading Capacity standards (RPLC)

DOE should develop specific river pollution loading capacity standards. This is because the assimilative capacity of a river or water body to receive and absorb the pollution load from diffuse and point sources should be measured and determined.

3.3.5 Flood Management

1. Implement the Integrated Flood Management (IFM) Approach to address the increased incidences and cost of flood damages

The state authorities, and Town and Country Planning Department (TCPD) should adopt the IFM approach to address the flood management issue since it is a total flood management approach that involves using both structural flood control measures (e.g. flood walls and bunds) with equal emphasis on non-structural flood management measures (e.g. land use zoning for flood detention storage). IFM requires a proactive management of risks due to flooding, where land use management plays a central role. Thus, it is recommended that the State authorities and other relevant agencies cooperate with DID to implement IFM principles to address flood management issues.

2. To legislate and define designated flood protection zones to address the issue of uncontrolled development in flood prone areas

State authorities should designate the low-lying, undeveloped areas along a river corridor, that have been identified as flood detention zones in the river

basin Flood Mitigation (FM) master plan, as flood protection zones. DID should prepare for every river basin a FM master plan that highlights the undeveloped low-lying flood-prone areas where development has to be controlled.

3.3.6 Drought Management

1. **Management of dry spell (drought-like) conditions in a river basin**
   All states should have a drought management plan ranging from water stress or water shortage (drought-like conditions) to extreme conditions of long periods of no rain (drought). Thus, there is a need for monitoring plans for drought-like conditions, such as for low river flow, low rainfall, low water supply, reservoir levels and develop water supply plans resilient to water shortages (seasonal dry periods).

2. **Reprioritise water allocation in times of drought-like conditions**
   All states should include in their respective SWRE the power to re-prioritise water allocations under drought conditions, e.g. LUAS enactment Sec 72. General Drought Order.

3. **Development of a climate change mitigation and adaptation plan for drought-like conditions**
   All states should develop a plan to include the mitigation and adaptation for climate change impacts, such as the risk of climate variability of rain not falling at the desired catchment locations.

3.3.7 River Basin and Land Use Planning

1. **Control of uncoordinated land use at the local authority level**
   All States that do not have any WRML should adopt the NWRL for controlled enforcement of land use at the local level to support WRM objectives. For states that already have WRM laws, such as Selangor, Sabah and Kedah, they are recommended to start implementing and enforcing the provisions in their WRM laws.

2. **Land use control at the local authority level not guided by a river basin plan**
   The NRE, with the support of the NWRC, should develop IRBM plans for all 189 river basins in the country which are greater than 80 km2, in accordance to priority. The implementation of each IRBM plan's strategies should then be monitored and coordinated by a proposed River Basin Management Committee (RBMC).

3. **Inadequate technical capacity to monitor the implementation of IRBM master plans**
   States should set up SWRA to monitor the implementation of IRBM plans, and work with the proposed Federal NWRD to update the developed plans.

3.3.8 River Basin Information System

1. Too much information, lack of useful information products

The proposed NWRD should create a River Basin Information Management Unit (RB-IMU) to manage and update the developed IRBM plans and carry out all necessary information management functions to support IRBM implementation by the SWRA.

2. Selection and choice of Information Management (IM) tools

The proposed NWRD should adopt appropriate guidelines for the selection of IM tools and standards for the proposed RB-IMU.

3.3.9 R&D on IRBM and an IRBM Pilot Project

The NRE, with the support of the NWRC, should provide funding support for R&D related to IRBM topics and the development of the Best Management Practices (BMP) in IRBM implementation via a pilot IRBM project involving partnerships between multiple stakeholders, Federal and state stakeholders and public or private organisations. In this regard, the "River of Life (RoL)" project for the Klang River basin that began in 2010, estimated to cost RM4 billion and a duration of 10 years, can be chosen as the pilot IRBM project for R&D related to IRBM in Malaysia. The IRBM Taskforce also supports the specific IRBM-related recommendations of the ASM Water R&D Taskforce.

3.3.10 River Basin Monitoring DID to prepare annual river basin monitoring reports

DID should start compiling and publishing annual river basin monitoring reports for the important river basins in the country. This is in line with its function as proposed in the restructured NWRD when the proposed NWRL is enacted.

3.3.11 Stakeholder Participation Need to get more public participation in river basin management

NRE should provide additional funding to DID for IRBM capacity building activities so that DID can partner and complement the IRBM-related capacity building efforts being carried out by both local and international organisations.

1

BACKGROUND

Malaysia is committed to implementing IWRM for the sustainable management of the country's water resources since the late 1990s. The NWRP, formally launched in March 2012, further reaffirms the adoption of IWRM which calls for the balanced development and management of "water as a resource" and "water for livelihood". Implementation of the IWRM agenda involves the integration of both natural and human systems set within an overall framework that provide the enabling environment with effective institutional arrangements supported by necessary management instruments. Implementation of IWRM across all sub-sectors and levels of hierarchy are guided by the internationally endorsed 1992 International Conference on Water and the Invironment (ICWE) Dublin Principles.

ASM, an independent think-tank providing strategic advice to the Government on STI matters, has since 2008, been undertaking studies pertaining to the water sector, considered strategic for the country's economic development. The studies have been overseen by a dedicated ASM Water Committee. Adopting IWRM as the central thrust and noting that IWRM per se is a rather abstract concept, the committee has, for practical application in the Malaysian context, broken down IWRM into discrete sub-sets or sub-themes. Each of these sub-sets or sub-themes have then been subjected to in-depth studies culminating in the preparation of a strategy plan or advisory report for consideration and adoption by the relevant authority or agency responsible for their implementation.

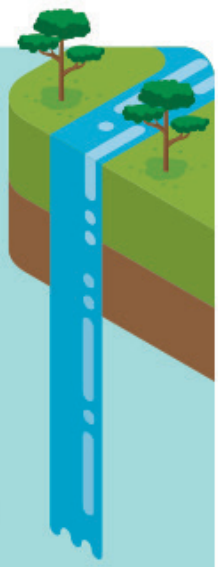
The Dublin principles on Water (ICWE 1992)

Principle No. 1
Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.

Principle No. 2
Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels.

Principle No. 3
Women play a central part in the provision, management and safeguarding of water.

Principle No. 4
Water has an economic value in all its competing uses and should be recognized as an economic good.



The studies have also undergone a process of strategic consultations with relevant institutional, community and private sector stakeholders.

One of the studies undertaken by the Academy is the study on IRBM.

1.1 The Need for IRBM

Rivers have always played a very important role in Malaysia's development as being the source for domestic, industrial and agricultural water supply, navigation, power generation, recreation and upkeep of the environment. Rivers also play an important role in maintaining the ecological balance and as a habitat for flora and fauna. The rapid pace of development over the last four decades has brought about degradation in many of the country's river systems. The rivers are being silted up, river water quality has deteriorated, potable water shortages are more frequent and the incidences of floods have become relatively common.

The river basin is defined naturally by its topography and captures all the rain waters that fall within it. Thus, in order to address all issues related to the rain waters in a basin, for example, competition for their use and the problems caused by inappropriate land use, there is a need for an integrated approach to the management of the river basin. In 2000, the GWP provided a useful definition of IRBM Planning, which is as follows:

"A process of coordinating conservation, management and development of water, land and related resource across sectors within a given river basin, in order to maximise the economic and social benefits derived from water resource in an equitable manner while preserving, and where necessary, restoring freshwater ecosystems".

In assessing the water resource within a basin, there is also a need to assess ground water resource related to the basin.

1.2 ASM's Advisory Report on IRBM to the Government

In order to support the Government's efforts to address the challenges of managing river basin in an integrated way, ASM under its Sustainable Water Management Programme has created a "Task Force (TF) on IRBM " to prepare a Strategic Advisory Report on IRBM for the Malaysian Government. The work to prepare the report involved two stages:

a) Preparation of a position paper status report on IRBM in Malaysia; and

b) Strategic Consultations on IRBM issues with key stakeholders.

Chapter 2 provides a summary of the current river basin management status and related issues in Malaysia. Chapter 3 highlights the key limiting factors and gives the key recommendations of the IRBM TF to support effective IRBM implementation in Malaysia.

RIVER BASIN MANAGEMENT – STATUS AND ISSUES

The current status and issues on IRBM in Malaysia are organised and presented under the following 13 thematic focus areas. They are as follows:

1. Policy
2. Legislation
3. Institution
4. Finance
5. Water Assessment and Allocation
6. Pollution Control
7. Flood Management
8. Drought Management
9. River Basin and Land Use Planning
10. River Basin Information System
11. R&D on IRBM and an IRBM Pilot Project
12. River Basin Monitoring
13. Stakeholder Participation

2.1. Policy – Status and Issues

2.1.1. Policy Status

Figure 2.1 (*page 7*) shows a roadmap of the status of IWRM implementation in Malaysia. It shows the historical evolution of the IWRM approach in the country over the past two decades as listed below, culminating in the NWRP of 2012.

1. (1993) – Awareness programme, such as "Love our rivers programme"

2. (1998) – Formation of NWRC

3. (1999/2000) – National Water Vision and the formation of state apex water resource management organisation in Selangor and Sabah (LUAS, SWRE)

4. (2001) – Urban Storm-water Management Manual (MSMA)

5. (2002) – National sewerage project and National strategic plan for solid waste management

6. (2003) – Study on Integrated Management of Sg. Damansara catchment

7. (2005) – National Study on Effective Implementation of IWRM in Malaysia

8. (2007) – WSIA and formation of the SPAN

9. (2009) – Implementation of IWRM BMP pilot projects

10. (2009/2010) – Review and updating of the 1982 National Water Resources Study; and

11. (2012) – National Water Resources Policy.

Thus, it can be seen that there is a NWRP to guide the water resource management in the country, which the IRBM approach in river basins would be guided by IWRM principles. Furthermore, states such as Sabah, Selangor and Kedah have also enacted specific water resource management policies and laws to manage water resource in their respective states based on the IWRM approach.

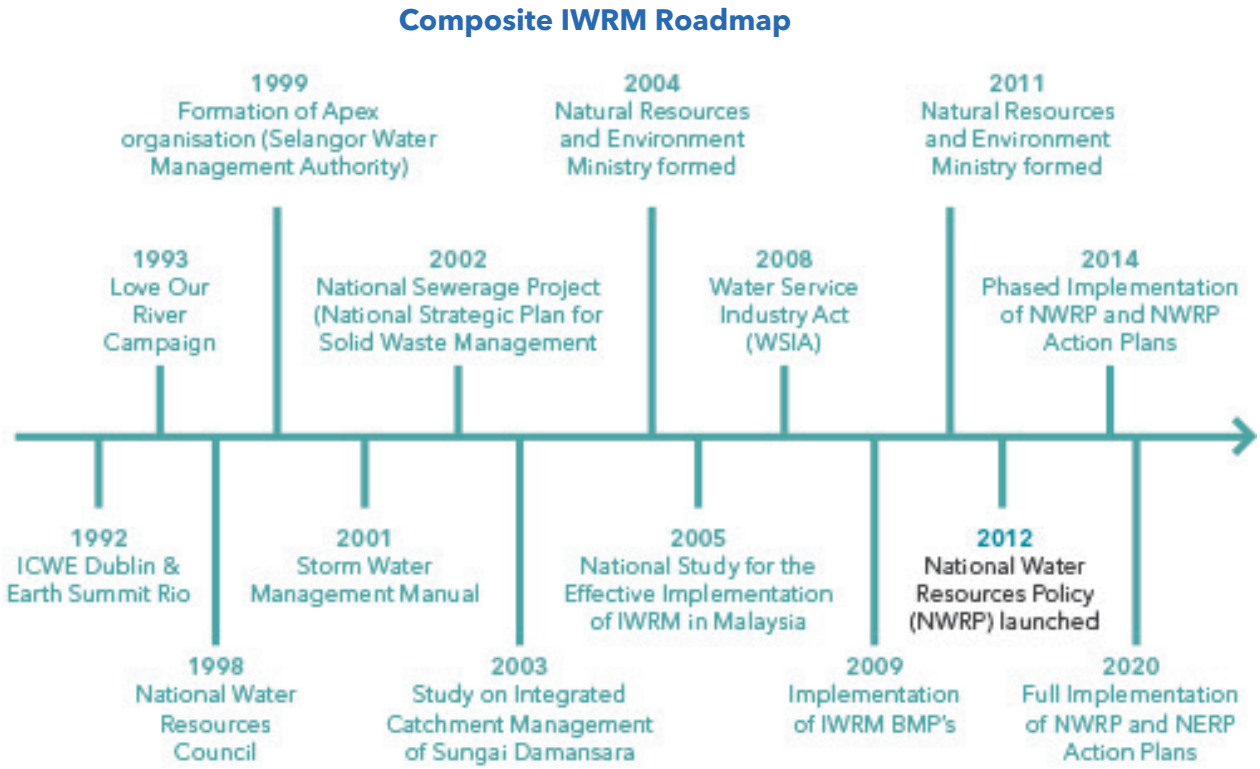


Figure 2.1– Roadmap of Status of IWRM Implementation in Malaysia

2.1.2 Policy Issues

The key policy issues are as follows:

(a) Implementation of NWRP at state-level

With the official endorsement of the NWRP by the NWRC, in which, each state is represented by their respective chief minister, there is a need now to translate the NWRP into specific state-level water resource policies which would support the integrated management of water resource in each state. This is because water resource is a state matter as defined in the Federal Constitution. For states that have enacted specific state-level water resource policies and laws, such as Selangor, Sabah and Kedah, this is not a key issue. However, for states that do not have any specific state-level water resource management policy, there is a need to define their specific state-level water resource management policy coherent with the NWRP. These will then provide the basis for the development

of the Federal/state level partnerships for the implementation of IWRM compliant approaches in each state, which will include the implementation of IRBM.

(b) Development of Federal/state level partnerships to implement NWRP

The NWRP has four specific policy core areas, in which Policy Core Area 3: Partnerships, with its two policy Thrusts, Targets and Strategic Actions are reproduced below. There is a need to identify and develop details of the specific Federal/state level partnerships to facilitate the implementation of IWRM compliant approaches in each state.

Policy Directions for Core Area 3: Partnerships

Water resource governance requires the collective action of all stakeholders, which does not only include government mandate holders. The central idea here is that, to give effect to integrated approaches already adopted in Malaysia such as the integrated water resource management and integrated river basin management, these integrated approaches must be adopted nationwide, and key to adoption is integrating governance measures. What is important to note here is that through collaboration and partnership, the task of governing water resource can be shared. Effective governance requires structured mechanisms and platforms as well as processes to facilitate involvement and participation. Also important are the processes that provide the means to involve participate and collaborate.

Thrust 7: Stakeholder Inclusiveness and Engagement

Target 15: *Establishment of mechanisms for formal and informal consultation on matters related to water resource*

1. ***Strategy: Identify stakeholders and clarify roles as well as responsibilities***
   Strategic Action Plan:
   a) *Identify and profile stakeholders*
   b) *Identify common objectives, goals and targets for local water resource use and conservation*
   c) *Identify and profile roles, responsibilities and options for shared responsibilities and collaboration*

2. ***Strategy: Develop means and measures for consultation Strategic Action Plan:***
   a) *Identify channels of formal and informal communication networks*
   b) *Identify options to strengthen collaboration, consultation and stakeholder engagement platforms and processes.*
   c) *Develop consultation processes in local water plans development for integrated and concerted actions related to sustainable use and conservation of water resource.*

Thrust 8: Shared Water Resource Governance

Target 16: *Develop framework for stakeholder collaboration in water resource governance*

Strategy: Determine means, measures and approaches for collaborative governance
Strategic Action Plan:

i) Identify processes and procedures that can be integrated to ensure shared governance of water resource.

ii) Identify options for the formation of formal and informal, shared and collaborative partnership platforms.

iii) Identify channels of formal and informal communication networks.

iv) Review and reconcile the prerequisites in adopted and accepted approaches for water resource conservation and management such as IWRM, IRBM, IFM, ILM etc.

v) Identify and implement on pilot basis joint projects that promote accepted approaches for water resource management such as IWRM and IRBM.

vi) Strengthen programme on awareness and the need for shared responsibility.
(vii) Identify platforms for resolution of conflicts and competing interests.

2.2 Legislation – Status and Issues

2.2.1 Legislation Status

Currently, the various aspects related to IWRM and IRBM approaches are covered under many laws, such as the EQA, Forestry, Geological Survey and Fisheries. There is a need for a holistic water law to implement the IWRM, IRBM principles and approaches in the country. A number of states have enacted legislations to govern certain aspects related to water resource, such as Kedah, Melaka, Negeri Sembilan, Pahang, Sabah, Sarawak and Selangor. The lack of uniformity or consistency between the states' water laws is a cause for concern. The primary objective of the Waters Act 1920 is to ensure greater uniformity in the governance of rivers by all states.

As part of the NWRS of 2010, a draft National Water Resources law was developed to complement the NWRP. The draft NWRL has been developed as a "model law" for all states in Peninsular Malaysia. This is to facilitate the adoption of the law by states that do not have any comprehensive water law to ensure uniformity with the NWRL and will supersede the Waters Act 1920.

2.2.2 Legislation Issues

The key legislation issues are as follows:

a) Official enactment of the draft National Water Resources Law (NWRL)
There is a need for the draft NWRL to be enacted by the national legislature as soon as possible so that the proposed institutional framework for the implementation of the law can be setup to facilitate the implementation of IWRM compliant policies in the country.

b) Official adoption of the law by state legislature

The draft NWRL has been developed based on the following guiding principles so that it can be adopted as a state law upon adoption by the state legislature. Thus, once the NWRL is enacted, there is a need for each state legislature to officially adopt the Law before it can take effect in each state.

1. Pursuant to Article 76(1) of the Federal Constitution, Parliament may adopt a law to ensure uniformity among all states.

2. The law will be in strict conformity with the jurisdictions of the Federal and state government as enshrined in the Constitution.

3. The law shall only come into effect in any state (other than the Federal Territories), after the state legislature adopts the Act and converts it into state law.

4. The law shall take into account existing enactments in some states on water resources.

5. The Federal law must be consistent with and shall give effect to the proposed National Water Resource Policy and Institutional set up.

6. The Federal law will leverage on existing state laws (e.g. Land Conservation Act) and other Federal laws (e.g. EQA) and avoid duplication or conflict with such laws.

2.3 Institution – Status and Issues

2.3.1 Institution Status

The Federal Constitution has defined the jurisdiction of the Federal and state governments over water resources. They are as follows:

a) States have jurisdiction over water resources and related aspects such as land, forest, agriculture and rivers.

b) Federal Government has jurisdiction over the following matters related to water resources:

   i) International treaties and agreements

   ii) Transboundary rivers

   iii) Transfer of water (if not resolved between states)

   iv) Data, information collection and management

   v) Scientific research; and

   vi) Setting of national standards, safety and security.

Thus, the current institutional status for water resource management in the country can be summarised as follows:

1. Each state is responsible for the management of its own water resources. Thus, some states have created their own state water resource management organisations to manage their water resource, such as Selangor, Sabah and Sarawak, whereas others depend on the Federal Government's water-related technical departments to provide the necessary support for the management of their states' water resources.

2. The key Federal water-related technical departments are as follows:

   i) DID for the physical management of rivers and coastal water resource.

   ii) DOE for the management of water quality of the rivers, lakes, coastal and ground water resources.

   iii) DMG for the physical management of ground water resources.

3. NWRC was set-up in 1998 to facilitate co-ordination and uniformity of decision-making on water resource among the states. The NWRC was chaired by the Prime Minister until 2009 when it was transferred to the Deputy Prime Minister. The other NWRC members are:

   i) The Minister of Finance;

   ii) Minister of Natural Resource and Environment (NRE);

   iii) Minister of Energy, Green Technology and Water (KeTTHA);

   iv) Minister of Works (KKR);

   v) Minister of Agriculture and Agro-based Industry (MOA);

   vi) Minister of Federal Territories (KWP);

   vii) Minister of Urban Wellbeing, Housing and Local Government (KPKT);

   viii) Minister of Science, Technology & Innovation (MOSTI);

   ix) Minister of Plantation Industries and Commodities (MPIC);

   x) *Menteri Besars* of Perlis, Kedah, Perak, Selangor, Negeri Sembilan, Johor, Pahang, Terengganu and Kelantan; and

   xi) Chief Ministers of Pulau Pinang, Melaka, Sabah and Sarawak.

   The roles and functions of the NWRC are as follows:

   i) Implement water management on a national basis to ensure long-term sustainability of water supply.

   ii) Promote resolution of water resource disputes among states, including the establishment of a mechanism for agreeing of terms.

iii) Address legal and other issues needed to allow the increase in use of water through inter-basin and inter-state water transfers.

iv) Coordinate the implementation of water resource development projects.

v) Advise state governments on the conservation, control and gazettal of water catchments areas.

vi) Coordinate data management of water resources.

vii) Act as an apex body for water resource governance.

viii) Set general policy directions on water resource (planning, development and management).

ix) Advice and recommend on inter-state matters and state water-related matters.

x) Take charge of all international water-related matters.

4. The institutional arrangement for water resource management in each state (as of July 2011) can be categorised into four as listed below:

Category 1 – Fully developed and implemented (Fully functional with institutional structures addressing most aspects of water resource management) [Selangor (LUAS), Kedah, Sabah, Sarawak]

Category 2 – Developed and/or need refinement and/or to be implemented (All have been mandated by legislation but some aspects of the institutions have yet to be made fully functional) (Pahang, Kelantan, Terengganu and Negeri Sembilan)

Category 3 – Service oriented and industry or distribution based (Development through COPPRI)
(Malacca, Johor, Perak, Kelantan, Terengganu, Negeri Sembilan, Penang, Sarawak)

Category 4 – None of the above or preparations underway (No provisions yet) (Perlis-Syarikat Air Perlis has signed an agreement with Pengurusan Aset Air Berhad (PAAB) regarding water assets in 2010 and the three Federal Territories – No provisions yet except in Putrajaya)

5. DID has also developed and implemented the "One-State-One-River (1S1R)" Programme to support the implementation of river basin plans for each state. However, due to the current institutional limitations faced by DID, they faced a number of institutional challenges in implementing the recommended river basin action plans and thus, could not scale the programme effectively across the state and country.

6. DID has also implemented the "JPS@ Komuniti" Programme within DID as a "bottom-up" approach to overcome the

current institutional limitations of the "top-down" approach in implementing the river basin plans. The programme is an attempt to "kick start" the implementation of IRBM at the local district level. The programme requires all DID District offices to identify key sub-basins within their districts, identify the key sub-basin water management issues faced by them, compile the necessary sub-basin information and prepare sub-basin maps to support decision-making based on the IRBM perspective.

2.3.2 Institutional Issues

The key institutional issues have been identified in the NWRS Study that was completed in 2010. It involved the four institutional components that needed to be aligned to support the implementation of the NWRP 2012 and are as follows:

a) New Federal institutional structure for water governance

The NWRC is currently not formalised by legislation. This situation will change when the proposed NWRL comes into effect. Provisions have been made in the proposed NWRL to formalise the NWRC with membership, roles and functions clearly defined by law. The NWRC will provide a forum for direct Federal-state and inter-state communication on water issues, because all states are represented through their heads of governments, who are members in the Council. When fully mandated, the NWRC will be a very effective apex body for water resource management in the country because of the membership in the Council.

b) Revision to the existing institutional arrangement in all the states

The current institutional arrangement between the Federal Government and the states in terms of water resource management is fragile in terms of sharing common functions such as data collection, research and training. This situation has not led to the integration of water resource management in the country. However, the relationship is very strong in terms of development of water projects as the states depend on the Federal Government for funding, expertise and management at the state level.

c) Creation of a National Water Resources Management Department (NWRD)

Currently, the various aspects of water resource management and development are carried out separately by the various technical departments. There is a need to create a National Water Resource Management Department (NWRD) to co-ordinate the technical functions of water resource management and development in the country.

d) Alignment of functions and responsibilities with the NWRP and proposed NWRL

Currently, the functional responsibilities for water management are carried out by a number of agencies and ministries. Also, with the enactment of the Water Services Industry Act (WSIA)

2006, the water sector is divided into the water resource sector that is under the jurisdiction of the states and the water services sector which is under the Federal jurisdiction. Thus, there is a need to streamline the functions and responsibilities in the water resource sector to align them with those proposed in the NWRP and the proposed NWRL.

2.4 Financing – Status and Issues

2.4.1 Financing Status

Before the enactment of the WSIA 2006, each state was responsible for the financing of both the water resource and water services sectors. After WSIA, the Federal Government is now responsible for managing and financing the water services sector while the state is left with the responsibility to finance and manage the water resource sector. Since water resources belong to the state, each state is now deriving financial revenue from the sale of raw water to the Federal water services providers who treat the raw water for sale to the consumers. Since the cost of treating raw water increases with polluted raw water, there is a need to ensure that the water resources are properly managed. Thus, there is a need for the Federal Government to provide funding to help the states to improve their management of water resources. This means that the financing and pricing models for both raw and treated water are inter-linked and should be considered together.

Malaysia has one of the lowest water tariffs among the newly industrialised nations. Currently, there is no uniform water tariff in the water services sector in the country. Every state has its own water tariff structure.

The following is a summary of the current financing and pricing model for the water services sector after the implementation of the WSIA and the SPAN Act in 2006.

a) The WSIA provided the mandate to the Federal Government to manage water services industry from the treatment of raw water to the discharge of wastewater. SPAN was established to regulate the water services industry and to implement and enforce the provisions of the WSIA.

b) Through the legislative mandate of both the WSIA and SPAN Acts, an institutional structure was put in place, whereby all water operators and water asset owners are regulated by SPAN through a licensing framework.

c) The legislation had separated the role of water operators from the water asset owners by creating the PAAB to take over all water service assets owned by the states in exchange for absorbing all their outstanding loans and freeing the service operators to concentrate on service delivery.

d) With the creation of the PAAB, the Federal Government now provides loans only to Sabah and Sarawak for the development of their water service infrastructure. The responsibility

to finance and develop new water infrastructures in the Peninsular States is now transferred to the PAAB.

e) As a Government-owned company, PAAB is eligible for more favourable financing rates, which can translate into better tariff rates for the consumers. The water infrastructure will be leased to the water operators for operation and maintenance.

f) The separation of ownership from the operation of water infrastructure is aimed at driving the industry towards financial sustainability as well as better service efficiency.

g) The setting of water service tariffs is based on uniform principles and procedures and is subject to approval by SPAN.

h) SPAN itself does not promote privatisation of water services but instead promotes the corporatisation of state water authorities to enable them to operate as efficient corporate entities and to ensure that revenue generated from water service operations are reinvested back into the water supply sector.

i) SPAN is run by a committee whose members are appointed by the Minister of TTHA. The committee consists of the Chairman, the Chief Executive Officer, and not less than eight and not more than 10 other persons, who in the opinion of the Minister, have experience and shown capacity and professionalism in matters relating to finance, engineering, business or administration, or have special knowledge and experience.

j) The mandate and responsibilities of SPAN go beyond its regulatory role in the water and sewerage services industry as it also has licencing and technical regulatory roles. In terms of water resource and the environment, its responsibilities are to promote protection of the water-courses and the environment, improve the quality of life and the environment through effective and efficient management of the water supply and sewerage services.

There is no similar model for the financing and pricing in the water resource sector. This needs to be developed, in accordance to the model for the water services sector, in order to support the implementation of IWRM by the states with adequate funding for the formation of the SWRA and implementation of its regulatory activities.

2.4.2 Financing Issues

With the major restructuring of the water services sector in 2006 through the WSIA, the financing and pricing model for the water services sector are now quite well-defined. However, this is not the case for the water resource sector as there is no financing model for improved water resource management by the states and the water pricing structure for water resource is not developed at all. Thus, the financing issues are as follows:

a) Financial model for water resource management by the states

The success in the implementation of IWRM by all the states depends to a very large extent on the availability of sufficient expertise, manpower and funding. Thus, there is a need for the states to get Federal Government support to implement water resource management projects due to the current limited revenue that they derive from the sale of raw water to the water services providers. A Federal-state funding model needs to be developed to support amongst others, capacity building to ensure that the state water resources are effectively managed.

b) Pricing model for water resource

A financial study had been carried out in the 2010 NWRS to provide the basis for the pricing mechanism for water resource. The study highlighted that water resources had economic value just like any other natural resource such as minerals and timber from forests. The study also stated that the economic value of water resources had to include the non-financial components such as the environment, which was often difficult to monetise, but was nevertheless important in the overall water resource pricing mechanism. The water pricing model for the water resource sector would be different from the model for the water services sector. This is because the objectives of the water resource sector are to sustain and conserve the natural water resource environment, whereas those of the water services sector are to provide a service to water consumers. The different objectives of the two water sub-sectors will have a fundamental effect on the way the economic value of water resource is derived.

2.5 Water Assessment and Allocation – Status and Issues

Water assessment needs to be carried out to ascertain the available water resource in a river basin. It will provide information necessary for the relevant state authorities to make decisions on the equitable allocation of the limited water resources in a river basin among competing users, including the needs of the river ecosystem. In river basins where there is water scarcity, or it will be in the future, there is a need to regulate the water usage to ensure the sustainable, equitable and efficient utilisation of the limited water resource. The monitoring of the water resources are normally made through a permit or licencing system, which enables the government or state authorities to regulate the resource taking into account all stakeholder interests, including the river ecosystem.

2.5.1 Water Assessment and Allocation Status

The Federal Constitution gives the states the rights to water resources, both surface and groundwater resources. Thus, each state needs to know the amount of water resource that is available in each of its river basins in order for it to make decisions on its water allocation priorities. The states would also need the information to assist them in

regulating and licencing the withdrawal of both the river and ground water resources in the state. The task of assessing the available water resources in the country is a Federal function and was given to the DID in 1972, when the DID established its Hydrology Division. Since then, the hydrological information collected by the DID has been used by the Federal Government in its National Water Resource Studies, by water supply authorities in the development of new potable water supply sources and by Agricultural Development Agencies in the development of new irrigation schemes. Similarly, DMG had also carried out assessment of groundwater resources in the country.

Currently, all states give priority in allocations for water withdrawal for potable water supply, followed by withdrawal for irrigation for paddy crops. Due to increased threats to water resource from pollution and to water demands arising from industrial and urban development, a number of states, such as Kedah, Melaka, Negeri Sembilan, Pahang, Sabah, Sarawak and Selangor have enacted state legislation that deal with various aspects related to the management of water resource in their respective states. Some of the SWREs, like those in Kedah and Selangor, provide wide powers to the state authority or a state regulatory body to manage, control and protect water resources.

With the enactment of the WSIA in 2006, the water services sector is now regulated by the Federal Government and the states are responsible for managing the water resource sector. Thus, all the water supply operators have to apply for a license and pay to withdraw the raw water from the rivers or ground water for treatment.

2.5.2 Water Assessment and Allocation Issues

The key water assessment and allocation issues are as follows:

a) Ad-hoc Studies on Water Resource Assessment

Currently, both surface and groundwater water resource assessment in the country are carried out in an ad-hoc manner, based on the requirements of water resource projects to meet potable water supply or irrigation water supply needs. There are no systematic programme to carry out water resource assessment for a river basin to establish the amount of water resource available in a river basin and also groundwater aquifer. Since the information on the availability of water resource within a river basin and also aquifer is necessary to ensure the sustainable management of both the river ecosystem and aquifer, there is a need to implement a systematic programme of water resource assessment of river basins and aquifers in the country.

b) Fragmented and non-uniform State legislation governing water allocation

The state water resource enactments differ in jurisdiction, scope and powers which means there are gaps, conflicts and duplications in the enactments with both other Federal and state laws. Thus,

there are no standard, consistent, clear and comprehensive guidelines or policies governing water allocation among the states. Even though the states do not need to give up their existing powers over water resource, there are significant advantages in terms of Federal technical support to adopt a more consistent water allocation approach in line with national initiatives to promote greater consistency and uniformity of standards, methods and procedures.

c) Water allocation is not guided by an IRBM Plan and IWRM principles

Currently, the decision-making and approach to water allocation is not guided by a developed IRBM plan or IWRM principles, where the water demands from a river are balanced with other conflicting uses and factors.

2.6 Pollution Control – Status and Issues

Water resource management deals with both the maintenance and development of adequate quantities and quality of water. Thus, water resource management cannot be conducted properly without paying due attention to water quality. Managing water pollution is one of the most critical challenges to sustainable management of water resource. Pollution is increasing rapidly with urbanisation, industrialisation, and population growth. There is thus an urgent need to control water pollution.

2.6.1 Pollution Control Status

The DOE is responsible for river water quality monitoring in Malaysia and has implemented a program to monitor river water quality in 1978 for the 120 important rivers in the country. In 2012, the total number of programs conducted was 473 using 5,083 manual and 10 continuous stations. The appraisal of the water quality in each river basin is based on the Water Quality Index (WQI) consisting of parameters such as dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), ammoniacal nitrogen (NH3-N), suspended solids (SS) and pH. Due to the deteriorating trend of river water quality over the years, the DOE has implemented a programme known as the "Pollution Prevention and River Water Quality Improvement Programme", aimed at rehabilitating rivers with serious pollution problems to ultimately meet their beneficial status.

The DOE is also responsible for enforcing the Environmental Quality Act (EQA, 1974). The Act was enacted for the abatement and control of pollution and enhancement of the environment, which includes river water quality. According to the DOE, Malaysian rivers are degraded by both point and non-point sources of pollution. The major point sources of pollution in rivers are sewage treatment plants, agro-based industries, manufacturing industries, sullage or grey-water from commercial and residential premises and pig farms. Nonpoint source (or diffuse) pollution is largely due to storm run-off after a downpour. Earthworks and land

clearing activities contribute to siltation of rivers and can be both point and non-point sources of pollution.

Rigorous land clearing, oil palm replanting schemes and logging activities including logging pathway exploration and 4×4 expeditions, earthworks for construction purposes, sand mining within the river have resulted in soil erosion and the accumulation of sediments in the rivers. Significant negative impacts on the rivers have occurred not only in the form of siltation but also the loss of river habitats. Although these activities are supposed to cause temporal effects, their continuous occurrence would result in significant impacts on certain rivers, such as in Sg. Bertam in Cameron Highlands, Sg. Lojing in Dabong, Sg. Semantan of Sg. Pahang, Sg. Muda, etc. Thus, it is necessary to impose control measures on developers to comply with the ESCP required by the DID and DOE's "Guidelines for Prevention and Control of Soil Erosion and Siltation".

2.6.2 Pollution Control Issues

The key water pollution control issues are as follows:

a) Control of pollution from sewage effluents

Sewage is a major river pollutant in Malaysia. The IWK is only responsible for managing sewerage systems in 86 out of the 144 local authority areas in the country. The management of sewerage systems in even the 86 local authority areas is not comprehensive since there are sources that do not come under IWK's control, such as private sewage treatment plants, individual septic tanks, sewage from primitive systems and discharges of raw sewage from squatters.

b) Control of pollution from SME Manufacturing industries

The manufacturing industries generate both organic and inorganic pollutants, toxic wastes and persistent organic pollutants. Thus, DOE requires all manufacturing industries to instal wastewater treatment systems to treat their effluents to comply with the required effluent standards before they are discharged into water courses such as small streams, man-made canal/ channel and storm-water ditches. The level of control of the effluent discharges from the manufacturing industries varies from industry to industry. SME industries have difficulties in complying with the effluent discharge standards due to financial problems and the lack of space for the construction of wastewater treatment facilities.

c) Control of Sullage (Grey-Water)

Sullage or grey-water is wastewater that comes from places such as kitchen sinks, bathrooms, washing machines, restaurants, wet markets and car washing centres. It is a major contributor to urban river water pollution since it contributes organic pollutants, ammoniacal nitrogen and nutrients to the rivers. The urban rivers and streams usually do not have enough assimilative capacity to absorb the sullage pollutant loads. At present, sullage is not treated and poses a problem to improving river water quality.

d) Control of livestock farming and aquaculture

Livestock farming, especially pig farming discharges large quantities of wastewater with high organic content into the rivers. The implementation of the Agro Food Policy is also expected to increase discharges from other livestock industries e.g. cattle farms, poultry etc. Thus, there is a need for designated livestock and pig farming areas to ensure a proper control of their wastewater discharges and for disease control.

e) Pollution control from non-sanitary landfill and open dumps

There is a need to control pollution from non-sanitary landfills and open dumps. Open rubbish dumps that are not designed as sanitary landfills result in leakage of polluted effluents into groundwater and river systems.

f) Pollution control of sedimentation and siltation

There is a need to control pollution from sedimentation and siltation from the following sources:

i) River flow disturbances at headwater/ fountain source;

ii) Logging activities and laterite (logging) road deterioration;

iii) Sand mining within river and river banks;

iv) Open terrace/ hill slope agricultural activities;

v) Oil palm tree planting and replanting activities;

vi) Slope and river revetment work;

vii) Land clearing for small as well as massive development works; and

viii) Lack and inadequate mitigation measures to control each of the above mentioned activities.

g) Need for review of effluent discharge standards

There is a need to review the current effluent discharge standards to be in line with current acceptable international standards and availability of treatment technology. Also there is a need to evaluate the palm oil mill and rubber industry effluent discharge standards, especially for those factories located in upstream areas. There is also a need to add more pollutant parameters in the effluent discharge standard.

h) Need to develop specific RPLC standards

The assimilative capacity of a river or water body to receive and absorb the pollution load from diffuse and point sources should be measured and determined. For example, sullage and surface run-offs that flow through the urban drainage system into a river. Also, the pollution load from point sources should include, in addition to sewage and industrial point discharges, those discharged from food services establishments, etc.

With regards to the setting up of a RPLC standard, there is a need to first adopt and define a specific RPLC standard for a particular stretch of river before any action to control and allocate the acceptable amount of pollution loading from the specific river catchment can be carried out. Thus, for a desired river water quality to be achieved and sustained for a specific river stretch, there is a need to ensure that the regulations governing the planning and siting of polluting activities within a specific river catchment are strictly enforced.

An example of a RPLC standard is the Total Maximum Daily Load (TMDL), which is the maximum amount of pollutant a specific water body can receive and still meet the desired water quality standards. The use of the TMDL standard, or other similar standards and approaches, will enable all pollutant generators within a specific river catchment to share in the maximum allowable pollution load of the specific river stretch, and thus permit the prediction of the amount of pollutant load reductions that will be required to meet the desired river water quality standards.

2.7 Flood Management – Status and Issues

Floods occur when the capacity of the natural or man-made drainage system is unable to cope with the volume of water generated by rainfall. Floods can vary in size and duration.

2.7.1 Flood Management Status

There are 189 river systems in Malaysia of which 85 are prone to frequent flooding. Flooding has become a national issue in Malaysia (see Figures 2.2 and 2.3) as the nation's economy and population has grown over the years and developments started to encroach into river corridors and flood plains which has resulted in increased incidences of floods. According to the DID, about 29,720 sq. km or 9% of Malaysia is flood prone and the estimated average annual flood damage in Malaysia is worth RM915 million per year.

The DID is the lead government department entrusted with the technical management of floods in Malaysia. It plans and implements flood mitigation projects around the country, advises local authorities, provide flood forecasting services and warnings. It is also the official custodian of the nation's hydrological data. Divisions in DID that have functions related to flood management are as follows:

a) Flood Mitigation Division

This is the division that deals directly with flood issues. Its foremost task is to produce a comprehensive master plan for resolving the national flood problems using structural and non-structural measures including flood defence (e.g. flood risk and flood hazard maps).

b) Urban Drainage Division

This division focuses on urban drainage issues and provides advisory services on the use of the Manual Saliran Mesra Alam

The floods in December 2014 and January 2015 in Kelantan, Terengganu, Perak, Pahang, Johor, Sabah and Sarawak resulted in devastating damages forcing about 400,000 people to be evacuated. Thus, the Prime Minister had to convene a special Parliamentary Session on 20th January 2015 to approve a special budget allocation of RM893 million for flood mitigation works, RM800 million as initial allocation to repair and reconstruct basic infrastructure like schools, hospitals, roads and bridges, RM500 million for rehabilitation works and welfare programme and RM500 million for flood relief loan Guarantee Scheme.

Figure 2.2 – The disastrous December 2014 floods in Kelantan – (Left) Flooding at Stadium Kota Bahru, (Right) The flood damages and sufferings of the flood victims

(MSMA) urban storm water management guidelines to local authorities.

c) River Division

This division plans and implements river management, river conservation and rehabilitation programme. It implements public awareness and runs education campaigns on flood management including public participation in river water quality monitoring. It also collects and stores river data and monitors the river reserve gazette. The Division also undertakes IRBM studies for some of the river basins in the country.

d) Coastal Division

This division plans and implements coastal management programme, such as erosion control, river mouth improvement and beach restoration programme based on the concept of Integrated Shoreline Management Plan (ISMP).

e) Hydrology and Water Resource Division

This division collects and disseminates

DID rainfall records show that for the upper reaches of Sg. Kelantan, Sg. Pahang and Sg. Perak's rainfall exceeded 100-years return period. The Gunung Gagau Rainfall Station at Gua Musang recorded a total of 1,898 mm of rainfall in 10 days during the December 2014 flood which was equivalent to 2.7 times the average monthly rainfall for December.

Figure 2.3 – The disastrous December 2014 floods in Kelantan – (Left) Flooding at Kuala Krai, (Right) The sufferings of the flood victims at Kuala Krai Hospital

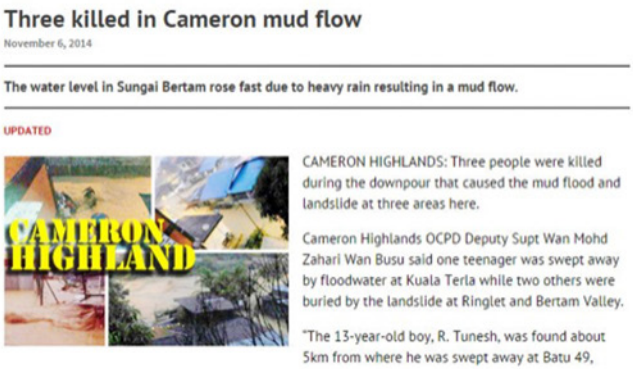
hydrological data, in particular rainfall records, river water levels, river flows, water quality and water resource assessments. The Division also conducts flood warnings and forecasting exercises for major rivers and towns.

Each state government also has its own DID offices with engineers seconded from the Federal DID. The functions of the state DID are similar to that of the Federal DID, with the major difference being that the state DID is more focused on operations whereas the Federal DID is more focused on policy, planning and design. It also implements and manages both Federal and state funded projects and provides state governments with advice on water resource matters. Also, within each state, there are district DID offices that work directly with the local authority and the public.

To address the increased incidences of flash floods in urban areas due to uncontrolled developments (see Figure 2.4) and also improve the urban river water

quality, the MSMA was developed by DID and approved by the Cabinet in 2001 for use by all local authorities in Peninsular Malaysia. The MSMA provides control at-source measures and recommendations on flood control by means of detention and retention, infiltration and purification processes, including erosion and sedimentation controls. The DID has also prepared a "Submission Checklist for Stormwater Management in Malaysia" to assist developers, contractors and consultants on the proper use of MSMA and to ensure better compliance to the measures in the manual.

The Government had also established the Natural Disaster Relief Committee in 1972 with the task of coordinating flood relief operations at the national, state and district levels, with the objective of preventing loss of human lives and reduce flood damage. The coordination of relief operations was under the responsibility of the Natural Disaster Relief Committee headed by the Deputy Prime Minister in the National Security Council of the Prime Minister's Department. The committee also included the Minister of Finance, Minister of Women, Family and Community



Three killed in Cameron mud flow

November 6, 2014

The water level in Sungai Bertam rose fast due to heavy rain resulting in a mud flow.

UPDATED

CAMERON HIGHLANDS: Three people were killed during the downpour that caused the mud flood and landslide at three areas here.

Cameron Highlands OCPD Deputy Supt Wan Mohd Zahari Wan Busu said one teenager was swept away by floodwater at Kuala Terla while two others were buried by the landslide at Ringlet and Bertam Valley.

"The 13-year-old boy, R. Tunesh, was found about 5km from where he was swept away at Batu 49,

Severe landslides and mud flooding in Kampung Raja, Pekan Ringlet and Bertam Valley in the resort area of Cameron Highlands in November 2014 killed five people and affected 100 victims from 28 families. A similar case occurred in 2013. The main causes of the tragedy were the use of plastic roof houses for extensive vegetable farming leading to increased surface water run-off being directly discharged into rivers and resulted in flash floods. The recurring flash flood situation was made worse over the years by the uncontrolled opening of forest lands for illegal vegetable farming due to the lack of enforcement by the local authorities.

Figure 2.4 – The disastrous November 2014 flash floods at Cameron Highlands resulting in landslides and mud flow due to uncontrolled land clearing and soil erosion

Development, Minister of Natural Resources and Environment, the Minister of Science, Technology and Innovation, senior government officials such as the Chief Secretary to Army General, and related government agencies/departments such as DID, Malaysian Meteorological Department (MMD), Malaysia Remote Sensing Agency (MRSA), Social Welfare Department, Royal Malaysia Police and the Fire and Rescue Department.

The organisation of flood relief and operation is based on the Operation Procedure No. 29 published by the National Security Council. Also, the DID has published Circular No. 2/2003 – "Guidelines for Management of Flood Disasters during the Monsoon Season and Flash Floods", to provide guidelines for the coordination of the preparation of flood operations at federal, state and district levels. DID also maintains the "Public InfoBanjir" (<.http://publicinfobanjir.water.gov.my>/) website which provides real time flood information to the public.

2.7.2 Flood Management Issues

The key flood management issues are as follows:

a) Increased incidences and costs of flood damages

Due to increased development in urban, flood prone areas and encroachment of development into urban river corridors over the years, both the number of flood events and costs of flood damages have been increasing over the years. This has resulted in a trend of a continuous increase in DID's budget allocation for flood mitigation projects over the years. The situation is unsustainable since the provision of flood control structures to protect low-lying urban areas from floods of a certain risk level give a false sense of security from the threat of floods and encourages further development in the areas. This will result in disastrous and increased flood damages when floods of magnitude greater than the designed flood risk level occur. Thus, there is a need to move away from the flood control approach to the flood management approach in the implementation of flood mitigation projects.

b) Uncontrolled development in flood prone areas

Floods are natural events that occur within a river floodplain at different frequencies depending on the magnitude of rainfall and river flow. Figure 2.5 shows the river floodplains and the water levels in the river at different flood levels. For normal events, the flood level would stay within the low level areas within the river corridor. However, for the rare, high flow events the flood levels would cover the whole floodplain. In order to reduce the potential threats to lives and property from floods in the floodplain areas, there is a need to control the types of development that is allowed in the floodplain areas. From inspection of the locality of many existing urban areas and also the topographic plans of those areas, it can be seen that there have been many cases of uncontrolled development in

the flood prone areas. Thus, there is a need for a policy, law and enforcement to control development in the food prone areas so that the potential flood damages can be minimised.

2.8 Drought Management – Status and Issues

Drought is an insidious hazard of nature and is a "creeping phenomenon" with impact that varies from region to region. Drought originates from a deficiency of rainfall over an extended period of time, resulting in water shortage for some activity, group, or environmental sector. Its impact results from the interplay between the natural event (less rainfall than expected) and the demand people place on water supply. Human activities can exacerbate the impact of drought.

Conceptually, a drought can be defined as a protracted period of deficient rainfall resulting in extensive damage to crops and extending into loss of crop yield. However,

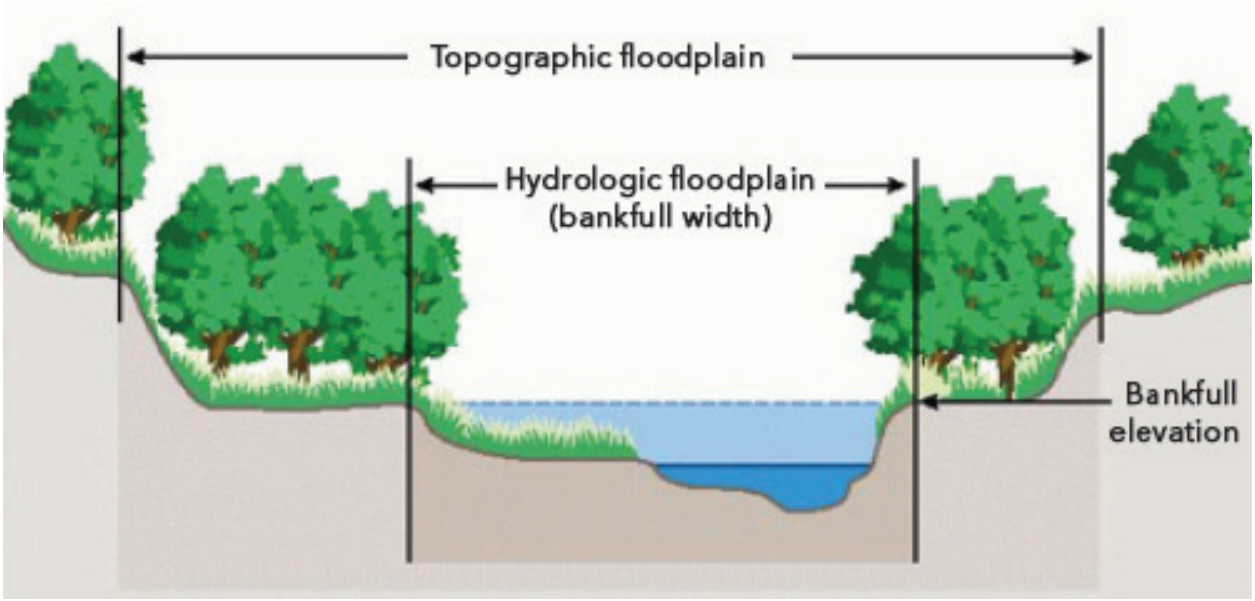


Figure 2.5 – The River Floodplain

for those responsible in making decisions in response of a drought condition, an operational definition of drought is necessary to help define the onset, severity, and end of droughts. Thus, to determine the beginning of drought, an operational definition will specify the degree of departure from the average rainfall or some other climatic variable over some time period. This is usually done by comparing the current situation to the historical average, often based on a 30-year period of record.

2.8.1 Drought Management Status

Unlike the situation in arid countries, drought is not a major issue in a tropical country like Malaysia with its abundant rainfall. However, due to the natural, annual variability of rainfall, there may be some period in some years where a prolonged period of low rainfall which may affect the amount of water stored in the dams to provide for potable and irrigation water supply. Thus, there is a need to monitor the likelihood of drought so that early action can be taken to conserve water supply so that it can last through a potential drought period.

In Malaysia, the DID has instituted a drought monitoring programme since 2001 and has also created a website to disseminate information to the public on the potential drought situation in the country. The website is known as "Infokemarau" (<http://infokemarau.water.gov.my>).

The website uses rainfall information from 41 selected rainfall stations to assess the water resource status of Peninsular Malaysia. The percentage deviation of the rainfall from the long-term mean (LTM) value of 3-monthly moving rainfall totals is used as the indicator of the potential drought conditions in a water catchment. A negative deviation from the LTM value indicates that the particular region is experiencing a drier than normal condition and vice versa.

The website also defines a "Hydrological drought" as follows:

a) River discharge – A drought situation occurs if the low flow continuously exceeds the 5-year Average Recurrence Interval (ARI) for a three-months period.

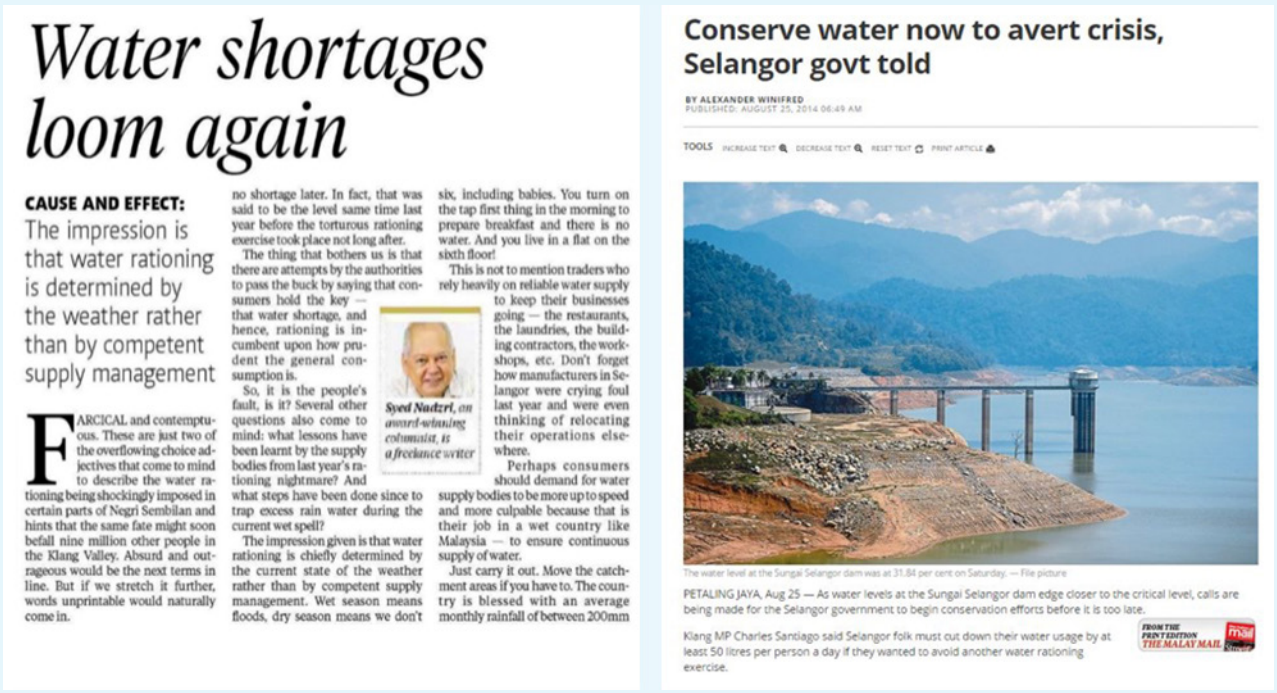
b) Dam levels – A drought situation occurs when the water level in a dam is below the alert level, continuously for at least two or three months.

2.8.2 Drought Management Issues

Since Malaysia has abundant annual rainfall, there are no drought-like conditions in Malaysia, such as those found in arid and semi-arid countries. However, there are issues related to periods of long dry spells with water shortages (See Figure 2.6). Thus, there is a need to monitor river low flows and develop contingency plans to conserve and reallocate water resources during a dry spell period.

2.9 River Basin and Land Use Planning – Status and Issues

River basins are the natural accounting units for water management. However, political and administrative decisions relating to water management are usually made according to jurisdictional boundaries that do not coincide with river basins. Thus, water managers faced the challenge of how to bring together the different actors and stakeholders to contribute to the development and management of the river basin. River basin planning provides an opportunity to address water management problems and prioritise development in a strategic and integrated manner.



Water shortages loom again

CAUSE AND EFFECT:
The impression is that water rationing is determined by the weather rather than by competent supply management

FARCICAL and contemptuous. These are just two of the overflowing choice adjectives that come to mind to describe the water rationing being shockingly imposed in certain parts of Negri Sembilan and hints that the same fate might soon befall nine million other people in the Klang Valley. Absurd and outrageous would be the next terms in line. But if we stretch it further, words unprintable would naturally come in.

no shortage later. In fact, that was said to be the level same time last year before the torturous rationing exercise took place not long after.

The thing that bothers us is that there are attempts by the authorities to pass the buck by saying that consumers hold the key — that water shortage, and hence, rationing is incumbent upon how prudent the general consumption is.

So, it is the people's fault, is it? Several other questions also come to mind: what lessons have been learnt by the supply bodies from last year's rationing nightmare? And what steps have been done since to trap excess rain water during the current wet spell?

The impression given is that water rationing is chiefly determined by the current state of the weather rather than by competent supply management. Wet season means floods, dry season means we don't

Syed Nadzri, an award-winning columnist, is a freelance writer

six, including babies. You turn on the tap first thing in the morning to prepare breakfast and there is no water. And you live in a flat on the sixth floor!

This is not to mention traders who rely heavily on reliable water supply to keep their businesses going — the restaurants, the laundries, the building contractors, the workshops, etc. Don't forget how manufacturers in Selangor were crying foul last year and were even thinking of relocating their operations elsewhere.

Perhaps consumers should demand for water supply bodies to be more up to speed and more culpable because that is their job in a wet country like Malaysia — to ensure continuous supply of water.

Just carry it out. Move the catchment areas if you have to. The country is blessed with an average monthly rainfall of between 200mm

Conserve water now to avert crisis, Selangor govt told

BY ALEXANDER WINIFRED
PUBLISHED: AUGUST 25, 2014 06:49 AM

TOOLS INCREASE TEXT DECREASE TEXT RESET TEXT PRINT ARTICLE

The water level at the Sungai Selangor dam was at 31.84 per cent on Saturday. — File picture

PETALING JAYA, Aug 25 — As water levels at the Sungai Selangor dam edge closer to the critical level, calls are being made for the Selangor government to begin conservation efforts before it is too late.

Klang MP Charles Santiago said Selangor folk must cut down their water usage by at least 50 litres per person a day if they wanted to avoid another water rationing exercise.

FROM THE PRINT EDITION THE MALAY MAIL

Potable water shortages occurring in 2014 and 2015 in several states has led to water rationing. The affected states are Selangor, Negeri Sembilan, Johor, Perak and Kuala Lumpur (KL). The cause of the water shortage in the Klang Valley was due to the insufficient water resource in the Sg. Selangor Reservoir which is the raw water source for the potable water supply for more than 60% of the populated areas in Selangor, KL and Putrajaya.

Figure 2.6 – Recurring crisis of water shortages due to long dry spell – (Left) Water shortages in Rembau and Tampin, Negri Sembilan, Jan 2015, (Right) Water crisis in Selangor in August 2014

A river basin plan is a strategic action plan for the integrated management of the water and related land resources in the basin. It will have details of actions and broad budgets as well as strategic elements to address key water management issues in a basin. The plan will normally be relevant for several years and will facilitate the co-ordination of specific works by the relevant agencies who shall incorporate the required works into their annual work plans accompanied by specified actions and detailed budgets.

2.9.1 River Basin and Land Use Planning Status

Land use planning in Malaysia is carried out by the TCPD based on a 3-stage urban planning system. At the top-level, the country's development is guided by the National Physical Plan (NPP) which describes the macro land use planning for Peninsular Malaysia. This is followed by the State Structure Plan which describes the strategic land use development plan for each state. At the local authority level, local plans that define the specific land use at the lot level are also prepared. The TCPD has also prepared a series of land use planning guidelines to help planners and local planning authorities implement the objectives of the land use plan.

NPP recognises the importance of carrying out water resource management based on IWRM and IRBM principles, as can be seen in the stated objectives of the plan as follows:

a) Water resource management shall be based on IWRM, IRBM and Integrated Coastal Zone Management (ICZM).

b) Safeguard and manage sustainably all surface and ground water resources.

c) Natural barriers, especially mangroves, forests and peat lands should be protected and expanded, and further land conversion will no longer be allowed.

Also, the NPP has the following policy statements:

a) NPP26 – All surface and ground water resources should be safeguarded and managed sustainably.

b) NPP38 – Drainage infrastructure should be provided in all settlements to eliminate the incidence of major floods, minor floods and pollution.

DID had completed a study to develop a Register of Rivers in Malaysia in 2001, together with a recommended list of River Basin Management Units (RBMU) which defined the river basin boundaries for management purposes. On 29 July 2003, the NWRC stated that river basin master plans should be the basis for development within a river basin and had agreed to the preparation of IRBM plans for all 189 RBMU in the country. The following is a list of the river basin plans that were completed by DID up till 2010:

1. *Pelan Pengurusan Bersepadu Lembangan Sungai Selangor* (2002);

2. Master Plan Study on Flood Mitigation and River Management for Sg. Muar Basin (2003);

3. Klang River Basin Environmental Improvement and Flood Mitigation Project (2003) ;

4. *Pelan Pengurusan Bersepadu Lembangan Sungai Langat* (2005);

5. *Pelan Induk Tebatan Banjir dan Pengurusan Sungai untuk Lembangan Sungai Bernam* (2007);

6. *Kajian Pelan Induk Tebatan Banjir dan Pengurusan Sungai Kedah/Sungai Anak Bukit, Kedah* (2007);

7. Master Plan Study on Flood Mitigation and River Management for the Kerian and Kurau River Basins (2008);

8. River Basin Master Plan for Sg. Pahang;

9. River Basin Master Plan for Sg. Perlis;

10. River Basin Master Plan for Sg. Perak;

11. River Basin Master Plan for Sg. Melaka; and

12. River Basin Master Plan for Sg. Terengganu.

As part of DID's IRBM Blueprint Study in 2010, detailed reviews of key completed river basin studies for Sg. Langat, Sg. Kerian, Sg. Muar and Sg. Linggi, had also been carried out. DID Malaysia had also developed a set of IRBM Blueprint Guidelines, which gave the framework and methodology for the development of an IRBM plan and a model TOR for IRBM planning.

DOE had also completed a number of river basin plans related to river pollution management and water quality. The following is a list of the plans that were completed up till 2009:.

1. *Kajian Pencegahan Pencemaran & Peningkatan Kualiti Air Sungai Langat* (2001)

2. *Kajian Pencegahan Pencemaran & Peningkatan Kualiti Air Sungai Tebrau Dan Sungai Segget* (2002)

3. *Kajian Pencegahan Pencemaran & Peningkatan Kualiti Air Sungai Melaka, Melaka* (2003)

4. *Kajian Pencegahan Pencemaran & Peningkatan Kualiti Air Sungai Cameron Highlands* (2004)

5. *Kajian Pencegahan Pencemaran & Peningkatan Kualiti Air Batang Rajang, Sarawak* (2004)

6. *Kajian Pencegahan Pencemaran & Peningkatan Kualiti Air Sungai Merbok, Kedah* (2007)

7. *Kajian Pencegahan Pencemaran & Peningkatan Kualiti Air Lembangan Sungai Kinabatangan, Sabah* (2007)

8. *Kajian Pencegahan Pencemaran & Peningkatan Kualiti Air Sungai Sepetang* (2008)

9. *Kajian Pencegahan Pencemaran & Peningkatan Kualiti Air Sungai Linggi* (2008)

10. *Kajian Pencegahan Pencemaran & Peningkatan Kualiti Air Lembangan Sungai Kuantan, Pahang* (2009)

11. *Kajian Inventori Lembangan Sungai Buloh, Selangor* (2009)

12. *Kajian Inventori Sungai Sarawak, Sarawak* (2009)

2.9.2 River Basin and Land Use Planning Issues

The key river basin and land use planning issues that have been identified are as follows:

a) Inadequate legislative support for IRBM-compliant land use control in river basin

Even though the principles and strategies for IRBM-based land use planning have been stated in the NPP, the implementation of the strategies is weak at the local level due to the lack of specific IRBM-compliant land use zoning laws that can enable the states to exercise specific land use control targeted at water management objectives. For example, the lack of a specific flood protection zoning law to control land use in the low-lying areas along a river corridor for flood protection purposes is a big handicap for DID and the local authorities in their attempts to prevent the increasing severity and frequency of floods in urban areas.

b) Land use control at the local authority level is not guided by a river basin plan

In 2003, the NWRC had endorsed the use of river basin master plans as the basis for development within a river basin. In line with the NWRC's directive, the DID and DOE had developed river basin plans to support their respective functions of river management, flood mitigation, water quality and pollution control for a number of key river basins. However, since the control of land use in a river basin is essential to the effective implementation of a river basin plan, there is need for a mechanism and process at the state and local authority level to coordinate the implementation of the recommended strategies and action plans in the DID and DOE's river basin plans.

c) Inadequate technical capacity to monitor the implementation of IRBM master plans

In order to implement the recommended strategies and action initiatives in the DID and DOE's river basin plans, there is a need for additional technical resources to monitor and update the plans as they get implemented. Without monitoring and updating, the developed river plans would be outdated and no longer useful.

d) Loss of river biodiversity

Globally, there is increasing recognition that the biodiversity of freshwater and riverine ecosystems would only be conserved in the long term if their management is integrated with river basin management. However, the understanding and practical experience for this type of management is still low among government agencies, the private sector and the Malaysian community. Rivers are frequently channelised, and river bank vegetation is removed and replaced with concrete or exotic plants. Management of rivers and their associated basins is fragmented between many different sectors including forestry, fishery, agriculture, plantations, water resource, tourism, urban management and the environment.

Riverine biodiversity in Malaysia is of global significance with many rare, threatened and endemic species found in riverine habitats. Most of the rivers are found outside of the formally protected areas and so are affected by a broad range of land use and industrial impacts, as well as direct over-exploitation. In Malaysia, the rapid pace of development has overstressed the river systems. As a result of the numerous conflicting uses and demands made on the rivers, many of the river's natural resources including biological diversity and beneficial ecological services have been destroyed or degraded in recent years.

Rapid degradation of the rivers and their ecosystems are caused by the lack of factors like appropriate institutional frameworks, capacity for integrated river basin management, and institutional focus on the conservation of riverine biodiversity. The current institutional framework is focused by sector and not interlinked. For instance, the main focus of the DID is primarily on flood mitigation and river engineering while the Department of Fishery focuses on the commercial value of fish production and the Forestry Department focuses on management of forest resources. There is no single river-related government agency which focuses on the biodiversity conservation of rivers. Riverine biodiversity conservation as well as the integration of riverine biodiversity concerns into river basin and wetland management in Malaysia is also hampered by inadequate efforts on biodiversity assessment and monitoring in rivers.

2.10 River Basin Information System – Status and Issues

IWRM, in the context of a river basin, is about the management of limited water resource in a river basin for an optimum outcome among different competing water users. Thus, comprehensive, accurate and timely information is necessary for objective planning, decision-making and gaining support from competing river basin stakeholders. There is a need for the proposed SWRA to understand the main IWRM issues in a river basin and prioritise the types of information that it needs to collect (separating the essential from the

non-essential) to address the identified issues. Deciding on what to report, to whom and how to communicate the report to the relevant stakeholders is the most important step.

2.10.1 River Basin Information System Status

The DID has already developed RBIS for four rivers in Malaysia, which are (a) Sg. Kuantan, (b) Sg. Muar, (c) Sg. Putatan/Sg. Moyog, and (d) Sg. Sarawak. The DOE has also set up river water quality monitoring systems at 926 monitoring stations in 120 river basins in the country. The DID has a division responsible for collecting and processing hydrological data (such as rainfall and streamflow) in the country. In addition to this, DID has set up dedicated websites, such as InfoBanjir and Infokemarau, to provide real-time flood and drought information, respectively, to the public. DID has set up the National IWRM Information Repository to provide the necessary information support for IWRM implementation in the country.

In addition to the RBIS set up by DID and DOE, other RBIS also have been set up by different water management entities.

a) Muda Agricultural Development Authority (MADA)

MADA has set up an RBIS / Supervisory Control and Data Acuisition (SCADA) that implements the following functions;

i) To control the release of water from its dams.
ii) To control and ensure sufficient irrigation water supply to the paddy fields.
iii) To monitor rainfall within MADA's operational area.

b) Syarikat Air Darul Aman (SADA)

SADA has a River Information System that monitors the water quality at the water intakes.

c) Syarikat Air Johor (SAJ)

SAJ has a River Information System that monitors the water quality at the water intakes.

d) Water Supply Operators in Selangor

All the water supply operators in Selangor (Puncak Niaga, SPLASH and ABASS) have River Information Systems that monitor the water quality at their water intakes.

2.10.2 River Basin Information System Issues

The following are the identified RBIS issues:

a) Too much information, lack of useful information products

Currently, there are numerous dedicated ICT systems generating different types of information (data, figures, tables, maps) for different uses. However, there is a lack of useful informational products to support river basin stakeholders in decision-making.

b) Selection and choice of information management tools

There are numerous tools to support information collection, processing,

management and decision-making. It is very important to select the right information management tools to produce the appropriate information products for decision-making. Failure to do so would result in failure of the selected ICT systems to meet its objectives.

c) No coordination in information dissemination for national-level decision-making

There is a lack of coordination in information collection and dissemination of information for national-level decision-making.

2.11 R&D on IRBM – Status and Issues

There are many issues related to IRBM that need additional research, especially in relation to the local context. This is because the R&D results and experiences from other countries cannot be applied directly to Malaysia since the local institutional and legal framework is different from those in other countries. The climatic, physical and socio-economic characteristics of Malaysian river basins are also different from those in other countries. Thus, there is a need for R&D on IRBM issues in Malaysia and additional pilot projects on IRBM in specially selected river basins.

2.12 River Basin Monitoring – Status and Issues

For effective water resource management, it is essential that monitoring be carried out to assess the availability of water resources, of water quality, water use and pollution discharges in a river basin. Information management of the monitored data is additionally necessary to ensure that they are analysed and presented in the form of information products that can be used by stakeholders to make decisions.

2.12.1 River Basin Monitoring Status

Currently, DID is responsible for monitoring the rainfall and stream flow data that are used in the assessment of water availability in a river basin. DID also monitors the flood and drought situations in river basins. In addition, it also publishes its processed hydrological data for use by consumers.

The DOE is responsible for monitoring the effluent discharges and ambient water quality in the rivers. The DOE publishes the analysis of water quality monitoring results in an annual environmental quality report. The Ministry of Health also conducts water quality sampling surveys.

The responsibility for monitoring the use of the surface and ground water in a river basin lies with the state that issues the licenses for the water extraction by users.

2.12.2 River Basin Monitoring Issues

The following are the identified river basin monitoring issues.

a) No annual river basin monitoring reports

There is currently no publication that

compiles all individual monitoring reports, such as for rainfall, stream flow, water quality, water pollution, water extraction, water consumption, floods, etc. in the form of a single "state of a river basin" annual river basin monitoring report. It is important that such a report be compiled so that the concept of water resource management based on the river basin approach can be disseminated to all the river basin stakeholders.

2.13 Stakeholder Participation – Status and Issues

Stakeholder participation is important because stakeholder interest in, and acceptance of, the water resource management system can make it possible to implement it in reality. Communication with stakeholders is also important to raise the awareness of the river basin stakeholders and educate them on the benefits of their participation in the management of the river basin.

The following are the several other benefits of stakeholder participation:

a) It leads to informed decision-making as stakeholders often possess a wealth of information which can benefit water resource management;

b) Stakeholders are most affected by the lack of water resources or poor management decisions on water resource and they are therefore able to prioritise actions in the basin;

c) Consensus at the early stages of development projects can reduce the likelihood of conflicts which can harm the implementation and success of such projects;

d) Stakeholder participation can reduce costs and improve the effectiveness of water resource management; and

e) The involvement of stakeholders can build trust between the government and civil society, which can possibly lead to long-term collaborative relationships.

2.13.1 Stakeholder Participation Status

A number of NGOs have carried out environmental education and awareness activities related to rivers. A "National Study for the Effective Implementation of IWRM in Malaysia" was completed by DID in 2008, where the environmental awareness in Malaysia at that period was described, together with the list of awareness programme that had been implemented. DID has also developed a set of seven IWRM BMP Guidelines for awareness and public participation based on the experiences and lessons learnt from implementing nine pilot IWRM BMP projects. The set of guidelines had been tailor-made for the Malaysian context and can be adapted for similar use in other river basin(s) and/ or sub-basins(s) in Malaysia. They were best used as a critical component of the non-structural measures used to support and complement the structural measures for water resource/ river basin management and development

projects/programme for a particular river.

The following is the list of the seven BMP Guidelines:

a) Guideline 1 "Raising IWRM Awareness Among Urban Dwellers";

b) Guideline 2 "Raising IWRM Awareness Among Rural Residents";

c) Guideline 3 "Enforcement of State Water Resources Enactment";

d) Guideline 4 "Integrated Lake Catchment Management & Poverty Alleviation for Local Community";

e) Guideline 5 "Ground Water Management";

f) Guideline 6 "Water-related Diseases Management"; and

g) Guideline 7 "Rehabilitation of a Polluted Urban River".

2.13.2 Stakeholder Participation Issues

The following are the identified stakeholder participation issues.

a) Need to get more public participation in river basin management

There is a need to get more public participation in river basin management activities at the local level. This is necessary to increase public awareness and education about the importance of their role in minimising the pollution of rivers and the long term environmental sustainability of rivers and also the use of water resources.

b) Lack of information dissemination to stakeholders

There is a lack of effective information dissemination to stakeholders on how they can participate in river basin management and to create a sense of ownership of the rivers.

THE WAY FORWARD – KEY RECOMMENDATIONS

3.1 Key Limiting Factors

The ASM IRBM Task Force has identified the following to be the key limiting factors to address the river basin management issues and IRBM challenges in Malaysia.

a) Lack of a uniform water law to support IRBM implementation

From the review of the current status of the enabling environment to support IRBM implementation in the country and also the key IRBM functions, it can be seen that most of the elements of IRBM implementation are already in place. What is lacking is a uniform national water law to bring all the components together to support IRBM implementation and to assist the states in enacting complementary state water enactments. For example, the states' water enactments are necessary to enable local authorities to enforce water resource management compliant land use laws which are essential for effective IRBM implementation.

b) Lack of institutional capacity to implement IRBM implementation

From the reviews, it is also found that there is very weak institutional capacity at the state level to implement IRBM. Since water resource management is under the jurisdiction of the state, there is a need to create a SWRA to implement the provisions in the proposed SWRE.

c) Lack of financial support to the states to implement IRBM

Since the states have limited revenue sources, the formation of the proposed SWRA and also implementation of the proposed State Water Resource Enactment will need additional funding support from the Federal Government, in addition to whatever revenues that the states may get from the extraction of its water resources.

3.2 Key Recommendations

The following are the key recommendations of the ASM IRBM Task Force to address the above three limiting factors and identified river basin management issues in Malaysia.

3.2.1 Enabling Environment

a) Implementation of the NWRP at state-level

NRE should conduct state-level dialogues and workshops to create awareness of the NWR Policy to identify and develop the specific framework for Federal/state level partnerships to implement the NWRP in each state. Arising from such a developed Federal/state level partnership framework, the state can then develop its specific state-level water resource management policy that is compliant with the NWRP.

Thus, NRE should implement the strategic actions for the three strategies identified in the NWRP's Strategic Targets 15 and 16 as listed;

i) Strategy: Identify stakeholders and clarify roles as well as responsibilities;

ii) Strategy: Develop means and measures for consultation; and

iii) Strategy: Determine means, measures and approaches for collaborative governance.

b) National Legislature to enact the draft NWRL

As part of the 2012 NWRS, a draft NWRL has been prepared and it is currently at the consultation stage with the relevant states and stakeholders. The various policies, legal and institutional elements to support the enactment of the draft NWRL have had already been piloted, refined and put in place at the national and state levels since 1998. They were incorporated into the formation of the National Water Resource Council in 1998 and the state's WRE of Selangor, Sabah and Kedah.

Selangor and Sabah have more than a decade of experience in implementing the SWRE, which they enacted in 1999 and 1998, respectively. Their numbers were increased in 2008 when Kedah enacted and subsequently implemented the Kedah SWRE. The NWRP was also formulated in 2012 and task forces had been set up to support its compliance. What is lacking and required now is the integration of all the various elements together, with the benefits of the lessons learned from the implementation of the SWRE by Selangor and Sabah, via the enactment of the proposed draft NWRL and the subsequent streamlining of the institutional framework to support its implementation.

c) **State Legislatures to adopt the draft NWR Law**

With the support of the NWRC, via its decision at its 8th Meeting in 2013 that DID should serve as the Secretariat to all State Water Resource Councils, except for Selangor and Kedah. NRE and DID Malaysia should work via the respective state DID Departments and relevant state government agencies to get the proposed NWRL adopted by the respective state legislatures.

d) Appropriation of adequate Federal funds and support in key areas are catalytical to the sound and sustainable management of river basins.

The NWRP 2012 Policy Principles stress Water Resources Security, Water Resources Sustainability and Collaborative Governance. A strong Federal-state alliance and commitment is vital for the sound management of the river basins nationally, noting that natural resources belong to the states. IRBM requires the development of basin management plans for each river basin together with the deployment of competent managers and support personnel who have the necessary skills and knowledge relevant to sustainable and integrated river basin management. In addition, there needs to be in place a robust and continuing research programme harnessing the best of

science, technology and innovation nationally to provide sustainable solutions to resolve the many issues and challenges faced. Hence, within the spirit of collaborative governance, the appropriation of adequate Federal funds to support in the following critical areas is a vital for the successful national implementation of IBRM.

i) **Federal funding support to the states to enact parallel water resource legislation and related institutional infrastructures**
The Federal Government needs to provide additional funding to the states to encourage them to adopt and implement water resource laws similar to the proposed NWRL. As highlighted above, the effective implementation of IRBM requires the agreement and support of the respective states to back up the enactment of the proposed NWRL as state law. This is because WRM involves land management, which is a state matter under the Federal Constitution. Thus, there is a need for the Federal Government to provide states with adequate financial support to enact their respective SWRE, to create and subsequently finance their respective SWRD.

ii) **Federal funding for the development of IRBM Plans**
There is a need for the Federal Government to provide financial allocations for the development of IRBM Plans, which have been estimated to cost RM1 million per plan, to facilitate the implementation of IRBM in the 189 river basins in the country, in accordance to priority.

iii) **Federal funding for IRBM-related R&D and capacity building activities**
There is an additional need for funding support for R&D related to IRBM topics and to complement the IRBM-related capacity building efforts carried out by both local and international organisations such as the MyWP, MyCDNet, GEC, GWP-SEA, AguaJaring SEA Network, NARBO, etc.

3.2.2 Institutional Set-up

a) **New Federal institutional structure for water governance (Federal WR Department and State WR Departments should be created)**
A Federal and state-level Water Resources (WR) Departments (except for Selangor and Kedah) should be created to implement the provisions of the proposed Draft NWRL and the SWRE when they are enacted by the Parliament and the respective state assemblies. They will then provide the required institutional capacity to implement IRBM in the respective states, except for Selangor, Sabah and Kedah.

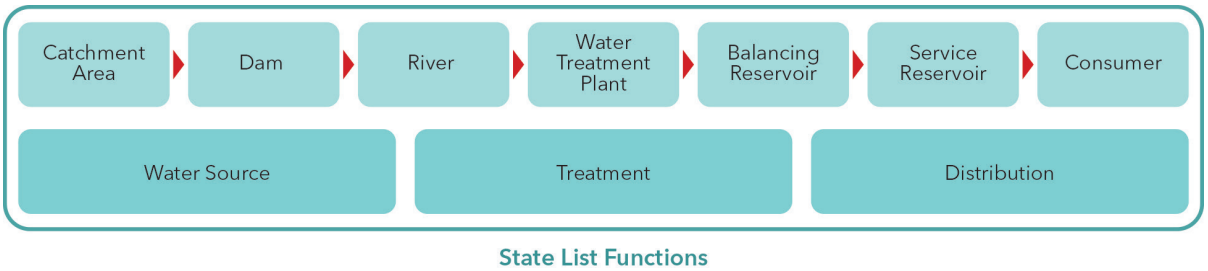
Since the enactment of the proposed draft NWRL requires the agreement of all the states, in view of the fact that WRM is a state matter, there is a need to address the issues related to the "legacy" state WRM institutional framework which are

holding back the enactment of the draft NWRL. The major institutional issue for those states that have not enacted a SWRE is the designation of the state-level agency that would be entrusted with the responsibility for WRM functions.

In the past, WRM-related functions were considered to be part of the responsibility of the state agency which was responsible for sourcing and treating the raw water for supply to the public. However, with the enactment of the WSIA (2006), there is a clear separation of the responsibility and functions for WRM which is related to water source, with the treatment and distribution of the treated water to the public, as illustrated in Figure 3.1 below.

Thus, after 2006, there is a need for two state-level agencies/departments to manage the two separate sets of functions related to water. They are:

a) Water Sector before WSIA 2006



b) Water Sector after WSIA 2006

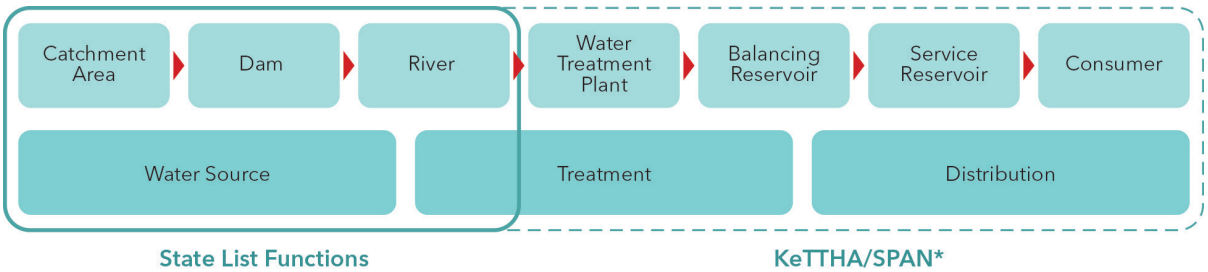


Figure 3.1 – Separation of Water Resources and Water Services Sector after enactment of WSIA (2006) – [Extracted from NWRS (DID, 2012)] [* Note: Concurrent List]

a. An agency/department (the existing Badan Kawal Selia Air) that manages all aspects of treated water while coordinating its work with the federal agency, the SPAN, that has taken charge of all the regulatory functions of treated water in Malaysia.

b. An agency/department (the proposed state-level WR Department, with functions and responsibilities that are similar to LUAS, LUAK and the Sabah DID WRM Section) that manages all aspects of WRM related to catchment areas, dams and rivers, including river and groundwater resource management and thus, shall be responsible for implementing IRBM within the state. This state-level agency/department will be supported in its work by the proposed federal-level NWRD that will be set up upon the enactment of the draft NWRL.

The NWR Study (2012) has recommended that the Federal and state DID be reorganised and renamed as the National and SWRD, except for Selangor and Kedah, in view of the fact that the existing water resource management functions of DID already cover more than 60% of the WRM functions of the proposed WR Department in the draft NWRL. Thus, the enactment of the draft NWRL and subsequent enactments of the state WRM Laws (based on the template state WRM Law in the draft NWRL) would provide DID or other similar WRM agencies (e.g. those that have been created in Selangor and Kedah) with the regulatory powers to implement all of the WRM functions.

The NWRC in its eighth meeting in 2013, had also recognised DID's existing key role in WRM when it decided to assign DID to be the Secretariat to all the State Water Resources Councils, except for Selangor and Kedah. The Secretary-General of NRE is the present Chair of the Committee for the Implementation of the NWR Policy and the Director-General of DID is the present Chair of the NWR Policy Implementation Task Force.

b) Alignment of functions and responsibilities with the NWRP and proposed NWRL

Almost all of Malaysia's water supplies are derived from river sources. Thus, it is not possible to achieve IWRM without IRBM. The NWRS (2012) identified six major WRM functions that the proposed NWR Department had to fulfill to implement IWRM and IRBM. They are:

i) Water Resources Assessment;

ii) Water Resources Sustainable Integrated Management;

iii) Water Resources Allocation and Regulation;

iv) Water Hazard Management;

v) Water Resources Technical and Scientific Support; and

vi) Intra- , Inter- and International Technical Water Resources Services.

Thus, upon the enactment of the NWRL, the existing WRM functions of DID should be enhanced to cover all the six WRM functions as listed above.

3.2.3 Management Instruments

Water Assessment and Allocation

1. **Ad-hoc Studies on Water Resources Assessment**
   DID should implement a systematic programme of water resource assessment by river basin and the DMG should also implement a systematic programme to assess the water resources available in the country's aquifers. This will ensure that the available water resources in a river basin and in the aquifers can be known. They can subsequently be compared with the water demands placed on it by various water users to ensure sustainable water resource management by river basins and aquifers, respectively.

2. **Fragmented and non-uniform state legislation governing water allocation**
   All states should adopt the proposed NWRL, where relevant, when it is enacted by the Parliament so that there would be relative uniformity between the states in the application of the water allocation rules and regulations.

3. **Water allocation to be guided by IWRM principles**
   The NRE, with the endorsement of the NWRC, should prepare IRBM plans for all the important river basins in the country. These should then be used by the states to guide their water allocation decision-making. The status of the development of IRBM plans for the 189 river basins in the country that have basin areas of more 80 km2 is given in Appendix 1. Appendix 1 also supplies the 12 IRBM plans that have been completed up till 2014 together with a list of the 25 river basins that have been identified as priority for the development of IRBM plans in the 11th Malaysia Five-Year Plan (2016-2020).

The NWRD, when created upon the enactment of the proposed NWRL, shall provide the necessary technical support to the states for their development of IRBM plans and also the necessary technical advice to the SWRD in making water allocation decisions.

Uniform Pricing Model for Water Resources

The 2010 NWRS has recommended that a uniform pricing and tariff regime for the water services sector be adopted after taking into consideration the funding requirements for the management activities that would be required to sustain the water resources and the environment in river basins. Although different states have their own supply and service providers, an equitable uniform price and tariff structure for water supply would be much easier to enforce. Thus, the study recommends a set of guiding principles for water pricing that take into consideration water resources and the environment.

Implement PES Schemes

Experiences from around the world show that there are two main approaches for sustainable freshwater governance: the traditional way of command and control; or the use of economic market-based instruments. The traditional way of deterring environmental degradation is to enact a law coupled with sanctions for non-compliance. Such command and control policies might be effective in controlling pollution from well-defined point sources, e.g. factories or sewage treatment plants. However, they would be less effective in regulating non-point sources of pollution, such as those occurring when numerous upstream landholders dedicate their land to intensive agricultural or other non-sustainable activities.

For such cases, downstream water pollution (or scarcity) is the result of a combination of individual actions carried out by geographically spread out and heterogeneous upstream users. For these cases economic mechanisms and incentives, especially PES, are increasingly being proposed as a promissory conservation approach. PES programme have been established in a number of places around the globe and they function in a variety of geographic scales, e.g. the emerging markets for carbon sequestration credits constitute an international programme; national forest conservation programme are operating in Australia, Costa Rica, and Mexico; and the World Bank, among others, has piloted watershed-level initiatives in several countries.

The distinguishing feature of a PES is that as in any payment arrangement, those who pay are aware that they are paying for an ecosystem service that is valuable to them or to their constituencies and those who receive the payments engage in meaningful and measurable activities to secure the sustainable supply of the ecosystem services in question. There are three types of possible PES schemes – private PES schemes, cap and trade schemes or public PES schemes.

Pollution Control

1. **Control of pollution from sewage effluent**
   SPAN should work with the relevant state authorities to increase the areas covered by IWK for sewerage control. There is also a need for local authorities to control the discharge of raw sewage from squatters.

2. **Control of pollution from SME manufacturing industries**
   The Ministry of International Trade and Industries should provide financial and technical assistance to the SME industries to enable them to comply with the effluent discharge standards.

3. **Control of Sullage (Grey-Water)**
   All local authorities should be required to ensure that sullage water from households is treated before it is discharged into rivers through increased enforcement and conduct awareness programme among the public. There is also a need to control the creation of the sullage at source.

4. **Control of livestock farming and aquaculture**
   State authorities should designate specific areas for the livestock and pig farming industry to ensure proper control of their wastewater discharges and also for disease control.

5. **Pollution control of non-sanitary landfills and open dumps**
   State authorities should ensure that all landfills are designed as sanitary landfills and that all open rubbish dumps are closed.

6. **Pollution control of sedimentation and siltation**
   The DOE and DID have implemented the requirements of the Erosion and Sediment Control Plan (ESCP) as part of land development submissions. The enforcement and implementation of the ESCP plan's requirements would mitigate the negative impact of non-point sources of pollution. In order to detect pollution sources, especially in non-accessible areas, water supply operators such as Badan Kawal Selia Johor have also used drone technology to detect pollution sources.

7. **Need for review of effluent discharge standards**
   DOE should review the effluent discharge standards so that they can be in line with the current acceptable international standards and available treatment technologies. There is also a need to review the palm oil mill and rubber industry effluent discharge standards, especially for those factories located in upstream areas. Increased pollutant parameters need to be added to the effluent discharge standards.

8. **Need to develop specific RPLC standards**
   DOE should develop specific river RPLC standards. The assimilative capacity of a river or water body to receive and absorb the pollution load from diffuse and point sources should be measured and determined. The need is to first adopt and define a specific RPLC standard for a particular stretch of river before any action to control and allocate the acceptable amount of pollution loading for the specific river catchment can be carried out. Thus, for a desired river water quality to be achieved and sustained for a specific stretch of river, there is a need to ensure that the regulations governing the planning and siting of polluting activities within the specific river catchment are strictly enforced. An example of a RPLC standard is the TMDL, which is the maximum amount of pollutant a specific water body can receive and still meet the desired water quality standards.

Flood Management

1. **Implement the IFM Approach to address the increased incidences and costings of flood damages**
   The state authorities as well as the TCPD should adopt the IFM approach to address flood management issues, since it is a total flood management approach that involves using both structural flood

control measures (e.g. flood walls and bunds) with equal emphasis on non-structural flood management measures (e.g. land use zoning for flood detention and storage). DID has had already adopted IFM principles in the design and implementation of its flood mitigation projects. While traditional flood management focuses only on defensive practices (flood control and protection by structural measures, e.g. dikes), IFM requires a proactive management of risks due to flooding, where land use management plays a central role.

Since the power to decide on land use management lies with the state authorities and is beyond the scope of DID's responsibilities, it would be quite difficult for DID to implement IFM without the political and administrative support of the state authorities and other relevant agencies, such as the TCPD. Thus, it is recommended that the state authorities and other relevant agencies cooperate with DID to implement IFM principles to address flood management issues.

2. Legislate and define designated flood protection zones to address the issue of uncontrolled development in flood prone areas

State authorities should designate the low-lying, undeveloped areas along a river corridor, that have been identified as flood detention zones in the river basin flood mitigation (FM) master plan, as flood protection zones. DID should prepare for every river basin, a FM master plan that highlights the undeveloped low-lying flood-prone areas where development has to be controlled.

Currently, DID is unable to develop and implement a flood mitigation master plan that involves using natural flood detention storage spaces located in the flood prone areas that lie within private lots along a river corridor. The owners of these private lots may subsequently fill up the low lying areas within their lots for development, causing a reduction in flood detention storage along the river corridor at the location. This may then result in increasing flood risk at other locations along the river as the previously detained water moves to other low-lying parts of the river corridor. This is one of the main reasons why many of DID's river basin FM master plans get outdated quickly.

The uncontrolled land used for development along the river corridor also makes it difficult for DID to implement a strategy of incremental, staged implementation of its FM master plan for a river basin to optimise the use of its limited flood mitigation budget. This is because the master plan can get superseded by uncontrolled development. The staged implementation of a FM master plan for a river basin is very important for DID to provide "immediate flood relief" for many high priority flood-prone areas in the country with its limited FM budget. It is easier to get the economic and social benefits of investing in projects that give a minimum level of flood protection for as many high priority flood prone areas as

possible, rather than give maximum flood protection to a few priority areas. Without a FM master plan to guide the implementation of FM projects in a river basin, a lot of the ad-hoc FM projects may become ineffective in addressing the flood problems that they were designed to address.

Thus, it is recommended that the state authorities use their legislative powers to designate the low-lying, undeveloped areas along a river corridor, that have been identified as part of flood detention areas in a river basin FM master plan, to become flood protection zones. In this way, the private owners of the land covered by the designated flood protection zones would need the state's approval to make any alteration to the topography and land use in the designated land zones. This restriction, however, does not prevent the private land owners from developing their affected land if the owner could replace the natural flood detention storage in their land with an equivalent amount of storage in a reshaped topography using less land area.

The legislative provisions for designating the flood protection zones in a river catchment and basin area are already available in some state water resource enactments, such as that in the LUAS (1999) Enactment. For states that do not yet have any similar water resource enactment, the draft NWRL has made similar provisions for the designation of the flood zones. Thus, when the draft NWRL is enacted by the Parliament and subsequently adopted by the states, the States will have the necessary powers to assist DID in making the objectives of the IFM approach a practical reality in Malaysia.

Drought Management

1. Management of dry spell (drought-like) conditions in a river basin

All states should have a drought management plan ranging from water stress or water shortage (drought-like) conditions to extreme conditions of long periods of no rain (drought). Thus, there is a need for monitoring plans for drought-like conditions such as low river flow, low rainfall or low water supply reservoir levels and to develop water supply plans that are resilient against water shortages (seasonal dry periods).

2. Reprioritise water allocation in times of drought-like conditions

All states should include in their respective SWRE, the power to re-prioritise water allocations under drought conditions e.g. *LUAS Enactment Sec 72. General Drought Order*.

3. Development of a climate change mitigation and adaptation plan for drought-like conditions

All states should develop a plan to include mitigation and adaptation for climate change impact, such as the risk of climate variability with rain not falling at the designated catchment locations.

River Basin and Land Use Planning

1. **Uncoordinated land use control at the local authority level**
   All states that do not have any WRM law should adopt the NWRL for enforcement of land use control at the local level to support WRM objectives. Those states that already have WRM laws, such as Selangor, Sabah and Kedah, are recommended to start implementing and enforcing the provisions in their WRM laws.

2. **Land use control at the local authority level is not guided by a river basin management plan**
   The NRE, with the support of the NWRC, should develop IRBM plans by priority, for all the 189 river basins (see Table 3.1) in the country which are larger than 80 km^2. The implementation of each of the IRBM plan's strategies should then be monitored and coordinated by a proposed RBMC. The legislative provisions for the formation of RBMC should be provided in the NWRL, and these can be used by the states to create the RBMC when the NWRL is adopted for implementation by the states.

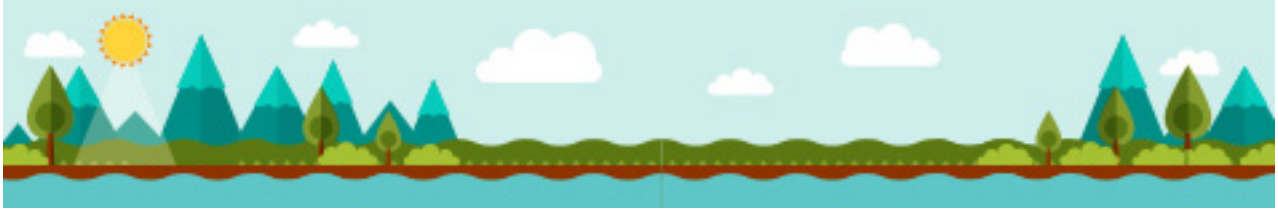
Appendix 1 displays a table giving the draft list of the 37 priority river basins that have been identified by DID Malaysia for the development of IRBM plans. The list covers 23 Category 1 river basins (basin area wholly within a state), 13 Category 2 river basins (basin area covering two or more states) and one Category 3 river basin – Sg. Golok (basin area shared between Malaysia and Thailand). It can be seen from Appendix 1 that the IRBM plans for the following 12 river basins have been completed – Sg. Perlis, Sg. Kerian, Sg. Perak, Sg. Bernam, Sg. Selangor, Sg. Langat, Sg. Linggi, Sg. Melaka, Sg. Muar, Sg. Pahang, Sg. Terengganu and Sg. Kedah. DID Malaysia has also implemented some components of the developed IRBM plans, especially those related to flood mitigation which are within its current functions.

The final list and priority status for the development of the other IRBM plans would depend on the outcome of the discussions that DID Malaysia will be carrying out with the respective State Economic Planning Units and the state DID. It would also depend on the availability of the required budget allocation of RM1 million per IRBM Plan by the Federal Government in each of the future Five-Year Malaysia Plans.

Based on the feedback from DID Malaysia, it has been estimated that a maximum of five IRBM plans per year can be developed, taking into account the DID's staff capacity and the likelihood of the annual budget for the development of IRBM Plans. Thus, for the 11th Malaysia Plan (2016-2020), DID Malaysia has identified in the Table in Appendix 1, the priority list of 25 river basins for development of IRBM plans. They were selected due to the important economic activities, such as agriculture, drinking water, etc. that are located within the river basins. The IRBM plans for the other remaining 152 river basins in the country shall be developed in the subsequent Malaysia Plans.

Figure 3.1 – The 189 River Basins in Malaysia

No.	Region	Total No. of River Basins (>80km2)
1.	Peninsular Malaysia	74
2.	Sabah	75
3.	Sarawak	40
	Total	**189**



3. Inadequate technical capacity to monitor the implementation of IRBM master plans

States should set up SWRA to monitor the implementation of IRBM plans and also work with the proposed Federal NWRD to update their developed plans. The blue-print for the development of an IRBM plan has also been developed by DID. The DID and DOE can thus develop the components of the IRBM master plans with federal funding. However, the implementation and enforcement of the developed IRBM plans would have to be carried out by the respective states since land and water resources are under the jurisdiction of the states. Thus, as recommended in the 2010 NWRS, there is a need for states to set up their SWRA to monitor the implementation of IRBM plans.

There is also a need for increased funding support for IRBM capacity building activities to be carried out by DID Malaysia to complement the IRBM-related capacity building efforts as carried out by both local and international organisations such as the MyWP, MyCDNet, Global Environment Centre (GEC), Global Water Partnership South-East-Asia (GWP-SEA), AguaJaring SEA Network, NARBO, etc. For example, DID Malaysia had started an annual programme in 2010 to conduct at least one IRBM course a year.

River Basin Information System

1. Too much information, lack of useful information products

The proposed NWRD should create a River Basin Information Management Unit (RB-IMU) to manage and update the developed IRBM plans, and to also carry out all necessary information management functions to support IRBM implementation by the SWRA. DID's blue-print for IRBM Plan development has identified a number of different types of information that needs to be collected, processed and constantly updated to produce an updated IRBM plan. This task can only be carried out effectively if a dedicated RB-IMU is created and given the responsibility to manage and coordinate information collection, processing, updating and dissemination of the developed river-basin information products to the relevant river basin stakeholders. Similarly, the SWRA should also create state-level RB-IMU to work with the Federal RB-IMU in the NWRD to update the IRBM plans, and to produce the relevant information products for their respective river basin stakeholders.

2. Selection and choice of Information Management (IM) tools

The proposed NWRD should adopt appropriate guidelines for the selection of IM tools and standards for the proposed RB-IMU. The "Information Management Module" in CapNet's ten-module training course for river basin organisations provides useful guidelines for the selection and development of ICT systems, and also advice on the appropriate use of modelling and decision support systems.

DID's blue-print for the IRBM Plan also provides the following advice on the use of Geographical Information System (GIS) and Data Management: *B4. GIS and Data Management -"The use of GIS to support river basin data management is essential. Thus, the development of GIS Data Model based on MS175-2004 standards should be carried out and further expanded to include data for biodiversity and other sectors."*

R&D on IRBM and an IRBM Pilot Project

The NRE, with the support of the NWRC, should provide funding support for R&D related to IRBM topics and the development of BMP in IRBM implementation via a pilot IRBM project involving partnerships between multiple stakeholders such as Federal and state stakeholders, public and private organisations. In this regard, the ROL project for the Klang River basin that began in 2010, with a total estimated cost of RM4 billion and duration of 10 years, can be chosen as the pilot IRBM project for R&D related to IRBM in Malaysia. Thus, funding support should be given by the Federal Government to researchers to carry out operations on the various IRBM-related topics within the ROL project so that the lessons learned and BMP on IRBM from this pilot project can be used to support IRBM implementation for the other river basins in the country.

The IRBM Taskforce also supports the specific IRBM-related recommendations of the ASM Water R&D Taskforce.

River Basin Monitoring

1. **DID to prepare annual river basin monitoring reports**
   DID should start compiling and publish annual river basin monitoring reports for the important river basins in the country. This will be in line with its function as proposed in the restructured NWRD when the proposed NWRL is enacted.

Stakeholder Participation

1. **Need to get more public participation in river basin management**
   NRE should provide additional funding to DID for IRBM capacity building activities so that DID can partner and complement the IRBM-related capacity building efforts that are being carried out by both local and international organisations. The proposed River Basin Management Committee should implement IWRM awareness programme in important river basins. The possible listings of IWRM awareness programme have been developed and are given in Chapter 2 of the ASM's IRBM Task Force Position Paper report.

Additional funding support for DID would enable it to develop effective IRBM capacity building partnership programme with both local and international organisations such as the MyWP, MyCDNet, GEC, GWP-SEA, AguaJaring SEA Network, NARBO, etc.

APPENDIX A

APPENDIX 1 – LIST OF PRIORITY RIVER BASINS FOR THE DEVELOPMENT OF IRBM PLANS AND THEIR STATUS OF COMPLETION AS OF NOVEMBER 2014

No.	River Basin	Area (km2)	Category	State	Remarks
1.	Sg. Perlis	724	2	Perlis/Kedah	Completed
2.	Sg. Kerian	1,420	2	Pulau Pinang/Kedah/Perak	Completed
3.	Sg. Perak	14,908	1	Perak	Completed
4.	Sg. Bernam	2,836	2	Perak/Selangor	Completed
5.	Sg. Selangor	1,937	1	Selangor	Completed
6.	Sg. Langat	2,348	2	Selangor/WPKL/N. Sembilan	Completed
7.	Sg. Linggi	1,298	2	N. Sembilan/Melaka	Completed
8.	Sg. Melaka	615	2	N. Sembilan/Melaka	Completed
9.	Sg. Muar	6,138	2	Johor/Pahang/Melaka/ N. Sembilan	Completed
10.	Sg. Pahang	28,682	2	Pahang/N. Sembilan	Completed
11.	Sg. Terengganu	4,596	1	Terengganu	Completed
12.	Sg. Kedah	2,972	1	Kedah	Completed
13.	Sg. Perai	448	2	Pulau Pinang/Kedah	
14.	Sg. Merbok	439	1	Kedah	
15.	Sg. Muda	4,150	2	Kedah/Pulau Pinang	
16.	Sg. Klang	1,297	2	Selangor/WPKL	
17.	Sg. Buloh	452	2	Selangor/WPKL	
18.	Sg. Kesang	658	2	Melaka/Johor/N. Sembilan	
19.	Sg. Johor	2,286	1	Johor	

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No.	River Basin	Area (km2)	Category	State	Remarks
19.	Sg. Johor	2,286	1	Johor	
20.	Sg. Batu Pahat	2,049	1	Johor	
21.	Sg. Sedeli Besar	1,425	1	Johor	
22.	Sg. Pontian Besar	362	1	Johor	
23.	Sg. Pulai	346	1	Johor	
24.	Sg. Skudai	293	1	Johor	
25.	Sg. Mersing	273.458	1	Johor	
26.	Sg. Tebrau	256.972	1	Johor	
27.	Sg. Kuantan	1,684.353	1	Pahang	
28.	Sg. Kemaman	2,190.887	1	Terengganu	
29.	Sg. Dungun	1,828.113	1	Terengganu	
30.	Sg. Besut	953.222	1	Terengganu	
31.	Sg. Setiu	876.189	1	Terengganu	
32.	Sg. Marang	411.889	1	Terengganu	
33.	Sg. Kelantan	12,981.185	1	Kelantan	
34.	Sg. Golok	1,011.125	3	Kelantan/Thailand	
35.	Sg. Juru	80.8	1	Pulau Pinang	
36.	Sg. Padas	8822.0	1	Sabah	
37.	Sg. Miri	680.9	1	Sarawak	

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