



WATER SECTOR TRANSFORMATION 2040

SUB-SECTORAL FINAL REPORT

ALTERNATIVE WATER FINANCING (AWF)

(VOLUME VIII)



WATER SECTOR TRANSFORMATION 2040 (WST2040)
ALTERNATIVE WATER FINANCING (AWF) (VOLUME VIII)

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Knowledge Content, Analytics & Curation by Academy of Sciences Malaysia

Published by:

Academy of Sciences Malaysia
Level 20, West Wing, MATRADE Tower
Jalan Sultan Haji Ahmad Shah
off Jalan Tuanku Abdul Halim
50480 Kuala Lumpur, Malaysia

Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

WATER SECTOR TRANSFORMATION 2040 (WST2040) : SUB-SECTORAL FINAL
REPORT. (VOLUME VIII), ALTERNATIVE WATER FINANCING (AWF).

ISBN 978-983-2915-78-2

1. Water-supply--Malaysia.
2. Water-supply--Government policy--Malaysia.
3. Water-supply--Planning.
4. Government publications--Malaysia.

363.6109595

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FOREWORD

The Economic Planning Unit (EPU), on 3rd April 2020, appointed the Academy of Sciences Malaysia (ASM) as its strategic partner to undertake the Study on Water Sector Transformation Agenda 2040 (WST2040), to transform the water sector from an enabler to becoming a dynamic growth engine by 2040, as stated in the 12th Malaysia Plan (12th MP). This standalone Volume 8, “Alternative Water Financing (AWF)”, forms part of 9 compendia of reports. Volume 1, the Main Report, summarised the output of Volume 2 to Volume 9. The details in Volume 1, can be found in each of the 8 standalone reports.

The emphasis in all these reports is in achieving a secure, sustainable, and vibrant water industry in Malaysia, to forge it into a dynamic, efficient, sustainable, and revenue-generating industry. The five focus areas of WST2040 are empowering people as drivers of the transformation, strengthening governance, enhancing data-driven decision-making, ensuring sustainable financing and developing a sustainable and cost-effective infrastructure. If the recommendations are implemented, the study will contribute significantly to the national gross domestic product (GDP), create new job opportunities and facilitates the development of science, technology, innovation and economy (STIE), and will enhance the research, development, innovation and commercialisation (RDIC) of indigenous new products for both the national and global platforms. This transformation agenda is planned over two decades and four phases of four five-year Malaysia Plans (MP), which starts with the 12th MP.

The water sector is currently very much relying and dependent on public sector financing. A financially more diversified and sustainable water industry needs to be developed. The alternative water financing sub-sector study aims to identify alternative and innovative financing mechanisms for the water sector. Amongst the key recommendation is to intensify private sector investments through several models of funding mechanism while acknowledging the vital contribution of the public sector investment in transforming the water sector. The other notable recommendation is the need to implement appropriate tariff setting mechanisms (TSM) for the water supply and wastewater services within the restructuring regulatory framework to ensure the operators’ financial sustainability towards achieving a full-cost recovery.

To achieve this ambition, we have partnered with expert advisors and researchers from multiple organisations led by KASA (Kementerian Alam Sekitar dan Air). Leveraging on their knowledge, expertise and relentless efforts, we were able to produce outputs and recommendations that will support us in our quest for a more diversified funding mechanism. On behalf of ASM, I would like to take this opportunity to thank the AWF team headed by Dato’ Seri Ir. Dr. Zaini Ujang FASc, the Secretary General of KASA and his very able deputy, Dr. Ching Thoo A/L Kim, for all their dedication, hard work, and commitment.

Thank you.

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PREFACE

The future of water in Malaysia relies on the ability of the country to strike a balance between growth in demand, capability to supply and ensure water security to improve the well-being of all. The strategy requires enormous investment to enhance the current state of water infrastructure and manage its complexity.

The primary challenge lies in the existing water financing model, which heavily relies on public investment and is no longer viable in the long run. The need for an alternative water financing mechanism is crucial to ensure sustainability of the water sector. Therefore, a diverse financing mechanism for alternative water financing and making the industry attractive for private investment involvement is the game-changer for the water sector. Public-private collaboration between the government and private sector is vital to narrow the gap in water financing.

The report reviewed 10 current policies, identified the governance and financing challenges faced by the water service sectors, and suggested proposals for improvement. The study also drew lessons from five countries on their water infrastructure financing models. The AWF Sub-sector identified seven alternative financing mechanisms and developed a road map to achieve a sustainable water ecosystem across the value chain. Establishing a water bank or a development bank for water to enable financing for water projects was included.

The findings pointed to enhancing the financial sustainability of water services operators by implementing the tariff setting mechanism (TSM) for the water supply and wastewater services under SPAN's regulation. Amendments of relevant laws and regulations were made to create a conducive environment for financing in the water sector. Enhancing data collection and storage for better infrastructure financing planning is essential for the water sector to reach its full economic potential.

More importantly, the public must be aware of the actual value of water, willing to pay and conserve water. The people are also encouraged to actively participate in the *Wakaf Air* to raise funds for rural water and sewerage projects.

The insights of the Final Report were developed with contribution from the Alternative Water Financing Sub-Sector members, various stakeholders, including government and private agencies. The proposed mechanisms were developed from long-standing national policies for water, legislation, and vision to transform the sector into a critical economic contributor to the country.

The sub-sector is confident that Malaysia will become a regional water hub and the technology and knowledge transfer leader in 2040. At the same time, the country will ensure clean and affordable water access to everyone and unleash the dynamic growth of water sector in unison with the WST2040 agenda.

On behalf of the sub-sector, I would like to thank everyone who contributed to the report and sincerely hope that the report will pave the way for an alternative water financing and sustainability of the water sector.

LIST OF ACRONYMS

AACB	Advocacy, Awareness, Capacity Building and Public Participatory Platforms
ABC	Active, Beautiful, Clean
Air Selangor	Pengurusan Air Selangor Sdn Bhd
AKSB	Air Kelantan Sdn Bhd
ARI	Average Recurrence Interval
AWF	Alternative Water Financing
BBA	<i>Bahagian Bekalan Air</i> Water Supply Department
BOO	Build Own Operate
BOOT	Build-Own-Operate-Transfer
BOT	Build-Operate-Transfer
BT0	Build-Transfer-Operate
CAPEX	Capital Expenditure
CMSA	The Capital Markets and Services Act 2007 (Act 671)
CWS	Cash <i>Waqf Sukuk</i>
DBO	Design-Build-Operate
DBOO	Design-Build-Own-Operate
DBOT	Design-Build-Operate-Transfer
DE	Development Expenditure
DFI	Development Financial Institutions
DIPAN SMI	<i>Data Industri Perkhidmatan Air Negara Beserta Spatial Mapping Yang Interaktif</i>
DOA	<i>Jabatan Pertanian, Kementerian Pertanian Dan Industri Makanan</i> (Department of Agriculture, Ministry of Agriculture and Food Industries)
DOB	Department of Biosafety
DOE	Department of Environment
DOF	<i>Jabatan Perikanan, Kementerian Pertanian Dan Industri Makanan</i> (Department of Fisheries, Ministry of Agriculture and Food Industries)
DWA	Dutch Water Authority
DWI	Drinking Water Inspectorate
EA	Environment Agency
ECB	European Central Bank
EFT	Ecological Fiscal Transfer
EIA	Environmental Impact Assessments
EPC	Engineering, Procurement and Construction

EPR	Extended Producer Responsibility
EPU	Economic Planning Unit
EQA	Environmental Quality Act 1974 (Act 127)
ETP	Economic Transformation Plan
FDI	Foreign Direct Investment
FELDA	Federal Land Development Authority
FILP	Fiscal Investment Loan Programme
GCF	Green Climate Fund
GDP	Gross Domestic Product
GG <i>Sukuk</i>	Government-Guaranteed Sukuk
GHG	Greenhouse Gas
GIC	Government Investment Corporation
GIS	Geographic Information System
GLC	Government-Link Company
GOU	Government-Owned Utility
GT	Green Technology
GTFS	Green Technology Financing Scheme
GTMP	Green Technology Master Plan
HAM	Hybrid Annuity Model
IADA	Integrated Agricultural Development Agency
IFC	International Finance Corporation
IMP	Industrial Master Plan
IRBM	Integrated River Basin Management
iSRA	Interstate River Authority
IWA	International Water Association
IWK	Indah Water Konsortium Sdn Bhd
IWRM	Integrated Water Resources Management
IWSCDC	Integrated Water Sector Data Center
JAKOA	<i>Jabatan Kemajuan Orang Asli Malaysia</i> (Department of Orang Asli Development)
JICA	Japan International Cooperation Agency
JMG	<i>Jabatan Mineral dan Geosains Malaysia</i> (Department of Mineral and Geoscience Malaysia)
JPP	<i>Jabatan Perkhidmatan Pembetungan</i> (Sewerage Services Department)
JPPH	<i>Jabatan Penilaian dan Perkhidmatan Harta</i> (Valuation and Property Services Department)
JPS	<i>Jabatan Pengairan dan Saliran Malaysia</i> (Department of Irrigation and Drainage-DID)
KADA	Kemubu Agricultural Development Authority
KASA	<i>Kementerian Alam Sekitar dan Air</i> (Ministry of Environment and Water)

KATS	<i>Kementerian Air, Tanah dan Sumber Asli</i> (Ministry for Water, Land and Natural Resources)
KeTSA	<i>Kementerian Tenaga dan Sumber Asli</i> (The Ministry of Energy and Natural Resources)
KETTHA	<i>Kementerian Tenaga, Teknologi Hijau dan Air</i> (Ministry of Energy, Green Technology and Water)
KLIA	Kuala Lumpur International Airport
KPI	Key Performance Index
KPLB	<i>Kementerian Pembangunan Luar Bandar</i> (Ministry of Rural Development)
KWAP	<i>Kumpulan Wang Persaraan (Diperbadankan)</i> (Retirement Fund (Incorporated))
LAP	<i>Lembaga Air Perak</i> (Perak Water Board)
LUAS	<i>Lembaga Urus Air Selangor</i>
MADA	Muda Agricultural Development Authority
MAFI	<i>Kementerian Pertanian Dan Industri Makanan</i> (Ministry of Agriculture and Food Industries)
MARA	Majlis Amanah Rakyat
MARC	Malaysian Rating Corporation Berhad
MEASET	Malaysia East Asia Satellite
MGS	Malaysian Government Securities
MGTC	Malaysian Green Technology and Climate Change Centre
MIDA	Malaysian Investment Development Authority
MLD	Million Litres per day
MOF	Ministry of Finance
MP	Malaysia Plan
MPIC	<i>Kementerian Perusahaan Perladangan dan Komoditi</i> (Ministry of Plantation Industries and Commodities)
MPOA	Malaysian Palm Oil Association
MPOB	Malaysian Palm Oil Board
MSPO	Malaysian Sustainable Palm Oil
MWA	Malaysian Water Association
myGAP	Good Agricultural Practices
NAP	National Agriculture Policy
NAWABS	National Water Balance System
NEP	New Economic Policy
NGOs	Non-government Organisations
NGTP	National Green Technology Policy
NMCG	National Mission for Clean Ganga
NPE	National Policy on Environment
NPM	New Public Management
NPV	Net Present Value

NRE	National Water Resources Bill
NRW	Non-Revenue Water
NTU	Nephelometric Turbidity Units
NWB Bank	Nederlandse Waterschapsbank Bank
NWC	National Water Council
NWP	National Water Policy
NWRP	National Water Resources Policy
O&M	Operation and Maintenance
OFWAT	Water Services Regulation Authority
OPEX	Operating Expenditure
PAAB	<i>Pengurusan Aset Air Berhad</i> (Water Asset Management Company-WAMCO)
PAIP	<i>Pengurusan Air Pahang Bhd</i> (Pahang Water Management Berhad)
PBAPP	<i>Perbadanan Bekalan Air Pulau Pinang</i> (Penang Water Supply Corporation)
PBC	Performance-based Contract
PE	Population Equivalent
PERNAS	<i>Perbadanan Nasional Berhad</i>
PFI	Private Finance Initiative
PMD	Prime Minister's Department
PPIAF	Public-Private Infrastructure Advisory Facility
PPP	Private-Public Partnership
PUB	Public Utility Board
REDD+	Reducing emissions from deforestation and degradation
RFP	Request for Proposal
RSJ	Ranhill SJ Sdn Bhd
RWA	Regional Water Authority
SADA	Syarikat Air Darul Aman Sdn Bhd
SAINS	Syarikat Air Negeri Sembilan Sdn Bhd
SAMB	Syarikat Air Melaka Sdn Bhd
SAP	Syarikat Air Perlis Sdn Bhd
SC	Securities Commission of Malaysia
SCC	Sewerage Capital Contribution
SCC Fund	Sewerage Capital Contribution Fund
SDG	Sustainable Development Goal
SEPU	State Economic Planning Unit
SIAP	Malaysian Enforcement Agency Integrity Commission
SID	<i>Bahagian Pelaburan Strategik</i> (Strategic Investment Division)
SMART	Stormwater and Road Tunnel Project
SME	Small And Medium Enterprise

SPAN	<i>Suruhanjaya Perkhidmatan Air Negara</i> (National Water Services Commission)
SPANAN	Suruhanjaya Perkhidmatan Air Negara Act 2006 (Act 654)
SPV	Special Purpose Vehicle
SRI	Socially Responsible Investment
STP	Sewage Treatment Plant
SWRO	Seawater Reverse Osmosis
TAHAP	Economic, Infrastructure and Welfare Development-Based Grants
TH	Lembaga Tabung Haji
TNB	Tenaga Nasional Berhad
TSM	Tariff Setting Mechanism
UKAS	<i>Unit Kerjasama Awam Swasta</i> (Public Private Partnership Unit)
ULB	Urban Local Body
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
USP	Unique Selling Proposition
WEPLS	Water Efficient Products Labeling Scheme
WIF	Water Industry Fund
WIRA	Water Industry Regulatory Accounting
WRMP	Water Resources Management Plan
WSIA	Water Services Industry Act 2006 (Act 655)
WTP	Water Treatment Plant

ACKNOWLEDGEMENT

The alternative water financing sub-sector would like to express gratitude and acknowledgement to government agencies, institutional funds, banking sector, and the water services industries for providing valuable inputs to develop the Final Report.

The sub-sector also wishes to thank Academy of Sciences Malaysia (ASM), PMC, the Technical Committee, and STIPAC for their assistance and feedback on the study.

The team appreciates the following contributions:

Federal and State Government Agencies

- *Kementerian Alam Sekitar dan Air (KASA)*
- *Jabatan Pengairan dan Saliran (JPS)*
- *Pengurusan Aset Air Berhad (PAAB)*
- *Indah Water Konsortium (IWK)*
- *Suruhanjaya Perkhidmatan Air Negara (SPAN)*
- *Unit Kerjasama Awam Swasta (UKAS)*
- *Bahagian Pelaburan Strategik (SID)*
- *Kementerian Pertanian dan Industri Makanan (MAFI)*
- *Muda Agricultural Development Authority (MADA)*
- *Kemubu Agricultural Development Authority (KADA)*
- *Jabatan Pertanian (DOA)*
- *Jabatan Perkhidmatan Veterinar (DVS)*
- *Jabatan Perikanan Malaysia (DOF)*
- *Kementerian Tenaga dan Sumber Asli (KeTSA)*
- *Jabatan Mineral dan Geosains Malaysia (JMG)*
- *Malaysian Palm Oil Board (MPOB)*
- *Malaysian Palm Oil Association (MPOA)*
- *Kementerian Perusahaan Perladangan dan Komoditi (MPIC)*
- *Federal Land Development Authority (FELDA)*
- *Jabatan Kemajuan Orang Asli Malaysia (JAKOA)*

Unit Perancang Ekonomi Negeri

- *Unit Perancangan Ekonomi Negeri (UPEN) Negeri Sembilan*
- UPEN Melaka
- UPEN Sabah
- UPEN Sarawak
- UPEN Pahang
- UPEN Perlis
- UPEN Kedah
- UPEN Selangor
- UPEN Pulau Pinang
- UPEN Terengganu
- UPEN Perak
- UPEN Kelantan
- UPEN Johor
- DBKL

Financial Institutions

- Bank Negara Malaysia
- Securities Commission
- The International Shari'ah Research Academy for Islamic Finance (ISRA)
- HSBC
- Agrobank
- RHB Investment Berhad
- Bank Pembangunan

NGO

- Malaysian Water Association (MWA)

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EXECUTIVE SUMMARY

Mobilising funds to build water infrastructures in meeting the existing and future demands is vital to unleash national economic growth. Malaysia requires about RM411.66 billion to spend for the next 20 years to develop infrastructure covering resources, urban and rural water supply, sewerage, irrigation, flood mitigation, coastal erosions and environmental sustainability. It ensures the continuous water supply for national development, food security, public health, and mitigating climate change.

Currently, the primary source of funding for water projects comes from the government's development expenditure. Financing for the water sector transformation must shift from relying on the limited and highly contested public fund to increasing private investments. Significant public-private partnerships between the government at Federal and State level and the private sector is crucial to bridge the financing gap.

The water services – water supply and sewerage services – had transformed since 2005. As of March 2021, 10 state water operators were corporatised and migrated to the migration framework within the “asset-light” model. The migrated water operators can access Pengurusan Aset Air Bhd (PAAB)'s low-cost financial assistance for water projects and pay back a long-term lease rental payment of up to 45 years.

The water and sewerage services operators are regulated by the National Water Services Commission (*Suruhanjaya Perkhidmatan Air Negara*, SPAN) through a licensing mechanism. They have to apply for licenses, submit a three-year rolling business plan and adhere to the key performance indicators (KPIs). The business plan covers the projection of operating expenditure and capital expenditures for water projects in the next three years.

However, the water operators have not yet achieved full-cost recovery, and Indah Water Konsortium, the national sewerage services operator of the country, is in the red as the company had not received any tariff adjustment since its formation 27 years ago.

Meanwhile, there are insufficient revenue streams from the infrastructure projects in agriculture, flood mitigation, coastal erosion and greywater management to ensure bankability. In addition, the water sector has been confronted with other challenges such as high water loss, low reserve margin, water resources pollution, ageing assets, water quality compliance, failure to comply with environmental regulation for sewage discharge, less appreciation to water and sewerage services.

The Alternative Water Financing Study has reviewed ten existing policies, studied the sectoral challenges and financing mechanisms for improvements and developed workable financing models for specific areas across the water value chain.

The sub-sector believes that diversifying financing mechanisms could meet the funding needs in developing the water value chain infrastructures and realising the sector's full potential into an economic sector.

The policy reviews showed that:

- i. Implementing the tariff setting mechanism (TSM) is the first step to ensure the financial sustainability of the water operators and enhance their creditworthiness. Tariff revision must also be extended to the sewerage services.
- ii. Enhancing SPAN's role in water services regulation, pollution control enforcement, and implementing new government policy on water reclamation and treated effluent is essential for a competitive water services industry.
- iii. Some policies, for example, the National Water Resources Policy, do not specifically mention financing as it is believed that the government would fund it. There is a need to shift from such mentality.
- iv. There needs to be awareness of the water value to improve consumers' willingness to pay and implement incentives for water-efficient products adoption.

The study proposes the following recommendations based on five focus areas.

I. Empowering people in transforming the water sector

1. Enhance public awareness on the value of water to encourage water savings; improve willingness to pay for water services, adopt water-efficient products and rainwater harvesting systems, and conserve water resources.
2. Encourage public participation in *Wakaf Air* to finance rural water supply and sewerage projects to complement the scope of KPLB.
3. Generate awareness amongst the financial institutions or investment funds to invest in water sector-related projects or green funds to meet the national water sustainability and security agenda.
4. Develop flood mitigation projects to protect human lives, livelihood and properties.
5. Develop National River Trail to ensure the rivers' sustainability and beauty, control river pollution, and create a shared responsibility amongst the various stakeholders in protecting the river.

II. Strengthening governance at all levels

1. Implement a transparent and fair TSM to review the water tariff rates every three to five years for water supply and sewerage services as the first step in creating a conducive ecosystem for businesses to thrive.
2. Implement seven financing mechanisms including *Wakaf Air*, and set up a water bank as an enabling institution for water infrastructures development as below:
 - a. An improved private finance initiative (PFI) with a build-own-transfer (BOT)/concession model under SPAN's regulation for large-scale water supply and wastewater projects to be realised in the 12th MP.
 - b. Three public-private partnership models, namely performance-based contract (PBC) for non-revenue water (NRW) reduction projects, land swap model and hybrid annuity model (HAM) for wastewater projects to be realised in the 12th MP.
 - c. Utilise the Green Climate Fund for climate adaptation projects in 12th MP.
 - d. An innovative Cash *Waqf Sukuk* model for large water projects to be realised in the 14th MP.
 - e. Establish a water bank as an enabling institution to lend for water projects to be realised in the 15th MP.
3. Establish a raw water pricing mechanism to encourage the State Government to conserve water resources quality. The price is based on the quality of resources, as higher quality water (Class I) can be sold at a higher price than water with Class III and below.

4. Improve existing laws to create a conducive environment for private investment, such as extending the licensing period to allow for a concession agreement under the SPAN regulation.
5. Enhance river quality through greater enforcement by DOE and generate a smart partnership with relevant stakeholders.
6. Set up Interstate River Authority (iSRA) to strengthen cooperation between Federal Government and State Government agencies at the river basin level and integrate all available resources from different agencies to deal with localised challenges in each river basin.
7. Develop Integrated River Basin Management Plan (IRBMP) to assist the State Government in adopting the IWRM at the river basin level while maximising water resources' socio-economic benefits and conserving the natural ecosystem.
8. Strengthen the cooperation between the Federal Government and State Government agencies in water resources management, data sharing and effectively utilise financial resources.

III. **Enhancing capacity in data-driven decision-making**

1. Set up a data centre as a decision support system to store financial data for cost benchmarking, water assets projects, water balance of river basins, etc. Carry out data collection and analysis systematically and timely to make sense of current and future situations.

IV. **Ensuring sustainable financing**

1. Maximising the value of existing assets for water security investments by improving the operational efficiency and effectiveness of existing infrastructure and service providers can delay investment needs and is a prerequisite to further investment in water security.
2. Increase the alternative financing from 10% in 2025 to 40% in 2040, increasing 10% in every Malaysia Plan.
3. Upscale the financing through improved risk-return frameworks to allow the public and private actors (including water users) to earn returns proportional to the risks they take.
4. Set up the Water Industry Fund (WIF) for water resources conservation to be managed and controlled by SPAN under Section 171(1) of the Water Services Industry Act.
5. Select investment pathways that maximise water security returns over time. It requires rigorous triple bottom line analysis on project sequences (or portfolios) and carefully considers the effect of pursuing a specific project in foreclosing or enabling future investment options. It also needs an analysis of the performance of the system over time under different scenarios.
6. Explore the feasibility of establishing a national water company to achieve operational efficiency and economies of scale, emulating the Tenaga Nasional Berhad in the power sector. It could begin with the consolidation of water companies at the regional level. Each water operator has equity participation in the company based on criteria agreed by all parties.

V. **Developing sustainable infrastructure with cost-effective technology**

Plan and develop water infrastructure across the value chain from source to source to ensure synergies and complementarities with investments in other sectors, especially urban development, food, and energy. Some initiatives include: maintaining existing infrastructure, developing new water assets to improve reserve margins in meeting future demand, reducing water loss, adopt nature-based approach such as constructed wetlands for wastewater treatment, building supply resilience by increasing inter-catchment connectivity of reticulation system via a water grid, reclaiming wastewater for non-potable use, utilising groundwater and harvesting rainwater as alternative sources.

1.0 BACKGROUND/INTRODUCTION OF SUB-SECTORAL STUDY

Countries worldwide use various funding methods to implement water projects to supply clean water and sewerage services, irrigation system of the agriculture sector for food security, and flood mitigation to reduce disaster risks.

Some governments chose full privatisation to address financial constraints and efficiency issues faced by state-owned water enterprises, while some turn to private investments – from short-term management or maintenance contracts to long-term concessions, such as Build-Operate-Transfer (BOT), Build-Transfer-Operate (BTO) or Build-Own-Operate-Transfer (BOOT).

Other countries embraced privatisation under different paths, such as Public-Private Partnership (also known as the Private-Financial Initiative in the UK) or Public-Private Community Partnership. While each country has a different definition of public-private partnership (PPP), this approach generally involves a long-term agreement between the government and one or more private partners to deliver and fund public services by using capital investment and sharing risks.

Some countries have opted to corporatise public water authorities after observing market liberalisation and privatisation failures. They injected the institutional arrangements, management principles and practices from the private sector into the operating context of the public water utilities. These entities still rely on government funding through a more structured long-term macroeconomic investment planning for a five-year circle or more.

It is also called New Public Management (NPM). In contrast to privatisation, NPM keeps the management and ownership of the water utility within the public domain but introduces private sector management practices. Although they differ in approaches and form, the fundamental objectives are usually similar: improving the water supply system through greater efficiency and effectiveness in the whole supply chain.

Both forms of funding methods, to some extent, are unable to answer the sustainability of water projects in the long run. For instance, while private financing is readily available and easy to manage, risk-sharing in many cases have not favoured the applicants (public agencies). Factors such as high funding costs, need for the government's guarantees, quick loan tenure, and interest rates fluctuation put pressure on public authorities to balance the economic consideration against the social needs. The easy way out would be to pass these costs to consumers via water tariffs. However, this option is politically sensitive, and it is also challenging to implement in the least developed economies where the affordability and income level is low.

Various economic sectors are competing for limited public funding to finance capital-intensive water projects. It has constrained the development of water projects as planned and, as a result, impeded supply coverage improvement, especially to underserved areas. The budgetary constraint affects the cash flow of state water authorities and often resulted in project implementation delays.

Malaysia adopts both funding methods (predominantly public funding) to finance various water projects undertaken by multiple agencies serving different purposes. It includes main water infrastructure work such as water and wastewater treatment plants, reservoirs, dams, flood mitigation projects, water sources, rural water supplies, agriculture irrigation, mainly paddy, fisheries, and operation and maintenance.

Therefore, it warrants the authorities, including Malaysia, to explore alternative water financing to sustain the value chain of water sector. The said financing must recognise the economic and social aspects of the sector. It must consider: i) the equal risk-sharing between funders and applicants; ii) water as economic and social goods; iii) the income and affordability level of consumers; iv) support the United Nations's (UN) Sustainable Development Goals (SDG) 2030 for equitable supply as well as advocates the notion of "leaving no one behind" from the perspective of the right to water for all.

This study examines the existing funding mechanism across all aspects of the water sector and proposes viable and practical alternative financing mechanisms to contribute to its long-term sustainability.

2.0 OBJECTIVES OF SUB-SECTORAL STUDY

The present mixed financial models have failed to attain the desired outcomes – improving the water sector's operational effectiveness and financial efficiency and implementing the best practices from other countries. The study examines and proposes alternative and practical financial mechanisms to realise the investment in the water sector.

The proposed mechanism covers the whole value chain in the water sector, ranging from the domestic water supply, (paddy) irrigation, flood mitigation, rural water supply, sewerage and environment (greywater).

The study objectives include, but are not limited to the following:

- i. Undertake a comparative study on the funding mechanism in other countries
- ii. Revisit current private financing requirement schemes by various funding agencies locally and internationally
- iii. Assess the challenges/shortcomings of the existing funding mechanism
- iv. Propose an alternative funding mechanism for long term sustainability
- v. Propose the roadmap for implementation
- vi. Propose the flexibility/amendment to the existing laws/regulations to promote greater private participation in the water sector

3.0 SCOPE OF THE SUB-SECTORAL STUDY ACCORDING TO THE TOR AND WITH REFERENCE TO THE RELEVANT 8 FOCI OF STUDY

The TOR of the AWF Sub-Sector study is to develop a new economic model to drive the nation's water industry towards an industry that is competitive, attractive and profitable.

The scope of the study covers the whole value chain in the water sector, includes urban, rural water supply, (paddy) irrigation, flood mitigation, power generation, rural water supply, sewerage, environment (greywater). However, power generation is dropped from the scope of the study later.

4.0 SUB-SECTORAL STUDY PROCESS AND IMPACTS, IF ANY, FROM COVID-19 PANDEMIC

The critical impacts of the COVID-19 pandemic on the sub-sectoral study process mainly concerned about the stakeholder engagements and data collection.

The Malaysian Government has implemented various forms of movement control order (MCO) in the country since early 2021 to break the spreading of the pandemic. The CMCO and RMC0 continued from 15 March to April. The government subsequently implemented MCO 3.0 on 12-31 May in all states, a total lockdown between 1 June – 2 July, and some states moved into different recovery phases. It affects direct face-to-face engagements with the relevant stakeholders for input gathering.

While virtual meeting could be a solution, it is ineffective and efficient for ideas generation and group discussions. It is also not suitable for feedback gathering from a large group of participants.

Moreover, the sub-sector has difficulties in connecting with the critical personnel due to “work from home”. It delayed the process of analysis and developing essential insights for the report.

5.0 REPORT ON FINDINGS BASED ON EACH SCOPE OF THE SUB-SECTORAL STUDY AS REQUIRED BY THE (TOR)

5.1 TOR Scope 1: Review and Analyse Current Policies with a View to Improvement

5.1.1 Current Policies Reviewed and Analysed (please include ministry currently responsible and year of policy launch)

The AWF subsector had reviewed 10 vital policies and laws related to financing the overall water supply chain.

The policies reviewed include:

- i. Water restructuring for the water services industry
- ii. Water Services Industry Act and Regulations
- iii. PAAB financing model under migration framework
- iv. Privatisation policy
- v. National Water Resources Policy
- vi. National Policy on Environment and Environmental Quality Act 1974 (Act 127)
- vii. Green Technology Master Plan (GTMP) 2017-2030
- viii. 11th MP
- ix. Regulatory Framework for Cash *Waqf Sukuk* Issuance
- x. Ecological Fiscal Transfer

In essence, reviewing the key policies – water restructuring and migration framework - showed that financing is a challenging yet vital element of a successful water services business model. Implementing the TSM is crucial to inject vitality into the water supply sector. In recent years, the privatisation policy, deemed lopsided, needs to balance social and economic perspective of development.

The National Water Resources Policy showed that financing is considered readied and prepared via public spending, as there is no mention of funding in any part of the policy.

The Environmental Quality Act is adaptive and updated constantly to meet the needs for future environmental protection.

The GTMP outlines strategies and goals for the water sector, but there is still a lot to be done. The sub-sector proposed to have a water sector-specific GTMP to spur the development of green technology in the sector.

The 11th MP outlines the water-related strategies and initiatives to improve continuous water supply, expand sewerage services coverage, and enhance disaster resilience. Some of the initiatives are ongoing, such as the National Non-Revenue Water Reduction Programme.

The Regulatory framework on the Cash *Waqf Sukuk* looked at the existing financial law that governs the Sukuk and the potential regulatory challenges for the issuance of Cash *Waqf Sukuk*.

Lastly, the ecological fiscal transfer studied the initiatives by the Federal Government to transfer its taxes to the State Governments to encourage the latter to conserve the forest as part of climate change mitigation.

This section also outlines the critical sectoral challenges faced by the water services sector and flood mitigation and solid waste management:

- i. Unsustainable water and sewerage service tariff
- ii. Inability to implement CAPEX and CAPEX increase not balanced with equivalent tariff rate review
- iii. Insufficient raw water resources
- iv. Pollution of water sources
- v. Low reserve margin
- vi. High non-revenue water (NRW) level
- vii. Limited flood mitigation financing
- viii. Limited financing for solid waste management
- ix. Limited financing for paddy irrigation infrastructure

5.1.1.1 Water Restructuring for the Water Services Industry

Malaysia has undergone water sector transformation since 2005 by introducing a new policy, governance structure and institutional arrangement. The restructuring of the water services industry is a public policy innovation from the Federal Government to solve existing problems in the Malaysian water supply industry. It anchors towards the long-term financial sustainability of the water services sector, underpinned by broadening participation. The major paradigm shift involves the Federal Government and State Government sharing the responsibility to provide clean and continuous water supply and better sewerage services coverage to the people in the Peninsular and Labuan.

The reformation aims to build a sustainable water services sector in the long-term by achieving full-cost recovery, effective regulation, competitive financing models of the water infrastructure and a suitable and equitable tariff setting mechanism.

Notable outputs of the initiative include introducing new laws and institutional arrangements to regulate the water services industry under a licensing regime. The Federal Government has set a policy direction for the restructuring based on an “asset-light” model for all states.

With this model, the State Government would hand over all assets and liabilities related to water to Pengurusan Aset Air Berhad (PAAB), a water asset management company owned by the Minister of Finance Incorporated. The water operators are relieved from the obligation to increase funding for water projects

and enhance efficiency and cost-effectiveness. Meanwhile PAAB would finance capital expenditure (CAPEX) at the competitive financial cost in a long-term low-interest rate loans to the water operators. It positively impacted water supply coverage and water loss management, amongst others, to the state water operators who participated in the initiatives for more than six years.

Under the new institutional arrangement, the Federal government set up the National Water Services Commission (SPAN) to regulate the water operators' performance and develop the tariff setting mechanism (TSM).

After 15 years of the policy implementation, the observable and measurable achievement remains small compared to the aspiration of policy. As of March 2021, 10 states in the Peninsular have completed the restructuring process by materialising the agreements between the State Government, water operators, and PAAB.

However, challenges remained. One of the main difficulties is the depoliticising of water tariff rate setting. Once the tariff is decided systematically and transparently, it could unlock the operators' revenue stream to achieve full-cost recovery and improve their creditworthiness.

The Context of the Restructuring

Before the restructuring in 2005, the water supply and sewerage sectors faced operational inefficiency, ineffective governance and regulation, budgetary constraints, and poor environmental performance (Kim, 2012).

Table 5.1: Four critical problems in water supply and sewerage sectors

Problem Category	Features
Operational inefficiency	- High non-revenue water level - Below cost-recovery tariff structure due to political consideration - The State subsidised water supply and sewerage
Ineffective governance and regulation	- There is no clear separation of power between formulating policy, regulating water provision, and supplying water - Conflict of interest as the state regulates and run water business
Budgeting constraints	- Limited public fund - Delay in investment in areas such as water loss, water supply coverage, and information system
Poor environmental performance	- Weak sludge management - Poor water quality standard compliance of sewage treatment plant

Source: Kim, 2012

In 2006, the government launched the Ten National Policy Objectives for the Water Services Industry to:

1. establish a transparent and integrated structure for water supply and sewerage services that deliver effective and efficient service to consumers
2. ensure long term availability and sustainability of water supply, including conservation of water
3. contribute to the sustainability of the watercourses and the water catchments areas
4. facilitate the development of competition to promote the economy and the efficiency in water supply and sewerage services industry

5. establish a regulatory environment that facilitates financial self-sustainability amongst the operators in the water supply and sewerage services industry in the long-term
6. regulate for the consumers' long-term benefit
7. regulate tariff and to ensure the provision of affordable services on an equitable basis;
8. improve the quality of life and the environment through effective and efficient management of water supply and sewerage services;
9. establish an effective system of accountability and governance between operators in the water supply and sewerage services industry
10. regulate the safety and security of the water supply and sewerage system.

The objectives ensure that the water supply is reliable, good quality, accessible by all and with appropriate economic value for sustainability in the long term.

The policy setup has two main outputs – law and institutional outputs. The law output referred to the Suruhanjaya Perkhidmatan Air Negara Act 2006 (Act 654) and the Water Services Industry Act 2006 (Act 655). The institutional output was establishing the National Water Services Commission (SPAN) in 2007 as the technical and economic regulator of the water services industry and the setting up of PAAB as a special purpose vehicle to manage the existing water assets and finance the new water infrastructure.

Main Components of the Water Restructuring Scheme

There are three crucial components in the restructuring scheme: A) corporatisation of water operators; B) migration of operators to the Water Services Restructuring Scheme; and C) SPAN's regulation on the water operators under a licensing mechanism.

A. The corporatisation of water supply entities

The process involved the corporatisation of the different entities into a standardised State Government's investment entity. These entities include the water supply unit under the State's Public Works Department, State Water Supply Department, a State's statutory body and State Government's subsidiary. A Board of Directors consisting of government officials oversee the corporate entity. The arrangement balances the commercial and consumer interests in policymaking, especially on tariff rates.

The water company operates on a business plan detailing the revenue and expenses projection, not the State Government's annual budget. It also has the flexibility to mobilise financing from an internal source or through financial institutions.

B. Migration to the National Water Services Industry Restructuring Scheme

In 2007, the Federal Government launched the National Water Services Industry Restructuring Scheme to structure the State Government's loan for rural water supply, develop a financing mechanism for water infrastructure development and lay the foundation for the water services sectors' long-term sustainability. It is through an asset-light model.

The arrangement under this model is as below:

- i. PAAB takes over the State Government's loan due to the Federal Government and restructures its repayment period to 45 years. The repayment is through the lease rental model.
- ii. In return, the State Government transfers its water assets to PAAB for 45 years.

- iii. The water assets would then lease to the water operator for the same period.
- iv. PAAB uses the lease rental payment to pay the Federal Government's loan, and it returns the water assets to the State Government after the loan repayment. PAAB also lends money to the water operators to develop new assets or upgrading existing assets at a competitive interest rate. The water operators must obtain approval from SPAN for the projects.
- v. The water operator rent the water assets from PAAB. It can then focus on improving its services to the consumer. The operators use the profit to pay a dividend and raw water extraction fees to the State Government.

PAAB provides a five-year moratorium to financially weak state water operators to gain a better financial footing before paying the lease rental.

Simultaneously, the Federal Government provides grants to the State Governments for rural water supply and water resource projects.

C. Regulation by SPAN

SPAN, a federal regulator, oversees the water services companies under a licensing mechanism through four main strategic thrusts: economic, technical, social, and consumerism.

SPAN ensures water operators achieve full-cost recovery in the long-term under the economic thrust, supported by a fair and reasonable tariff rate. The water operators must meet the technical standards to develop the new water infrastructure or upgrade the existing system from the technical aspect.

On the social aspect, SPAN ensures good water supply coverage. It also safeguards the consumer's interest through consultation with the stakeholders and collects feedback via Forum Air Malaysia and the customer complaints centre.

SPAN regulates through a licensing mechanism that requires water services operators to apply for an operating license or a facility license. The company must submit a thirty-year business and three-year rolling business plan for review. The license renews every three years.

There are two types of license: individual license – operating and facility license – for public water supply; and class license for private water supply system.

SPAN sets five key performance indicators (KPI) to monitor the performances of water operators, which include:

- i. water services performance on water quality, water supply coverage, continuous supply, reserve margin and others;
- ii. customer services in dealing with customer's complaints;
- iii. operating performance that is efficient and economical in water treatment and supply process such as reducing water loss, improve bill collection efficiency;
- iv. environment aspect of ensuring sludge management meeting the environmental standard;
- v. competency in getting qualified personnel to manage the water supply system.

Individual facility licensees are required to prepare asset management policy and system, value planning and management, implementation and monitoring of projects, operating and maintenance and disposal of assets.

SPAN also issues an authorised license for the operator not yet migrated to the restructuring scheme to operate. It is a temporary license for the transition period.

It issues permits to water services industry players, including contractors and plumbers, to carry out water projects.

SPAN also carries out the technical audit to identify high impact activities that could potentially harm the industry performance. The audit findings are essential inputs for SPAN to validate the operator's reporting or identify any non-compliance for further actions.

More importantly, SPAN develops the TSM, a uniform, systematic, and transparent model, to fix the tariff rate. Simultaneously, it also encourages water companies to be more efficient in their operation and cost through benchmarking. Only benchmarked cost is qualified for tariff adjustment, which is crucial for full cost recovery. The TSM also protects the consumer's interest as SPAN must consult the public before adopting a new tariff rate.

In summary, the scheme enables the water operator to develop its financial capability and obtain adequate revenue to cover its operating expenses and capital expenditure. The loan facility prepared by PAAB helps the operator to focus on improving the quality of its services. The State Government can pay back the federal loan and benefit from a well-performed water operator through raw water abstraction fees collection and dividend payment. Lastly, SPAN's regulation ensures the continuity and quality of the water supply to the consumer.

Achievements Progress

As the restructuring scheme is on a long-term trajectory to achieve full-cost recovery, which takes up to 40 years, the progress was relatively slow as to the aspiration of policy. However, the achievement progress was significantly palpable in improving the quality of the services, such as reducing NRW, decreasing water supply disruptions and improving reserve margin.

Base camp: As Is (2007-2017)	Camp 1: Stabilisation (2018-2030)	Camp 2: Consolidation (2031-2041)	Camp 3: Full Cost Recovery (2042-2047)
• Migration begins • Asset light model • Lack of financial sustainability • Moratorium given	• CAPEX for water infrastructure • Improve reserve margins • Improve services • Revision of tariff and lease rental rate	• Cost-efficient operation • Optimising resources • Profit and Reserves Improved • CAPEX funded using internal source	• Fair and reasonable tariff • Operators fund CAPEX fully • Operator is a bankable entity • Services and Quality Assured

Figure 5.1: Water operator's pathway to full-cost recovery

Source: PAAB, 2008

Based on the analysis, water operators migrated for more than six years benefit from their early participation in the scheme.

As of March 2021, 10 states in the Peninsula have completed the restructuring process by materialising the agreements between the State Government, water operators, and PAAB.

Table 5.2: Finalised restructuring agreement signing date of the states

No.	State	Finalised Restructuring Agreement Signing Date	State Water Operator
1.	Melaka	17 Dec 2008	Syarikat Air Melaka Sdn Bhd (SAMB)
2.	Negeri Sembilan	20 Jan 2009	Syarikat Air Negeri Sembilan Sdn Bhd (SAINS)
3.	Johor	11 March 2009	Ranhill SAJ Sdn Bhd (RSAJ)
4.	Pulau Pinang	2 Jun 2011	<i>Perbadanan Bekalan Air Pulau Pinang (PBAPP)</i>
5.	Perak	23 May 2012	<i>Lembaga Air Perak (LAP)</i>
6.	Kelantan	14 Sept 2016	Air Kelantan Sdn Bhd (AKSB)
7.	Selangor	4 Jan 2019	Pengurusan Air Selangor Sdn Bhd (Air Selangor)
8.	Pahang	23 Dec 2020	Pengurusan Air Pahang Bhd (PAIP)
9.	Kedah	4 March 2021	Syarikat Air Darul Aman Sdn Bhd (SADA)
10.	Perlis	4 March 2021*	Syarikat Air Perlis Sdn Bhd (SAP)

Source: Laporan Status Penstrukturan Semula Industri Perkhidmatan Bekalan Air, KASA, 2021

*The restructuring agreement was signed in 2010 but only came into force in 2021 after the signing of the Supplemental Master Agreement (SMA). The SMA intended to introduce the obligation of SAP as a successor to Bahagian Bekalan Air, Perlis.

As shown in **Table 5.2**, five states, Negeri Sembilan, Johor, Melaka, Pulau Pinang and Perak, have participated in the restructuring process for more than six years and reaped the benefits.

Most early participants performed better in water supply coverage, managing water loss (lower NRW level), better financial standing is underpinned by a tariff revision after 2008.

Water Supply Coverage: For Johor, Labuan, Melaka, Negeri Sembilan, Pulau Pinang, Perak and Selangor, the supply coverage was between 99.6% and 100% in 2019. The early participation in the migration process allowed these states to acquire the necessary capital expenditure (CAPEX) as compared to other states. For instance, Melaka received RM720.88 million CAPEX from PAAB between 2010 and 2021, Johor (RM2.99 billion), Negeri Sembilan (RM907 million) and Perak (RM152 million). Despite the availability of PAAB financing facilities, Pulau Pinang opted to finance CAPEX projects by using a soft loan provided by the Pulau Pinang State Government.

It is worth noting that before 2014 Selangor embraced privatisation and operated according to concession agreements between the State Government and the private partners. The investments into the sector are privately sourced.

As of end 2019, five latecomer states recorded a lower coverage rate: Terengganu (96%), Pahang (98%), Kedah (98.3%) and Perlis (99.5%) due to insufficient funds for supply coverage up to rural areas.

Non-revenue water (NRW) level: Most early migrated states like Melaka, Johor, Pulau Pinang, Perak and Selangor are below 30% as of Q1 2020. Meanwhile, Kedah, Pahang, Kelantan and Perlis recorded a higher NRW level of 48% to 64.5% in Q1 2020. A lower NRW level for the early participants in the migration scheme is their ability to carry out NRW reduction programmes financed by PAAB.

Financial performance: Water operators in Johor, Pulau Pinang, Perak, and Terengganu recorded a revenue of more than RM10 million, while Melaka, Negeri Sembilan, Kelantan, and Labuan earned a small revenue of about RM1 million in 2019.

On the contrary, water operator in Perlis (SAP), Kedah (SADA), Selangor (Air Selangor) and Pahang (PAIP) are loss-making. For Air Selangor and SADA, the weak financial standing is affected by the concession agreements arrangement before the restructuring, especially on the bulk treated water supply agreement; the poor performance of Perlis and Pahang is due to low income as the states have not revised tariff rates for decades.

Challenges Remain

Despite the small gains for the early participants, challenges remain. A critical challenge is to fully unlock the benefit of a fair, transparent and systematic tariff setting mechanism (TSM) to depoliticise the tariff rate issue. Besides, a new minimum charge setting must be incorporated into the TSM. Lastly, both Federal Government and State Government must set the water tariff every 3-5 years to support the water operator's business plan.

As an overview, the TSM has two key characteristics: i) a standardised tariff structure to set the reasonable cost components on each category, ii) gradual tariff adjustment based on licensing period of the water operator to match the actual cost of services.

SPAN considers only the qualifying costs for tariff setting. It compares the operators' qualifying costs to set the benchmarked cost as the basis for tariff estimation. The qualifying costs are expenses incurred in preparing the water services. The mechanism is fair to both the consumer and the operator. It also enables SPAN to identify the most efficient cost to provide a similar type of service.

There are four cost components in the tariff: operating expenditure (OPEX), capital expenditure (CAPEX), single-digit regulated profit (π), and environmental cost. The environmental cost is a fee to conserve the water catchment area, but it is not yet charged to the consumer. **Table 5.3** below is the cost structure for the different user categories against the band of water usage.

Table 5.3: Tariff setting mechanism structure

	Domestic			Non-domestic		3 special category (Flat rate)		
	Band 1 0-20m ³	Band 2 >20-35m ³	Band 3 >35m ³	Band 1 0-35m ³	Band 2 >35m ³	Religious/ Welfare Institution	Bulk Domestic	Shipping
Opex	Opex covered in all bands							
Capex								
Regulated Profit (π)								
Environmental Cost								

Source: SPAN, 2021

The TSM moves the water services industry towards full-cost recovery, with the environmental cost for water resources conservation and preservation. The tariff structure also encourages the consumer to save water. However, the water tariff for each state should vary as it has different topography, raw water resources, technology, infrastructure planning, water demands, population density and other factors.

Each state also imposes a separate minimum charge for the availability of water supply services. The consumers have to pay the amount even though they don't consume any water. The minimum payment is the fixed operating cost borne by the operator, such as maintenance and billing cost. Variable operational expenses, such as chemical and energy costs, must be excluded from the calculation of minimum charge. Therefore, a separate mechanism for calculating minimum charges under the TSM is based on a certain consumption threshold.

Tariff revision every 3-5 years is essential to match the rising OPEX and CAPEX to meet future water demand and ensure water operators' business sustainability.

According to SPAN's calculation, the delay in TSM implementation costs the operator to lost RM102.2 million a month in profit or RM1.2 billion a year. The Federal Government has written off two phases of loan for the rural water supply projects, which amounted to RM5.89 billion.

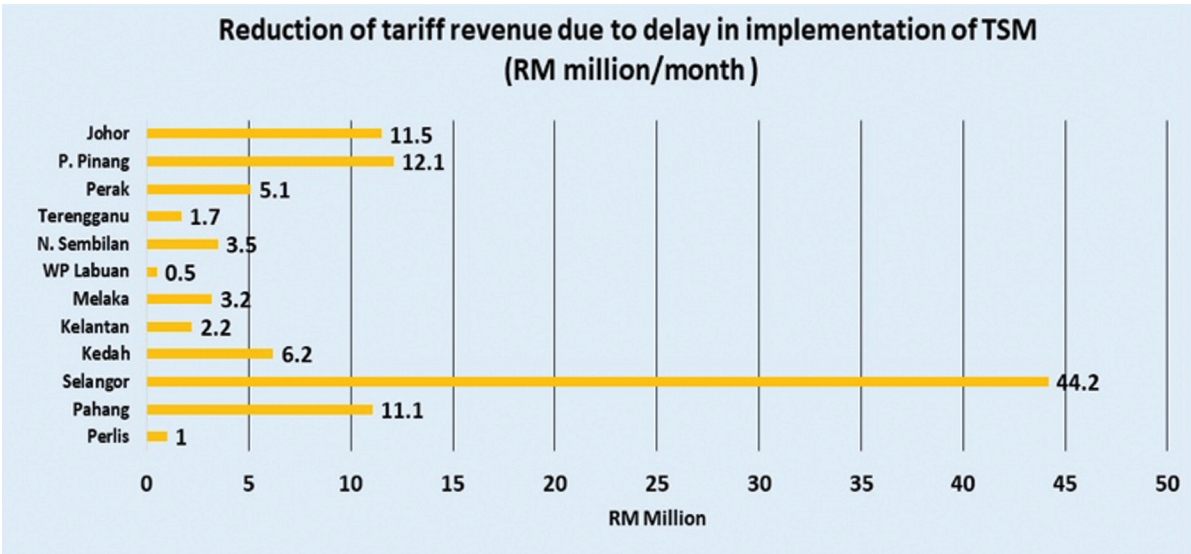


Figure 5.2: Implication of TSM implementation delay on water operators
Source: SPAN, 2021

To promote and encourage private investments within the migration framework, the government must consider the following issues:

- i. The current license period for three years is too short to attract private investments and provide a long-term financing facility in nature;
- ii. The high cost of financing in a commercial loan;
- iii. Considering the privatisation experience in Johor and Selangor that used various financing facilities before the migration scheme, it cost more for PAAB to take over and restructure the financial liabilities compared to the existing CAPEX offered by PAAB;

- iv. The current commercial financing does not have the flexibility to provide a forty five-year pay-back period provided by PAAB. The long pay-back period enables the operators to build their financial capabilities in stages in line with their current tariff rates.
- v. The current tariff rates are not commercially viable;
- vi. Under the restructuring framework, as a return for PAAB's takeover of the operators' financial liabilities, it enjoys the first rank priority to obtain the monthly lease rental payment. Any new CAPEX arrangements with private parties could be risky to PAAB's existing CAPEX arrangements.

In conclusion, implementing a new tariff system under TSM ensures the financial health of the water operators. Sound financial capability and a conducive licensing regime by extending the license period enable the industry to attract private investments.

5.1.1.2 The Suruhanjaya Perkhidmatan Air Negara Act 2006 and the Water Services Industry Act 2006

The Federal Government enacted the Suruhanjaya Perkhidmatan Air Negara Act 2006 (Act 654) and Water Services Industry Act 2006 (Act 655) to set the regulatory and institutional framework for the water supply and sewerage services.

The Acts were enacted following the amendments to the Federal Constitution in 2005 to transfer "water supply and services" from the State List to the Concurrent List. The amendments do not affect water resources such as rivers, canals, groundwater and water catchment areas that are still exclusively under the State's jurisdiction. The relevant legislation is the Water's Act 1920 or its equivalent.

After more than a decade, the Acts require improvement to enhance the function and role of the technical and economic regulator, the National Water Services Commission (SPAN), and strengthen Act 655 to effective enforcement and implement a new national policy.

Overview of the SPAN Act and WSIA 2006

Act 655 established a regulatory framework to promote the national policy objectives for the water supply and sewerage services industry. Meanwhile, Act 654 set up a Commission to supervise and regulate the water supply and sewerage services.

Act 654 had come into effect on 1 February 2007, while Act 655 came into force on 1 January 2008.

The Government introduced both Acts to restructure the water supply and services industry with the long-term goal of improving efficiency and reducing disparities in Peninsular Malaysia, including the Federal Territory of Labuan.

It also established a new licensing framework and mechanism regulated by SPAN, which is one of the main features of WSIA. The regime requires all water operators to apply for a license. Types of license and permit listed in **Table 5.4**.

Table 5.4: Types of licenses and permit under WSIA

Types of License/Permit	Features
Individual License	- Section 4 of Act 655 provides that the operators or owners of public water supply or sewerage systems shall obtain an Individual License. - As of 30 April 2021, SPAN issued 24 Individual Licenses (SPAN, 2021).
Class License	- Section 20 of Act 655 requires the owner of private water supply or sewerage systems to hold a Class License. - As of 30 April 2021, there is 686 approved class license (SPAN, 2021).
Authorisation to Operate Under WSIA	- Sections 188, 189, 191 and 192 of Act 655 provide for Authorisation to operate. It is given to operators who have not moved to the licensing regime due to factors such as: - The corporatisation of the State water supply departments, water boards or water authorities that have yet completed, or - Pending negotiations on existing contracts with privatised operators.
Permits	- Section 50 of Act 655 provides that any person who intends to carry out works related to water supply or sewerage systems must obtain one of the permits from SPAN. - The purpose of issuing permits is to ensure that all works are carried out by competent contractors and plumbers meet the quality and standards specified. - According to SPAN's Water Services Industry Performance Report 2019, a total of 30,595 permits (new and renewed) have been issued from 2010 to 2019.

Source: SPAN, 2021

Amendments to the SPAN Act and WSIA 2006

Act 654 and Act 655 came into force in 2007 and 2008, respectively. For the past 14 years, the Government has made policy changes in the water services sector. Furthermore, during this period, deficiencies in the enforcement of the Acts were apparent; thus, a need to amend the Acts to ensure the water services industry kept abreast with new policy requirements and effective enforcement.

Amendments to Act 654	Amendments to Act 655
- Objective: - improve SPAN's governance system 11 amendments	- Objectives: - strengthen and standardise the interpretation and translation for clarity - strengthen SPAN's powers and functions, including a more effective enforcement - implement a new policy to improve the water services industry 70 amendments

Figure 5.3: Objectives of Amendments to Act 654 and Act 655

Amendments to Suruhanjaya Perkhidmatan Air Negara Act 2006 (Act 654)

The main objective of the amendment is to enhance the powers and functions of the Commission and ensure the Commission can discharge its role effectively. The amendment also aims to strengthen SPAN's management efficiency and expand SPAN's jurisdiction.

The amendments include: the term of appointment of SPAN Members for standardisation, setting conditions of service for SPAN employees, disciplinary management procedures for officers and, setting new contractual limits for improving procurement procedures and strengthening existing financial procedures.

The proposed amendments also ensure the Commission has the exclusive right to use SPAN's logo to avoid misuse that could affect its image directly or indirectly.

Amendments to Water Services Industry Act 2006 (Act 655)

The amendments of Act 655 intend to guarantee continuous water supply by introducing an alternative water supply using 'reclaimed water' (water produced from treated effluent). The initiative allows water operators to obtain alternative water sources for non-potable purposes. It can maintain the country's clean drinking water resources and reduce pressure on water sources, thus increasing circular economy practices. Furthermore, reclaimed water can generate a new source of income for the water and sewerage industry and help the country build a more dynamic economy.

It also enables SPAN to regulate and manage 'water residue' (used water from any combination of domestic, industrial, commercial or agricultural activities, surface run-off or stormwater, and any sewer inflow or sewer infiltration) previously under the jurisdiction of the Department of Environment.

A proposed amendment raises the penalties for pollution offences from RM500,000 to RM10 million or imprisonment up to 15 years upon conviction. It serves as a deterrent to polluters that cause water treatment plants to shut down or discharge prohibited effluents or hazardous substances into public sewers. Another amendment allows licensees to claim costs for restoring contaminated water supply systems from parties found guilty of causing water pollution.

The amendments also place the responsibility of desludging on the owners of the premises. This measure is imperative to increase the awareness of premises owners to carry out regular desludging. Failure to desludging septic tanks pollutes our water source and threatens public health through water-borne diseases such as cholera, hepatitis a and typhoid.

Other amendments include imposing stricter laws on existing offences and introducing new offences, protecting the rights of consumers and licensees/permits through the establishment of the Water Services Industry Tribunal, strengthening existing water and sewerage services regulatory mechanisms and establishing clear boundaries of the jurisdiction in the regulation of water supply and sewerage services.

Funds for Water Resources Conservation

Section 171 and 172 of Act 655 provides for establishing the Water Industry Fund and the Sewerage Capital Contribution Fund.

The purposes of the Water Industry Fund are:

- to protect and preserve water basins;
- to ensure the sustainability of water supply;
- to improve the quality of raw water;
- provisions of water and sewerage services in rural development; and
- any other purposes as may be determined by the Minister.

Meanwhile, the Sewerage Capital Contribution Fund (SCC Fund) was established:

- to supplement Capital Expenditure (CAPEX) required for sewerage assets
- to implement regional sewerage systems
- other purposes as the Minister may determine

Section 179 of Act 655 empowers the Minister to make regulations on the matter specified therein and other matters as may be necessary to implement and give full effect to the Act, including Water Industry Fund and Sewerage Capital Contribution Fund.

SPAN also proposed replacing the name 'Sewerage Capital Contribution Fund' with 'Sewerage Development Fund', and payments to the Fund are mandatory and no longer treated as a contribution.

The said amendments were proposed after considering that the payment to the Water Industry Fund was mandatory and not deemed a contribution.

Subsidiary Legislations

SPAN introduced the new Water Services Industry (Desludging Services) Regulations (2020) on 29 March 2021 to ensure the occupants or owners of individual septic tanks carries out desludging at least once every two years or more frequently. Failure to perform regular maintenance or desludging leads to fines.

The rules aimed to reduce untreated wastewater that flows into the water body, contributing to water resource pollution. There are about 1.3 million individual septic tanks in Malaysia, and most of these may have been over 40 years old, and only about 10% of them undergo scheduled desludging.

Indah Water Konsortium (IWK) Sdn Bhd, the primary sewerage services operator in the country, can obtain a consistent income from desludging activities. It increases IWK's financial sustainability and reduces its dependency on annual Government subsidies.

Water Services Industry Act (Licensing) (Amendment) 2007 Regulations

The proposed amendment to the Water Services Industry Act (Licensing) (Amendment) 2007 Regulations extends the current license period of three years to up to 20 years. It ensures a bankable license period for the water operators to yield optimal returns as other utility providers such as energy and telecommunication industries.

The amendments can open up the opportunity for collaboration between water operators and investors to participate in various future water projects, such as NRW reduction, water reclamation and development of water infrastructure in a strategic industrial area. The collaboration is subjected to the regulatory framework

of Act 655, and for migrated states, the cost of funding must be lower than the existing financing facilities offered by PAAB. The proposed amendments are as follows (**Table 5.5**):

Table 5.5: Proposed Amendments to the Water Services Industry Act (Licensing) (Amendment) 2007 Regulations

Type of License	Proposed Amendments	
Individual License (Facilities)	Up to 10 years for PAAB, water operators and private companies who develop or take over water supply systems or sewerage systems and own the assets	Up to 20 years for parties who finance capital expenditure projects, develop and conduct water or sewerage treatments and own the assets
<i>To own a public water supply system or public sewerage system or any part of the systems</i>		
The current license period is valid for three years and subjects to renewal before the expiry date		The license period is not subject to the period of the contract, and thus still need for renewal.
Individual License (Services)		
<i>To undertake, provide or make available any water supply services or sewerage services or part of the services by means of operating a public water supply system or public sewerage system</i>	Up to five years for the principal operator of water supply and sewerage services and appointed water treatment sub-contractors.	Up to 20 years for parties who finance capital expenditure projects, develop and conduct water or sewerage treatments and own the assets
The current license period is valid for 3 years and subjects to renewal before the expiry date		The license period is not subject to the period of the contract, and thus still need for renewal.

Source: SPAN, 2021

5.1.1.3 PAAB Financing Under Migration Framework

In Malaysia, water matter was solely under the purview of the State Government until the Federal Constitution amendment paved water services to be under the joint list of both Federal and State Governments. The Water Services Industry Act (WSIA 2006) later been enacted, and water services industry restructuring took effect with the formation of SPAN and PAAB.

The water financing in the states, which was previously made available via federal water loan, has been converted into federal grants for water resources. For infrastructure related to water starting from the intake points at the river or water, storage is constructed and funded by the Federal Government via PAAB. PAAB is a wholly-owned company of the Minister of Finance Inc, incorporated on 5 May 2005 to hold the nation's water assets.

Under the restructuring framework and migration to the asset-light regime, PAAB takes over the water liabilities under the State Government and water-related commercial loans at the operator's level. PAAB's key responsibility is to implement CAPEX works in the business plan approved by SPAN by using competitive financing sourced from the private financial market.

To ensure projects were implemented most transparently and economically, PAAB appoints contractors via open tender practice. It is crucial to get the best value for money from the infrastructure so that the water operators have to pay lease rental to PAAB for 45 years.

To undertake this role, PAAB established two financing facilities totalling RM40 billion, comprising RM20 billion government's Guaranteed Islamic Medium Term Note Programme and another RM20 billion AAA-rated commercial paper/Medium Term Notes. It allowed PAAB to tap funding from the domestic capital market at the most competitive rates for CAPEX development.

About RM18.5 billion worth of Sukuk were raised to fund migration-related activities, upgrade the existing infrastructure, and construct a new one.

Due to a recent review on the government guarantee allocation by the Ministry of Finance, PAAB is currently allowed to make drawdowns by using its AAA-rated facility for future financing requirements. It is in the process of re-establishing its commercial paper part of its facility, which has expired to ease its short-term cash flow management.

PAAB's funding strategy is aligned to asset-liability management to ensure the weighted average cost of borrowing be maintained to ensure lease rental charged is sufficient to cover borrowing cost. PAAB runs a partly mismatched funding position and capitalises on long-term borrowing when the interest rate is low. Within 10 to 15 years, PAAB does not expect to make any principal repayments on its Sukuk due to increasing needs for CAPEX by water operators.

There is a provision for lease rental review every three years in the migration agreement. However, PAAB is unlikely to use this provision to increase the lease rental rate without a water tariff review. It poses a significant challenge as PAAB charges lease rental, which is barely enough to cover the borrowing cost and none for principal repayment. It is not impossible to see a lease extension as the current collection does not allow full principal repayment on Sukuk at the end of 45 years.

Challenges in Financing

As a primary financing vehicle for the water services industry, PAAB strives for funding sustainability in fulfilling its responsibility under the restructuring agreement, especially in repaying its loan to the MOF and offering least burdened terms with mostly unsustainable water operators.

Unlike in a typical project financing deal, water operators are not required to put front equity. Most of the interest incurred during construction was capitalised as part of the development cost of a long-term lease.

PAAB's business model assists water operators in improving their services by upgrading the facilities and relieving them from the financial burden in CAPEX development. Achieving this objective provides a conducive environment for tariff revision. Operating in a capital-intensive environment requires rigorous financial planning and cash flow management to become sustainable in the long run.

As a borrower in the market, PAAB borrowing cost fluctuates, depending on the market and credit factor. Market risk has more to do with interest rate fluctuation evidence in the Malaysian Government Securities (MGS) yield, whereas credit risks are related to the borrower's creditworthiness. Sometimes perception of risk increases due to other factors which may attract additional costs or premiums to borrowers.

Credit enhancement such as government guarantee plays an essential role in reducing borrowing costs. During an earlier stage of operation in 2010, the GG Sukuk issued by PAAB attracted premium charged over MGS in the range of 18-25 years basis points. Investors were competing fiercely for the allocation as PAAB was a new borrower in the market.

PAAB had established its name in the market as the issuer primarily for the water industry. However, with a significant volume of Sukuk outstanding, the market started to have difficulty attracting investors, partly because some have reached their exposure limit. It has also something to do with maturing GG Sukuk been refinanced by AAA-rated investors who usually do not assign limits on government-guaranteed investments. Competitions also come from other government investment corporations (GIC) and projects raising funds using GG. A considerable supply of guarantees coming to the market has affected the scarcity status resulted in some increase in the credit premium.

In the wake of interest rate run-up recently, PAAB Sukuk was priced poorly at 75 basis points above the MGS, a staggering 25 basis points higher than what it used to pay as the investors become more defensive on rate hike fear.

Market-based financing beginning to show its limitation in providing good support to the industry and is no longer sustainable if the cost of borrowing is determined by the perception of risks and price discovery been dictated by investors. In some cases, inadequate responses from investors could result in Sukuk issuance under subscription. Worse if the refinancing exercise fails to attract sufficient interest and lead to financial defaults.

Other financing sources such as bank loans require a strong cash flow profile, security arrangement, and covenants. The tenure of the loans is typically shorter, lesser quantum, requiring equity injection and subject to annual review. Some challenges mentioned earlier underscore the need to explore the alternative source of financing to improve access to funding at a fair cost.

5.1.1.4 Privatisation Policy

The Malaysian economy was dominated in the early 1980s by the increasing intervention of the public sector. It was a direct result of the expansion of public institutions created to achieve the socio-economic goals of the New Economic Policy (NEP) introduced in the 1970s. By 1983, Malaysia had about 900 public-sector firms. The share of public institutions (including government departments) in total employment had surpassed 25%, a far higher proportion than neighbouring developed Asian countries such as Japan and Singapore.

Malaysian policymakers were convinced that the public-sector-led growth strategy had failed to yield results as the country's external debt grown. It did not provide the necessary stimulus for faster development, nor did it strengthen the economy's resilience to external shocks.

The Malaysian government embarked on a large-scale privatisation programme to reform the economy, launched in 1983 by the Prime Minister under the Malaysian Corporation Policy. Malaysia is amongst the pioneers of the developing countries to privatise public enterprises. The strategy signalled the government's intention to reduce its role in the economy, reduce the size and scope of public spending, and allow market forces to control its economic activities (Dholakia & Dholakia 1994).

The Policy

Privatisation policy aims to alleviate the government's financial and administrative burdens while reducing the size and role of the public sector in the economy. Via private enterprise and investments, the policy aims to encourage competition, enhance production, boost productivity, and facilitate economic growth (Toh, 1989).

The Privatisation Policy has the following objectives:

i. To reduce the government's financial burden

The government invested thousands of millions of ringgits in the health, protection, water, fire, railway, port, airport, and other sectors. The expenditure expands over time, with a slow and low rate of return to the government. In addition, the Government has to maintain certain services and investments. One of the highest items is emoluments, accounting for more than a third of total operating expenses. Expenditure in the form of transfers has also risen steadily in recent years, accounting for nearly half of all operating costs.

ii. Increase efficiency and productivity

The government also provided various subsidies to public enterprises in a monopolistic position. However, those involved in trade and industry yielded unsatisfactory results. The obstacles in the public sector make it difficult to make the best use of the country's resources.

By privatising certain Government services, and with the expertise and better opportunities the private sector can provide, it is expected that these services can be further enhanced.

iii. Promote economic growth

Indirectly, setting up more private companies can boost the country's economic growth while allowing the government to share the benefits by collecting income tax from the relevant businesses.

iv. To reduce the involvement of the public sector in the economy

Government visibility in the economy means more government control over the country's resources. Decisions are usually made based on non-market considerations. Most of the goods and services produced by the government reflect the market value. The price of the goods is based on subsidies, and the resources allocated for its production cannot be distributed efficiently.

Subsidies and the maintenance of a welfare attitude encourage Malaysians to rely too much on Government assistance. This situation does not suit the long-term interests of individuals and the country as a whole.

v. Accelerate the achievement of national policy goals

By giving more opportunities to the private sector, the government can create more participation of Bumiputera private companies or the number of Bumiputera managers to meet the requirements of the NEP.

To carry out the privatisation programme, the Government formed a Privatisation Section (formerly known as the Privatisation Special Task Force) under the Economic Planning Unit (EPU) of the Prime Minister’s Department (PMD). It served as the secretariat to the Privatisation Committee, consisted of different entities working towards finalising and configuring the proposals on privatisation for the Ministers’ Council’s approval. The government issued a Guideline on Privatisation in 1985, which outlined the policy’s aim, method of privatisation, and implementation process. In 1991, it released a Master Plan on Privatisation to clarify the privatisation policy and strategy during the 6th MP. Between 1983 and April 2009, around 500 privatised projects were launched throughout the country as part of the privatisation programme. The government saved RM161 billion in capital spending and RM7.79 billion in annual management expenditure (or an estimated RM25 billion in 25 years).

The Government launched the Private Finance Initiative (PFI) approach as an alternative procurement tool for the public sector to construct and maintain infrastructures and other facilities under the 9th MP. It benefitted the private sector’s innovation and performance. The private sector would create assets and provide services to the public sector client. In exchange, the private sector was compensated based on the quantity, quality, and timeliness of services provided during the concession period.

In 2009, the Prime Minister’s Department formed the Privatisation and Private Finance Initiative Unit – PFI (now known as Public-Private Partnership – UKAS) as part of the economic reform effort to become more competitive. The EPU outlined the privatisation master plan in 1994 and implemented it in several stages, as shown in **Figure 5.4**.

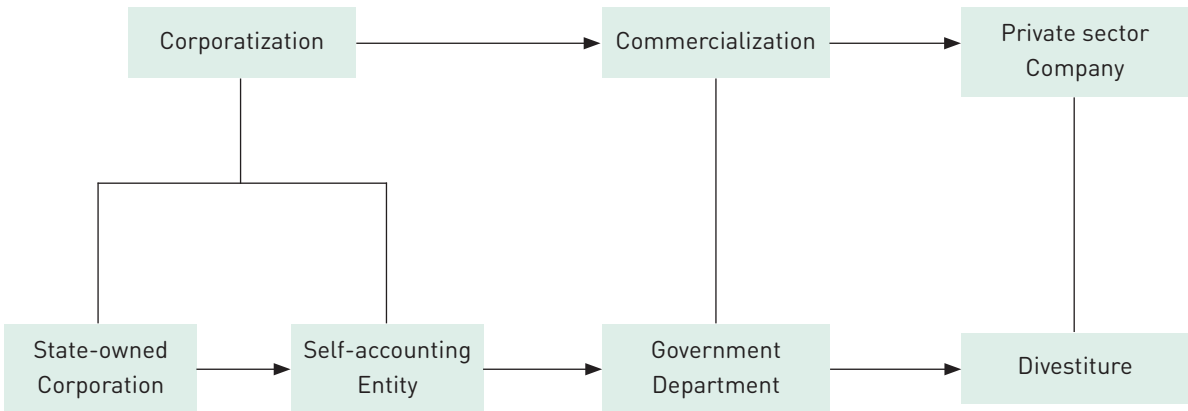


Figure 5.4: Privatisation of government department/statutory body

In general, the PPP model focuses on service delivery (output-driven) and private sector innovation and capabilities in asset/facilities maintenance during the concession duration.

Currently, UKAS operations are based on three main financial models, as shown in **Table 5.6**.

Table 5.6: UKAS financing models and example of approved projects

No	Financial Model	Project
1	Privatization	TNB was initially a government entity known as Lembaga Letrik Negara (LLN) and was transformed into a new private company.
2	BOT/BOOT	The highway company builds, operates and transfer the company back to the government after a concession period. The investment would be recouped back with toll collection. Another example is the express railway link (ERL), similar to the concept of BOT. However, it is subsidised via the public service charge to the operator annually to sustain the investment.
3	Concession	Constructing hostels or other facilities in the universities were given a concession of 20 years, in which the government agrees to pay all the charges monthly incurred. Similar to the build, maintain and transfer model.

Table 5.7, as published in UKAS (2009), lists the essential qualities that distinguish PPP from other models. PPP adoption in Malaysia has benefitted both the government and the general population. Malaysia has had many successful PPP projects that have benefitted the public, such as KL Sentral, Light Rail Transit (LRT), medical facilities, numerous highways, and bus stations.

Table 5.7: Differences between conventional, PPP, and privatisation approach

Conventional	PFI	Privatisation
Procurements are funded directly via the public budget.	Funding via private financial resources without the public sector's explicit guarantee.	Funding via private financial resources without implicit or explicit public sector guarantee.
Immediate impact on the public sector's financial position.	Impact on public budget spreads throughout the concession.	No impact on the public sector expenditure.
Risks are entirely borne by the public sector.	Risks are allocated to parties that can manage them most efficiently	Risks are entirely borne by the private sector
Extensive public sector involvement at all stages of project life.	The public sector's involvement is through enforcement of pre-agreed KPIs.	Government acts as a regulator.
Relationship with the private contractor is short term	Long duration of the relationship with private contractors.	Long duration of the relationship with private contractors.
Applicable for projects with high socio-economic returns and those justified on strategic considerations.	Applicable for projects with commercial viability.	Applicable for projects with high commercial viability

Besides, UKAS appoints an O&M contract for infrastructures built by using the public fund. One such example is the East Coast Expressway (LPT1 and LPT2).

The three ongoing land swap projects for the sewerage sector is mainly on government land gazetted under Federal Land Commissioner (PTP). The private company initiated the projects and approached the relevant ministry to discuss and implement the work upon obtaining approval. Land swap projects must go through UKAS as these projects involve a charge to the masses.

UKAS has also carried out a privatisation programme requested by a ministry such as the Ministry of Housing and Local Development (KPKT) to convert waste to energy. UKAS has assisted by calling for the request for proposal (RFP), specifying the requirement outlined by KPKT.

As a Federal entity, UKAS only facilitate federal projects that involve federal land. It handles a project with a concession period of more than seven years and a project cost of more than RM21 million. It does not intervene in state affairs. However, UKAS can assist the State Government's negotiation with private partners on a project.

Main Function of UKAS

The mission of UKAS is to drive economic transformation through strategic public-private partnerships based on integrity, innovation and the value for money principle for the wellbeing of the people. Its main functions are:

1. To provide advisory services and promote PPP programmes to the relevant Government Agencies as well as the public
2. To establish strategic collaboration with relevant agencies abroad
3. To undertake continuous research while improving the current PPP programmes from time to time
4. To negotiate terms and conditions of the concession agreement with the assistance of the Attorney General and relevant agencies
5. To formulate strategies and policies with regard to PPP
6. To plan, coordinate, implement, monitor and evaluate PPP and facilitation funds
7. To review and evaluate technical proposals and the financial aspects of PPP projects with the assistance of relevant agencies
8. To improvise and update the Guidelines of PPP from time to time

It is proposed that UKAS' role could also include:

9. To develop guidelines and framework for each type of PPP/PFI RFPs inclusive of scoring mechanism to enable consistent submission and maintain all RFPs for evaluation.
10. To enable transparency in the evaluation of PPP/PFI RFPs. All awards are to be justified and explained to the public.

UKAS Flow chart on the PFI/Privatisation Schemes in **Figure 5.5**.

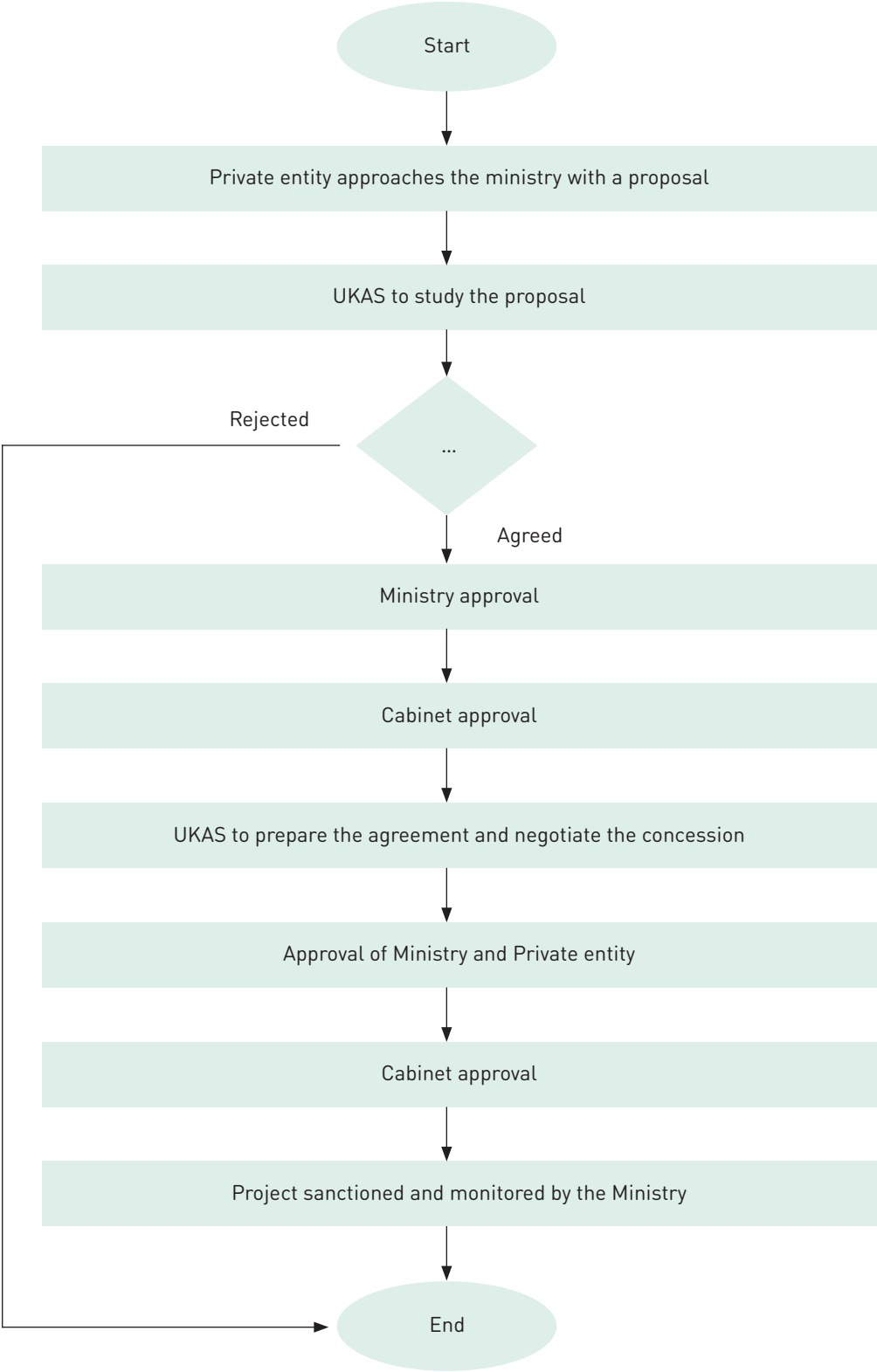


Figure 5.5: UKAS privatisation scheme flowchart

Institutional Reform: What Needs to be Done

The primary justification for privatisation is that it improves productivity and efficiency. Privatisation aims to reduce government interference in industry, preventing private sector activities from being crowded out and lowering the costs of government action. While the need for privatisation is essential, it should be followed by establishing adequate institutional mechanisms.

However, the privatisation record in Malaysia shows that the government is involved in business in different ways: it continued to intervene, perhaps less directly. Privatisation would have been successful if the government had deliberated more carefully, drawing an institutional framework that emphasised efficiency, transparency, and good governance. The Malaysian experience demonstrates the importance of 'soft' issues, such as institutional reform, because 'hard' outcomes are compromised when such matters require attention. The irregularities in the privatisation process reflect the value of regulatory reform in Malaysia, which highlighted that broader institutional reforms are required. Establishing a body that can lead to this process should be one of the main features of any institutional reform in Malaysia. The shortcomings and improprieties committed during Malaysia's privatisation process should be lessons for future action (Nambiar 2009).

The government should incorporate the following characteristics in the policy:

- i. Conduct policy research, including ones that look at the costs and benefits of policy actions to ensure that solid claims and statistical proof back up the government's desired policies.
- ii. Develop a straightforward plan to privatise public companies and properties to ensure an increase in private sector involvement and a decrease in the risk of government crowding out of industries, whereby the private sector can thrive.
- iii. Provide a platform for complaints. The organisation must have the authority to perform impartial investigations over allegations of impropriety.
- iv. The organisation can educate and disseminate information to the general public on project cost feasibility and community benefits. Simultaneously, the general public could provide feedback and input. It serves as a check and balance on special interests seeking to sway public opinion and ensure that the community's broader interests are represented.
- v. Take steps to improve the government-community relation. The organisation must meet the broader needs of the economy, and that expressing intentions and objections is an essential part of that mechanism.
- vi. Develop guidelines to evaluate all proposals submitted, include: a) credentials and experiences; b) incentives based on agreed KPIs; c) entire risks tied up to the agreed KPIs; d) skilled and experienced workforce in the proposer and they must stay with the proposer for the first five years.

5.1.1.5 National Water Resources Policy

The government endorsed the National Water Resources Policy (NWRP) policy on 22 February 2012 and launched it in March. Facilitative in nature, the NWRP was designed as a unifying policy that would guide legal and management frameworks to manage water and address the existing issues. The NWRP is essential to hasten integrated water resources management in Malaysia. It also paved the way for Federal and State agencies to resolve policy and jurisdictional disparities and update existing water laws where their provisions have become obsolete.

The NWRP is derived from the “Review of the National Water Resources (2000-2050)” and “Formulation of the National Water Resources Policy” study. The study compiled and assessed water resources availability versus demand against a backdrop of a growing population estimated at 42 million in 2050.

The NWRP’s three fundamental principles – water resources security, water resources sustainability, and collaborative governance – promote Integrated Water Resources Management (IWRM), an inclusive, consultative, and continual process towards long-term sustainability and transparency.

It is worth noting that the policy does not mention the financing aspect of water resources management as it assumed that the government would finance any project or programme under the NWRP via development expenditure, namely grants and loans. However, the NWRP states that formal and informal consultations would be part and parcel of the implementation. In that spirit, private and public sector partnerships would be encouraged and should extend towards financing.

The NWRP has four key core areas and nine thrusts (**Figure 5.6**). The policy is a blueprint for effective water management and outlines strategies for improving governance, such as establishing criteria for fair use, resolving issues, and creating water intelligence through extensive collection and collation of all water resources data.

It also emphasises the importance of raising public awareness and investment in capacity building. The NWRP should transcend the limitations of Federal and State Governments and serve as the national compass for all agencies concerning water resources management.

Long-standing issues of conflicting management objectives and competing sectoral priorities to be gradually resolved through the strategies proposed by NWRP. As recommended by the Cabinet of Ministers, the NWRP should be adopted by all Federal Government and State Government institutions.



Figure 5.6: National Water Resources Policy Overview

Although designed to address all water sectors, the NWRP does not explicitly address the water supply and sewerage sectors. Water is essentially a natural resource that needs to be secured and sustained for the use of all industries and future generations.

At its drafting, the water resources sector was under the Ministry of Natural Resources and Environment. Water supply and sewerage were a portfolio under the Ministry of Energy, Green Technology and Water (KETTHA). While the Water Services Industry Act 2006 governs the water supply and sewerage sectors, it could not prevent or resolve natural water resource conservation issues emerging from weak land development control that falls under the state's jurisdiction. Not much change was observed in the early days of the NWRP, and development continued to be driven by sectoral policies.

The ministries played a crucial role in driving a policy to fruition as it formulates policies to pursue their agendas. Yet, the success of a public policy lies in how well the said policy synchronises with other existing policies or initiatives. With the government acknowledging IWRM as early as the 8th MP, the drafting team of the NWRP ensured that stakeholder engagements were thorough and inclusive. The NWRP should complement other national policies, and it mentions at least 12 policies and national plans where the NWRP could bear some influence.

Although water security is crucial to an industry's survival, it is often absent in the narrative of many government plans and policies. For example, the National Agriculture Policy (NAP) has no mention of water resources, yet when paddy crop yield fails to meet its targets, water is cited as the contributing factor. Even though irrigation efficiency is a success criterion for optimum paddy production, there is no mention of specific initiatives in the NAP towards this.

In September 2010, the government launched the Economic Transformation Plan (ETP) to make Malaysia a high-income economy. The ETP identified twelve National Key Economic Areas, but there is no mention of the role of water resources in achieving them. Water resources are always assumed to be ever-present and sufficient to meet whatever demands.

NWRP and the Management Framework (KATS 2016-2020)

The NWRP marked the beginning of Malaysia's water transformation programme, and it needed a management team to coordinate the initiatives outlined. On 8 April 2016, the Cabinet of Ministers approved the Committee for Water Resources Management under the Ministry for Natural Resources and Environment (NRE). The committee reported to the National Water Resources Council. This structure underwent minor changes when the water sector was united under the newly formed Ministry for Water, Land and Natural Resources (KATS) in 2018.

The National Water Resources Council was renamed the National Water Council (NWC), and its organisational structure is in **Figure 5.7**. The NWC had its first sitting on 25 February 2019, chaired by the Prime Minister. Under the new arrangement, agricultural water resources management appeared isolated and the only water sector outside KATS.

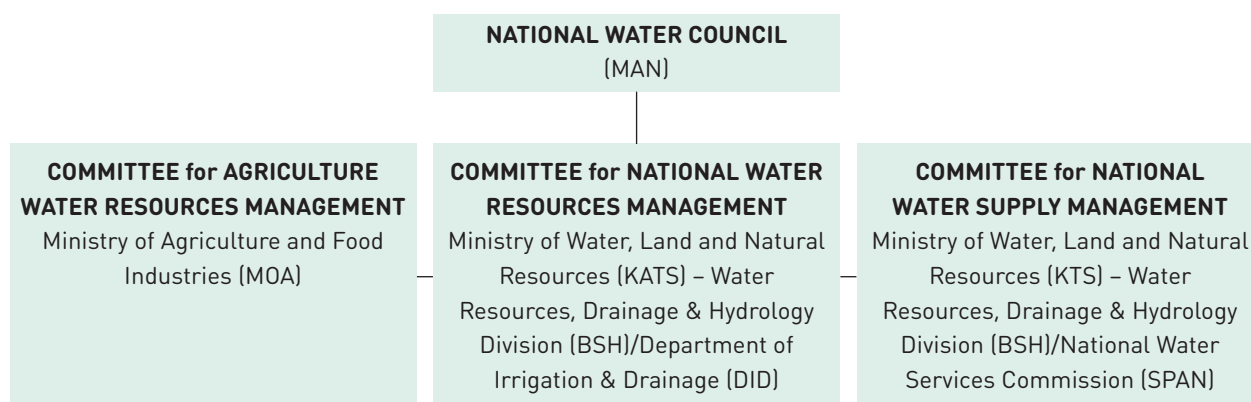


Figure 5.7: National Water Council

The management committee (**Figure 5.8**) did not entirely prevent its players from acting within their sectors. With water services and sewerage still under KETTHA (until 2018), the respective ministry/department/agency heads must clear the reports before presenting them to the main committee at NRE. Nevertheless, information exchange began to improve, which could be attributed to the diligence of individuals with shared goals. One of the most successful and dynamic committees was the Committee on Dam Safety Management which produced a list of dams in critical condition.

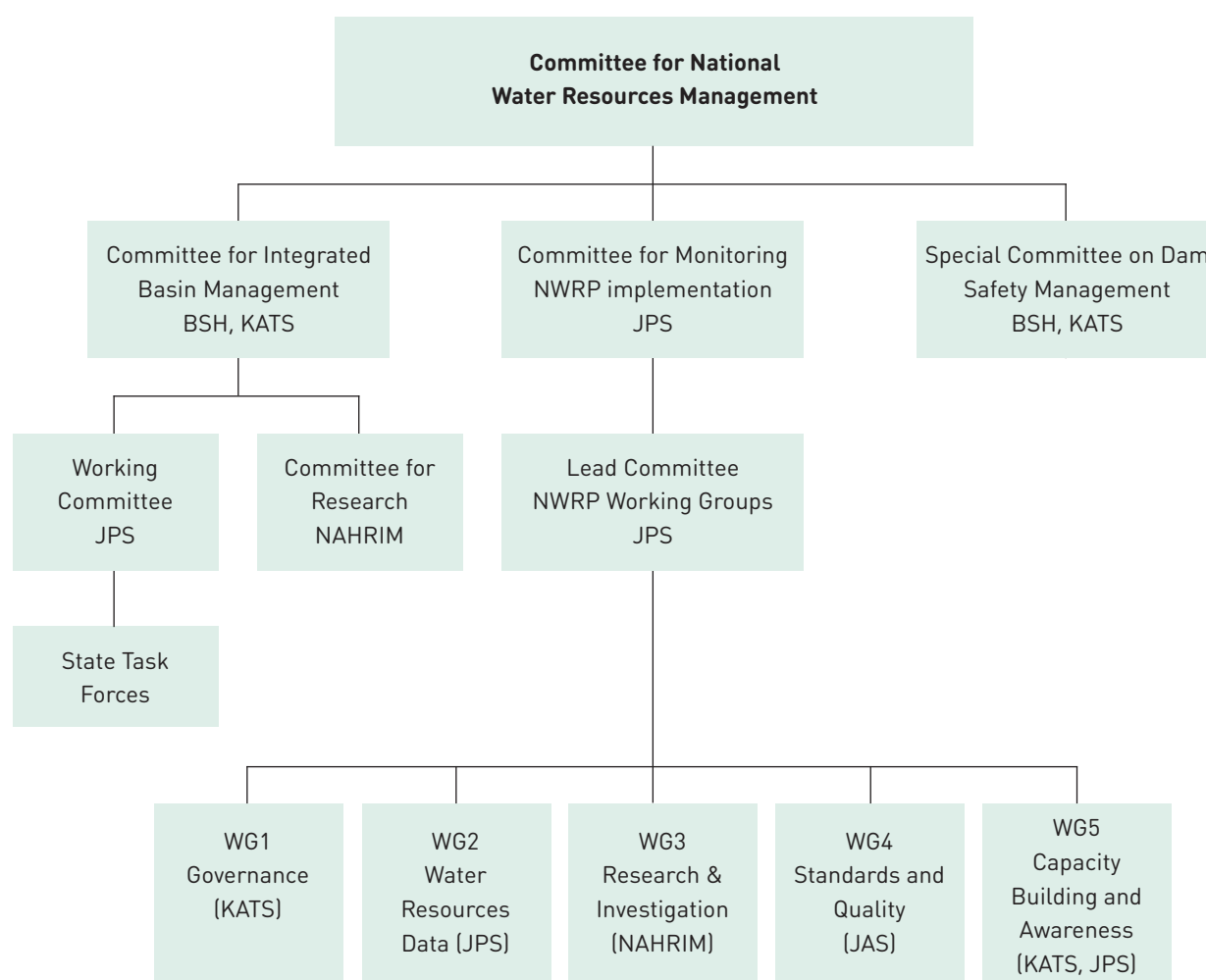


Figure 5.8: NWRP Management Framework (titles were translated from Bahasa Malaysia)

In 2018, KATS also contemplated the need to further update the NWRP into a National Water Policy (NWP). The new policy was supposed to incorporate the overarching strategies of the Water Service Industry Act 2006 with specific statements on sustainable water supply and sewerage services.

In a preliminary discussion, the agricultural water sector was also incorporated. Two schools of thought had arisen from the workshop discussions relating to NWP. One felt that the NWRP was sufficient since it encompasses all sectors and elements related to the conservation and sustainability of water as a resource. Therefore, a separate policy could cover water supply and sewerage services. The other school of thought was that there should only be one all-inclusive policy on water. The latter would require more time to establish, considering the normal consultative and approval process through which draft policies need to pass. However, the new NWP did not materialise as the ministries were restructured following the change of government on 24 February 2020.

NWRP and the Draft Water Resources Bill

Policies require laws to make adherence obligatory. In 2015, as per the “Review of National Water Resources” study recommendations, the NRE completed a draft National Water Resources Bill.

Despite engaging with the State Governments for support, this attempt by NRE to put in place a federal water resources law was not well-received. Several states were in the process of updating their water laws, and they met the introduction of the draft Water Resources Bill with trepidation.

The Ministry subsequently decided to promote the draft water resources bill as a modal law. Unfortunately, this did not have the desired effect. State Governments that were in the process of reviewing their Water Enactments chose to extract elements of the draft bill that served their purpose rather than to accept the draft bill.

In conclusion, State Governments continue to be mindful of any federal initiative perceived as infringing on their constitutional rights over water. *Lembaga Urus Air Selangor (LUAS)*, one of the most advanced states in water resources management, officially supported the idea of a unifying water resources law but already had a comprehensive State Enactment.

In hindsight, despite the Cabinet of Ministers’ endorsement of the NWRP, the State Government’s rejection of the draft bill could be attributed to the inadequate promotion of the NWRP amongst policymakers before drafting the law. The NWRP could have been leveraged as an instrument to justify applications for financial allocation. Instead, the Cabinet should present the NWRP as an essential tool in water security and obtain an endorsement from the Council of Rulers on the argument that water, like land, is the state’s constitutional right.

5.1.1.6 National Policy on Environment and Environmental Quality Act (Act 127)

Malaysia is a developing country experiencing massive economic growth over the past three decades, which caused a significant impact on the natural environment.

During the 1970s, Malaysia faced environmental pollutions in land and natural resources development caused by mining, new agricultural settlement, replanting of existing agricultural lands, logging, urban and general infrastructure development.

The problems include:

- inland water and marine pollution from multiple sources
- air pollution from traffic, industry and agricultural activities
- air pollution due to the occurrence of haze
- dangerous discharge of hazardous and toxic wastes.

As the deterioration of environmental quality continues, Malaysia has to manage the environment seriously.

The first legislative structure for environmental legislation, the Environmental Quality Act (EQA) 1974, was enacted in 1974 and went into effect in 1975 (Malaysia, 2011).

The EQA 1974 is Malaysia's most comprehensive regulation to protect the natural environment and control various pollutions. The Act also forms the fundamental mechanism to attain the objectives of the environmental policy.

Malaysia's rapid development in the early 1980s has revealed new dimensions to environmental distresses. The Act's scope and methods have been continuously revised, changed, or strengthened to pursue environmental policy goals. These changes suggest the growing complexities of Malaysia's ecological challenges. The EQA 1974 must be proactive and dynamic enough to accommodate new measures addressing complex environmental issues to conserve the environment (Mustafa, 2011).

The Department of Environment (DOE) is the primary agency empowered to enforce the Act and regulations. It is currently under KASA, created with the reorganisation of the ministry in 2020, to protect the interests and preservation of the environment. Following that, there is a need to strengthen and revise the existing legislative structure to improve environmental governance.

KASA proposed to amend Act 127 to improve the DOE's duty in pollution prevention and control. It would also allow the agency to take severe action and impose penalties against polluters.

Existing Constraints of Environmental Quality Act 1974 (Act 127)

Act 127 amendments seek to improve the act's position and work by focusing on pollution prevention, law enforcement, integrated environmental management by using the best technology, dealing with the cyclical economy, easing emerging contaminants, performance tracking, more transparent reporting and self-compliance practices. It approaches environmental concerns holistically and efficiently.

Act 127 is a legal mechanism to control environmental pollution, and the amendments are implemented through two phases as follows:

- i. Phase 1 – amendments focusing on compound elements, penalties and standards
- ii. Phase 2 – substantive amendments to deal with emerging issues in environmental governance.

Following the frequent occurrence of river pollution and resulting water disruptions, the Ministry proposed improving the existing prevention laws. Amendments to Act 127 through the first phase emphasise the following compound elements, penalties and standards:

- i. Increase the amount of compound
- ii. Amend penalty for each offence by creating a minimum fine and a maximum fine, especially for crimes involving water pollution
- iii. Establish mandatory prison sentence for offences, causing water pollution and breaches of conditions related to Environmental Impact Assessments (EIA)
- iv. Strengthen existing provisions covering specific sections of Act 127.

Meanwhile, the amendment to Phase 2 involves emerging issues such as cyclical economy, extended producer responsibility (EPR), emerging pollutants, use of technology in enforcement, including fostering accountability and self-compliance among industry and society. The approach aligned with the Malaysian Enforcement Agency Integrity Commission's (SIAP) recommendations in 2016.

Apart from taking numerous steps to ensure long-term environmental sustainability, Malaysia also articulated its pledge via international forums, most notably at the 1992 World Summit for the Environment in Brazil (also known as the Rio Summit).

Malaysia is a member of some international conventions and obligations, such as the Montreal Protocol, Basel Convention, Vienna Convention, Rotterdam Convention, regional agreements and various other directions. The country also signed the Stockholm Convention and the Minamata Convention but has yet to ratify the conventions. It requires the enactment of relevant regulations in the upcoming update of Act 127.

The recommendations outlined in these documents have been incorporated into government environmental policies. In 2002, the government adopted a National Policy on Environment (NPE) to include a policy structure for promoting a coordinated ecological management strategy (Maidin, 2005).

The main objectives of NPE are:

- Safeguard a clean, safe, healthy and productive environment for present and future generations.
- Conservation of the country's unique and diverse cultural and natural heritage with effective participation by all sectors of the society
- Sustainable lifestyles and patterns of consumption and production

Relevant Laws on Water Resources Management

The Federal Government and State Government passed several laws to safeguard the country's water resources. **Table 5.8** listed the relevant water management laws in various states. As the laws are enacted on a case-by-case basis, they overlap in many instances (Saimy & Mohamed Yusof, 2013).

Table 5.8: Significant water act and guidelines

Acts and guidelines	Responsibilities
Water Act 1920	Negeri Sembilan, Pahang, Perak, Selangor, Melaka, Penang, and the Federal Territory are the only states affected. The rules cover river property, restoration, prohibition of diversions and pollution, licencing, fines, and compensation. The Rivers and Streams Control Act is a law that regulates the flow of rivers and streams.
Water Supply Enactment (1955)	State water agencies are empowered in distributing water to domestic and commercial consumers. It only acts as a regulatory authority, overseeing the activities of the supply business and ensuring that drinking water requirements are met. It has no legal authority to compel firms to comply or to take corrective action.
Environmental Quality Act (EQA) 1974	Pollution prevention, reduction, and control, as well as environmental enhancement
Water Supply (Federal Territory of Kuala Lumpur), (Act 581)	Water supply and distribution in Selangor would apply to the Federal Territory of Kuala Lumpur, with specific changes.
Water Services Industry Act (WSIA) (Act 655)	Water supply and sewerage services moved from the State List to the Concurrent List. Its goal is to provide everyone with sustainable, dependable, and cheap water services. Water supply and sewerage services are regulated and supervised, and laws governing these services and associated concerns are enforced.
National Water Services Commission Act 2006 (Act 654)	To establish and empower SPAN to regulate the water services industry from raw water treatment to wastewater discharge

Conclusion

The strategies developed within the EQA 1974 have highlighted the importance of this legislation in providing effective and uniform protection for the environment.

The Act is fundamental in implementing the country's environmental sustainability policies. In many ways, continuous amendments of the Act reflect the constant development of environmental policies in Malaysia and the growing concern and magnitude of pollution problems and environmental degradation.

From the perspective of environmental protection through legal means, Malaysia has progressed tremendously since colonial administration and the introduction of the Act. Initially, the focus was curative, whereby criminal sanction primarily relied upon fines and imprisonment on those who violated the law.

In the mid-1980s, the focus shifted to pollution prevention. The government incorporated sustainable development concepts through various strategies, such as the environmental impact assessment. New and advanced methods were adopted to safeguard ecological quality in the long-term.

More economic measures have been adopted, which targets sectors known to be polluters, help ensure more effective and long-term environmental protection, greater environmental responsibility and direct environmental participation amongst the economic sectors. Financial instruments have a more prominent role in promoting sustainable development, as pointed out in the 7th MP.

Similarly, in the 9th MP, the government expanded economic instruments and market-based measures, including incorporating the polluters pay principle, user fees, and economic evaluation techniques. Amendments to the act also foster accountability among industry and society through effective and continuous communication and awareness activities. The government continues to update the Act according to future needs and challenges to ensure ongoing environmental preservation.

5.1.1.7 Green Technology Master Plan (GTMP) 2017-2030

The government introduced the National Green Technology Policy (NGTP) in 2009 to promote green technology to accelerate the national economy and promote sustainable development. It consisted of energy, environment, economy, and social pillars.

The policy defined Green technology (GT) as developing and applying products, equipment, and systems to conserve the natural environment and resources to minimise and reduce the negative impacts of human activities. Green technology must satisfy the following criteria:

- It minimises the degradation of the environment
- It has a zero or low greenhouse gas (GHG) emission
- It is safe to use & promotes a healthy and improved habitat for all forms of life
- It conserves the use of energy and natural resources
- It encourages the use of renewable resources

In 2015, the United Nations (UN) General Assembly introduced Sustainable Development Goals (SDG), which incorporates 17 interlinked global goals to be a “blueprint for achieving a better and more sustainable future for all”. The UN set a fifteen-year timeline (until 2030) to achieve each of the 17 goals.

To mirror the UN efforts, the Government of Malaysia introduced the Green Technology Master Plan (GTMP 2017–2030) in 2017, outlining the strategic plans for green technology development to create a low-carbon and resource-efficient economy. Malaysia had pledged to reduce its Greenhouse Gas (GHG) emission intensity of Gross Domestic Product (GDP) by up to 45% by 2030 relative to 2005 levels.

Malaysian Green Technology and Climate Change Centre (MGTC), formerly Pusat Tenaga Malaysia, is the lead agency to implement the GTMP. In October 2019, MGTC, under the Ministry of Environment and Water, had a rebranding exercise and expanded its scope to lead climate action for the nation. With this, the MGTC placed water security under adaptation sectors.

The GTMP set out the immediate course for a green growth journey. GTMP is the crucial document that anchors on the outcome approach to delivering high socio-economic and environmental impact. The success

draws upon effective cross-sectoral collaboration across various sectors to maximise its potential benefits. The production and development of green technology offer the opportunity to stimulate economic activities in multiple sectors, thus creating jobs and attracting investment.

GTMP outlines the targets of respective key focus areas, potentially generating the most noticeable socio-economic and environmental impact.

It also identified energy, manufacturing, transport, building, waste, and water as the six leading sectors for its action plan.

Currently, for the water sector, the GTMP outlines high-level goals as follow:

- Integrated river basin management: focusing on freshwater abstraction rate of 2% in 2015, 10% in 2025 and 15% in 2030
- Water harvesting technology: 60% of towns in Malaysia installed with rainwater harvesting systems by 2020
- Water treatment and distribution technology: to reduce non-revenue water (NRW) from 35.5% in 2015, to 25% in 2025, and 20% by 2030
- Water utilisation technology: to increase the number of labelled water-efficient products and to make WEPLS mandatory by 2019
- Wastewater treatment technology: 100% of sewage sludge recycled and 33% of treated sewage effluent recycled in 2030

GTMP identifies five strategic thrusts, in line with the NGTP, whereby government's intervention is essential to create conducive ecosystems for the development of green technology.

The five thrusts are i) promotion & awareness, ii) market enablers, iii) human capital development, iv) research development and commercialisation, and v) institutional framework.

The market enablers thrust outlined the green incentives and innovative financing to strengthen industry readiness to provide the green technology product and services and the financial feasibility of the green technology. The Green Technology Financing Scheme (GTFS) offers low-cost financing for green technology projects. The GTFS provides a government guarantee of 60% of the financed amount and a 2% rebate on the interest/profit rate charged by financial institutions annually.

MGTC approved 319 projects under the scheme from 2010-2017, receiving a total of RM3.6 billion in financing. The waste and water sector accounted for a meagre 13% of the total projects (MGTC Annual Report 2019). MGTC's Annual Report 2018 and 2019 showed remarkable outcomes in the energy, transport and building sectors, but not much mentioning of the impact on the water sector.

A GTMP for the Water Sector

There is a need to broaden the initiatives on the water sector holistically from source to source by examining the demand and supply chain of the water cycle loop that cuts across the various sectors. It must also include an understanding of the entire national water direction and cycle at all levels: town, district, regional, state, river basin and catchment.

There are many new potentials for GT exploration and utilisation to achieve a sustainable economy and a liveable planet for all living beings.

The catchment must refer to all waters to fulfil the total water mass balance within the specific catchment and not be restricted. For example, a complete water cycle mapping and footprint for a township like Putrajaya must be considered to ascertain the current and future needs plus potentials for social economics and environmental sustainability. It is where the actual application of GT and impacts of GHG can be scientifically monitored and sustained.

The GTMP can be further refined to look at action plans and targets for the short-term (2030), mid-term (2040) and long-term (2050).

Planning, investment, and enhanced research must be encouraged for the water sector progression and sustainability. Proper policy and enablers must also be available at all levels for the realisation of the expected outcomes.

It is recommended to have a specific and dedicated GTMP for the water sector alone. The comprehensive document shall be able to spur the roadmap towards water sustainability for Malaysia and beyond.

Every drop of water must be accountable. All intakes and discharges shall be monitored at all levels. Inventory of drains, streams, rivers, ponds and lakes related to uptake and release must be closely monitored for holistic planning purposes.

Information sharing, awareness and advocacy are equally important to realise these GTMP goals for water. Management and creative financing options need to be introduced, encompassing incentives for better water management.

Research, development, and commercialisation are crucial to overcoming the country's water management shortfalls. Application of GT, creativity and innovative ideas is more in need now than ever. Some of the following area of research in water and wastewater, and application are worth accelerations. This includes resource, treatment, consumption and distribution as depicted in the **Figure 5.9**.

With a more precise and detailed Water GTMP, Malaysia can be the leader in the water sector and drive capacity development in many parts of the world. It would further spur our economy and create new industries and jobs for many Malaysian.

In conclusion, it is the right time to review the current NGTP and GTMP to incorporate the many new ideas to enhance Malaysia's water sector. It is crucial to have holistic management, monitoring, and reporting to update the road map progress to realise the envisaged vision for all.

IWK has initiated several green initiatives such as water reclamation from treated effluent, utilisation of Biosolids for Black Soldier Fly Larvae (BSFL), utilisation of biosolids to be converted as fertilizers for non-crop initiatives, installation of solar panels, generating power from biogas and biosolids.

POTENTIAL AREAS OF RESEARCH IN WATER

GOING BEYOND COMPLIANCE,
LEADING TOWARDS RESOURCE REUSE, RECYCLE, RECOVERY



WASTEWATER – THE UNTAPPED RESOURCES

GOING BEYOND COMPLIANCE,
LEADING TOWARDS RESOURCE REUSE, RECYCLE, RECOVERY

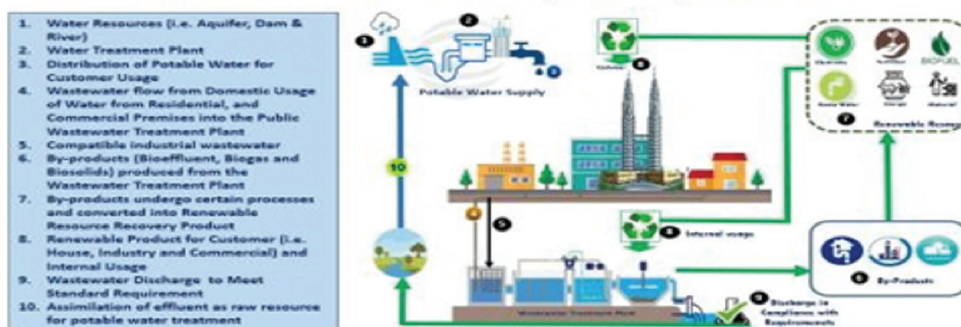


Figure 5.9: Potential area of research in water and wastewater sectors

5.1.1.8 11th Malaysia Plan

The Malaysia Plan is a five-year government development plan which started in 1956. The national development policies provide accessibility, especially economic opportunities to enable the people to achieve overall well-being regardless of race and reap the development benefits.

The government allocated DE on many water infrastructure projects via the five-year plan. It has identified several environmental initiatives, including pollution prevention and water quality, rehabilitation, beautification and cleaning of rivers, flood mitigation, and upgrading water supply and sewerage services, since the 8th MP, following the spirit of the Water Vision (Saimy & Mohamed Yusof, 2013).

The NRW reduction, rehabilitation of water treatment plants, water mains and distribution pipes have continued since the 9th MP. The 10th MP focused on IWRM, protecting polluted rivers, and restructuring the water services industry.

The 11th MP (2016–2020) strived for a future built on sound macroeconomic policy and inclusivity with no Malaysian is left behind and improved wellbeing for all. It developed strategies for future-proof human capital development, green and sustainable growth, infrastructure that supports economic expansion and a citizen-centric public service with high productivity. Collectively, these improvements ensure that everyone, regardless of gender, ethnicity, socio-economic status and geographic location, can live in a truly harmonious and progressive society that bears the mark of an advanced economy and inclusive nation.

Overview of the Malaysian Plan (1st-11th)

The aspirations of the First to the 11th MP are illustrated in **Table 5.9**.

Table 5.9: Summarised objectives and achievements of the Malaysia Plan (1st-11th)

Malaysia Plan	Years	Objectives/Implementation
1 st	1966-1970	• Focused on workforce and programmes for each economic sector and emphasised integration between Malaysian, including Sabah and Sarawak. • Formulated a specific development programme to improve the welfare of all citizens. • Several agencies were established, namely Majlis Amanah Rakyat (MARA), Malaysian Investment Development Authority (MIDA), Perbadanan Nasional Berhad (PERNAS), and Lembaga Penasihat Tarif (Tariff Advisory Board). • Created the pathway for a rapid and well-established economic initiation.
2 nd	1971-1975	• The New Economic Policy (NEP) was launched to eradicate poverty regardless of race, to address socio-economic imbalances between ethnic groups and regions. • The government focused on the public sector, especially in trade and industry; (PETRONAS) was established in 1974, and gross domestic product (GDP) increased by 7.4% due to the following factors 1. Agriculture - 25% 2. Manufacturing -19.3% 3. Trade-14.4% 4. Services -10.15%
3 rd	1976-1980	• The 3rd MP introduced the First Outline Perspective Plan (1971-1990). • The second stage of the implementation of the New Economic Policy (NEP).
4 th	1981-1985	• Focused on the rural agricultural sector. • Introduced new sectors, namely the capital investment-based heavy enterprise sector. • Introduced the Malaysian Industrial Policy studies Industrial Master Plan (IMP) programme. • GDP grew at an average rate of 5.8% per annum. Per capita income increased by 4.4% per annum, and the first national car, 'Proton Saga', was released.
5 th	1986-1990	• The goals were to achieve national unity and the objectives of the NEP; to enhance the role of the private sector in terms of company ownership, licensing and other economic activities; to increase foreign investment, especially in the export sector; and promote the agricultural and rural sectors. • Achieved human resource development in the aspects of skills training, management, entrepreneurship, construction, hospitality and shipping. • Established the Malaysia Tourism Corporation. • Introduced the "Visit Malaysia Year" in 1990.
6 th	1991-1995	• The objectives were to maintain the momentum of the country's rapid economic development and to manage the country's economic success to achieve balanced development. • Encouraged the involvement of the private sector in the national economy and accelerate privatisation programs, reduced unproductive spending. • Maintained the liberalisation policies and laws to improve the investment climate. • Transformed the existing industrial structure with the usage of more advanced technology and better quality products.

continue

continued

Malaysia Plan	Years	Objectives/Implementation
7 th	1996-2001	- The goals were to create balanced economic growth by increasing productivity; strengthen the country's economic resilience; eradicate poverty and prioritise income distribution; improve employment, education and training; and intensify privatisation programmes. - Implemented income-generation projects, such as Kuala Lumpur International Airport (KLIA), Malaysia East Asia Satellite (MEASET). - Provided facilities to improve the livelihood quality of the poor. - Implemented squatter resettlement, low-cost housing projects and housing projects for the hardcore poor (PPRT) programmes.
8 th	2002-2006	- The goals were to strengthen the nation's capacity, capability and determination to face future challenges and emphasised unity through socio-economic development. - Further emphasised for the increase of research and development (R&D) activities, primarily through information technology and telecommunications, strengthened privatisation policy and encouraged foreign direct investment (FDI), especially in the high-tech sector. - Introduced Rakan Muda programme to strengthen values and ethics.
9 th	2007-2010	- The main goal was to focus on the beginning of the second phase of Vision 2020 by prioritising aspects of soft development to ensure physical development. - Increased efforts to eradicate poverty, especially among the poorest people in rural areas. - Provided efficient and effective service facilities. - Encouraged the participation of small and medium enterprises (SMEs). - Boosted the privatisation programme.
10 th	2011-2015	- The goals were to drive the economy based on domestic factors; leveraging ethnic diversity for international success; transform into a high-income county, productivity-based growth and innovation; capitalize on equal opportunities and smart partnerships, and appreciate our national treasures. - Development based on national strength. - Created an environment for successful economic growth. - Towards exclusive socio-economic development. - Developed and maintained world-class human capital. - Created an environment to improve the quality of life. - Transformed the government towards the transformation of Malaysia.
11 th	2016-2020	- To be the last transformation in the goal of making Malaysia a developed and high-income country by 2020. Six strategic thrusts: - Enhancing inclusiveness towards an equitable society. - Improving wellbeing for all. - Accelerating human capital development for an advanced nation. - Pursuing green growth for sustainability and resilience - Strengthening infrastructure to support economic expansion. - Re-engineering economic growth for greater prosperity.

Water Policy/Funding Initiatives

The urban and rural water sectors were not given great emphasis in the two decades after Malaysia's independence in 1957. Since 1980, there has been a consistent rise in public funding dedicated to the water industry, except for the 6th MP, which saw a minor fall in spending compared to the previous plan (Padfield et al., 2016).

The Federal Government has listed many environmental goals since the 8th MP. The goals of the 11th MP in regards to the water sector are below:

- 60,000 additional homes receive clean and treated water supply
- At least 17% of terrestrial and groundwater areas are gazetted as protected areas
- The people are protected through flood mitigation projects amounting to RM2 million
- Non-revenue water of 31%
- A total of 80.0% of sewerage service coverage is connected, especially in major cities

The National Policy on Biological Diversity, 2016-2025, has been formulated to ensure the conservation and sustainable use of resources. More terrestrial and inland water and coastal and marine areas have been gazetted as protected areas.

The government needs to address several challenges to accelerate green growth, including governance, limited green technology and products, depletion of natural resources and environmental problems such as pollution, climate change and disaster risk.

The government has developed various reforms and regulatory frameworks for the water sector in the 11th MP towards the high-income status targeted by Vision 2020. The water sector-related issues were highlighted in some of the strategic thrusts (EPU, 2016).

Strategic Thrusts 11th MP (related to the water sector)

i. Enhancing Inclusiveness towards an Equitable Society

a. Improving rural infrastructure

Rural areas cover almost 75% of the total area of Malaysia. Despite continuous efforts, access to basic infrastructure such as rural roads, treated water supply and electricity in rural areas is still limited. This situation is due to higher development costs in the challenging terrain. However, providing basic infrastructure, utilities and quality services in rural areas is still needed to improve access and reduce the gap between urban and rural areas.

b. Expanding water supply coverage

Access to clean and treated water supply in rural areas remains a challenge. In 2016, Kelantan recorded the lowest percentage of access to clean and treated water supply, at 67.7%, followed by Sabah at 79% and Sarawak at 80.4%, as compared to other states which have achieved access to more than 90%. Accordingly, efforts to improve access to clean and treated water supply are available. Meanwhile, more than 30% of rural households in Kelantan choose alternative water supply sources such as wells, tube wells and gravity water systems. Therefore, alternative water supply sources continue to be expanded to meet the needs of rural households. This measure is to achieve the target of 99% coverage of clean water supply in rural areas. However, the 11th MP only achieved 96.8% coverage.

c. Improving access to water and electricity supply

Water and electricity supply coverage in Sabah and Sarawak remained lower than in other states despite a marginal increase in 2016. Sabah's water supply coverage increased from 87.9% in 2015 to 89.4% in 2016, while Sarawak rose from 94.2% in 2015 to 94.5% in 2016.

Efforts to improve access to water supply include encouraging more private companies and non-governmental organisations to provide clean water supply through CSR programmes and explore alternative sources of water supply in rural areas.

ii. Strengthening Economic Growth

Investment in new treatment plant networks and capacity continue in the water and sewerage sector, and the priority is to provide quality infrastructure. Some of the strategies are below:

a. Improving water services

Efficient and quality water services are essential for economic growth and improved well-being of the people. The final period of the Plan focused on increasing the efficiency and productivity of water supply and sewerage services, network expansion and capacity building of treatment plants, and optimisation of water use.

b. Improving the Efficiency and Productivity of Water Supply and Sewerage Services

Efforts to improve water services' coverage, quality, and efficiency to domestic and non-domestic consumers continue. Initiatives for water supply services include the implementing TSM and the water services industry restructuring. Initiatives for sewerage services include rationalising small and inefficient sewage treatment plants (STPs) to shift to regional or centralised STPs.

These initiatives increase revenue and reduce service providers' operating costs, leading to the efficiency and productivity of water supply and sewerage services.

The government has intensified the comprehensive implementation of the NRW Reduction Program by developing extensive district metering zones to monitor leaks, install new pipe meters and water tanks, replace old ones, and implement measures to improve water pressure control. In addition, it provided incentives to water operators who achieve the NRW reduction target through partial repayment of capital investment. The 11th MP target is to reduce the NRW level to 31% in 2020 but the rate remained high at 36.4% (EPU, 2021).

c. Expand the Network and Increase the Capacity of Treatment Plants

The capacity of treatment plants is enhanced by upgrading existing plants or constructing new water treatment plants and STPs, especially in high-density areas, such as Kedah and Selangor, with low reserve margins. It contributed to an additional 657 million litres per day (mld) of water treatment plants capacity, 210 million litres service reservoirs capacity as well as the installation and replacement of 367 kilometres (km) water distribution pipes (EPU, 2021).

Besides, regional and centralized STPs will be developed in major cities such as Alor Setar, Kuantan and Taiping. The government upgraded and constructed seven regional and centralised STPs with

195 km of sewer network during the 11th MP. Resource recovery facilities are also incorporated in the development of these plants to encourage waste-to-wealth initiatives (EPU, 2021).

Meanwhile, the sustainability of raw water supply for plant operations will be addressed using cost-effective alternatives such as off-river water reservoirs to store excess water from rivers.

d. Optimising Water Use

The optimal use of water resources across various sectors continues to be emphasised in the 11th MP. Accordingly, a comprehensive water demand management master plan is formulated to assist in a structured transition from supply-based to demand-based management to promote efficient and prudent water use. A national sewerage master plan is also formulated to provide an integrated and comprehensive long term policy direction to strengthen the sewerage services industry and minimize the impact on the environment.

Efficient water management and related infrastructure for the agricultural sector is also essential as the sector consumes a significant amount of water resources. A responsible attitude towards water use is instilled among farmers. Implementation of Good Agricultural Practices such as myGAP, organic and MSPO, and accurate agricultural practices further promote the efficient use of water in the sector.

Irrigation and drainage infrastructure, especially for paddy cultivation, were upgraded and better maintained to ensure food security. It contributed to an additional 10,422 hectares of irrigated paddy areas in the integrated agriculture development areas in Rompin and Pekan in Pahang, Kota Belud in Sabah, and Batang Lupar in Sarawak. A total of 1,152 farmers were trained in water management to optimise water usage (EPU, 2021).

iii. Pursuing Green Growth for Sustainability And Resilience

The government implemented several primary strategies to conserve terrestrial and inland water, coastal and marine ecosystems, conserve natural resources, and increase the income and capacity of indigenous peoples and local communities.

iv. Strengthening Resilience to Climate Change and Natural Disasters

Some of the key achievements from 2016-2017

- Develop the National Water Balance management system involving 18 river basins
- Six flood mitigation projects in Negeri Sembilan, Penang and Terengganu, have been completed
- Sixty-nine new flood mitigation projects nationwide have been approved

Uncontrolled development and non-compliance with development guidelines are often associated with increased incidence of floods and landslides. It affects economic activity, threatens lives and causes damage to infrastructure, private, public property. Malaysia experienced its worst flood disaster from December 2014 to January 2015, which affected more than 200,000 residents and had the worst impact on Kelantan, Terengganu, Pahang and Perak. In 2017, Penang experienced flash floods that involved nearly 12,000 people, in addition to a landslide in Tanjung Bungah that claimed 11 lives.

As anticipated, the integrated meteorological and flood forecasting and early warning system for the Sungai Kelantan, Pahang, and Terengganu river basins was created.

However, only 10% of terrestrial and inland water areas were gazetted as protected areas in 2018, as compared to the objective of 17% for 2020, and only 5.3% of coastal and marine regions were gazetted as protected areas in 2020, as compared to the target of 10%, due to the lengthy gazettement process and differing State Governments' conservation priorities (EPU, 2021).

The government continued to prioritise flood mitigation programmes and benefited 1.2 million people. The selected target of 2020 was to address climate change and reduce disaster risk by incorporating integrated weather and flood forecasting systems and early flood warnings to protect two million people from flood risk but only achieved 1.6 million people at the end of the Malaysia Plan cycle (EPU, 2021).

Key Achievements in the Water Sector (2016-2017)

- The water services sector in Kelantan has shifted to the asset-light model to improve the operator's financial position and service efficiency and tap into PAAB's financing
- The joint-billing pilot project in the Federal Territory of Labuan has increased the collection of sewerage service charges by 33.4% in the first year of implementation in 2016. IWK and SATU implemented the Joint Billing Initiative in March 2020.
- Upgrading four existing water treatment plants has increased production capacity by 221 million litres per day in Negeri Sembilan, Perak, Penang and Sarawak.
- Implementing a holistic non-revenue water reduction program to reduce water loss to 25% of total treated water production by 2020, including old pipes, tanks, and water meters replacement, developing a geographic information system (GIS) to map water distribution pipes accurately.
- 181 completed public sewage treatment plants have increased the coverage of sewerage services contributing to 67.9% population equivalent (PE) in 2016 compared to 65% in 2015.
- The piped water supply coverage increased from 95.5% in 2015 to 95.7% in 2016. Alternative water supply systems, such as tube wells and gravity water, were installed in areas with limited access to a piped water supply.

Continuing the Transition to the New Water Services Industry Framework

The 11th MP also set the below targets between 2016 and 2020.

Table 5.10: The 11th MP Plan Targets, 2016-2020

No	Strategy	2016	2020
1	Non-revenue water (NRW)	35.2%	31.0%
2	Coverage of connected sewerage services, especially in major cities	67.9%	80.0%
3	Residents get clean and treated water supply	95.7%	99.0%

Issues and Challenges

High NRW rates remain a significant challenge in the water services industry. The loss of treated water in the distribution network caused by leakage of pipes and water reservoirs, unbilled usage, including water theft, partly contributed by weak enforcement. The situation leads to low revenue collection and affects the maintenance of water assets, increasing the risk of water supply disruption.

Meanwhile, measures to ensure access to clean and safe water in rural areas, especially in Sabah and Sarawak, remain challenging due to the high cost of infrastructure construction.

Water supply services continue to be constrained by an inadequate supply of raw water to treatment plants due to pollution of water resources, resulting from human activities and environmental factors.

In addition, the existence of various agencies involved in water resources planning and management has contributed to the inefficiency of the service delivery system.

Water conservation efforts were also affected by low public awareness and involvement. Many property owners refused to connect to the regional STP despite massive investment in building the plants, resulting in low numbers of private sewerage facility connections in the sewerage services.

The government had identified the water sector's ineffective management as the key issues and challenges in the implementation of the 11th MP:

- i. Ineffective stakeholders' involvement and lack of ownership and ability to preserve water resources. Users have a low appreciation of the water value, as reflected in the high water consumption of 245 litres per capita per day (LCD).
- ii. Inefficient water sector governance due to incompatibility of law between federal and state. Water-related laws are outdated in pollution control and environmental management. IWRM is not effectively implemented.
- iii. Lack of data-driven and science-based decision-making contributed to inefficient management.
- iv. Limited financing capacity to fund the water infrastructures and lack of innovative financing resources.
- v. Insufficient infrastructure, especially in rural and island areas, and advanced technology adoption to efficiently manage water resources and use (EPU, 2021).

5.1.1.9 Regulatory Framework for Cash *Waqf Sukuk* Issuance

The following main Act and Regulations govern corporate *Sukuk* issuances:

- i. 2007 (revised in 2012), Capital Markets and Services Act 2007 (Act 671)
- ii. 2014, Guidelines on *Sukuk* issued by Securities Commission Malaysia
- iii. 2015 (5th MP revision, 2019), Guidelines on Issuance of Corporate Bonds and *Sukuk* to Retail Investors
- iv. 2017 (7th MP revision, 2020), Guidelines on Unlisted Capital Market Products under the Lodge and Launch Framework

The Capital Markets and Services Act 2007 (Act 671), known as CMSA, is the overarching framework that governs main capital market instruments. Part VI, Division 6 of the Act, provides for establishing the Syariah Advisory Council, Securities Commission Malaysia for Islamic capital market.

Guidelines of Sukuk, which came into effect in 2014, covers all requirements for issuance of the *Sukuk*, offering or invitation to subscribe or purchase the *Sukuk* (Part B of the Guidelines). It also outlines in Part C matters related to the approval for an issuance, offering or invitation to subscribe or purchase *Sukuk*.

Guidelines on Issuance of Corporate Bonds and Sukuk to Retail Investors (issued in 2015 with 5th MP revision in 2019) is an important document that covers the requirements for *Sukuk* if that is going to be offered to the public as a retail *Sukuk*.

The Malaysian Securities Commission has also issued **Guidelines on Unlisted Capital Market Products under the Lodge and Launch Framework**, where Socially Responsible Investment (SRI) *Sukuk* provisions have been incorporated. According to Section 7.08 of the Guidelines, the Eligible SRI projects, in brief, include:

- a. Green projects, such as renewable energy, energy efficiency, pollution prevention and control
- b. Social projects that relate to affordable basic infrastructure, access to essential services, affordable housing.
- c. *Waqf* projects that relate to the development of *Waqf* properties or assets

It is worth noting that “*Waqf* projects” are eligible for SRI projects under the Guidelines.

The Differences between Cash *Waqf Sukuk* (CWS) and Normal Corporate *Sukuk*

The world’s first *Sukuk* inaugurated in Malaysia back in 1990, when Shell MDS (M) Sdn Bhd launched a US\$125 million (RM525 million) issue in ringgit. The issuance was based on the regulations laid down by the Securities Commission of Malaysia (SC). Since then, the commission has enhanced the regulations through revisions. In addition, it also introduced new regulations such as the Lodge and Launch Framework (issued in 2015). As of today, Malaysia remains the leader in *Sukuk* issuance.

The differences between the CWS and the regular corporate *Sukuk* (**Table 5.11**) should be further examined to answer the question of whether the existing regulations are sufficient to cater for the issuance of the CWS:

Table 5.11: Difference between Corporate *Sukuk* and Cash *Waqf Sukuk*

Subject	Corporate <i>Sukuk</i>	Cash <i>Waqf Sukuk</i>
Issuer	Public listed companies, government-link companies (GLC)	Entities with <i>Waqf</i> features, i.e., no shareholders
Profit (about the <i>Sukuk</i> subscription) during the tenure of the <i>Sukuk</i>	<i>Sukuk</i> subscribers (investors)	<i>Sukuk</i> subscribers or other beneficiaries as agreed by the <i>Sukuk</i> subscribers
Profit after the tenure of the <i>Sukuk</i>	Shareholders	Beneficiaries (such as B40s and others)
Ownership of the project	Companies (with shareholders)	<i>Waqf</i> entities (without shareholders)

Potential Regulatory Issues

As explained above, the main difference between corporate *Sukuk* and the proposed cash *Waqf Sukuk* is on the issuer.

In this regard, the Capital Market and Services Act 2007 (Act 671) state the following:

“issuer” means–

- a. *in the case of shares or debentures, the corporation whose shares or debentures are being issued, offered for subscription or purchase or in respect of which an invitation to subscribe or purchase has been made;*
- b. *in the case of units of a unit trust scheme or prescribed investment scheme, the management company; and*
- c. *in the case of any other securities, the person making available, issuing, offering for subscription or purchase, or making an invitation to subscribe for or purchase, such securities;*

It can be observed that the Act does not mention the *Waqf* element in specific. The word “corporation” is further defined by the CMSA as follows:

... means anybody corporate formed or incorporated or existing within or outside Malaysia and includes any foreign company but does not include–

- a. *anybody corporate that is incorporated within Malaysia and is, by notice of the Minister charged with the responsibility for companies published in the Gazette, declared to be a public authority or an instrumentality or agency of the Government of Malaysia or of any State or to be a body corporate **which is not incorporated for commercial purposes**;*
- b. *any corporation sole;*
- c. *any society registered under any written law relating to co-operative societies; or*
- d. *any trade union registered under any written law as a trade union*

It is mentioned that a body corporate that is not incorporated for commercial purposes is excluded from the definition of a corporation. Indeed, a *Waqf* entity is not established for commercial purposes. Nevertheless, its operation resembles normal commercial corporate whereby it aims to make a profit. The only difference is that the profit will not be distributed to any shareholder. Instead, it will be distributed to beneficiaries.

It is the main grey area that requires further examination and clarification. Alternatively, to comply with the CMSA, a commercial corporation could be established. Nevertheless, the “shareholders” shall undertake to relinquish their rights to any dividend. All dividends will be distributed to the beneficiaries.

Apart from this main concern, there are no unforeseen challenges from regulatory perspectives.

5.1.1.10 Ecological Fiscal Transfer

Through the Ministry of Energy and Natural Resources (KeTSA), the Federal Government constantly strengthens synergies with State Government through various initiatives to improve forest care and conservation.

Although no special allocation has been made to State Government as compensation, the Federal Government has on average consistently allocated a development budget of RM1.54 billion to conserve forests since 2010.

The Federal Government has also introduced Ecological Fiscal Transfer for Biodiversity Conservation (EFT) in 2019 with an allocation of RM60 million to encourage the State Governments to gazette protected areas as a water catchment area and wildlife protection essential for ecosystem services. This allocation has been distributed to State Governments through the Economic, Infrastructure and Welfare Development-Based Grants (TAHAP) that states could apply.

EFT is a practice whereby the Federal Government redistributes its income from public revenues, such as taxes, to the State Government. The states are undertaking measures to conserve their natural resources, strengthen efforts to ensure the sustainability of forest resources and pay for the states development and maintenance expenses. The EFT incentive can partly solve the dilemma faced by the State Government in choosing between conservation and economic loss.

As it is, there is no formal policy to support EFT practice in Malaysia. Because of this, the State Government's initiative backfires every time they make the extra push to go green when they realise the high opportunity cost of conserving nature. In most cases, this had led them to abandon their conservation efforts later on.

With the EFT in place, the State Governments would have an official channel to bring in the necessary financial resource, to negotiate the impact of losing a considerable financial income due to the undertaken conservation efforts. Consequently, it could safeguard the interest between the state timber industrialists and the rural communities.

The EFT initiative continues in 2021 with an allocation of RM70 million as an additional incentive to State Government to implement programmes and projects to ensure biodiversity sustainability.

State Governments are encouraged to emphasise the recognition of forests as natural capital and forest beyond timber. They need to strengthen the Unique Selling Proposition (USP) for State Parks or Recreational Forests under their respective State Forestry Departments to market high-value ecotourism products more effectively.

In addition, KeTSA works with the State Governments to explore various new financial instruments to obtain conservation funds, including the United Nations Framework Convention on Climate Change (UNFCCC) instruments. One central tool is the "reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancing forest carbon stocks in developing countries" (REDD+) mechanism. The platform aims to facilitate intergovernmental cooperation on forests and climate change. Although the REDD+ instrument mainly preserves forests as carbon sinks for climate change mitigation, it could also safeguard water catchment areas in the forest.

In this regard, the private sector is encouraged to play a more significant role in providing funds for forest conservation.

Starting January 2021, KeTSA implemented the Greening Malaysia Programme through the '100 million Tree Planting Campaign' under the 12th MP to increase forested area coverage, conserve biodiversity and raise awareness at all levels. The initiative is set to fulfil the government's commitment to maintaining at least 50% of the country's land area covered by forested areas, in line with international obligations.

Moving forward, KeTSA needs to establish a policy on EFT and develop a workable model to calculate the opportunity cost of conserving the forest and make payment accordingly. In return, the State Government must implement specific measures to preserve their forests and water catchment areas and allow the Federal Government to monitor their progress.

The Federal Government could develop a financing mechanism to fund the EFT sustainably with the policy established.

5.1.1.11 Sectoral Issues and Challenges Faced

The Malaysian water sector is confronting with numerous challenges:

5.1.1.11.1 Unsustainable Water and Sewerage Service Tariff

Current water tariff rates in most states are low and do not reflect the actual cost of water supply services to consumers. On average, the water tariff rate charged on consumers in Peninsular Malaysia and WP Labuan is RM1.39 per m³ or 1,000 litres of consumption. As detailed in **Table 5.12**, the average rate of RM1.39/m³ is lower than the average OPEX of water operators at RM1.84/m³. The present rate is much lower than the overall service cost (including OPEX and CAPEX) at RM2.24/m³. Some states did not even consider the increasing OPEX and CAPEX in setting their water price because the last revision was over 20 years ago.

Table 5.12: Average current water tariff for Peninsular Malaysia and WP Labuan

State	Last Year of Review	Period of Years	Average Rates (RM/m ³)	Financial Position for the Year 2018	Lowest Tariff Position Ranking
Pahang	1983	37	0.79	-RM139 million	1
Terengganu	1997	23	0.84	RM8 million	2
Perlis	1996	24	0.85	-RM8 million	3
P. Pinang	2015	5	0.97	-RM0.1 million	4
Perak	2006	14	1.01	RM55 million	5
Kedah	2010	10	1.10	RM0.03 million	6
Kelantan	2013	7	1.13	RM1 million	7
N. Sembilan	2015	5	1.40	RM0.03 million	8
Melaka	2016	4	1.49	RM4 million	9
Selangor	2006	14	1.50	-RM1.61 billion	10
WP Labuan	2015	5	1.78	RM1 million	11
Johor	2015	5	2.21	RM116 million	12
Realised Tariff				RM1.39/m ³	
Average OPEX				RM1.84/m ³	
Average Overall Cost (OPEX + CAPEX)				RM2.24/m ³	

The State Government's unwillingness to review water tariffs also affected the water companies' financial position to cover the expanding operating costs. For example, Pahang has not reviewed its water tariffs for 37 years, Perlis for 24 years and Terengganu for 23 years. It affects the quality of the water supply services and impacts the coverage expansion and the construction of new water assets.

The unsustainable water tariff rates affected the financial position of the water companies. The financial performance of most water operators from 2018 to 2020 is at a worrying level. Of the 12 water operators, six recorded increased profits, one operator faced decline profit, four recorded a growing loss, and an operator plunged into the red.

Based on the financial position in 2020, SYABAS/Air Selangor recorded a loss of RM1.1 billion, Pengurusan Air Pahang Berhad lost RM121.2 million, Syarikat Air Melaka Bhd lost RM17.9 million, Syarikat Air Perlis lost RM10.1 million and BBA Labuan RM1.7 million. A few water companies have electricity bill arrears with Tenaga Nasional Berhad (TNB), amounting to more than RM700 million. A summary of the water operators' financial performance from 2018 to 2020 is shown in **Table 5.13**.

Table 5.13: Summary of financial performance of water operators from 2018 to 2020

Operator	Financial Performance* (RM Million)			Average Annual Increase/ Decrease Percentage
	2018	2019	2020	
PAIP	(138.5)	(48.3)	(121.2)	-4.3%
SAP	(7.1)	(10.2)	(10.1)	12.2%
SADA	0.03	(36.3)	1.0	220.5%
SAMB	2.4	(9.1)	(17.9)	-295.8%
SYABAS/Air Selangor	(1,606.1)	5,360.6	(1,112.9)	-11.5%
LAP	50.1	65.0	50.3	0.2%
PBAPP	(102.4)*	25.4	32.2	-168.0%
AKSB	1.1	0.7	0.6	-16.8%
SATU	8.2	5.8	13.4	17.7%
RSAJ	116.7	187.0	126.0	2.6%
BBAL	0.2	1.9	(1.6)	-314.9%
SAINS	0.03	2.7	2.8	364.2%

*PBAPP recorded a loss of RM102.4 million in 2018 due to payment for deferred tax liabilities of RM138 million in that year following the amendment of the Finance Act 2018

At the international level, water tariffs in Malaysia are the lowest at USD0.18/m³ as compared to Thailand (USD0.24/m³), Indonesia and Vietnam (USD0.30/m³), Philippines (USD0.35/m³), Mexico (USD0.77/m³), South Korea (USD0.92/m³), Brazil (USD2.05/m³), United Kingdom (USD4.14/m³) and Australia (USD5.15/m³).

As a result, bill collection from the low water rates could not cover the overall cost of providing services. The situation has weakened the financial standing and long-term sustainability of water operators.

Given the situation, there is a need to adjust the present water tariff rate immediately. Or else, it further weakens the financial sustainability of the water operators as well as the industry. It would also impact PAAB's ability to recover State Government loans from previously structured water supply and finance new water supply assets. If the situation prolongs, it hampers the efforts to generate economic and social prosperity for the country.

Similarly, the sewerage service is underpriced. The IWK, the principal operator of the sewerage services in Malaysia, charges RM8.00 per month on connected services and RM6.00 for the individual septic tank

(IST). The tariff is 2.15 times lower than the average cost of RM17.26/month for connected services and 3.66 times lower than RM22/month for IST. The average cost for desludging services is about RM263.37/m³, and the average volume per IST for domestic is 2m³ – the desludging service to be conducted every two years.

The tariff is insufficient to meet the OPEX, such as the rising electricity cost due to increased mechanical plants. As of Dec 2020, there are 6,077 mechanical plants as compared to 1,726 in 2000. Electricity cost contributes 30% of the total operating costs.

Besides, there is an additional cost to maintain operations of the sewage treatment plants complying with the Environmental Quality (Sewage) Regulation 2009 standards to safeguard water source quality. As of Dec 2020, there are 1,769 STPs located at upstream/water catchment areas.

There is also lack of funds for improvement programmes and other operation and maintenance initiatives towards providing efficient and better service to customers. There is more than 50% sewerage equipment under the category of ageing more than 10 years.

Since 2000, the government has injected RM2.898 billion subsidies for the operations and maintenance of sewerage services. Higher government subsidy is required to recover the gaps between revenue and operations cost.

5.1.1.11.2 Inability to Implement CAPEX and CAPEX Increase Not Balanced with Equivalent Tariff Rate Review

It requires a considerable amount of CAPEX to meet the growing water demand, adopt better treatment technology, and improve the effectiveness and efficiency of distribution methods. The scope of CAPEX includes constructing new water treatment plants, upgrading existing water treatment plants, replacing pipes/distribution systems, implementing Non-Revenue Water (NRW) reduction programs, sludge treatment, and others. It is also expensive to safeguard the quality of treated water to meet the consumers' demand and ensure supply continuity.

The National Water Services Industry Restructuring Scheme, introduced in 2007, aimed to ensure the long-term sustainability of the water services industry in Malaysia. Until now, only the states of Terengganu have not migrated to the scheme.

Migrated states can restructure water supply loans for an extended payment period (45 years) and gained access to CAPEX provided by Pengurusan Aset Air Berhad (PAAB) at a competitive repayment rate, compared to the commercial financing. Repayment is through lease rental set by PAAB. States¹ that have not participated in the scheme raise CAPEX funding through loans from the Federal Government and financial institutions. Through the scheme, the government set 45 years for the operator to achieve full cost recovery. Water operators who achieve full cost recovery could operate as a profitable business entity, ensure continuous and consistent water supply services, meet all service quality standards, and fully fund OPEX from bill collection. At the same time, the companies could reinvest their profits to improve the quality of services.

¹ Pahang, Kedah, Perlis, Terengganu

Over time, CAPEX increases due to a higher cost of building materials, consulting, technology procurement, currency exchange, etc. The water operators bear the cost through lease payments to PAAB or loan repayments to the Federal Government or financial institutions.

From 2020 to 2022, SPAN estimated that RM12 billion is required for CAPEX to improve access and quality of water supply services in Peninsular Malaysia and WP Labuan, as shown in **Table 5.14**.

Table 5.14: Water Operators' CAPEX Requirements, 2020-2022

Water Operator	CAPEX for Year 2020-2022
SAP	RM108 million
SADA	RM120 million
SAMB	RM222 million
AKSB	RM452 million
PBAPP	RM501 million
SAINS	RM607 million
LAP	RM685 million
PAIP	RM788 million
SATU	RM803 million
RSAJ	RM2,000 million
Air Selangor	RM5,400 million
BBA Labuan	Limited to allocations funded by the Federal Government

However, several water operators, such as PAIP, SAP, Air Selangor, SADA and SAINS, are not in good financial standing to implement the planned CAPEX. The implications of this situation including i) the quality of treated water does not meet the standards set by the Ministry of Health Malaysia; ii) high NRW level; iii) low water pressure problems; iv) frequent water supply disruption; v) resolution of customer complaints takes a long time; vi) low reserve margin to meet the present and future demand of consumers. The situation further hinders future economic development planning in the state concerned. **Table 5.15** summarised water operators' achievements as of the end-2020 for key performance indicators (KPIs) of water quality, NRW level and reserve margins.

To ensure the long-term sustainability of water operators and the industry, CAPEX needs to translate into the consumers' tariff so that the water operators are in excellent financial standing to pay lease rental to PAAB on CAPEX provided.

5.1.1.11.3 Insufficient Raw Water Resources Available for Treatment

Several states – Perlis, Kedah, Kelantan, Johor, and Melaka – do not have adequate raw water resources available for treatment. And it becomes critical during prolonged summer and dry season. Some states had to implement water supply rationing. For example, the State of Melaka on 29 Jan 2020 has implemented a scheduled water supply, involving 250,000 user accounts caused by the drought. The measure aimed to enable water storage in existing dams to last longer.

Table 5.15: Achievement of water operator operations for water quality KPIs, NRW and reserve margins
(As of end-2020)

Water Operator	KPI Performance					NRW Level (%)*	Reserve Margins (%)
	2016	2017	2018	2019	2020		
AiS	5/5	5/5	5/5	5/5	5/5	28.5	17.7
AKSB	2/5	1/5	4/5	4/5	2/5	51.7	0
SADA	5/5	5/5	4/5	5/5	5/5	48.4	0.5
SAP	3/5	1/5	0/5	1/5	5/5	64.9	4.2
SAJR	5/5	5/5	5/5	5/5	5/5	26.7	9.7
SAMB	4/5	5/5	5/5	4/5	3/5	30.0	11.2
PAIP	3/5	3/5	3/5	5/5	1/5	50.8	14.2
SAINS	5/5	4/5	5/5	3/5	5/5	31.8	20.0
SATU	5/5	5/5	5/5	5/5	5/5	35.5	23.6
BBA Labuan	4/5	5/5	5/5	3/5	5/5	33.6	18.7
LAP	5/5	5/5	5/5	5/5	5/5	29.9	26.2
PBAPP	5/5	5/5	5/5	5/5	5/5	23.5	30.7
National NRW level						36.4	16.3
National Reserve Margins level							16.0

Source: SPAN, 2021

Note: * Increase in NRW in 2020 is due to the implementation of MCO, which also affects the execution of NRW reduction works at the site.

In Johor, a total of 29,920 consumer accounts in four areas, including Simpang Renggam, Layang-Layang and Pontian Utara, also faced water rationing for a month starting 4 Sept 2019 due to the hot weather. It also caused the State of Johor to depend on the supply of clean water from Singapore. The state imported 70 million litres per day (MLD) of treated water from Singapore to meet the demand for the Southern Johor area, as compared to 22 MLD stipulated in the 1962 Water Agreement.

Kedah and Penang also experienced similar problems, and the situation worsened when rainfall reduced during the prolonged dry days.

5.1.1.11.4 Pollution of Water Sources

Water source pollution is one of the leading causes of water treatment plant (WTP) shutdowns, triggering water supply disruptions to consumers. The National Water Services Commission (SPAN) reported 574 cases of WTP closure in 2018 involving 4,458 hours of shutdowns. Until June 2019, a total of 216 WTP closure cases with 1,719 hours of downtime.

Pollution of water sources aggravates insufficient raw water for treatment. It frequently occurs in several states in Selangor, Johor, Melaka and Pahang. For example, in 2020, pollution in Sungai Selangor has forced the closure of four WTPs three times, and thus causing water supply disruption to more than five million consumers in Selangor and parts of Kuala Lumpur.

Also, ammonia pollution from the landfill site on Sungai Ulu Benut in April 2019 has caused the shutdown in Simpang Renggam WTP. The incident caused 23,000 premises in Simpang Renggam and Pontian to experience water cuts.

Uncontrolled agricultural activities and widespread exploration of agricultural areas also cause high turbidity in the water treatment plant's intake point that supplies water to residents in Raub, Pahang. The turbidity reached 10,000 Nephelometric Turbidity Units (NTU), which the WTP can no longer treat. Agricultural waste flows into the river as well, especially during the rainy season.

5.1.1.11.5 Low Reserve Margin

Reserve margin refers to the difference between plant design capabilities and total water supply-demand by consumers. Low reserve margin exposes the water production deficit from the water treatment plant during dry weather. According to SPAN's analysis, several states recorded a margin reserve rate below a comfortable level of 10%-15% set by SPAN. For example, Kelantan, Johor, Kedah, and Perlis recorded a reserve margin rate below the 10% level.

Low reserve margin condition does not guarantee continuous water supply in the long run. It can lead to prolonged water supply disruptions, and any shut down for maintenance work draws flak from the consumer, which affects the system's integrity. It also delays the implementation of new development projects in an area.

There is a need to balance a rapid pace of economic development with the expansion of commodity water infrastructure or impact the reserve margins. The situation occurred in the Gebeng Industrial Area, whereby the Semambu WTP with a 4% reserve margin cannot meet foreign investors' increasing demand for water supply. Semambu WTP, with a production capacity of 290 MLD, cannot meet the water demand estimated to grow to 315 MLD by 2020.

5.1.1.11.6 High Non-Revenue Water (NRW) Level

NRW is the difference between the total quantity of water production from a water treatment plant and the total quantity of water billed to the consumer. NRW has two categories of loss – physical loss and commercial loss.

Physical loss is the water loss that does not reach the consumer due to leaks in the distribution system and overflows and leaks in the service reservoir. Pipe leaks are usually associated with connecting pipes and old distribution pipes, especially Asbestos Cement (AC) pipes. Commercial loss refers to the quantity of water channelled to the consumer but not billed correctly due to inaccurate recording of water consumption reading by a damaged or worn-out meter. Another cause of NRW is water theft.

Statistics in 2020 show that the average NRW rate in Malaysia increased to 36.4% from 35.6% in 2019. Several states even recorded an NRW level that is higher than the national average. They are Perlis (64.9%), Kelantan (51.7%), Pahang (50.3%), Kedah (48.4%), Sabah (59.4%) and Sarawak (40.9%). Regionally, the NRW level in Malaysia is higher than Singapore (4%), Thailand (34%), Indonesia (51.4%) and Japan (8%).

The 36.4% of national NRW level amounted to 6,546 MLD of water loss, involving three main components: i) physical loss: 4,859 MLD (74%); ii) commercial loss: 1,551 MLD (24%); and iii) unbilled legal usage: 136 MLD (2%).

It is estimated that 1% of NRW rate equivalent to 180 MLD involves a loss of RM50.5 million. An estimated annual RM1.6 billion or equivalent to a water loss of 5,000 MLD loss. The total loss is equivalent to the water consumption in Selangor and Melaka in 2018. In 2019, the losses suffered by water operators had increased to RM1.8 billion.

The cost of reducing 1% National NRW rate is estimated at RM800 million, covering the holistic NRW programme, including replacing old pipes, which contributed to the highest cost in the NRW reduction program.

5.1.1.11.7 Limited Flood Mitigation Financing

Flood is the most significant natural hazard to Malaysia, and about 10% of Malaysia's land area is flood-prone. Without mitigation, floods cause an estimated US\$250 million in damages each year. Therefore, flood mitigation commands the lion's share of the DID's development budget.

In the 9th MP, the expenditure for flood mitigation amounted to RM5.382 billion. The figure includes the costs of surveys and site investigation, flood master plan studies and detailed design. Although the expenditure has been reduced to RM3.769 billion and RM2.073 billion in the 10th MP and 11th MP, it does not reduce flood incidences.

Flood mitigation projects are designed to reduce the frequency or occurrence of floods in a particular area. Flood maps are created based on anecdotal and photographic information. Nowadays, satellite images of flood events can provide accurate spatial information of a flood event. Flood inundation maps can be simulated by using two dimensional numerical modelling based on a rainfall event, and from there, mitigative measures can be designed.

A major flood event is often related to an extreme rainfall event, and mitigative measures are typically based on a rainfall average recurrence interval (ARI) or return period. In Malaysia, flood mitigation projects in urban settings are designed based on a hundred-year ARI event, whilst a fifty-year ARI is used for rural areas. Numerical modelling allows a with-project scenario to be modelled. From the comparison between a with-project and without-project simulated flood inundation area, the effectiveness of the proposed mitigation works can be ascertained.

Overview of Flood Mitigation Works

Flood mitigation works in Malaysia are typically financed through government development funds (grants). DID identifies projects from the flood reports in its database. Significant projects are almost always preceded by Flood Mitigation Master Plans, determining the general scope and extent of works necessary. Integrated River Basin (IRBM) Plans are vital references to a flood mitigation initiative as they provide a comprehensive outlook of the entire basin regarding water resources.

A desktop study by DID on Sungai Kemaman Flood Mitigation has revealed that a whole-basin approach to flood mitigation may reduce the cost of mitigation works by RM70 million. The approach requires a more extensive compilation of geophysical data and knowledge of development and hydrological trends. In this way, more options beyond the traditional solutions such as deepening and widening rivers, raising bunds, and constructing pump-houses can emerge. For example, the broader scope of IRBM spatial information capture may reveal swamps and lakes that channels can connect to create more cumulative storage.

Financing Flood Mitigation

Among the first projects that employed alternative financing was the Stormwater and Road Tunnel Project (SMART), operational in July 2007. The amount spent was RM1.887 billion (USD514.6 million), of which RM1.30 billion was from government coffers. The remaining portion was financed through deferred payment loans acquired by the joint-venture company MMC-GAMUDA.

As detailed in the Memorandum of Agreement cum Concession Contract, MMC-GAMUDA was given the right to operate and maintain the stormwater/traffic tunnel and collect tolls for 40 years.

Flood mitigation projects are costly, but they reduce disaster risk, contributing to faster recovery time and ultimately improving resilience. Proposals that have been put forward to the government include the following:

1. Carrying out flood mitigation works, e.g. river deepening and widening in exchange for a sand mining concession in the work area:
 - There have been many such proposals, but DID is not in favour due to the tendency of over-dredging or dredging beyond the prescribed limits.
 - Over-dredging results in deep pockets which de-stabilise the banks and cause collapse;
 - Over-dredging risk is high because the concessionaire relies on the volume of sand they sell for a more significant profit after paid royalties.
2. Constructing flood mitigation infrastructure in exchange for the right to develop state land adjacent to river reserves for commercial/residential purposes:
 - It is essentially a form of land swap where the cost of the land pays for the mitigation works.
3. Build and operate flood mitigation infrastructure in exchange for the right to generate revenue from the public through the use of the infrastructure:
 - The SMART project is probably the best and most successful example.
 - The infrastructure should have an added purpose other than flood mitigation, such as for traffic as in SMART
 - Flood mitigation requires sizeable underground storage, and it can double as a water supply source for revenue.
 - However, they must then become the primary source of water to sustain maintenance. Underground storages are complex structures and require massive engineering input, particularly in KL's Karst limestone formation.

Flood Insurance

In Malaysia, flood insurance coverage is more associated with motor vehicle insurance than property. It is not compulsory and is an added feature to the usual motor vehicle insurance coverage. Property owners can, however, insure their property from damage due to floods.

The question is how the insurance companies determine the flood risk of a particular area and how accurate their flood studies are. The government should produce flood risk maps and use them as a bias-free reference for determining the risks.

Insurance companies can then work out the premiums based on the risk (higher flood risk means costly premiums) or choose not to insure the properties constructed in flood plains.

5.1.1.11.8 Limited Financing for Solid Waste Management

Solid waste management is crucial to protecting the environment and ensuring sustainability and people's quality of life. Solid waste management is a global challenge in environmental management, as human

socio-economic activities produce tonnes of solid waste daily. It is a significant problem faced by most cities in developing countries.

Environmental Impact Deficiencies in solid waste management contaminates the environment. Wastewater from nearby landfills (leachate) carries various pollutants, in particular, heavy metals, such as Magnesium (Mg), Zinc (Zn), Copper (Cu) and lead (Pb) that causes health concern. Wastewater from food premises, workshops and vehicle wash centres are sources of pollution.

The financial limitation is critical for effective solid waste management. Local authorities lack funds to hire labours, carry out effective operations, maintaining vehicles and equipment to improve the quality of services to the public.

It is costly to carry out waste management operations from collection to the transportation of waste to landfills. Collection and transportation account for about 60% of the total budget allocated for solid waste management. Waste disposal in the urban area costs a lot more than composting. However, annual charges or taxes imposed on urban residents could not cover the high costs of ensuring service delivery efficiency – dispose of waste and maintain oil traps. There is a need for a sustainable financing scheme to address the issue and provide effective environmental management for sustainability.

5.1.1.11.9 Limited Financing for Paddy Irrigation Infrastructure

Paddy cultivation and rice production are crucial for the nation's food security. The government had set a target of achieving a self-sufficiency level of 75% for rice production.

There are three central irrigation systems in Malaysia, namely the Muda granary managed by the Muda Agricultural Development Authority (MADA), Kemubu granary system managed by Kemubu Agricultural Development Authority (KADA) and the nationwide Integrated Agricultural Development Project (IADA). The authorities' primary mandates include improving agricultural productivity, increasing farmers' income, and overseeing the irrigation infrastructures in the areas.

The irrigation system includes dams for water regulation, primary, secondary and tertiary canals, drainage, pumping stations, recycling pumps, feeder roads, bridges and tidal control gates.

The financing for the dam is mainly from a grant provided by the Federal Government or the State Government. Meanwhile, the in-situ irrigation system is built by using the public fund via MAFI. There is a lack of investment from the private sector to develop these infrastructures. Private investments in the agriculture sector predominantly focus on production outputs.

It is believed that large-scale paddy farming could attract private investment into the sector and absorb the maintenance cost of the existing irrigation infrastructure.

Under the Agriculture National Key Economic Area (NKEA) of the Economic Transformation Programme (ETP), the government implemented the entry point project 10 (EPP10) and entry point project 11 (EPP11) to scale up and strengthen paddy farming productivity in the Muda granary area and other irrigated areas.

The EPP10 and EPP11 promoted commercial-scale farming, improved irrigation density and sped up the adoption of new technologies with the target of increasing average yield to 8 tonnes per hectare by 2020 as compared with the current average yield of 5 tonnes per hectare in MADA. The irrigation density in the Muda granary is low at about 18 metres of irrigation per hectare compared to 30 meters per hectare in other granaries.

The government allocated about RM2.7 billion in EPP10, of which RM2.2 billion to intensify irrigation and RM0.5 billion as incentives for small farmers to lease their land or agree to be managed on a profit-sharing basis by large operators. For EPP11, the government spent RM1.8 billion in KADA and IADA areas mainly to encourage the farmers to outsource their land for large-scale farming (PEMANDU, 2010).

The existing facilities also required maintenance, such as changing pumps. There is also a need to increase the irrigation density of the paddy field to support higher yield. Adopting technology such as the GIS system to map the pest and disease attack areas for analysis and mitigation measures and the Supervisory Control and Data Acquisition (SCADA) system to control and monitor tidal gates also required an annual budget for maintenance.

AgroBank, the development financial institution specialising in the agricultural sector, predominantly provides loans to customers for non-infrastructure related projects.

5.1.2 Proposals for Improvement of Policy (ies)

The AWF Sub-Sector reviewed ten policies, identified the gaps and proposed several critical proposals for improvement as summarised in **Table 5.16**. Some of the proposals are already in place, awaiting implementation, for example, the amendments to the WSIA and EQA for better enforcement and change of old rules to meet future needs.

5.2 TOR Scope 2: Undertake Comparative Strategy Analysis/Business Models with Other Nations

The subsector has studied the financing models in several countries to draw lessons from these countries. The countries are Singapore, India, Japan, England, and the Netherlands.

The studies on Singapore, Japan and England, are on their overall financing models while focusing on the Hybrid annuity model in the India case study and the Water Bank model in the Netherland case study. The salient features of the lessons are summarised in **Table 5.17**.

Table 5.16: Policies reviewed and proposals for improvement

Policies Reviewed	Effective Date	Ministry Involved	Revision Findings and Proposals for Improvements
Water restructuring policy for the water services industry	2007	SPAN and PAAB	- Promoting alternative financing within migration framework - Implement water and sewerage tariff review to ensure financial sustainability of water industry
Suruhanjaya Perkhidmatan Air Negara (SPAN) Act 2006-Act 654	1 February 2007	SPAN	- Water Services Industry Act (Licensing) (Amendment) 2007 Regulations extends the current license period of 3 years to a bankable license period of 10 years or more. - Water operators can access CAPEX funding resources other than PAAB to develop water supply infrastructure
Water Services Industry Act (WSIA) - Act 655	1 January 2008		
Water Services Industry Act and Regulations	2007		
PAAB financing under migration framework	The Water Services Industry Act (WSIA 2006) was enacted, and water services industry restructuring took effect with the formation of SPAN and PAAB	PAAB	- The need to explore the alternative source of financing to improve access to funding at a fair cost while protecting PAAB's interest in migration agreement - Set up a dedicated Water Bank to complement PAAB's role in providing financing for water projects. - Review current procurement policy to allow greater involvement of water operators in project implementation - Migrating PAAB's role from Water Asset Management Company (WAMCo) to Water Holding Company (WAHco) - Review PAAB's role to include financing for the sewerage sector.
Privatisation policy	1985 - Government issued a Guideline on Privatisation 1991 - The government released a Master Plan on Privatisation to	UKAS, EPU and private sector company	- Privatisation plan in water projects ensures greater private sector involvement and minimises the government's risk of crowding out industries where the private sector can thrive. - There is a need for greater transparency for land swap projects through the request for proposal (RFP) and open tender to get the best deal - Conduct policy research, including ones that look at the costs and benefits of policy actions to ensure that factual claims and statistical proof back up the government's desired policies.

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Policies Reviewed	Effective Date	Ministry Involved	Revision Findings and Proposals for Improvements
	clarify the privatisation policy and strategy during the 6 th MP		• Develop a straightforward plan to privatise public companies and properties to ensure an increase in private sector involvement and a decrease in the risk of government crowding out of industries where the private sector can thrive. • Provide a platform for complaints. The organisation must have the authority to perform impartial investigations over allegations of impropriety. • The organisation can educate and disseminate information to the general public on project cost feasibility and community benefits. Simultaneously, the general public could provide feedback and input. It will serve as a check and balance mechanism. • Take steps to improve the government-community relationship. The organisation must meet the broader needs of the economy, and that expressing intentions and objections is an essential part of that mechanism. • Develop guidelines to evaluate all proposals submitted, include: a) credentials and experiences; b) incentives based on agreed KPIs; c) entire risks tied up to the agreed KPIs; d) skilled and experienced workforce in the proposer and they must stay with the proposer for the first five years. • Set clear direction to achieve the intended objectives. Currently, the policy is perceived as benefitting the concessionaires regarding conditions on automatic tariff revision and guaranteed compensation.
National Water Resources Policy	Endorsed by Govt on 22 February 2012 and launched in March 2012	KASA, JPS	• Financing was not mentioned in the policy as funding for water projects was deemed to rely 100% on government grants. There is a need to consider alternative financing for water resource projects while acknowledging the necessity to continue to fund projects with strategic importance for national water security • KASA should present the NWRP as an essential tool in water security and obtain an endorsement from the Council of Rulers on the argument that water, like land, is the state's constitutional right. • KASA to expedite the enactment of a comprehensive DAN that promotes the whole water value chain management covering water source, water supply and sewerage services.
National Policy on Environment and Environmental Quality Act 1974 (Act 127)	1975	KASA, DOE	• Act 127 is constantly reviewed and adaptive to tackle the current and future environmental protection challenges • There are proposals to amend the law for a stricter penalty on polluters and meeting future challenges to be carried out in two phases: ◦ Phase 1 – amendments focusing on compound elements, penalties and standards; ◦ Phase 2 – substantive amendments to deal with emerging issues in environmental governance.

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Policies Reviewed	Effective Date	Ministry Involved	Revision Findings and Proposals for Improvements
			- Integration of sustainable development elements through financial instruments and environmental impact assessment via awareness initiatives - Amendment to EQA to enhance the function of the Department of Environment to combat environmental crime such as pollution. It includes the establishment of the Environment Commission to regulate the environmental sector effectively. - Financial instruments have a more prominent role in promoting sustainable development, including incorporating the polluters pay principle, user fees, and economic evaluation techniques.
Green Technology Master Plan (GTMP) 2017-2030	Govt introduced National Green Technology Policy (NGTP) in 2009. GTMP was introduced in Oct 2017	KeTSA	- Review the GTMP & NGTP in line with SDG, Shared Prosperity Vision & WST. - It is proposed to have a Green Technology Blueprint for the water sector solely to support the implementation of GTMP & NGTP - The government to relax conditions to facilitate better and easy access to the GTFS by water sectors. In addition, the size of the GTFS fund is to be increased to provide broader coverage.
11 th MP	2016-2020	Fed Govt, State Govt	- Continue to implement water-related strategies and initiatives to improve continuous water supply, expand sewerage services coverage, enhance disaster resilience and layer a conducive environment for WST2040 to take place. - The initiatives on NRW reduction and water supply coverage continued. The fragmented governance causing inefficiency in delivery must be streamlined.
Regulatory Framework for Cash Waqf Sukuk Issuance		Securities Commission	- The existing Capital Market and Services Act 2007 and relevant guidelines on Sukuk issuance are sufficient to implement Cash Waqf Sukuk. - Act 671 did not factor in the non-profit Waqf entity as the issuer for Sukuk. Nevertheless, the Waqf entity's operation resembles normal commercial corporate whereby it aims to make a profit. The only difference is that the profit is distributed to beneficiaries. - It requires further examination and clarification. Alternatively, to comply with the CMSA, a commercial corporation could be established.
i. Capital Markets and Services Act 2007 (Act 671)	i. 2007, revised in 2012		
ii. Guidelines on Sukuk issued by Securities Commission Malaysia	ii. 2014		

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Policies Reviewed	Effective Date	Ministry Involved	Revision Findings and Proposals for Improvements
iii. Guidelines on Issuance of Corporate Bonds and <i>Sukuk</i> to Retail Investors	iii. 2015 (5 th revision, 2019)		
iv. Guidelines on Unlisted Capital Market Products under the Lodge and Launch Framework	iv. 2017 (7 th revision, 2020)		
Ecological Fiscal Transfer (EFT)	Introduced in 2019 with an allocation of RM60 million to encourage the State Governments to gazette protected areas as a water catchment area and wildlife protection essential for ecosystem services	Fed Govt (KeTSA) & State Govt	• There is no formal policy to support EFT practice in Malaysia. • The Federal Government needs to develop an EFT policy and a financing mechanism to fund the EFT sustainably. • The private sector is also encouraged to play a more significant role in providing funds for forest conservation.

Table 5.17: Lessons from comparative country studies

No	Country	Financial Mechanism	Exemplary endeavours
1	Singapore	- PUB, a corporatized public water utility, efficiently handles water services in Singapore. PUB includes private companies in technical development projects using PPP (BOT, DBOO models) schemes - Foreign bidders are invited to participate in PPPs, and long-term bonds are issued.	- Catchment conservation, self-sufficient in water, using 40% recycled water, 30% desalinated water and 20% rainwater storage - Substantial capital investments in infrastructure and technology - Water tariff restructure, an increased workforce in the water sector, low NRW, and high drinking water quality supplied
2	India	- The Hybrid Annuity model was first used in highway infrastructure and is being adopted in the water sector, especially in developing wastewater projects under the Namami Gange Programme - India has been tapping into various models: build-own-operate (BOO), build-operate-transfer (BOT), design-build-operate (DBO), design-build-operate-transfer (DBOT), among others. For the past two decades, PPP models have evolved from simple operations and maintenance (O&M) to long-terms BOT or DBO contracts	As of March 2021, the Indian government had awarded 24 sewerage projects with a total project cost of Rs 9014.27 Crore. Out of which, 15 projects in Uttar Pradesh, three projects in Bihar, and six West Bengal
3	Japan	- The State and Municipal governments are responsible for 50% to 80% of the costs, while the recipients are responsible for 20% to 50% for maintenance and administrative costs of essential water projects - The national government subsidises more than half of the expenditures involved with infrastructure building (water-related projects). It gives low-interest loans to local governments to cover the remaining funding needs while helping to develop new infrastructure. - PFI programme (BOO, BTO and BTM) to promote private participation in infrastructure development.	- Water conservation initiatives, infrastructure developments such as dams and weirs - Implementation of laws to encourage water conservation - Reclaimed waste water used for toilet flushing, industrial use, stream restoration, and flow augmentation to create "urban amenities" dominates urban wastewater reuse - Desalination, reuse of industrial wastewater, advanced water treatment methods such as activated carbon adsorption and ozonation
4	England and Wales	- Privatization movement to reduce the role of the state and keep public sector borrowing to a minimum - Corporations became owners of the whole water infrastructure and properties of the RWAs, under the Water Act of 1988 - The Act granted the corporations twenty five-year privileges in sanitation and water delivery, shielding them from any competition to create a private monopoly	- Business customers are allowed to switch to water suppliers of their preference - The Environmental Act was established to protect the environment - Privatisation increased company infrastructure investments and improved service quality - Tariff revision, improved drinking and bathing water quality and leakage reduction

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No	Country	Financial Mechanism	Exemplary endeavours
		Water trading incentives or water trading through third-party suppliers are encouraged	
5	The Netherlands	- Dutch Regional Water Authorities established the Nederlandse Waterschapsbank Bank (NWB) to fund the much-needed repairs after the 1953 flood. - NWB was established as a public limited liability company to provide money to DWAs at the lowest possible cost. - Primarily funded by private loans from institutional investors and banks - Currently, the Dutch Water Authorities control 81% of the Bank, the Dutch state owns 17%, and the provinces control 2%	- The Bank supports flood protection, water supply and quality and wastewater treatment infrastructure projects - The Bank offers the DWAs with: - long-term loans; - financial services; and - a central treasury role; - centralised finance - NWB's investments are not limited to the water sector: 63% go to social housing, 14% go to water authorities, 13% to municipalities, 7% to healthcare, and 2% to other public institutions.

5.2.1 Singapore

Singapore, a sovereign island city-state with 719 square kilometres, is densely populated with approximately 5.6 million people. Singapore receives an average rainfall of up to 2400 mm annually. However, the limited land to collect and store rainwater labels it as a water-scarce country.

In 2006, The United Nations World Water Development Report ranked Singapore at 170 out of 193 countries to availability natural water resources. Lacking big rivers and lakes, one of the biggest challenges faced by the government is the supply of clean water to the country's population, which consumes up to almost 1.5 billion litres of water per day (Tan, 2015).

Singapore recognised the importance of developing a long-term water conservation plan early on and realised its weakness in the 1960s when extreme droughts caused water shortages. Water graced one of the top national agendas when the Prime minister, Lee Kuan Yew, stated that "water dominated every other policy and every other policy had to bend at the knees for water survival" at the inaugural of Singapore International Water Week 2008.

Challenges

Singapore built its first reservoir and waterworks in 1868, and the government continued to expand its water supply infrastructure. Unfortunately, it realised early on that water supply would still be inadequate to accommodate the growing population into the 1920s, even if all potential water resources in Singapore were fully established and operated. As a result, Singapore sought water from the neighbouring Malaysia's State of Johor and signed an agreement to import water.

However, Singapore's long-term water stability became a significant concern after failed water negotiations with Malaysia between 1998-2002, and the country decided to achieve self-sufficiency in its water supply (Ng and Teo 2019).

Towards Sustainable Water Management

Singapore has always made a concerted effort to conserve its water supplies in terms of quantities and efficiency. Catchment conservation has become more critical over the years, and currently, more than half of Singapore's land area serves as a protected or partially protected catchment.

In the 1970s, Singapore explored the prospect of recycling wastewater, though the recycling plant was soon shut down as it was unprofitable and inefficient. Singapore's Public utility board (PUB) and the Ministry of the Environment collaborated on a reclamation study in 1998. For two years, reclaimed water from a prototype facility in 2000 was tracked daily. The NEWater, as the treated used water is now known, was approved by an advisory group for its purity and potability.

Desalination became a realistic option for the island with the advancement in membrane technology. Singapore's first desalination facility, with a capacity of 136,000 cubic metres per day, opened in 2005, and five more facilities are planned to be operational by 2020 (Tortajada 2006).

With these efforts, Singapore aims to become self-sufficient in water, by using 40% recycled water, 30% desalinated water, and 20% rainwater storage. Singapore is now known worldwide as a model city for sustainable water resources and an emerging Global Hydrohub – a hub for water-related business opportunities and expertise.

The focus of Singapore's water policies has changed from survival to preservation over time, and the three critical strategies for holistic water management are:

- Collect every drop of water
- Reuse water endlessly
- Desalinate more seawater

The country has devised plans to improve water conservation and self-sufficiency through more effective water management activities, such as developing and executing new water-related policies and substantial capital investments in infrastructure and technology.

Water Governance Framework

Singapore's government has been a driving force behind effective water policies, including strategies, preparation, and enforcement. Lee Kuan Yew had the vision that allowed the Ministry of the Environment and the Public Utilities Board (PUB) to accomplish the Four National Taps Strategy:

- Imported water (from Johor)
- Local catchment (reservoirs)
- NEWater (recycled water)
- Desalinated water

PUB, a corporatised public water utility founded in 1963, has efficiently handled water services in a city-state with limited freshwater capacity.

It handles water supply, from rainwater harvesting to water processing, delivery, and treatment. It underwent its first significant structural change in 2001 when the sewage and drainage divisions were transferred from the then Ministry of Environment to PUB as part of integrated water management.

PUB is a wholly government-owned utility (GOU), structured as a regulatory board under the Ministry of Environment and Water Resources (MEWR), giving it greater authority than if it were a separate ministry.

A management board, made up of government ministers and senior civil servants selected by commissions of government ministers and civil servants, manages the PUB.

The Public Utilities Act, the Sewerage and Drainage Act, the Environmental Protection and Management Act, and the Environmental Public Health Act set PUB's regulatory framework.

In addition to maintaining the availability of piped water for human use, PUB is responsible for water reclamation, irrigation system control, and upkeep. Furthermore, PUB and the public are each given different duties, and employees are held accountable for the maintenance and protection of the water facilities.

Water Infrastructure Financing Models

In response to complaints about water shortages, PUB began including private companies in technical development projects such as NEWater⁴ and desalination. Hyflux (70%) and Suez Ondeo (30%) of Singapore gained a 20-year (build-operate-transfer) BOT contract to develop Singapore's first desalination plant in 2002.

Until 2007, four NEWater Factories were built. The fourth plant, the Ulu Pandan NEWater Project, was established by PUB with a DBOO (Design-Build-Own-Operate) model, involving the private sector in the asset's operation and maintenance (O&M) (OECD 2009).

On the other hand, PUB began working with private firms as it outsourced the planning, construction, service, and management of some of its major water infrastructure schemes to private contractors, as seen in the growth of NEWater and desalination plants.

The Singapore Ministry of Finance's (MOF) core principles governed the use of private sector resources. It claims that public-private partnership (PPP) projects enable the public sector to purchase facilities at the lowest possible cost rather than actively controlling and managing properties. **Table 5.18** shows the first PPP agreement for a desalination plant in Tuas in 2003 as a Design-Build-Own-and-Operate (DBOO) scheme (Tiong et al., 2013).

As the monopoly buyer, the government proposed a tariff rate (first-year water price) of SGD 49 cents/m³. The plant supplied 10% of the country's potable water, and banks funded the initiative.

Table 5.18: Tuas Desalination Project: Private Sector Participation

Indicators	Data
Capital cost	USD143 million
Concession period	20 years
Contract ends	2025
Contract type	Build Own Operate (BOO)
Tender	Open competitive
Financing equity	USD25 million by Hyflux (70%) and Ondeo (30%)
Financing debt	USD118 million by four banks
Production capacity	136,000 m ³ /day
Plant type	Seawater reverse osmosis (SWRO)

PUB invited foreign bidders to participate in private partnerships and awarded bids on a strictly competitive basis. Given Singapore's comparatively healthy surpluses, access to private capital was not a priority for the government; instead, the government was interested in the private sector's expertise.

A second DB00 facility, a reclaimed water facility, began operations in 2011 to supply 318,500 m³ of desalinated water per day. Hyflux (sustainable products and research company) obtained a USD515 million 18-year term loan to fund the factory. To date, the PUB has completed five desalination plants and two NEWater plants.

Table 5.19 lists the PPP projects in Singapore.

Table 5.19: PPP for Desalination and NEWater Plant

PPP Project	Year
Singspring Desalination Plant	2005
Tuas South Desalination Plant (formerly known as Tuaspring Desalination Plant)	2013
Tuas Desalination Plant	2018
Marina East Desalination Plant	2020
Jurong Island Desalination Plant	2021
Keppel Seghers Ulu Pandan NEWater Plant	2007
Bedok NEWater Factory	2002
Kranji NEWater Factory	2002

The private sector and the water industry profited from PPPs in Singapore. The private companies own and invest in plants and sell the water provided to PUB, absorbing the demand risk.

PUB has demonstrated a steady success in its service quality, operating efficiency, and economic efficiency of PUB in the last decades, as showed in **Table 5.20** (Leong and Li 2017)

Table 5.20: The performance efficiency of PUB

	2008-2009	2013-2014
Customer accounts (million)	1.27	1.36
Water delivered (million m ³ /day)	1.64	1.80
Asset value (million USD)	7905	9477
Capital expenditure (million USD)	944	681
Operating expenditure (million USD)	933	1324
Drinking Water Quality (%)	100	100
Employees per thousand accounts	2.46	2.37
Leakage (%)	5.00	5.00
Capital efficiency (m ³ /USD)	0.64	0.96
Operating efficiency (m ³ /USD)	0.64	0.50

Between 1997 and 2000, PUB gradually raised water tariffs, allowing the Board to raise funds for current projects and potential investment. The water tariff was restructured in 1997 to guarantee a consistent flat rate for domestic and non-domestic consumers.

Initially, the domestic tariff was cross-subsidised by industries that paid a higher price. The policy was later abolished, and residential users had to pay a tariff rate covering all supply costs.

PUB currently uses a water pricing formula that includes a water tariff, a water conservation levy, and a waterborne and sanitary appliance rate. The average household water intake fell from 21.7 m³ to 19.3 m³ between 1995 and 2004.

Although water tariffs have risen over time, Singapore charges water at the “marginal amount” and provides substantial water subsidies as pricing remains a highly political and challenging problem.

However, due to the existence of the PPP in Singapore, the government could maintain its reputation with the private sector as long as it has solid financial status as a monopoly buyer. As a result, PUB can finance its CAPEX investments with its profits and internal savings due to this strategy.

Additionally, PUB issued bonds to raise funds. Its first bond in 2005, collected USD400 million to fund a portion of its investment scheme. CAPEX was budgeted at approximately USD200 million that year. Bonds have been issued frequently since, including USD300 million bonds with a twenty-year maturity in 2007. PUB Group also secured a USD185 million operating grant in 2010 to finance the construction and maintenance of the stormwater drainage network and the operational costs of some water supply facilities such as the Marina, Serangoon, and Punggol Reservoir schemes.

Conclusion

Singapore ranks first in Asia based on operational management metrics, with a continuous water supply and excellent water losses reduction. PUB has achieved significant efficiency without an independent regulator.

The city-state managed to safeguard water quantity and quality; manage water supply and demand; implement public and private sectors participation; achieve efficiency and equity considerations; balance the strategic national interest and economic efficiency; strengthen internal capabilities and dependence on external sources.

5.2.2 India

India is the home to nearly 1.4 billion people with significant demand for clean and safe water supply and connection to sewerage services. The country faces a water crisis, as 600 million people are coping with high to extreme water stress and 70% of households use contaminated water. It poses a grave public health risk (Singh, 2019, p. 14).

In 2019, Bank of America Merrill Lynch estimated that India must invest USD270 billion in the next five to 15 years for water infrastructures. It includes providing piped water supply, river linking projects, Namami Gange programme for Ganges River cleaning and Pradhan Mantri Krishi Sichi Yojana (PMKSY) to better use resources in the agricultural sector (FE Bureau, 2019).

At the central level, the Ministry of Water Resources is responsible for setting policies on water resource governance and preparing the budget for water projects. The Pollution Control Board is responsible for monitoring the water quality in the environment.

The municipal under the state is responsible for supplying water to the consumers. It is also tasked with preparing for wastewater treatment infrastructure to ensure the release of the pollutants adheres to the prescribed standard.

Financing Water Infrastructure in India

The central government of India utilises public funds and public-private partnerships (PPP) to finance water supply and sewerage services in the country. Government allocates funds in the form of budgetary support and grants through various schemes such as the Namami Gange Programme and a five-year development plan.

The State Government has purview over water resources and municipal water supply, funded water projects to urban local bodies (ULBs) from the state budget through transfers and grant-in-aid. The ULBs also use their resources to cover the capital expenditure of the urban water and wastewater infrastructure.

Besides, international organisations such as the World Bank, the Asian Development Bank, and Japan International Cooperation Agency (JICA) also provided a sizeable fund for water and wastewater projects in India. Between January 2018 and January 2019, the organisations granted USD7 billion funds via concessional/non-concessional loans, equity investments, grants and loan guarantees for water and wastewater projects (Indian Infrastructure, 2019).

India has been tapping into various PPP models to fund water infrastructures, such as build-own-operate (BOO), build-operate-transfer (BOT), design-build-operate (DBO), design-build-operate-transfer (DBOT), among others. For the past two decades, PPP models have evolved from simple operations and maintenance (O&M) to long-terms BOT or DBO contracts (Indian Infrastructure, 2019).

However, the existing mechanisms in the sewerage sector do not yield the desired outcome with poor-performed O&M of the plants with discharges that do not comply with the stipulated environmental standard (Centre for Water and Sanitation, 2018).

The HAM Model in India

In 2016, the Indian government adopted the hybrid annuity model (HAM), a new PPP financing model for infrastructure projects such as road, sanitation services and others to address the challenge of mobilising adequate financial resources.

HAM combines the BOT-Annuity, engineering, procurement, and construction (EPC) model to couple with a long-term BOT contract. It is considered the most practical for sectors with an uncertain revenue stream.

Under this model, the government only needs to pay 40% of the project cost during the project's construction phase and pay the remaining 60% through annuities and interests over the O&M period of 15 years. It could ease the initial cash flow pressure of the government.

The benefit of the model is that the annuity payment is tight with the performance of the O&M operator. The government could set key performance indicators (KPIs) to be met by the operator.

The model was first being used in the transport sector and later adopted in the sanitation sector. Two sets of sewage treatment plants (STP) projects in Varanasi and Haridwar under the Namami Ganga Programme or the National Mission for Clean Ganga (NMCG) are the first using this model.

The Ministry of Water Resources, River Development and Ganga Rejuvenation Department manages the NMCG programme to develop modern STPs to reduce pollution. The Ganges River is the water source for 400 million people, about 40% of India's population.

The International Finance Corporation (IFC) of the World Bank helped design the hybrid annuity structure that balanced the public and market risks and created a competitive bidding process. It engaged with potential investors to gauge the viability of the projects and the investor's interest. It also managed the bid process, including preparing and evaluating the bids (Gupta, 2019).

The Uttar Pradesh Jal Nigam implemented the project in Varanasi. It is a 50 million litres per day (MLD) STP at Ramana to rehabilitate the pumping station, raise the main bund, boundary wall and effluent disposal pipeline. Meanwhile, the Uttarakhand Pey Jal Nigam carried out the two projects in Haridwar: a 68 MLD STP at Jagjeetpur and 14 MLD STP at Sarai.

In this model, the State Government handles the land issue to clear the early hurdle for construction. It channels the fund into an Escrow Account and releases it to the special purpose vehicle (SPV) based on the project milestones. The SPV mobilises loans from private financial institutions for the capital.

The NMCG appoints an independent project manager to review the construction, supervision and KPIs' monitoring for the O&M payment for 15 years.

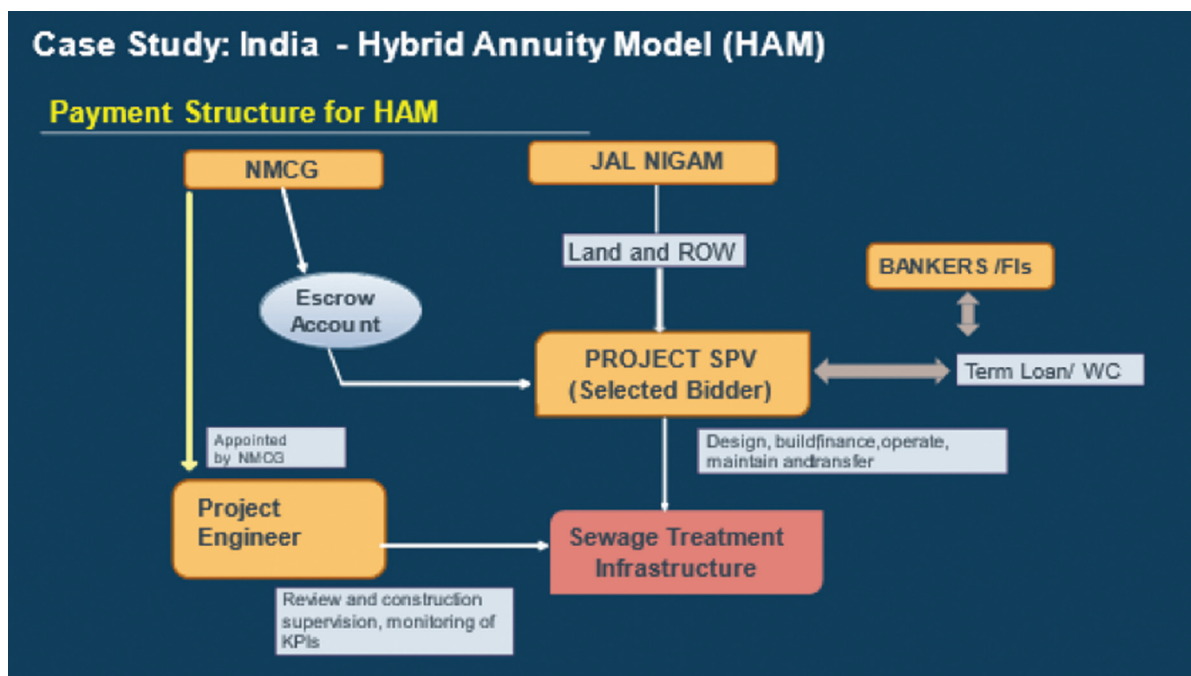


Figure 5.10: Payment structure of HAM in Haridwar projects

Following the success of the two projects, the NMCG has launched the design of hybrid-annuity projects in several cities:

1. Allahabad - (Jhusi, Naini, Phafamau)
2. Kanpur - (Unnao, Shuklaganj)
3. Kolkata - (Tolly's Nallah, Howarth)

4. Mathura
5. Patna - (Digha, Kankarbagh)

As of March 2021, data on the NMGC website showed that the Indian government had awarded 24 sewerage projects with a total project cost of Rs 9014.27 Crore. Out of which, 15 projects in Uttar Pradesh, three projects in Bihar, and six West Bengal.

The advantages and critical challenges of HAM are summarised in the table below.

Table 5.21: The advantages and critical challenges of Hybrid Annuity Model

Advantages	Critical Challenges
The government requires less initial capital for the projects (40% of the project cost).	The project's cost might be higher as the private sector has higher financing costs when mobilising 60% of the project cost.
The remaining 60% annuity payment is linked to the performance of the O&M operator.	The model may hinder small bidders from participating in the project due to high initial capital.
The government bears all the financing risk during the O&M contract period. An escrow account is set up to ensure timely payment.	It is difficult for the government to commit to a long-term annuity payment.
Less delay in project commencement as the government handles land issues for the project.	
Guaranteed annuity payment makes it easy for a contractor to obtain financing from a bank.	
Construction cost and O & M cost are indexes linked to cover inflation risk.	
Project supervision by independent Project Engineers appointed by NMCG.	

Source: Centre for Water and Sanitation, CEPT University, 2018

5.2.3 Japan

Japan is a water-rich country with abundant rainfall, little land area and a high population density. In 1994, a nationwide water shortage impacted over 16 million people owing to problems with tap water supply as well as agriculture, resulting in output losses of over 140 billion yen (USD1.28 billion).

Since then, the government actively construct dams to store water resources in response to a long-term water deficit in urban regions during fast economic expansion.

In recent years, water usage has declined due to sustained economic development, extensive use of water-saving devices in households, increased industrial water collection rates, and lower paddy field acreage. However, global climate change leads to new water problems for Japan, such as increased heavy rains and early snowmelt.

Additionally, growing population and industrial concentration, urbanisation, and ageing have radically altered the social environment and water security system. Not forgetting, the deteriorating water infrastructures,

worsening water quality, water supply capacity during catastrophes, and the public's continuous desire for safe and tasty water place additional pressures on water security in Japan (Su et al., 2019).

Water Preservation Projects

Domestic water conservation initiatives in Japan are mainly carried out by development and construction enterprises. The Japanese water resources development group is primarily responsible for designing and constructing most water conservation projects in Japan's six major water systems. In contrast, the electric power development and electric power companies are primarily responsible for hydropower projects in each water system.

On the other hand, the Japanese government continues to implement more appropriate laws to encourage water conservation initiatives. Japanese regulations require specific water conservation projects to apply different investment and sharing mechanisms in investment strategy. But, in general, the State and Municipal Governments, private investors, and beneficiaries are the investors. State and Municipal Governments are responsible for the majority of public water conservation infrastructure.

Non-public welfare water conservation projects will be comprehensively put on the market, with private investors, relevant beneficiaries and the government bearing a portion of the subsidy costs. The state and local governments benefitted from the projects, shoulder most of the cost of the initiatives, such as river control projects and soil and water conservation.

Financing for irrigation and drainage projects and other agricultural-related projects are special grants and loans from the State with favourable interest rates.

Bank loans and bond stocks account for the bulk of industrial and domestic water. The financing policy includes all levels of government funding, bank loans, society-issued bonds, self-financing, and donations. Furthermore, Japan has established a compensation mechanism to maintain and administer essential water conservation projects. The State Government and Municipal Government are responsible for 50% to 80% of the costs, while the recipients are responsible for 20% to 50% (Wang 2020).

The Japanese government has substantially invested in building drainage and sewerage networks and wastewater treatment facilities for pollution control, environmental protection, and amenities in the urban environment. The construction of sewerage and wastewater treatment facilities would result in sizeable economic investment effects because:

1. A large portion of investment would be used for construction activities rather than land purchase, which would stimulate the local economy
2. Construction activities boost business in a variety of fields, including civil, mechanical, and electrical construction and architectural design
3. Sewage projects of varying sizes that help all parts of the construction sector
4. Private sector investment supported by such works as building drainage and flush-toilet facilities, producing economic side-benefits
5. Construction work being done throughout the year, eliminating seasonal layoffs; and
6. Operation and maintenance (O&M) expenditures for the facilities help local economies.

Urban amenities dominate wastewater reuse in Japan, such as toilet flushing, industrial use, stream restoration, and flow augmentation. It contrasts with the rest of the world, where agricultural and landscape irrigation is the most beneficial use of reclaimed wastewater.

Water Resources Management Technology

Japan has created a wide range of technologies to maximise limited water resources and has laid the groundwork for economic and social development in other nations. Some of the Technological advances are:

- Technology for reuse of industrial water - 79% in a recycling rate of discharge from factories (2008)
- Desalination technology - Membrane treatment technology
- Leakage Prevention Technology - Material Improvement of pipes
- Advanced Water Treatment of Waterworks - Biological activated carbon adsorption treatment, ozonation process

Financing Water Management

The water resource management sector is a close partnership between national authorities (responsible for formulating and implementing national water resources policy – water resources development, waterworks administration, and water quality protection), and local governments (responsible for operating, maintaining, and managing waterworks, water quality protection, water treatment plants and utilities), as well as municipal utilities. They implement and oversee the mentioned measures, which are carried out close to the ultimate beneficiary. It enhances the bonds between the service provider and receiver.

Government subsidies fund water resource management at all levels, which reflects the water consumers' limited ability and willingness to pay and recognises the public goods nature of water-related services.

The National government funds the planning and the majority of new constructions. It directly subsidises more than half of the expenditures involved with infrastructure building (flood control, wastewater treatment, and agricultural water supply). It also gives low-interest loans to local governments to cover the remaining funding needs for the new infrastructure. The initial government budget for water supply related operations in Japan amounted to approximately 41 billion Japanese yen in fiscal 2021. The government spending rose significantly in fiscal 2019, rising to roughly 74 billion Yen to make the water supply systems more earthquake resistant.

While the national government uses general tax income and government bonds to fund its expenditures, the local government uses the Fiscal Investment Loan Program (FILP) and municipal bonds to support its investment and spending for water facilities. The local utilities then paid back the FLIP loans from the income.

As a result of the high level of subsidies, nearly all water consumers pay a water price below the actual cost. It has a detrimental impact on water efficiency and the incentive value of existing water prices. **Table 5.22** below shows the subsidies in Japan as a proportion of overall expenditure, as reported by the World Bank 2006 (Mattheiß et al., 2010).

Some governments have difficulties conceptualising water as a particular economic good to determine who should be accountable for its management. Practically any involvement in water management has an intended or unintended impact on the environment, society, and economy. The complicated interplay between encouraging water conservation and guaranteeing a steady income stream to support the OPEX of a water company has been considered. As a result, to maximise social efficiency while minimising deadweight losses, price should be set at long-run marginal cost.

Table 5.22: Subsidies in Japan as a proportion of overall expenditure

Objective of expenses	Financing institution	Financing resources Tax	Category of expenses (basic law on subsidies)				
			Flood Control (river law)	Sewage water (Sewage water law)	Domestic Water (Water supply law)	Industrial Water (Industrial Water Supply Business law)	Agricultural Water (Land Improvement Law)
Construction of new facilities or expansion of existing facilities	National Government	Tax and Government Bond Issuance	70%	50% or 55%	33% or 50%	40% or less	67%
	Local government	Municipal Bond issuance	30%	45% or 40.5%	-	-	33%
	Water Utilities (Beneficiaries)	Fiscal Investment and Loan Program	-	-	-	-	-
		Water Tariff Revenue	-	-	67% or 50%	60% or more	-
			-	5% or 4.5%	-	-	-
Operation, Maintenance and Management cost	National Government	Tax and Government Bond Issuance	55%	-	-	-	55% or less
	Local government	Local Tax and Local Allocation Tax	45%	-	-	-	22.5% or more
	Water Utilities (Beneficiaries)	Water Tariff Revenue	-	100%	100%	100%	22.5% or more

Low water prices, rising OPEX, inadequate infrastructure development, and poor management prevent most Asian water utilities from reaching full cost recovery, including Japan. Tariff modifications, on the other hand, are essentially outside the control of most utilities. The government controls most water resources to balance water conservation and income stability in water systems.

In certain circumstances, privatisation is used as a model to improve access to water. Still, some economists consider privatisation can foster competition because a private or public monopoly is wasteful.

Private Sector Activity

At the end of the 1990s, Japan began to implement a Private Finance Initiative (PFI) programme, following international trends to promote private participation in infrastructure development. All official and tendering documents were made exclusively in Japanese, unlike PFI applications in other Asian nations. As a result, only a few international corporations have expressed an interest in investing in Japan. Local banks, investors, and private enterprises were keen to support and participate in PFI projects due to the low yield on Japanese government bonds, macroeconomic concerns, and the massive availability of excess capital. It led to more competition amongst financiers, resulting in extremely cheap long-term interest rates (Kleiss & Imura 2006).

The Private Finance Initiative Act (PFI Act) was adopted in 1999 to improve public infrastructure by utilising private funding, engineering skills, and managerial knowledge. This strategy is founded on the premise that involving the private sector would result in better results. **Table 5.23** shows several PFI projects for water treatment plants in Japan (JICA, 2017).

Table 5.23: Water treatment plant PFI projects

No	Province	Authority	Year	Type	Target Facility
1	Tokyo	Bureau of Waterworks, Tokyo Metropolitan Government	1999	BOO	Power generation facilities for Kanamachi WTP (1.6 mil m ³ /day)
2	Tokyo	Bureau of Waterworks, Tokyo Metropolitan Government	2001	BOO	Facilities for power generation, chemical feeding, sludge treatment (Asaka Water Treatment Plant and Misono Water Treatment Plant, 2 mil m ³ /day)
3	Kanagawa	Enterprise department Kanagawa Prefecture	2003	BTO	Renewal of a sludge treatment facility for Samukawa WTP (750,000 m ³ /day)
4	Saitama	Enterprise department Saitama Prefecture	2004	BTO	Facility renewal for power generation and sludge treatment for Okubo WTP (1.3 mil m ³ /day)
5	Chiba	Waterworks Bureau Chiba Prefecture	2004	BTO	Sludge treatment facility for Nogikunosato WTP (60,000 m ³ /day)
6	Aichi	Enterprise department, Aichi Prefecture	2005	BTO	Sludge treatment facilities renewal for 4 WTP (664,000 m ³ /day)
7	Kanagawa	Yokohama City	2008	BTO	Renewal of Kawai WTP (171,000 m ³ /day)
8	Chiba	Waterworks Bureau Chiba Prefecture	2009	BTO	Sludge treatment facility renewal for Hokuso WTP (127,000 m ³ /day)
9	Hokkaido	Yubari City	2010	BTO	Renewal of 2 WTP (7,200 m ³ /day)
10	Aichi	Enterprise department Aichi Prefecture	2010	BTO	Sludge treatment facilities renewal for 6 WTP (approx... 1 mil m ³ /day)
11	Aichi	Okazaki City	2012	BTM	Rapid sand filtration facility renewal in Otogawa WTP (68,395 m ³ /day)

*BOO – Build Own Operate; BTO – Build Transfer Operate; BTM – Build Transfer Maintenance

The private-sector water activity was restricted to short-term operating contracts. Concession contracts for water services are allowed under Japan's public-private partnership (PPP) statute, adopted in 1999 and revised in 2011. However, these provisions have yet to be utilised.

Instead of liberalising the local market, the Japanese government assisted domestic enterprises in expanding abroad. Financial investors, contractors, and equipment suppliers all benefited from their assistance (Jensen 2017). Japan's privatisation attempts have focused on the water and sewerage sectors administered by municipal and regional governments.

Japan's national legislature revised the Water Supply Act in 2018 to allow municipalities to outsource operations to private companies. In 2014, the Ministry of Land, Infrastructure, Transport, and Tourism released rules for municipalities leasing sewage operations. The initiatives aimed to relieve municipalities of the debt load by establishing more efficient, privately managed platforms in charge of water management across many areas. Smaller water firms had a shakier financial base, and as a result, 33% of providers, particularly in sparsely populated areas, lost money because sales couldn't keep up with supply expenses. Lawmakers hoped that the concession deal would bring much-needed private funding to replace Japan's decade-old pipeline infrastructure.

In 2016, fewer than 40% of the major water pipelines were certified seismically resistant, according to government statistics. Local governments have been hesitant to capitalise on these assets. The principal entities that own and run the water and sewage enterprises are regional and municipal governments. They lacked human resources and expertise in concession processes. More significantly, there is an insufficient political will to begin privatisation due to concern over a massive public backlash.

The revision to the Water Supply Act sparked hostility to potential privatisation and is the biggest roadblock to the process. A rise in water bills is one of the public's top concerns, resulting in only a handful of municipalities proceeding with water and sewage management concessions.

Japan's water tariff structure has three main components, i) customer cost, include the cost of meter reading and meter cost; ii) fixed cost, covering O&M cost, depreciation cost, interest payment, and capital maintenance cost; iii) variable cost, includes electricity and chemical costs that are fluctuating. A rise in O&M cost and the asset maintenance cost result in a higher minimum rate.

The calculation steps and cost components are shown in **Figure 5.11**.

In 2018, the city of Hamamatsu, which has a population of roughly 810,000 people, was the first to hand over part of its wastewater operations to a private company, which included France's Veolia. The project came with a 2.5 billion Yen concession fee to be paid by the successful bidders. However, due to local opposition, the municipality had to hold the transfer. Therefore, the country's municipalities and citizens would need to grasp better how concession agreements might benefit them if PPP is to flourish (Fernandez, 2019).

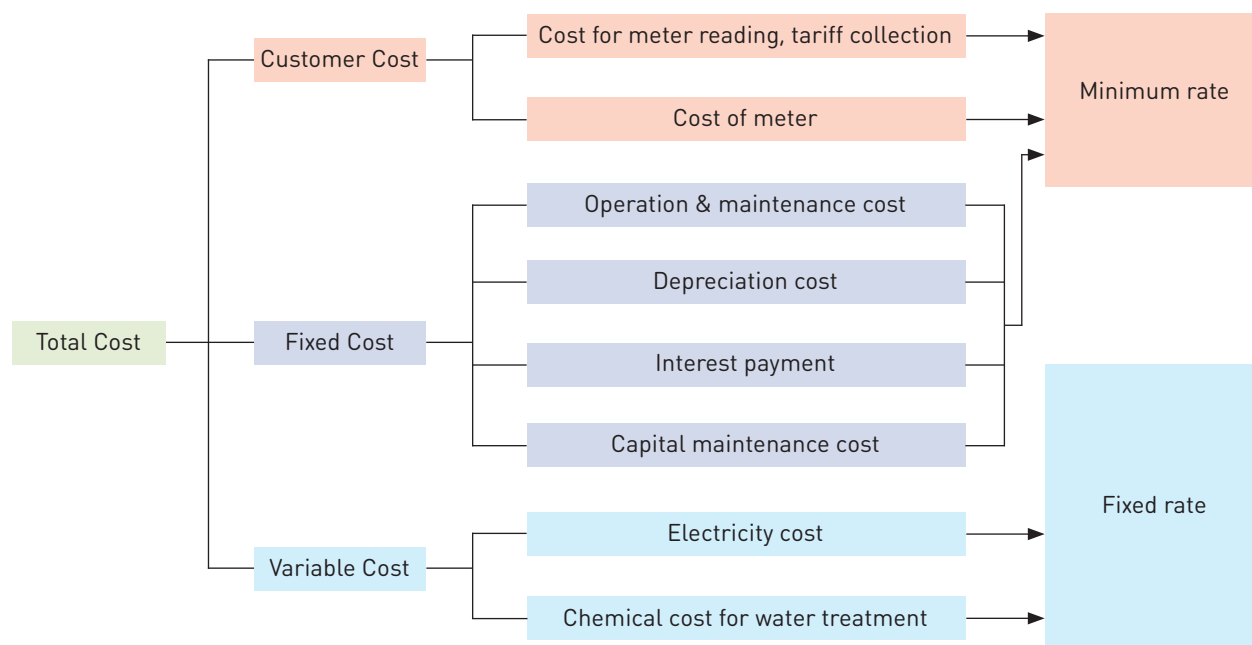


Figure 5.11: Cost components in Japan's water tariff

Conclusion

In Japan, everyone has access to an excellent water supply. Public utilities provide piped water to almost 98% of the population. Japan now boasts a nearly 100% water supply coverage, with safe drinking water available from the tap 24 hours a day. Land subsidence settlement and high water use efficiencies, such as the reuse of industrial water and leakage control, are also among the world's top achievements. Japan's water utilities had a countrywide average water leakage rate of less than 5% in 2014, which is incredibly low compared to other countries. Japan has also had success with various water conservation efforts in both the household and the workplace.

The Water Cycle Basic Act, enacted in 2014, establishes the basic concept and measures connected to the water cycle in a comprehensive and integrated manner. The government must identify each watershed's status and encourage efforts to manage and conserve water resources to create a healthy water cycle.

Water conservation requires the general public's participation. The government should carry out water-related education to raise their interest in water protection. Reducing water demand would temporarily relieve strain on water resources. However, enhancing water resource use is the key to ensuring water resource balance.

Given Japan's geographical location, the number of water resources may reduce in the future due to climate change, making it critical to adjust the water supply policy, alter the way people use water, and improve water efficiency.

Therefore, to ensure water security, Japan cannot rely solely on developing new water resources facilities due to increasing social and economic costs and properly utilising existing water resource infrastructure. Society should place a greater emphasis on risk management to ensure a secure water supply.

5.2.4 England and Wales

England and Wales's water industry was privatised in 1989. Most water and sewerage firms operate as regional monopolies, with dedicated pipe networks and water sources in each water company's service area prohibiting household customers from switching their suppliers. As a result, industry regulation is required to ensure that customers receive good value for their money. Following the advent of a competitive retail market in England in 2017, business customers can switch to another water provider.

Following privatisation under the UK Water Act 1989, four "Consolidation Acts" were introduced to clean up the law and eliminate the need to refer to prior Acts. The following were the four Acts:

- The Water Industry Act 1991
- The Water Resources Act 1991
- The Statutory Water Companies Act 1991
- The Land Drainage Act 1991

The then Prime Minister Margaret Thatcher spearheaded the privatisation movement in the United Kingdom, overseeing the sale of numerous significant companies such as British Airways, British Telecom, British Steel, and British Gas. Proponents of privatisation argued that:

- the private sector would be more efficient
- private enterprises would be better able to fund the enormous investments required; and
- privatisation would foster competition.

However, comparative studies or international examinations of public and private sector water providers' performance do not support these claims. The underlying motivation was Thatcher's neoliberal economic policies, which aimed to reduce the state's role and keep public sector borrowing to a minimum. The policies limited Regional Water Authorities (RWAs) ability to generate capital for investment, which was presented as yet another rationale for privatization. The government first suggested water privatisation in 1984, but the plans were shelved before the 1987 election due to an immense popular backlash. Once the election was accomplished, the privatisation proposal was revitalised and quickly executed.

The newly floated corporations became owners of the whole water infrastructure and properties of the RWAs under the Water Act of 1988. The Act granted them twenty five-year privileges in sanitation and water delivery, shielding them from any competition. It was the simple establishment of private monopolies. The RWAs were sold by issuing shares on the stock market, with special discounts to the general public to ensure the plan is politically acceptable. As the RWAs controlled the industry, this form of privatisation was viable and did not create any competition.

The privatisation process resulted in the creation of three regulators

- the Drinking Water Inspectorate (DWI), which monitors water quality
- the National Rivers Authority (now the Environment Agency (EA)), which monitors the river and environmental pollution
- Water Services Regulation Authority (OFWAT) regulates the industry and sets the price regime.

Meanwhile, the Department for Environment, Food and Rural Affairs (DEFRA) regulates matters relating to the environment, and the Drinking Water Inspectorate ensures the quality of drinking water.

The Thatcher administration enacted various measures to increase the profitability of privatised water firms at the cost of either taxpayers or consumers. Before privatisation, the government paid off all of the water companies debts, which totalled over £5 billion (about USD8 billion), and awarded the corporations a £1.6 billion “green dowry” (about USD2.6 billion). The government also offered the firms for sale at a significant discount, estimated to be equivalent to 22% of the enterprises’ market worth, as determined by the difference between the water firms’ issue price and the share price after the first week of trading. The first price system, established as a political act before the establishment of OFWAT, was extremely generous (Ratnayaka et al., 2009).

Sustainability and Engineering Choices

The British government defines sustainable development as “development that meets people’s ‘basic’ requirements and improves their quality of life while not compromising future generations’ quality of life.” The European Union Water Framework Directive impacts water use in the environment and directly affecting water supplies. Water supply development must incorporate the effective use of non-renewable resources (including fossil fuels), waste minimization, and recycling.

Water firms in the United Kingdom have adopted the sustainability indicators created by their trade association, Water UK, which produces an annual progress report (Water UK, 2005). However, there is still a lack of a consistent and complete strategy. Sustainability factors affect the decisions taken in the implementation of water supply developments. The industry requires the central government’s assistance to balance the water resource usage against the consequences, and the cost may be interpreted in various ways.

In the early 1990s, it was clear that the government needed to protect the entire environment against pollutions. As a result, the Environment Act of 1995 established the Environment Agency for England and Wales to take over the responsibilities of the National Rivers Authority, but with far broader powers. The three primary functions of the Agency in respect to the usage of water resources were as follows:

- All water abstractions and wastewater discharges must be licenced
- contamination of all waters must be prevented, controlled, and reduced
- flood prevention and coastal defence measures must be implemented.

Other responsibilities include: promoting the environmental and recreational advantages of water, fisheries preservation, land drainage, inland navigation management, and compliance with specific government protection measures in any region designated as a “water protection zone.” The law covers all water in rivers, lakes, and subterranean and estuarial and coastal waters three miles out to sea.

The Water Act of 2003 was designed to address a broader range of abstraction licence scenarios than the 1995 Act had anticipated.

Economic Performance

Leading up to 2000, ten years after privatisation, England and Wales experienced the highest price growth, with the water bill prices rising by 50% in real terms. The water sector claims that rate increases have been accompanied by company infrastructure investments and improved service quality since privatisation.

Because the cost of delivering services varies significantly between places, water bills change from one water provider to the next. Regional geography, varied population densities, water availability, the degree of

treatment necessary, and the level of maintenance or new infrastructure required are impacting the cost of delivering services.

The pricing review is a procedure through which OFWAT establishes price controls on what each water company may charge its customers in exchange for the services and investment it delivers. As part of this, OFWAT sets performance targets for water companies, such as affordability and vulnerable customer care, and aims to minimise leakage, pollution events, and supply disruptions. Companies that produce above and beyond their performance objectives are rewarded financially; in this sense, the pricing review serves as a policy instrument for addressing customer and government goals in these areas. Companies face financial struggles if they are to meet their performance objectives within the pricing constraints. The pricing review procedure takes place every five years, and OFWAT finalised its decision for the 2019 Price Review (PR19) in December 2019.

The requirement of a flexible framework for price controls by OFWAT:

- Enables businesses to fund the investments required to provide long-term sustainable services
- Permits the development of future regulatory measures, such as the introduction of market mechanisms that might aid in the delivery of sustainable water
- Encourages monopoly businesses to offer water and sewerage services as effectively as possible

Water Trading Incentives

Rather than creating its water resources, the water corporation responsible for delivering water in a region purchases water from a third-party supplier. It is known as water trading. Water trades can be made for either raw or processed water and are usually agreed upon as part of the water resources management plan (WRMP).

Water trading between water companies has been stable since privatisation, at roughly 4% to 5% of distribution input (water entering supply). However, water firms have spent substantially in connecting their networks and selling their water internally. Water trading at a higher level can benefit:

- consumers because it can enhance supply reliability and postpone more costly investments in developing new resources within a water company's service region
- the environment, by ensuring that water is delivered to areas where it is limited, rather than creating new resources or relying on unsustainable abstractions; and
- the water industry, by allowing water providers to share in cost savings through trading rather than investing and by enabling businesses to benefit and develop via trades.

Water trading incentives are provided for both new water exports and imports. Although many water firms currently trade water, OFWAT offered financial incentives to encourage them to do so more frequently. It also guarantees that enterprises only trade in an ecological and economically sustainable manner to avoid market power abuses. Exporters keep half of the lifetime economic earnings for all newly qualified exports in 2015-20. Under the new agreements, importers receive a 5% import incentive on the cost of water imported.

Water Company Investment

Water firms require a lot of capital investment since they have to invest in infrastructures like pipes, pumping stations, and treatment plants. Water corporations owned and maintained 345,034 km of mains pipelines, 566,884 km of sewer pipelines, 1,081 water treatment plants, and 6,341 sewage treatment plants.

The companies must maintain pipes to prevent leaks, decrease sewage floods, and enhance water quality. Treatment facilities guarantee that drinking water is high quality and safe for use and ensures sewage is handled and appropriately released into the environment. Water companies' services are almost entirely paid for by their consumers, with the rest coming from private investment. Water corporations have invested approximately £160 billion since privatisation to maintain and upgrade infrastructure and services. As a result, customers are now significantly less likely to experience service outages, sewage floods, or insufficient water pressure.

The National Audit Office reported that service quality had improved remarkably on most criteria since privatisation, including the quality of England and Wales's drinking and bathing water, in its 2015 report on economic regulation of the water business. In the decade after privatisation, leakage rates have decreased by 30%, two-thirds of beaches are rated outstanding, as compared to less than a third 25 years ago, and wildlife has returned to biologically dead rivers since the industrial revolution. And an average of £8 billion was spent every year from 2015 – 2020 to continue advancing.

Conclusion

Over 50 million home and non-home customers in England and Wales benefit from high-quality water, sanitation, and drainage services every day. Thirty-two private firms provide these services. Since the privatisation of the water and sewerage business in 1989, a regulatory framework has been in place to guarantee that consumers receive high-quality service at a reasonable cost. Thanks to this structure, the corporations have invested more than £130 billion in maintaining and enhancing assets and services.

In addition, the sector must adhere to national and European regulations. It is challenging to hold water firms accountable in the long run since they have to make investments today to benefit future generations later.

On the other hand, OFWAT ensures all businesses are encouraged to make balanced decisions that include customers' present and future demands. OFWAT also works with stakeholders and the government to achieve UK's carbon target, meet social policy obligations, improve the local environment, and increase the competitiveness of the UK economy.

5.2.5 The Netherlands

Approximately two-thirds of the Netherlands lies beneath the sea or river levels. In the 13th century, farmers and landowners formed water boards to safeguard their land from flooding. The major river flooding in 1926 put a massive strain on the Dutch Water Authorities (DWA), who had to repair dikes and improve the drainage system.

These infrastructure projects necessitated significant investment, but brokers charged very high commissions. To cut commission expenses for each DWA, the newly formed Association of Regional Water Authorities established a credit bureau in 1927 to mediate the loan process. However, the DWAs had to pay relatively high interest rates, which were excessive considering their outstanding creditworthiness.

Water investment was sorely needed after World War II, but cash was scarce at the time, and commercial banks only gave short-term loans. In the early 1950s, the Association of Regional Water Authorities issued two long-term bonds, backed by several DWAs, to avoid a stall in water infrastructure investment. While this temporarily helped the DWAs' financial problem, the Association lacked the financial resources to continue lending on a big scale.

After the disastrous flood of 1953, which killed over 2,000 people, the Dutch regional water authorities established the Nederlandse Waterschapsbank Bank (NWB Bank), which successfully obtained funding for the much-needed repairs in the aftermath of the flood.

NWB was established as a public limited liability company to provide money to DWAs at the lowest possible cost. The Bank was primarily funded by private loans from institutional investors and banks, allowing the DWAs to access funds at comparatively cheap interest rates.

Apart from flood protection, the NWB also supports water supply and quality and wastewater treatment infrastructure. NWB assists water authorities in obtaining risk-free finance and promotes public health services and education for water and other related initiatives. As RWAs can create their tax structure and generate income to operate, maintain, and improve treatment facilities, risk-free capital was assured (Vij et al., 2021).

Because NWB solely loans to the public sector, it poses no risk, and thus its credit rating is triple A. NWB Bank's balance sheet was over 88 billion euros in 2013, and the bank grants roughly 5 billion euros in new loans each year. Regional water agencies, the state, and several provinces all own shares in the bank (Havekes et al., 2013). The financing mechanism of the Dutch water sector is shown in **Table 5.24** below.

Table 5.24: Financial mechanism and responsibilities in the Dutch water sector

Function	Financial mechanism	Responsibility/Organization
Flood protection, water quantity and quality (main system)	General resources, pollution levy national waters	State (public)
Groundwater	Regional tax	Province (public)
Flood protection, water quantity and quality (regional)	Regional tax	Water authority (public)
Wastewater treatment	Regional tax	Water authority (public)
Drinking water supply	Price	Water companies (semi-public)
Sewerage	Local tax	Municipalities (public)

Source: Acioly et al. 2016

Today's Dutch Water Bank

The DWAs control 81% of the Bank, the Dutch state owns 17%, and the provinces control 2%. The Bank offers the DWAs with:

- i. long-term loans
- ii. financial services
- iii. a central treasury role
- iv. centralised financial expertise
- v. low-interest rates

Today, NWB's investments are not limited to the water sector: 63% go to social housing, 14% to water authorities, 13% to municipalities, 7% to healthcare, and 2% to other public institutions.

The Bank's lending totalled €5 billion in the first half of 2015. The DWAs continue to rely heavily on the Bank, which holds 82% of their long-term loans. Each year, the DWAs invest €1.3 billion, 34% going towards flood protection infrastructure, 32% into water systems, 26% towards wastewater treatment, and 8% going into other projects.

The Bank has also issued green bonds solely for climate-friendly DWA sustainability initiatives since June 2014. Credit rating firms Standard & Poor's and Moody's have given the NWB Bank AA+/Aaa ratings and are under the European Central Bank's direct supervision (ECB).

From the beginning, investors had to have faith in NWB to attract enough initial capital to ensure the Bank's long-term viability. The DWAs are viewed as generally risk-free due to their excellent financial foundation and relative independence, ensuring that the NWB Bank receives long-term loans to finance its big investments.

Conclusion

NWB is the first and, so far, the only Water Bank in the world. The NWB Bank has over 60 years of expertise and offers various services and a wealth of information for anyone looking for institutional financing or assistance with water management. NWB is the public water sector's bank, an essential financial service provider in the Dutch public sector, and the Netherlands' go-to partner for financing sustainability. The NWB positions itself as a long-term water bank and has been rated as one of the top 10 secure financial institutions.

5.3 TOR Scope 3: Study Potential of the Nation's Water Sector Industry Taking into Consideration Current Global Markets Towards Making the Water Sector As a Dynamic New Economic Sector capable of Driving the Nation's GDP Growth in the Future

This Scope is elaborated in Water as an Economic Sector (WES) (Volume IX).

5.4 TOR Scope 4: Prepare a Transformation Strategy and Initiative Implementation Framework for each of the 4 Phases including the Implementing Agencies, Estimated Budgets and Main Target Achievements Based on the Analyses Undertaken and Expert Reviews:

KASA, which oversees the water portfolio, is the lead ministry in implementing the transformation strategy in the four phases of the WST2040. KASA plays a vital role in setting policies and coordinating the management of water ecosystems, including water resources, water services industry, environmental water, and water-related disaster risk. The other primary agencies include KPLB, focusing on rural water supply coverage, MAFI handling paddy irrigation and MPIC managing water for the plantation sector.

Focus Strategy for the 12th MP (2021-2025)

Considering the current situation and future needs of the water sector in Malaysia, the following strategies are the focus of the 12th MP:

a. Reforming the Water Services Industry

- Reform the water services industry benchmarking on other industries; and
- Emulate best practices from other countries in reforming the water service according to local needs.

b. Strengthening Financial Sustainability of Water Services Providers

- Implementation of tariff setting mechanism for water supply and sewerage services
- Carry out tariff revision for water supply services

c. Enhancing Innovative Financing for Water Sector

- Consider the establishment of a new facility license entity to develop sewerage infrastructure with the option for repayment for Capex only and Capex and Opex combined model
- Encourage the private sector to invest in mutually beneficial water sector transformation projects
- Institutionalize existing ecological fiscal transfer mechanism
- Promote payment for ecosystem services
- Optimize the Green Technology Financing Scheme to encourage water savings and circular economy practices amongst the water-intensive industries

d. Promoting Disaster Risk Financing

- Establish alternative disaster relief funds to complement disaster-related public funding.
- Explore flexible social protection systems through disaster risk transfer mechanisms, including disaster risk insurance.
- Promote the role of the insurance market to incorporate proper risks management to mitigate risk to the economy and provide a source of finance to the incurred damages and losses.

The successful implementation of the 12th MP requires strategic intervention and concerted efforts from the Federal Government, State Government, water operators, private sector, NGOs, and consumers.

It also requires macro planning to optimise usage of resources across the value chain and ease into the circular economy through reuse and recycle water-related by products. The strategy encourages water services operators to expand their non-tariff revenue from reclaiming wastewater for non-potable use, recycling bio-effluent or bio-solids, and generate renewable energy such as biogas.

Given the country's economic standing and current fiscal policy, it is realistic for the government to consider limited spending on development projects in the policy formulation. Thus, a strategy for alternative water financing needs to be articulated for 2021-2025 and beyond (2026-2040). It ensures that the financial constraint does not hinder the country's progress in achieving the aspiration of Water Sector Transformation by 2040.

The strategy aims to layer a strong foundation for alternative financing to take place. The strategy will progressively shift the current financing model to the mix financing model. The contribution of alternative financing is expected to grow from 10% in 2025 to 40% in 2040, increasing by 10% in every phase.

The financial mix targets for each phase in **Figure 5.12**.

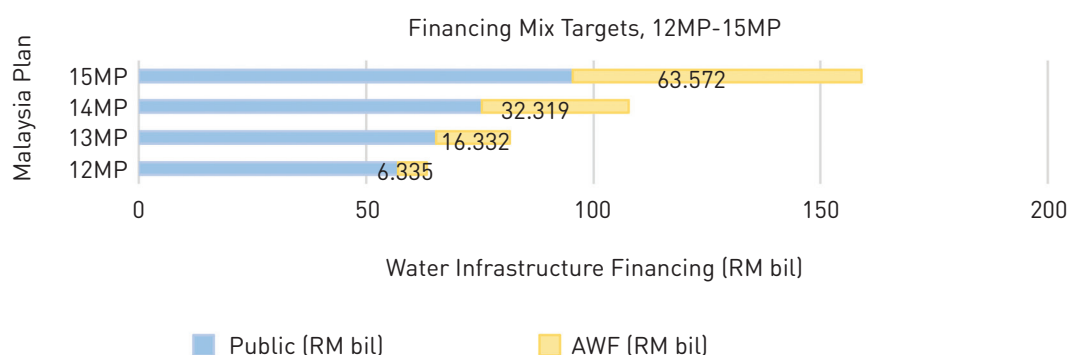


Figure 5.12: Financing mix targets, 12th MP-15th MP

It is estimated that about RM411.66 billion investments are required to finance the water infrastructure projects under KASA, KPLB, MAFI and MPIC for the 12th MP to 15th MP as stipulated in Table 25. The budget estimates for the 13th MP is projected based on the total increase of 50% against the 12th MP budget. The same principle of a 50% budget increase applies to 14th MP and 15th MP.

The 12th MP

The Government launched the 12th MP on 27 Sept 2021 to rebuild the country's economic growth, focusing on three main themes: i) resetting the economy; ii) strengthening security, wellbeing and inclusivity; and iii) advancing sustainability. The five-year plan is underpinned by a whole-of-government approach with broad stakeholders' participation, supported by 14 game changers and four policy enablers.

The 12th MP highlighted the importance of the whole-of-government approach to strengthen public service through better service delivery and decision-making, improving governance ecosystem, efficiency in budgeting and project management. Initiatives are in place to enhance project financing mechanisms, such as introducing the Public-Private Partnership Blueprint to replace the existing 1991 Privatisation Master Plan. The blueprint outlines a comprehensive PPP policy framework, including revising the implementation and financing models, terms and conditions for a fairer sharing of risks and benefits between the public and private sectors.

Besides, the implementation of "Garis Panduan Proses Penjualan Tanah dan Pembangunan Fasiliti" in 2019, aimed to improve the land swap method of privatisation by increasing transparency and achieving value for money through open tender processes.

The whole-of-government approach enhances cooperation between the Federal, State and local governments to align development priorities better. It is vital in water resource management which requires seamless implementation of IWRM principles, monitoring of water quality and effective enforcement at the different levels of governance.

The 12th MP's strategies are in line with the AWF sub-sector's proposal to sustain the water sector's financing through strengthening the financial capabilities of the water services providers and introducing innovative financing mechanisms. The success in enhancing the investments into the water sector could support the nation's effort to move into the circular economy in the entire value chain through reusing and recycling industry by-products.

Below is selected 12th MP's strategies related to financing, including Strategy B4 of "Transforming the Water Sector" (Chapter 9) and Strategy C2 of "Advancing Green Growth for Sustainability and Resilience" (Chapter 8):

a. Strategy B4: Ensuring Sustainable Financing

i. Strengthening Financial Sustainability of Water Services Providers

- Implement TSM to improve the financial sustainability of the water services providers
- Encourage providers to explore non-tariff revenue, particularly from water recycling and wastewater treatment by-products
- Benchmark water services against the energy sector, which is financially independent, market-driven and technologically efficient.
- Emulate best practices from other countries in the water services industry

ii. Promoting Innovative Financing

- Institutionalise ecological fiscal transfer mechanism to ensure payment for ecosystem services commensurate with the benefits derived and cost incurred
- Encourage state government and local authorities to conduct an assessment of the river ecosystem services before deciding on land-use change
- Utilise the existing Green Technology Financing Scheme for cultivating water-saving and promote circular economy practices

b. Strategy C2: Scaling-up Green Financing and Investments

i. Enhancing Domestic Green Financing and Investments

- Utilise domestic green financing and investment by encouraging the public and private sectors to adopt SGDs and ESG principles in macroeconomic policies, fiscal planning, budgeting, investment management and procurement practices
- Encourage the use of green and sustainable *Sukuk* and bonds across economic sectors
- Encourage financial institutions to incorporate sustainability elements into their business portfolio and processes

ii. Leveraging Bilateral and Multilateral Financing

- Leverage bilateral and multilateral financing to narrow the financing gaps for clean, green and climate-resilient projects.

iii. Enhancing Environmental Economic Instruments

- Implement economic instruments based on the user-pay and polluter-pays principles
- Carry out studies on the options of economic instruments, including PES and carbon pricing, as well as related costs and benefits to conserve the environment.
- Review existing environment-related fees to reflect the fair value, and the proceeds go to support environmental protection and conservation efforts.

iv. Promoting Disaster Risk Financing

- Promote disaster risk financing such as disaster relief fund, disaster risk transfer mechanism and disaster risk insurance to reduce the financial burden on the government.
- Scale up climate-resilient and environment-friendly financing and investment.

Table 5.25: Projected allocations for water projects 2020-2040 (KASA and non-KASA)*

Initiatives	11 th MP (RM billion) approved	12 th MP (RM bil) (2021-2025)	#Projects	13 th MP (RM billion) (2026-2030)	14 th MP (RM billion) (2031-2035)	15 th MP (RM billion) (2036-2040)	Total WST2040
JPS							
Flood mitigation		7.12	184				
Dam management		1.3	8				
Corridor and river protection		1.81	40				
Coastal protection		0.65	44				
Total JPS	5.12	10.88	276	16.32	24.48	36.72	88.4
NAHRIM							
Study							
Others							
Total NAHRIM	0.09	0.12	27	0.18	0.27	0.41	0.98
BBA							
Continuous projects		15.78	78				
New projects		1.55	12				
Total BBA	2.82	17.73	90	26.6	39.89	59.84	144.06
JPP							
Grants			10.96	28			
Loans - Sabah			3.14	16			
Loans - Sarawak			1.82	9			
Total JPP	4.73	15.93	53	23.89	35.84	53.86	129.52
TOTAL KASA	12.76	44.66	446	66.99	100.48	150.83	362.96

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Initiatives	11 th MP (RM billion) approved	12 th MP (RM bil) (2021-2025)	#Projects	13 th MP (RM billion) (2026-2030)	14 th MP (RM billion) (2031-2035)	15 th MP (RM billion) (2036-2040)	Total WST2040
KPLB							
Rural water supply - Peninsular	0.91	0.12	42	1.00	1.00	1.00	3.12
Rural water supply - Sabah	1.24	0.28	63	1.40	1.40	1.40	4.48
Rural water supply - Sawarak	0.86	0.20	42	1.20	1.20	1.20	3.80
JAKOA (orang Asli)	0.08	0.01	125	0.05	0.05	0.05	0.16
TOTAL KPLB	3.09	0.61	271	3.65	3.65	3.65	11.56
MPIC							
Malaysian Rubber Board (MRB)	3.25	-	2	-	-	-	-
Malaysian Cocoa Board (MCB)	-	0.50	1	1.00	-	-	1.50
National Kenaf and Tobacco Board (LKTN)	-	9.00	2	6.00	-	-	15.00
Malaysian Pepper Board (MPB)	-	7.25	3	2.30	1.30	1.30	12.15
TOTAL MPIC	3.25	16.75	8	9.30	1.30	1.30	28.65
MAFI							
MADA (paddy irrigation)	0.75	0.73	10	1.09	1.64	2.46	5.92
DVS (livestock)	-	0.0315	2	0.0331	0.0348	0.0365	0.1359
DOF (fisheries)	-	0.1215	8	0.1276	0.1339	0.1406	0.5236
DOA (agriculture)	-	0.2525	16	0.2651	0.2783	0.2922	1.0881
KADA (paddy)	-	0.1891	8	0.1986	0.2085	0.2189	0.8151
MARDI (agriculture R&D)	-	0.001232	2	0.001294	0.001358	0.001426	0.00531
TOTAL MAFI	0.75	1.3258	46	1.7157	2.2969	3.1496	8.4880
GRAND TOTAL	19.85	63.35	771	81.66	107.73	158.93	411.66

Source: KASA, KPLB, MPIC and MAFI (2021)

*Assumption: Forecasted allocations for 13th MP-15th MP based on the total increase of 50% against the 12th MP figure.

5.5 TOR Scope 5: Undertake Consultations with Stakeholders and Experts with the Aim of Finalising the Proposed Strategies and Initiatives of the Nation's Water Sector Transformation

The AWF Sub-Sector has conducted 12 online engagements via online meetings and email correspondences with 26 stakeholders to gather data on water sector financing and accumulate inputs on the proposed alternative water financing mechanisms. Besides, the Sub-Sector also organised a webinar to discuss future water financing. The engagements are shown in **Table 5.26**.

Table 5.26: List of stakeholder engagements

Date	Stakeholders	Platform	Purpose of Engagement
11/2/2021	HSBC	Virtually via Google Meet	AWF meeting on alternative financing models in the water sector in Malaysia
09/03/ 2021	- Jabatan Kemajuan Orang Asli Malaysia (JAKOA) - Kementerian Pertanian dan Industri Makanan (MAFI) - Kementerian Tenaga dan Sumber Asli (KeTSA) - Malaysian Water Association (MWA) - Indah Water Konsortium (IWK) - Jabatan Pengairan dan Saliran Malaysia (JPS) - Malaysian Palm Oil Board (MPOB) - Malaysian Palm Oil Association (MPOA) - Kementerian Perusahaan Perladangan dan Komoditi (MPIC) - Muda Agricultural Development Authority (MADA) - Federal Land Development Authority (FELDA) - Jabatan Mineral dan Geosains Malaysia (JMG) - Unit Perancang Ekonomi Negeri (UPEN) Negeri Sembilan - UPEN Melaka - UPEN Sabah - UPEN Sarawak - UPEN Pahang - UPEN Perlis - UPEN Kedah - UPEN Selangor - UPEN Pulau Pinang - UPEN Terengganu - UPEN Perak - UPEN Kelantan - UPEN Johor - DBKL	Google Forms	To obtain data related to water sector financing from the stakeholders
12/3/2021	Bank Negara Malaysia	Virtually via Microsoft Teams	Meeting on WST2040 AWF study, Cash <i>Waqf Sukuk</i> model and Water Bank.
10/5/2021	Securities Commission	Virtually via Google Meet	To deliberate on the proposed Cash <i>Waqf Sukuk</i>

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Date	Stakeholders	Platform	Purpose of Engagement
18/5/2021	• UKAS • MOF • SID • EPU • KPLB • MPIC • KETSA • MAFI • DOA • DOF	Virtually via Google Meet	AWF meeting with Federal Government agencies to get input on financing in the respective agency
3/6/2021	• Bank Pembangunan • KWAP • TH • MARC • PAAB • Air Selangor	Virtually via Zooms	Webinar on Alternative Water Financing
15/6/2021	Bank Negara Malaysia	Virtually via Microsoft Teams	Meeting on AWF WST2040 Roadmap
8/7/2021	MAFI – KADA, MADA, DOA, DOF, DVS	Virtually via Google Meet	Meeting on Alternative Water Financing and Roadmap
22/7/2021	• Bank Pembangunan • PAAB Note: SME1 was the moderator for webinar.	Virtually via Zoom	Webinar on Financing Solutions for Water Infrastructure Projects in Malaysia organised by the Malaysian Water Association (MWA)
16/8/2021	Unit Kerjasama Awam Swasta (UKAS)	Virtually via Microsoft Teams	Meeting on Alternative Water Financing
23/8/2021	• Agrobank • RHB Investment Berhad	Virtually via Microsoft Teams	Meeting on Alternative Water Financing
Jan-August 2021	• Kementerian Alam Sekitar dan Air (KASA) • Jabatan Pengairan dan Saliran (JPS) • Pengurusan Aset Air Berhad (PAAB) • Indah Water Konsortium (IWK) • Suruhanjaya Perkhidmatan Air Negara (SPAN) • The International Shari'ah Research Academy for Islamic Finance (ISRA)	Via email correspondence	Data collection from agencies

5.6 TOR Scope 6: Prepare a Complete Roadmap for the National Agenda on the Water Sector Transformation 2040 for the Various Ministries' and Agencies' Information and Guide for the Implementation of Programmes and Activities Towards Achieving the Targeted Transformation Objectives

The WST2040 road map of the alternative water financing runs through the four phases of the five-year Malaysia Plan.

The primary approach is to create a conducive business environment for the water services industry to operate sustainably and attract private investment into the sector within the migration framework under SPAN's regulation. It, in turn, reduces reliance on the government's DE in the water services sector. The fundamental strategy is to implement the tariff setting mechanism (TSM) for water and sewerage sectors and carry out a tariff revision cycle in each road map phase. It includes utilising the existing financing mechanism provided by the laws and economic tools such as incentives and subsidies.

A solid governance structure at the Federal and State levels based on the IWRM principles would support the transformation strategies.

However, the AWF Sub-Sector believed that the government still needs to finance non-commercial infrastructure projects that secure water sources, water-risk related projects to build resilience, irrigation and plantation projects for food security, non-commercial water, and sewerage projects to ensure a continuous supply and planetary health.

The KPIs for the roadmap align with the KASA's Environmental Sustainability in Malaysia Plan 2020-2030.

Phase 1: 12th MP (2021-2025)

In the first phase, the focus is to lay the transformation foundations by accelerating the adoption of IWRM.

The 12th MP highlighted the whole-of-government approach to enhance cooperation between the Federal, State and local governments to align development priorities better. It is vital in water resource management which requires seamless implementation of IWRM principles, monitoring of water quality and effective enforcement at the different levels of governance.

Several efforts to be in place that would contribute to the State Government's income, including:

- i. Implement the TSM to improve the financial status of the State water operators, which could increase the income of the State Government as the shareholders of the company in the form of dividends and revenue from raw water abstraction.
- ii. Operationalise the Water Industry Fund to collect a 1%-1.6% levy of the monthly water bill for conservation.
- iii. Develop and implement the raw water pricing mechanism to incentivise the State to maintain the water resources.
- iv. Institutionalise Ecological Fiscal Transfer mechanism or Payment for Ecosystem Services for water to set up a distribution system and provide sufficient funds for environment conservation.

The water services migration framework with the asset-light model under SPAN would be strengthened with amendments to Act 655 and regulations to implement the improved PFI model and resource recovery policy. Amendment to the EQA1974 would also be carried out to strengthen DoE's river pollution enforcement and meet future environmental management challenges. In addition, Section 121 of Act 655 will also be amended to protect water course and water supply system from the risk of pollution. The proposed amendment will allow water operator to claim any cost incurred to restore the operations from the polluters.

On the financing front, the Federal government continues to provide DE to the State Government or fund non-commercial water infrastructure projects through federal agencies for social benefits.

As detailed in Scope 4, the AWF study proposes 4 main strategies for this phase to set the stage for a financially sustainable water sector, as summarized in **Table 5.27**:

- i. Reforming the current water services framework
- ii. Strengthening the financial sustainability of the water services providers
- iii. Enhancing Innovative Financing for Water Sector
- iv. Promoting Disaster Risk Financing

Table 5.27: Strategies, proposed KPIs and estimated budget for 12th MP

Main strategy	Initiative	Proposed KPIs	Lead Agency	Budget Estimated (RM billion)
Layering foundation for implementation of Alternative Water Financing	Implementation of TSM for Water & Sewerage service	OPEX Recovery IWK 90% 7/12 water operators	KASA, SPAN, UKAS, KPLB, MAFI, MPIC	Total funding RM63.35bil
Review of the Current Water Services Industry Reform Initiatives	Development of new policy on holistic water financing covering public & alternative financing	100% OPEX recovery		Public funding RM57.01bil
Strengthening Financial Sustainability of Water Services Providers	Amendment of related regulations in Act 655 and other legal, procedural instruments	Financing Mix AWF to fund 10% of the total investment required for the 12 th MP		Alternative financing RM6.34 bil
Enhancing Innovative Financing for Water Sector	Implementation of Wakaf Air, PBC and DFI Financing (NRW), Eco-payment			
Promoting Disaster Risk Financing	- Disaster risk financing, including utilisation of Green Climate Fund - New facility license for sewerage - Establish raw water price mechanism			

Based on budget requirements from the relevant agencies, it requires about RM63.35 billion to implement the various water projects in 12th MP. The main target is to achieve a public-private funding mixture ratio of 90:10, which means about RM6.34 billion investments from the alternative water financing.

The primary initiative is to implement TSM for the water supply and sewerage services to boost the operators' revenue and financial capability. The main KPI is for 7 out of 12 water operators to achieve OPEX recovery, and IWK achieve 90% of OPEX recovery.

To meet the target, the Sub-Sector proposes to implement four financing mechanisms and utilise the Green Climate Fund to meet the funding needs:

- i. Private finance initiative (land swap) for wastewater treatment projects;
- ii. PPP – hybrid annuity model (HAM) for wastewater treatment projects;
- iii. PFI model (BOT/BOOT/concession) with regulation by SPAN; and
- iv. Performance-based contract (PBC) for non-revenue water reduction projects.
- v. Green Climate Fund for climate adaptation projects

Wakaf Air, launched in December 2020 to fund small-scale rural water projects below RM50,000 to implement at least 20 projects annually and increase its fund size by RM1 million a year. As of 23 September 2021, Wakaf Air had raised about RM3 million and implemented 7 projects that benefitted 2,880 water users in 6 states. The PPP-land swap model is been used in three sewage treatment plant upgrade projects. Meanwhile, the PPP-HAM could also be adopted in the existing privatisation policy framework for wastewater projects.

The PBC model is expected to take off with public grants under the National Non-Revenue Water Reduction Programme to save water loss levels from 32.6% in 2020 to 25% in 2025.

The current allocation for the programme can only bring down the NRW level to 28.5%. Hence the government planned to inject an additional RM4.8 billion for the new initiative to reduce the water loss level to 25% in 2025, of which RM2.8 billion is a Targeted Grant, RM1.112 billion for NRW Reduction Programme Approach 1 Phase 2 and RM0.8 billion to pay 50% reimbursement to 7 water operators assuming they achieve their NRW rate target.

To implement the PFI model with SPAN's regulation, the government needs to develop a new policy on holistic water financing covering public and alternative financing and amend the related regulations in Act 655 and other legal instruments outlined in Chapter 5.1.2.

The Government can also utilise the Green Climate Fund on water-related projects for climate adaptation.

Phase 2: 13th MP (2026-2030)

The second phase of the roadmap aims to uplift indigenous technology to be on par with international standards. The ongoing strategy aims to strengthen water services providers' financial capabilities and increase access to alternative funding models (**Table 5.28**). It could free up the government's funding channelled to the water services sector to research and develop water technology to enhance service providers' operations.

The sub-sector believed the central theme also covers indigenous financing models for water infrastructure in Malaysia that could be exported to other countries in the future.

The AWF Sub-Sector proposes setting up a Water Financing Coordination Taskforce to coordinate the establishment of the novel Cash *Waqf Sukuk* financing model and a specialized financial institution to fund water projects by establishing either a Development Bank for Water (DFI Water) or a Water Bank. The Taskforce's membership may include KASA, PAAB, MOF, Securities Commission (SC) and EPU.

Besides, KASA, PAAB and SC shall develop and fine tune the Cash *Waqf Sukuk*'s concept and implementation roadmap and get the stakeholder buy-in.

During this phase, the government carries out the second cycle review of water and sewerage services tariff to support the operators' financial capability.

The main KPI on financial capability is for 10 out of 12 water operators to achieve OPEX recovery, and IWK achieves 100% OPEX recovery.

Meanwhile, the AWF Sub-sector estimated that it requires RM81.66 billion to develop water infrastructures and targeted 20% of the investment (RM16.33 billion) from the private sector, while the rest from public funding. The projection is based on a 50% increase from the 12th MP allocation for KASA's projects.

With the 20% of private financing target, there is a need to intensify the existing Public-Private Partnership models implemented in the first phase. The study also proposed setting up a one-stop platform for facilitating water financing.

Table 5.28: Strategies, Proposed KPIs and Estimated Budget for 13th MP

Main strategy	Initiative	Proposed KPIs	Lead Agency	Budget Estimated (RM billion)
Improving financial capability of the industry and increase access to alternative water financing	Second cycle review of water and sewerage services tariff to support financial capability of operators	OPEX Recovery IWK 100% 10/12 water operators 100%	KASA, SPAN, UKAS	Total funding RM81.66 • Public funding RM65.33 • Alternative financing RM16.33
	Intensify public-private financing project	Financing Mix AWF to fund 20% of the total	KASA, UKAS	
	Formation of Water Financing Coordination Taskforce to coordinate the establishment of Cash <i>Waqf Sukuk</i> , DFI Water & Water Bank	investment required for the 13 th MP	KASA, PAAB, MOF, Securities Commission (SC), EPU	
	Development concept and implementation roadmap for Cash <i>Waqf Sukuk</i>		KASA, PAAB, SC	
	Development of a one-stop platform for facilitating water financing		UKAS, KASA	
	Stakeholder engagement for Cash <i>Waqf Sukuk</i>		KASA, PAAB	

Phase 3: 14th MP (2031-2035)

The third phase of the transformation road map focuses on achieving the water sector's economies of scale. It is expected that the efforts in the previous two phases have made the water sector an attractive industry for investors. The water services providers are efficient in operations and services delivery through cost benchmarking by SPAN, while the cost savings from NRW reduction could be invested back into the business. Besides, the general public, the private sector and the financial institutions would realize the importance of working together in ensuring water security in the country. Water cuts cause businesses to suffer financial losses, potentially materialize into financial risks to the banks exposed to these businesses. It is pertinent for financial institutions to implement a minimum exposure policy to ensure a specific portion of loans or investments into water security.

The primary strategy for Phase 3 (**Table 5.29**) is to widen the access and scope of alternative water financing in the sector underpinned by the solid financial capabilities of the services providers.

Table 5.29: Strategies, proposed KPIs and estimated budget for 14th MP

Main strategy	Initiative	Proposed KPIs	Lead Agency	Budget Estimated (RM billion)
Widening access and scope of alternative water financing in the water sector	Third cycle review of water and sewerage services tariff to support financial capability of operators	OPEX Recovery + Full Cost Recovery IWK 25% Full Cost Recovery	SPAN	Total funding RM107.73 - Public funding RM75.41 - Alternative financing RM32.32
	Launching of Cash <i>Waqf Sukuk</i> to fund 3% water project (RM 3.01 billion)	4 water operators 25% Full Cost Recovery	KASA, PAAB	
	RM27.13 billion from the other alternative financing	8 water operators 100% OPEX Recovery	KASA	
	Stakeholder buy-in for DFI Water & Water Bank	Financing Mix AWF to fund 30% of total investment required for 14 th MP	KASA, PAAB	
	Enhancing implementation of public-private financing project		KASA, UKAS	
	Development concept and implementation roadmap for DFI Water & Water Bank		KASA, PAAB	

It requires about RM107.73 billion to implement water supply and sewerage projects, high investment water and sewerage projects with a guaranteed return of investment, NRW reduction projects, water reclamation plant (WRP), integrated waste treatment facilities and resource recovery facilities. The target is for the private investors to take up about 30% of the investment, which amounted to RM32.32 billion.

At this stage, the water supply and sewerage services operators are at a better financial status which the third cycle of tariff revision would further boost their income. The goal is for 4 water operators to achieve full cost recovery and 8 to reach 100% OPEX recovery. Meanwhile, IWK is targeted to reach 25% full cost recovery.

This phase also sees the implementation of the Cash *Waqf Sukuk* model to fund 3% water projects, which amounted to about RM3.01 billion, while the remaining RM27.13 billion is funded through other alternative financing mechanisms.

At the same time, the government enhances the implementation of public-private financing projects.

At this stage, the Water Financing Coordination Taskforce set up in Phase 2 develops the concept and implementation road map for DFI water and the water bank and obtain stakeholder buy-in for the setting up of the financial institutions to be the critical enabler for the sector.

Phase 4: 15th MP (2036-2040)

The fourth phase of the transformation sees Malaysia be a regional water industry hub by exporting technologies and transferring knowledge on the water services technologies and financing models to other countries, especially in the Asian region.

The crucial strategy in this phase is to further strengthen the role of alternative water financing by increasing the investment portions to 40% of the total investment required (**Table 5.30**).

Table 5.30: Strategies, proposed KPIs and estimated budget for 15th MP

Main strategy	Initiative	Proposed KPIs	Lead Agency	Budget Estimated (RM billion)
Strengthening the role of alternative water financing to ensure the sustainability of the water sector	Fourth cycle review of water and sewerage services tariff to support financial capability of operators	Sewerage industry IWK achieve 35% Full Cost Recovery (FCR)	KASA, SPAN	Total funding RM158.93 - Public funding RM95.36 - Alternative financing RM63.57
	Intensifying Cash <i>Waqf Sukuk</i> to Fund 8% water project (RM12.07 billion)	Water Industry 4 water operators achieve 35% FCR	KASA, PAAB, SC	
	Launching of Water Bank/DFI Water to fund 10% of water projects (RM15.08 billion)	3 water operators 25% FCR	KASA, PAAB	
	RM33.18 billion from other alternative financing models	5 water operators 10% FCR	KASA, PAAB	
	Water Financing Coordination Taskforce monitors the performance of water financing	Financing Mix AWF to fund 40% of the total investment required for the 15 th MP	KASA, SPAN, PAAB, UKAS	

The 15th MP requires about RM158.93 billion to finance the water projects, based on a 50% increase from the 14th MP for KASA's project. The target is to obtain 40% of private funding, which amounted to RM63.57 billion, to meet the industry's CAPEX need.

The bulk of the private funding would come from the alternative financing models, which amounted to RM33.18 billion, 10% funding from the water bank or DFI water to finance model (RM15.08 billion) and 8% of projects (RM12.07billion) funded via Cash *Waqf Sukuk*.

At this phase, the water supply and sewerage services operators are expected to get another round of tariff revision to boost their revenue. It also means that the operators are moving towards full cost recovery, 4 water operators to achieve 35% full cost recovery, 3 water operators to achieve 25% full cost recovery, and 5 reached 10% full cost recovery. Besides, IWK is targeted to achieve 35% full cost recovery.

The Water Financing Coordination Taskforce set up in 13th MP would continue to monitor the performance of water financing.

In conclusion, the AWF Sub-Sector proposes five alternative financing models and establishing a DFI Water or Water Bank as critical enablers to a conducive water sector. **Table 5.31** summarises the problems faced at each value chain stage, the financing models to meet the financing needs and the key enablers.

Table 5.31: Alternative financing models across the water value chain

Value Chain	Existing Financing model/ funding mode	Problems with an existing financing model	Implementing Agencies	Alternative financing model	Enablers
Water Resource Infrastructure 1. Flood mitigation/ Adaptation 2. Coastal protection/ river bank erosion 3. Irrigation 4. Ground water 5. Dam/weir/barrage/ coastal reservoir/ ORS/TAPS	1. DE (Grant for 1) – 4) 2. DE (Grant/ loan) for 5)	DE is limited and highly competitive.	JPS for 1) -2) MAFI for 3) JMG/KeTSA for 4) KASA/state government for 5)	1. PFI: BOT/ Concession 2. PPP: HAM 3. PPP: Land swap	
Water treatment 1. Urban 2. Rural/KLPB/JAKOA 3. Community	1. PAAB funding (loan) 2. DE (Loan/ Grant) 3. State loan 4. Private funding	1. PAAB's loan for CAPEX depending on the repayment capability of the water operators. If the financial standing of the operators is not good, there may be a delay in developing the necessary infrastructure. 2. DE is limited, and many sectors are competing for the fund. 3. State loan is limited and competitive.	PAAB SPAN BBA KPLB JAKOA Felda	1. PFI: BOT/ Concession 2. PPP: HAM 3. PPP: Land swap 4. Wakaf Air for small-scale rural projects 5. Cash <i>Waqf Sukuk</i>	1. Policy Change 2. Amend License Requirements under SPAN 3. Flexibility of Authority 4. Sustainable Tariff 5. Macro Planning from source to source

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Value Chain	Existing Financing model/ funding mode	Problems with an existing financing model	Implementing Agencies	Alternative financing model	Enablers
		4. The cost of private funding is higher than PAAB, and many projects are deemed non-bankable by the bank.		6. DFI Water/ Water Bank	
Water distribution	1. PAAB funding (loan)	1. PAAB loan may not cover pipe replacement, and other maintenance are considered OPEX.	PAAB	1. PFI: BOT/ Concession.	1. Policy Change
	2. DE (Loan/ Grant)		SPAN	2. PPP: HAM	2. Amend License Requirements under SPAN
	3. State loan	2. DE for NRW reduction is limited, and when the operator lacks funds to carry out NRW reduction efforts to complement the projects funded by DE, it may not yield an effective outcome.	BBA	3. PPP: Land swap	3. Flexibility of Authority
	4. Private funding	3. State loan is limited and competitive.		4. Performance- based contract for NRW reduction project	4. Sustainable Tariff
		4. The cost of private funding is high and depends on the creditworthiness of the water operators.			5. Macro Planning from source to source
					6. DFI Water/ Water Bank
Wastewater treatment/ collection	1. DE (grant)	1. DE grant is limited.	IWK	1. PFI: BOT/ Concession	
	2. Developer funded		HH	2. PPP: HAM	
	3. JPP's trust fund		SPAN	3. PPP: Land swap	
	4. SPAN's SCC fund			4. <i>Waqf Air</i> for rural projects	
				5. Cash <i>Waqf Sukuk</i>	
Reclamation water	1. Private Financing		IWK	1. PFI: BOT/ Concession	
	2. Developer funded		HH	2. PPP: HAM	
			SPAN	3. PPP: Land swap	

6.0 WAY FORWARD: 8i ECOSYSTEM APPROACH IN WATER FINANCING

The AWF Sub-Sector's main task is to develop a new economic model to drive the nation's water industry towards a competitive, attractive and profitable industry.

Despite its importance, the water sector only accounted for 0.6% of the national GDP in 2020 as compared to 2.2% of the electricity and gas sectors. It does not consider the economic value generated from the continuous water supply with good quality to meet the demand of industries that are heavy water users.

The public fund is still the primary source of water sector financing (**Table 6.1**) to build storage facilities, reduce NRW levels, develop irrigation systems, enhance rural water supply, and flood mitigation. The government allocates public funding, acquired via borrowings, through the five-year Malaysia Plan, loan and grant through several departments and agencies. The loan support helps State Governments to build water infrastructures. Data on water infrastructure allocations for Malaysia Plans (**Table 6.2**) showed an upward trend, from RM538 million in the 3rd MP (1976-1980) to RM16.218 billion in the 11th MP (2016-2020). It is estimated that the allocation for the 12th MP 2021-2025 is about RM674.75 million.

Despite the increase in allocation for the Malaysia Plans, government development expenditure (DE) on public utilities declined, from about RM6 billion in 2011 to RM2.3 billion in 2020. The overall DE allocation had reduced from 9.7% of GDP in 2001 to 3.5% in 2020.

DE is also limited and highly competitive among the various sectors in the country. Nevertheless, the AWF sub-sector believed that the government still needs DE to construct the necessary raw water storage for continuous water supply, non-commercial water supply and sewerage projects, irrigation infrastructures for food production, and water-related disasters adaptation projects to protect the people.

Currently, there are two existing sewerage capital contribution funds available for small scale wastewater projects. Besides, Wakaf Air was launched in December 2020 to carry out small scale rural water supply and wastewater projects.

Sewerage Capital Contribution Fund

There are four primary sources of funding for sewerage projects: i) government allocations (loans and grants) through a five-year plan mainly for large CAPEX projects; ii) private funding from developers; iii) two trust funds managed by KASA's Sewerage Services Department (JPP), and SPAN for small CAPEX projects.

The private sector financed close to 70% of the sewerage infrastructure development through land developments. The government enforced a nationwide minimum on-site facility such as a septic tank or multipoint sewage treatment system for the developers to invest in as part of development approvals. Since the inception of SPAN, the government has set up a sewerage capital contribution (SCC) fund to finance direct connections to the public sewerage system.

The Sewerage Capital Contribution (SCC) funds are managed by KASA's Sewerage Services Department (JPP) and SPAN.

Table 6.1: Sources of fund

Areas of funding	WTP/STP	Pipe replacement/ Non-Revenue Water (NRW)	Dams/ Reservoirs/ ORS/barrage/ water transfer schemes	Flood mitigation	Rural water supply	Irrigation/ Agriculture
Sources of funding	FG – loan(water) FG – grant (sewerage) SG – grant PAAB – loan SPAN/JPP – SCC grant (sewerage) Private – loan Land swap/PFI	FG – loan SG – grant PAAB – loan Private – loan		FG – grant SG – grant Private – loan		
Limitation/ Challenges	Public funding - Limited funding - Widely contested by many sectors - High outstanding/non-payment	Private funding - High COF/expensive borrowing - Government Guarantee requirement - Interest rate risk/fluctuation - Shorter tenure - Pressure on tariff - Imbalance risk sharing - Weak (state) regulation - The long process if it involves land matters - Difficult to get the government's backing rating/GG/Triple-A rating				

Table 6.2: Water infrastructure allocations under successive Malaysia Plans

Malaysia Plan	Period	Total Allocation (RM million)
3 rd MP	1976-1980	538
4 th MP	1981-1985	2,085
5 th MP	1986-1990	2,348
6 th MP	1991-1995	2,089
7 th MP	1996-2000	2,385
8 th MP	2001-2005	4,000
9 th MP	2006-2010	7,817
10 th MP	2011-2015	7,944
11 th MP	2016-2020	16,218
12 th MP	2021-2025	674.75 ²

Source: Ministry of Economic Affairs, 2016

The JPP's SCC fund receives contributions from property developers to develop and upgrade the sewerage system to meet the sewerage need in a development area before 2011. An eight-member Account Committee lead by the Secretary-General of KASA managed the fund.

JPP used the fund to finance all the costs for developing or upgrading the sewerage system for development and financing research and development of the national sewerage system.

Meanwhile, SPAN established the SCC fund on 1 January 2011 after the Water Services (Sewerage Capital Contribution Fund) Regulations 2011 came into force. The fund is for small-scale sewerage projects.

Section 172 of the Water Services Industry Act provides for the setting up of the fund:

- i. to supplement Capital Expenditure (CAPEX) required for sewerage assets;
- ii. to implement regional sewerage systems and
- iii. other purposes as the Minister may determine.

Section 172(2) of Act 655 stated that the SCC Fund consist of any sums contributed by any developer or person who constructs –

- a. *a building and connects the building to a public sewer;*
- b. *a sewage treatment works without a sludge processing facility or standby power generation or both; and*
- c. *I a septic tank or communal septic tank that requires an off-site sludge processing facility, in accordance with the rates as may be prescribed.*

SPAN's Finance and Sewerage Capital Contribution Fund Committee, set up under Section 13 of the Suruhanjaya Perkhidmatan Air Negara Act, manages the fund and makes policy and procedures for its utilisation in line with its purpose as prescribed by the law.

² estimation

As of 2019, SPAN approved 45 projects with a total project cost of RM630.32 million of the SCC fund (SPAN, 2019).

Wakaf Air

In December 2020, KASA established a Tabung *Wakaf* Perkhidmatan Air (*Wakaf Air*) to raise capital for small scale projects of rural water supply (less than RM50,000), water resources conservation and sanitation.

Wakaf Air is an innovative crowd-funding mechanism to collect contributions from the public, civil servants, corporate companies, and organizations to bring water services to all. Thus, improving the public's knowledge and awareness about water's socio-economic and environmental value is pertinent to drive them to contribute. In this way, the public takes part and ownership to achieve the government's agenda.

KASA collaborates with the Yayasan *Wakaf* Malaysia (YWM) to set up a Tabung *Wakaf* Air to leverage the latter's experience in managing a *waqf*. Both parties signed a Memorandum of Understanding (MoU) to outline the fund's goals, objectives, targets, and modus operandi, including collections, distribution of benefits, investments, and governance structure.

Part of the collection is to be invested for long-term benefit into syariah compliance portfolio, while a portion of the fund is allocated for projects.

YWM would act as the trustee to collect contributions and grow the fund through investment in syariah compliance products; KASA would be handling the project application and approval process.

The governance involves the fund's management and a project assessment and selection mechanism. This structure involves two committees – *Jawatankuasa Induk Tabung Wakaf Air* and *Jawatankuasa Teknikal Penilaian dan Agihan Tabung Wakaf Air* - to coordinate and monitor the operation of this fund and project selection.

The Financial Procedure of *Wakaf Air* sets out the ministry's duty and YWM in managing the project applications, collection of contributions and disbursement of allocations. KASA accepts project applications, assessment, and approval, while YWM obtains sufficient funds for the projects.

Upon approval of a project, KASA notifies YWM about the project executor's information for fund disbursements. The project executor would later claim the payment from YWM with relevant supporting documents.

Licensees authorized persons, Federal Government agencies, state water regulators or state agencies, non-governmental organisations, academics, or the public could submit fund applications for a project related to water supply, alternative water resources and others.

As of 23 September 2021, *Wakaf Air* collected about RM3 million and had implemented seven projects totalling RM266, 486, benefiting at least 2,880 water users in 6 states.

Lastly, the exposure of the institutional funds in the water-related investments is still low, apart from purchasing the debt issued by PAAB. There is no water sector-specific investment strategy in some of the

institutional funds in Malaysia, for example, in the Retirement Fund (KWAP). Due to the perception that water projects are risky, institutional funds have to align their investment strategies to the returns promised to the shareholders. However, the institutional funds should also share the responsibilities towards meeting the national water security agenda.

The WST2040 must shift from a reliance on the public fund to develop water infrastructure to cater to the national economic growth and bring in the private sector to thrive together. The goal is to slowly reduce the public fund's portion in the water financing and increase private investments in the industry.

In this section, the sub-sector analysed the water financing by using the 8i ecosystem approach. The 8is are Infrastructure, Infostructure, Intellectual Capital, Integrity, Incentives, Institutions, Interaction and Internationalisation.

6.1 Infrastructure

Malaysia has a comparatively good water infrastructure, but a lot still needs to be done to enhance the current facilities. At the same time, planning and providing for future facilities in tandem with population and development growths.

The forecast shows that by 2040, there will be many water-stressed locations throughout the country if we remain at the do-nothing position.

KASA, KPLB, MPIC and MAFI require RM63.35 billion under 12th MP to carry out water-related projects for water storage, flood mitigation, coastal protection, expanding urban and rural water supply coverage, plantation watering and irrigation system improvement projects.

The investment requirement for 13th MP-15th MP is indicative based on a 50% increment for each Malaysia Plan. The existing figure will be revised during mid-term review and at the end of each Malaysia Plan. Please refer to **Table 5.25** on the Projected Allocations For Water Projects 2020–2040 (KASA and non-KASA).

The investment ensures that the nation's water supply system is intact. The additional water storage and improved inter-connectivity between the water reticulation systems via a water grid expand the water reserve margins. It can be one of the salient points to attract foreign direct investments to spur economic growth.

Nature-based Solution

Nature-based solution could also be used in flood mitigation and coastal erosion protection.

In addition, nature-based approach such as constructed wetland to be promoted to address the water quality in cost-efficient manner. For example, the Frangipani Resort in Langkawi had built a close loop constructed wetland to treat wastewater and reuse it since 2009. The system uses low technology, low energy, affordable and easy to maintain. It also saved financial cost of sewage maintenance and water usage (Md. Akhir et al., 2016).

As a way forward, KASA has commissioned NAHRIM to carry out a study on the feasibility of constructed wetlands as an alternative to sewerage systems. The study focuses on the effectiveness of using constructed wetland as wastewater treatment alternative, its social and economic impacts, business model, current laws and regulatory framework, the operation, maintenance and challenges of implementation. If the measure is feasible, it could be implemented throughout 12th MP-15th MP through viable financing model including alternative water financing.

Non-Revenue Water Reduction

The way forward is to reduce the non-revenue water (NRW) level from 36.4% in 2020 to 25% in 2025 and 10% in 2040. The government estimated that it requires about RM800 million to RM1 billion to reduce 1% of NRW. The water loss includes physical loss (74%), commercial loss (24%) and unbilled usage (2%). The NRW reduction could save the operator's production cost, as the operators can produce less to meet the consumers' demand and reduce the over-run of the water treatment plants. As a result, they can reduce maintenance costs and the need for additional investment for capital expenditures. Besides, one-quarter of the loss held could turn into income to the operators.

Expand Alternative Water Resources

Expanding alternative water resources is crucial in ensuring a sufficient water supply to generate economic development. Constructing a water grid to connect the reticulation systems could improve overall reserve margins and attract foreign direct investments.

Developing multi-purpose infrastructure could optimise water resource usage and management. For example, construction of new dam for water supply, power generation, irrigation and flood mitigation; flood rendition pond for water storage and so on.

Building water reclamation plants, industrial effluent treatment plants, groundwater exploration and utilisation, contribute to safeguarding water supply security.

6.2 Infostructure

Many water operators are slowly adopting technological solutions, especially in non-revenue water reduction and collecting river basin data using a geospatial information system (GIS). Still, not all operators can afford to adopt these technologies due to insufficient revenue and investment.

Some operators face a challenge in producing data based on the requirements of SPAN. For instance, the calculation of NRW needed to be standardised among the operators. The government assists the water operators in building necessary infostructure to accurately capture the water loss data through the National NRW Reduction Programme Approach 1. Private water-related companies do have their ad-hoc systems, which are not integrated.

SPAN also developed the Water Industry Regulatory Accounting (WIRA) system as a cost benchmarking tool, where the operators have to separate the qualifying and non-qualifying cost for tariff setting. Qualifying costs are those eligible for the tariff rates, while the non-qualifying expenses cannot be accounted for in the price setting. The WIRA system is used to benchmark the cost among operators to drive down costs and ultimately improve efficiency in financial management.

Besides, SPAN's Data Industri Perkhidmatan Air Negara Beserta Spatial Mapping Yang Interaktif (DIPAN SMI) is a future GIS project fully funded by EPU. The regulator was appointed as a strategic partner by KASA to develop this project.

There is no single data centre for water sectors and financial data as a decision support system. The National Water Balance System (NAWABS), developed by the DID on a river basin to record the water accounts, is helpful for policymaking. Still, it requires a considerable fund to complete all the 189 major river basins in the country, including close to 3000 rivers covering approximately 330,000 square kilometres. Data on stream flow, water inventories such as dams, lakes, drains, pipes, treatment plants, reservoirs and sewerage are incomplete and not comprehensive.

Besides, the budget preparation process under the five-year Malaysia Plan requires reliable data. The process has been conducted based on five broad steps:

- i. Agencies or departments, after consultation with relevant stakeholders, submitted the proposed budget to the respective division responsible for supervising these agencies/departments, or directly to the Budget Division of the respective ministries;
- ii. Budget Division screens the proposed budgets taking into account the ministry's policies and strategic directions;
- iii. Ministry organises stakeholder engagement on the proposed budgets with relevant stakeholders;
- iv. inputs from stakeholder engagement scrutinised and submitted for approval from the ministry's top management; and
- v. Ministry submits the proposed budgets to the EPU, PMD.

In the review, the Sub-Sector noticed that information asymmetry between agencies/departments and the ministry's divisions have led to over-dependent on information from agencies/departments.

The Sub-Sector recognised these challenges and believed that the proposed financial model must be inclusive and supported by reliable information from all water sectors.

The current data on water investments are mainly on the public fund and those submitted by the water operators to SPAN. It isn't easy to obtain data from the private sector on investments in the water sector. There is no single data centre that keeps the financial data of the water sector.

The establishment of a one-stop data centre to store water-related data, financial data, hydrology and GIS data could support decision-making. Data collection and monitoring must be improved by installing sensors in the water supply system, and the discharge of pollutants into the water body provides real-time data.

All the above requires mega financing. Hence innovative and intensive infostructure systems need to be developed and put in place for better water management in the future. The required information may be available through the WST2040 Working Groups on Integrated Water Sector Data Center (IWSCDC) and IR4.0 in Water.

6.3 Intellectual Capital

The water sector requires talents in engineering, hydrology, business and finance, risk management. Due to the previous institutional set-up where water supply and resources management remained under the purview of the State Government, the water supply sector in different states adopted different management styles, band on tariff and asset management.

As of March 2021, ten state water operators have completed their migration, of which four operators only migrated for two years or less. It takes time for the water operators to shift from state funds to an asset-light model and implement a business model towards full-cost recovery.

Technical and regulatory know-hows are not well retained in the sector. It is also slow in incorporating new knowledge due to the industry's inability to finance new technology adoption.

The main reason is that the water sector is still very highly fragmented in Malaysia. Unlike the energy, telecommunications, and transportation sectors, the billion-dollar sectors attract multi-disciplinary skills and talents.

Water remains split and defensive – very much the old school regime. Under the WST2040 proposals, the water sector to transform into a holistic, integrated and transparent sector that attracts high skills and talent. In addition, capacity development and continuous professional development programs must be in place to grow the industry.

Attractive schemes and packages should be put in place to retain talent and expertise in the field with a plan to export the talent to the international arena for water development around the globe. Innovative financing and job creation can attract and retain talent within the industry.

6.4 Integrity

The governance of the water sector is complex and fragmented. Different government agencies are working on different segments of the water sector.

KASA is the central ministry in charge of water services and environment water at the federal level.

Under KASA, the Water Supply Department (BBA) undertakes water supply projects. At the same time, the Sewerage Services Department (JPP) handles sewerage projects via grants from the Malaysia Plan and the Sewerage Capital Contribution (SCC) fund.

Meanwhile, the DID implements flood mitigation, river control, and coastal erosion mitigation projects funded by federal grants.

SPAN, under the ministry, is the technical and economic regulator of the water industry. SPAN regulates the water supply and sewerage services under a licensing regime. It also developed the Tariff Setting Mechanism (TSM) to fix the tariff rate for the water supply.

SPAN plays an essential role in the water sector transformation, primarily regulating the private players into the water supply and the water reclamation projects under the body's purview.

Several amendments to the Water Services Industry Act and Regulations and Suruhanjaya Perkhidmatan Air Negara Act strengthen SPAN's function and role in pollution control, implement the new government policy on water reclamation and treated effluents.

The Ministry of Rural Development is in charge of expanding rural water supply coverage according to the planning of the water operator, and it secures financing for such projects through the public fund.

The Ministry of Agriculture and Food Industries (MAFI), through its agencies such as MADA, carries out paddy irrigation projects via federal grants as there are no clear revenue streams from such projects. Financing for this sector relies on the public fund to safeguard food security.

Mineral and Geosciences Department under the Ministry of Energy and Natural Resources (KeTSA) implements groundwater exploration projects.

The Unit Kerjasama Awam Swasta (UKAS) at the Prime Minister's Department coordinates the public-private partnership projects.

Besides, the Securities Commission regulates financing instruments in the market while Bank Negara Malaysia regulates the financial institutions.

Although the State Government controls the water resources, not all states have a water regulatory body to manage water resources, conservation, and preservation.

Moving forward, the Sub-Sector proposed that the instrument under the existing law must first be exhausted and introduce new models to diversify the financing options for the water sector.

Besides, a benchmark on the current status of water sector integrity is paving the way for a better state of affairs and governance to move towards an integrated river basin water management in the country supported by healthy management tools and a monitoring system.

6.4.1 Implementing Tariff Setting Mechanism

First and foremost, the government must implement the Tariff Setting Mechanism (TSM) that leads to tariff rates increase and immediately boosts the water operator's revenue. It also sends a positive signal to the market that the water sector is on the path to full-cost recovery, and investment opportunities are opening up in the industry.

6.4.2 Setting up Water Industry Fund

Safeguarding water resources is essential for continuous supply and posterity. While the water resources fall within the state's jurisdiction under the Federal Constitution, it is challenging for the State Government to raise sufficient funds to meet the high cost of conserving and preserving water resources.

Water resources conservation and preservation are mainly funded using development expenditure via grants. Considering the competition among various sectors for the limited public fund, the Federal Government proposed setting up the Water Industry Fund.

It is estimated that the cost to conserve and rehabilitate the water quality of Class III and Class IV rivers, used for water intakes, to Class II is about RM27 billion for 30 years. The estimate does not include rivers in Sabah and Sarawak. In addition, to ensure the water quality is suitable for treatment at the water intakes, the rehabilitation work must be carried out 15km from the water treatment plant with an additional RM8.1 billion for 30 years.

Section 171 (1) of the WSIA provides for the setting up of a fund to be known as the Water Industry Fund (WIF) and shall be controlled and operated by the National Water Services Commission (SPAN).

The purpose of the Water Industry Fund are:

- a. to protect and preserve water basins
- b. to ensure the sustainability of water supply
- c. to improve the quality of raw water
- d. provision of water and sewerage services in rural development
- e. any other purposes as may be determined by the Minister

According to WSIA, the fund contributor is licensees or persons authorised under the law and based on the prescribed rates.

The Commission must keep proper accounts of the WIF and report its activities. The annual report on its activities and the auditor's report must be submitted to the Minister and laid before both Houses of Parliament.

Proposed WIF Requires Amendments to the Law

However, the proposed WIF targeted receiving contributions from consumers from residential, commercial, industrial and institutions private systems for water and sewerage categories. It is suggested that the quantum of the levy is between 1% and 1.6% on water bills per month.

It requires the amendment to the various Water Services Industry (Rates for Water Supply Services) regulations of the relevant states to enable a WIF charge collection from consumers as part of the water tariff. Besides, SPAN must enact the WIF Regulation to set up the fund.

The water operators are the collection agent, and SPAN is the custodian of the fund. In addition to the current provision of Section 171, WSIA needs to be amended to make contributing to WIF compulsory.

The state water resource agency, individual service licensee, and non-governmental organisations can apply for the fund for projects.

Qualified projects must fall under the Assessment Framework aligning with Section 171 WSIA and fund national water education programs and emergency use.

Examples of projects include:

- 1. Drone monitoring/satellite mapping, capacity building, minor CAPEX
- 2. Total maximum daily load (TMDL) studies, impact assessment studies, barrages/ORS studies
- 3. Catchment management, river rehabilitation studies, sanitary survey

4. Public Awareness Programme
5. Diesel spillage, contamination management, raw water supply shortage

6.4.3 Private Finance Initiative with SPAN Regulation

A private finance initiative (PFI) is a form of private investment in providing public infrastructure. It lifts the burden off the government's coffer to prepare a significant allocation for public projects. In the water sector, the PFI model applies to both water supply and wastewater treatment projects. The PFI model is implemented through BOT with the concession agreement.

Looking back at the history of water privatisation in Malaysia, companies are engaged to build water treatment and distribution facilities and signed a long-term concession agreement with guaranteed revenue through tariff revisions over the years. The long agreement period of 20–30 years allows the project implementer to source for upfront financing. However, the lop-sided concession agreements, especially the compensation provision favouring the private sector, are being contested, and the water price hike remains a political issue.

Notably, in Selangor, three concessionaires – Puncak Niaga, SPLASH and Konsortium ABBAS – supplied treated water to Syabas for distribution. Long-term concession agreements guarantee tariff revisions every three years and compensation over the state's failure to increase the tariffs. However, the inception of the Selangor model happened before SPAN.

The Sub-Sector is aware of the impact of tariff hikes on the people. Thus, SPAN would regulate companies involved in projects by using the proposed BOT with the concession model through licencing approval and renewal, business plan inspection, company audits, KPIs setting and others.

A crucial issue remains that SPAN's licencing period must be long enough for the private sector to obtain financing from the financial institutions. The Sub-Sector proposes an amendment on SPAN's Licencing Regulations to grant an extended licence period based on the type of investment and scope of activities, as outlined in **Table 6.3**.

Table 6.3: Proposed licencing period based on investment activities

Licencing period	Investment Activities
Individual License (Facility) up to 10 years	• PAAB • Operators that are holding part of the assets/ implementing their own CAPEX, and • Private enterprise which develops new or takes over existing water supply/public sewerage system
Individual License (Facility) up to 20 years	• Parties who (fully/partially) finance CAPEX projects, build and implement water or sewage treatment facility and own the assets; and • The license period is not subject to the operator's contract period
Individual License (Service) up to 5 years	• Water supply/sewage treatment services – principal operator; and • Water treatment – appointed subcontractor.
Individual License (Service) up to 20 years	• Parties who (fully/partially) finance CAPEX projects, build and implement water or sewage treatment facility and own the assets; and • The license period is not subject to the operator's contract period.

Case Study: Amata Industrial Park, Thailand

Amata is the largest public listed Thai conglomerate in the industrial estate sector. It has built a robust regional platform that serves a global clientele of close to 1,200 customers.

Amata's two industrial estates (flagship projects) in Thailand, Amata City Chonburi (formerly Amata Nakorn) and Amata City Rayong are located in the nation's Eastern Seaboard region. It is perceived as one of Asia's most successful large-scale industrial developments by the World Bank.

To meet the water supply in the industrial parks, Amata Water Plc, a wholly-owned subsidiary of the group, commissions the private sector to build:

- a. Water treatment plants to supply potable water (cost: ~ THB 5/m³)
- b. Wastewater treatment plants (cost: ~ THB 9.31/m³)
- c. Water reclamation plants to recycle water (cost: ~ THB17.25/m³)

The above rates are purely for bulk supply and bulk treatment. It does not include distribution costs.

About 30 suppliers sell treated water to Amata in bulk, and then Amata supplies the water for 28-30 TBH/m³ to the factories in the parks via its own four pipes system. It also maintains the non-revenue water level in the parks.

The conglomerate provides land for constructing these plants and uses BOT and Operations and Maintenance (O&M) contracts for 20 years. Amata in-charges of the tender process and regulate the water providers in the area. Amata owns the water assets later.

Foreign companies invested in these facilities parties are allowed 100% ownership following Thailand's Board of Investment approval. This feature is attractive to private investors as Thailand is a closed investment environment for foreign companies.

6.4.4 Public-Private Partnership – Performance-Based Contract for NRW Reduction

Governments worldwide increasingly use the performance-based contract (PBC) model to carry out non-revenue water (NRW) reduction projects. Water loss has plagued the water supply industry for a long time and caused financial loss to the water distributors. It is also costly to plug the leakages, and some operators do not have the resources and technical capacity to implement a holistic and continuous NRW reduction programme.

The World Bank's Public-Private Infrastructure Advisory Facility (PPIAF), Water Global Practice, and the International Water Association (IWA) conducted a study on 43 NRW reduction projects. It showed that 68% of the PBC model projects are more effective than those carried out by utilities alone. The model is also "systematically faster at reducing the rate of loss." (Sy, 2018)

In Malaysia, water operators tackle water loss by using internal funds and often put NRW reduction as the least priority as the return of investment is low, especially when the tariff is below the cost-recovery rate.

Table 6.4: Comparison of BOT/concession model and proposed model across the supply chain

Model/ Supply chain	Resource	Provider	Operator	NRW	User	Wastewater treatment	Reclamation
Amata Industrial Park	State	Private sector – BOT/ Concession (20 years)	Amata Water	Amata Water	factories	Private sector – BOT/ Concession (20 years)	Private sector – BOT/ Concession (20 years)
Selangor (privatisation)	State	SPLASH Konsortium ABBAS Puncak Niaga (Concession)	Syabas	Syabas	Domestic/ industrial users	IWK	
Proposed model	Private Sector BOT/Concession License/Concession period based on development value Regulated profit by SPAN		State water operator	State water operator/ government/ Private sector	Domestic/ industrial users	IWK	IWK

With the financial institution's support, the private sector is ready to fund water projects, especially pipe replacement for reducing non-revenue water. The PBC model involves private investment to reduce NRW, and the recovered income from the reduced water loss pays back the project cost. The main feature of this model is that it is tied with the performance level promised by the private company.

For example, if the private partner can reduce the NRW level by a pre-agreed percentage, the water operator/ State Government and the private sector share the income.

Both parties could sign a profit-sharing agreement for 20 years with a pre-determined ratio. The private partner obtains a more significant portion in the early phase of the project (for example, first 10 years) to recoup its investment faster and gradually reduce the amount in the later stage of the agreement (from 11-20 years).

The sub-sector is happy to report that there have already been several private parties and banking institutions, showing interest to fund PCB NRW-related projects. This project would complement public investment through the existing National NRW Programme to realise the NRW target of 25% by 2025.

6.4.5 Public-Private Partnership – Land Swap for Wastewater and Flood Mitigation Projects

The public-private partnership (PPP) – land swap model is a financing mechanism whereby the private sector develops a new infrastructure or upgrades existing water assets using its fund. The government would provide a piece of land with the same value as the private investment in exchange for the infrastructure.

The private sector is the key driver of a PFI project. The government could also initiate a request for proposal (RFP) to carry out specific projects using this mechanism.

The main idea of this model is that the government does not need to fork out any cash but using land in exchange for the development project.

The model applies to the sewerage sector to upgrade existing sewage treatment plants (STP), such as upgrading oxidation ponds to mechanised plants.

The modus operandi is as scenario below:

1. A private partner brings a proposal to upgrade an STP to a mechanised plant that would serve the exact population equivalent served in an area, but the plant would only take up half of the current land area.
2. The government provides the remaining (half) of the land to the private partner for development.
3. The government land evaluator (Jabatan Penilaian dan Perkhidmatan Harta) would value the remaining land. If the land value is more significant than the investment, the private partner needs to pay for the land's shortfall. For example, if the land value is RM600 million, but the investment is RM500 million, the private partner needs to pay RM100 million in cash to the government. If the land value is lower than the investment value, the government opts for an upgrade level equal to the land value.
4. The government would only transfer the land to the private partner after the completion of work. The land would be degazetted later from STP land and change its land-use category to suit the private partner's development plan.
5. Once the construction is completed, the government signs a privatisation contract with the developer. Sometimes, it involves an operations and management (O&M) agreement if the developer operates the facility over a period stated in the contract.

Currently, there are three projects carried out under the mechanism (**Table 6.5**).

Table 6.5: Three projects using land swap model

Project A	Project B	Project C
Upgrade of STP, installation of pipes, build the new pump station, decommission sewage pipelines.	Construction of a new sewage treatment plant (160,000 PE), construction of a GBI standard government building, upgrade of STP (121,000 PE), carry out O&M work of the new STP for 10 years.	Upgrade 3 STPs (13,000PE, 23,000PE & 87,000PE), construct new pipes and decommission 5 STPs.

Land Swap Model in a Flood Mitigation Project

Several private sector consortiums have proposed to carry out river improvement/flood mitigation in exchange for the right to develop a river corridor. The developer bears the capital cost of the river improvement or flood mitigation scheme and receives compensation in the form of the right to develop and redevelop state lands.

Essentially a land swap, this business model involves the developer having first to enter into an agreement with the government for the right to redevelop. The developer then proceeds to raise funds for capital expenditure from private financial institutions. Benefits to the government include:

1. reduction of flood risk; less disruption to socio-economic activities and improved resilience of the community against disaster;
2. increase in land-value and improved premiums from land conversions and increase in plot ratio;
3. redevelopment introduces attractive commercial properties that attract new investments;
4. creation of new jobs due to enhancing economic activity;
5. redevelopment creates the opportunity to introduce better waste management technology, thereby contributing to better quality wastewater and river environment quality; and
6. enhanced aesthetics attracts tourism.

6.4.6 Public-Private Partnership – Hybrid Annuity Model for Wastewater Project

The hybrid annuity model (HAM) is a form of public-private partnerships which the government would allocate a specific portion of the project cost (30% to 40%) into an escrow account, and the private sector injects the remaining part (60% to 70%) to the project.

There are two portions of payment to the private partner undertaking the construction of the water project:

- i. 40% of the project cost to be paid according to the construction milestone as defined in the contract;
- ii. 60% of the project cost is to be paid via a long-term operations and management (O&M) contract for the private partner to recoup its investment from the tariff collection and partial government repayment if full cost recovery is not attained through sewerage tariff. If there is a shortfall in the collection, the government would need to compensate the private partner.

The Indian government uses this model for infrastructure projects such as road, sanitation services and others to address the challenge of mobilising adequate financial resources.

Critical features of India's HAM for a toll road project include:

1. **Bid Parameter:** Life cycle cost of project = Net Present Value (NPV) of the project cost + NPV of O&M cost for the 15 years concession period
2. **Revenue collection and O&M payments:** The government collects tariff and pay inflation-indexed O&M payments to the concessionaire.
3. **Secured cash flows in the form of annuity payments:** The government makes bi-annual annuity payments for 15 years, including interest payments (at Bank rate + x%) on reducing balance method and agreed on O&M.
4. **Risk Allocation:** Private partner bears the construction and maintenance risks as in BOT (Toll) projects. The government takes all the revenue/traffic risk as well as the inflation risk.
5. **Sharing of Capital cost:** 40% of the bid project cost shall be payable to the concessionaire by the authority in five equal instalments linked to the project's physical progress. Concessionaire must initially balance 60% of the project cost through a combination of debt and equity.

The model applies to water supply, wastewater treatment and water reclamation projects where tariff collection or trading of reclaimed water could serve as revenue streams.

Malaysia could emulate the HAM in the sewerage sector to construct sewage treatment plants (STP). The proposed model is as follows:

- i. The Ministry of Environment and Water (KASA) would provide land into the project special purpose vehicle (SPV) and prepare an allocation of 40% of the construction cost to be channelled in the escrow account. For sewerage projects, IWK or JPP can be the representative of the Government holding up 40% shares managing the projects. The repayment of 15 years can include collection from IWK tariffs and Government injection.
- ii. The private partner or selected bidder funds 60% of the project cost from a term loan secured by the private partner. The SPV would design, build, finance and transfer the asset to the government upon completion.
- iii. SPAN regulates IWK/SPV and sets KPIs to be fulfilled for the annuity payment. The diagram below shows the proposed structure of the HAM for the sewerage sector in Malaysia.

Malaysia can consider two options:

Option 1: The HAM model, whereby the Government representative in the SPV shall be JPP. The SPV shall implement the Project and carry out the long-term Operations. The scope of the operations shall be under the liability of the 60% private sector shareholder in the SPV. IWK shall be the agency entrusted to ensure compliance with the operational KPIs. IWK can carry out partial repayment on the 15 years recovery cost along with the Government repayment.

Hybrid Annuity Model (HAM) for Malaysia

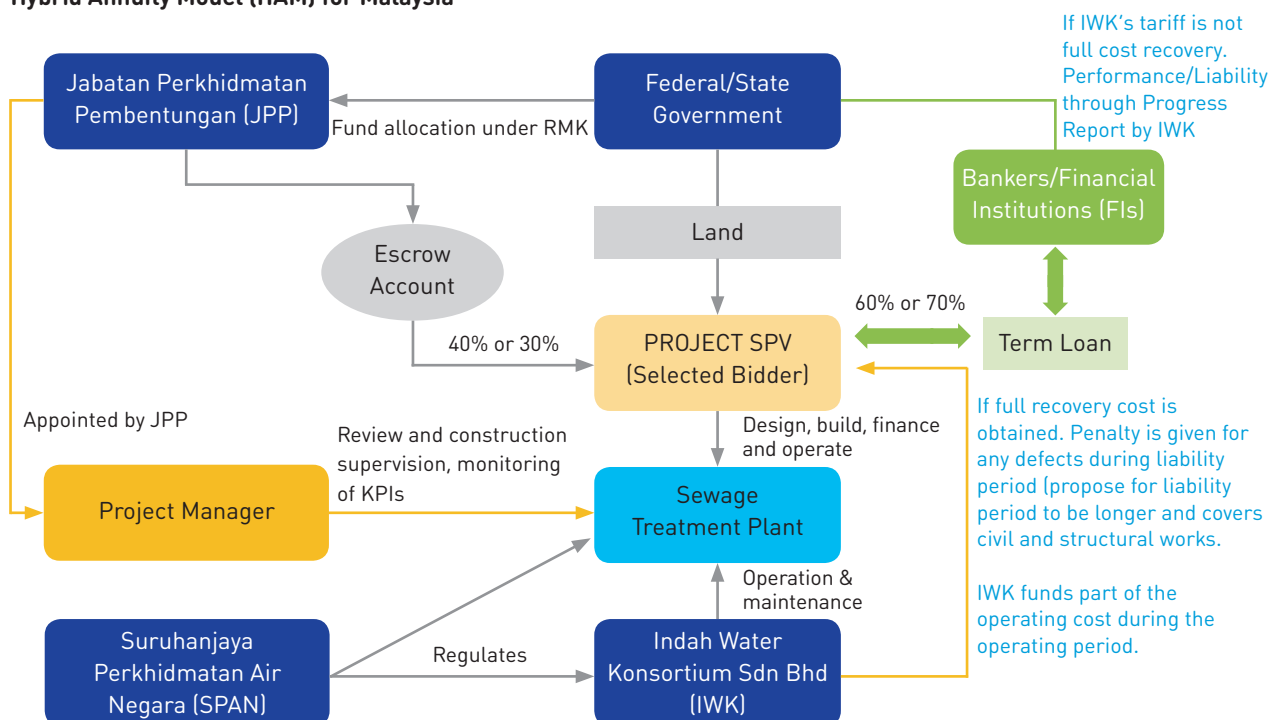


Figure 6.1: Proposed structure of Hybrid Annuity Model Option 1

Option 2: The HAM Model whereby IWK is the Government's representative in the SPV. The SPV shall implement the Project and carry out the long-term Operations. IWK shall pay partially for operational recovery, and the remaining shall be funded by the repayments from the Government.

Hybrid Annuity Model (HAM) for Malaysia

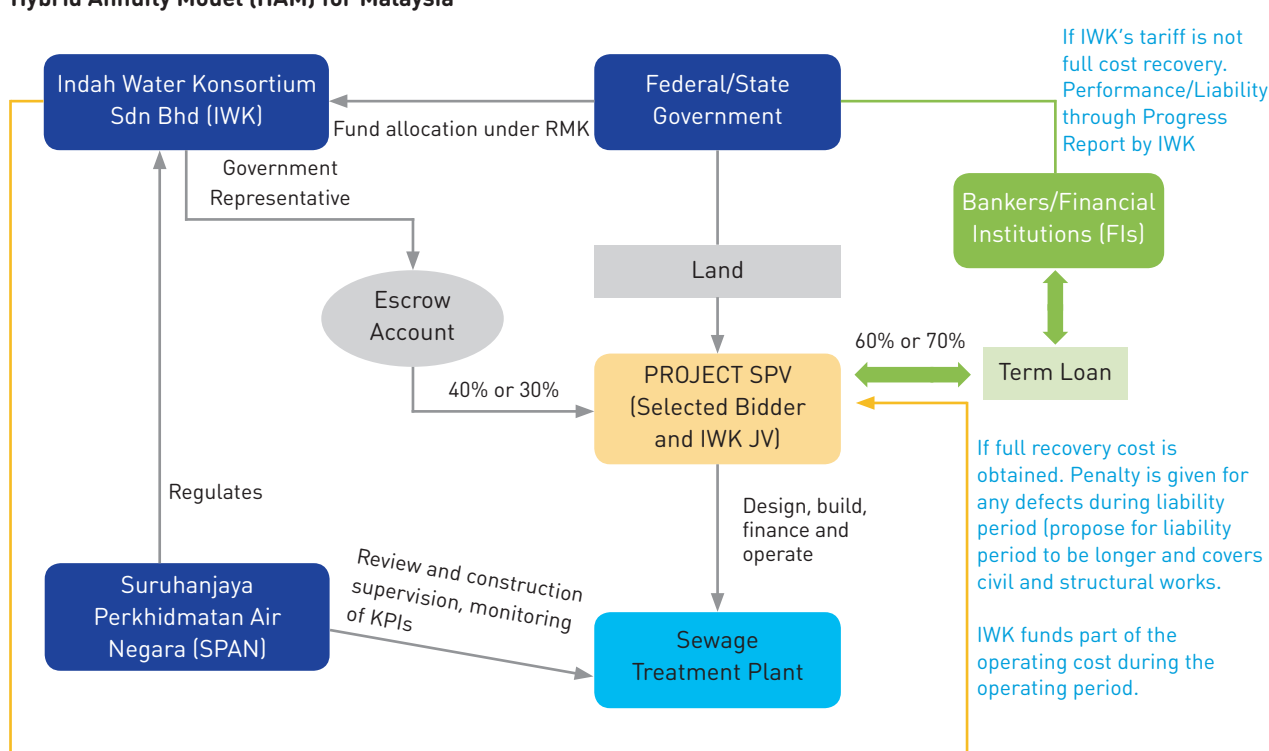


Figure 6.2: Proposed structure of Hybrid Annuity Model Option 2

6.4.7 Cash Waqf Sukuk

Cash *Waqf Sukuk* (CWS) is a financing framework that combines both the *Sukuk* and Cash *Waqf* features.

Sukuk refers to certificates or securities representing financial rights arising from underlying trade and other commercial activities in the context of money and capital markets. In Malaysia, the Securities Commission of Malaysia regulates the *Sukuk* market.

Legally, *waqf* is an irrevocable gift of a corporeal property ('ain) for the benefit of donor's family or someone else or something, in perpetuity or temporarily, as a charity promised and executed typically during the lifetime of the donor, which is not capable of transfer, gift, and transmission thereafter.

Temporary cash *waqf* occurs when the *waqf* lends his money for a specific duration and get it back at the expiry of the period. The justification for temporary cash *waqf* is the outcome of the rationale for the permissibility of temporary *waqf* and cash *waqf* and a combination of both pieces of evidence.

It is allowed to have perpetual *waqf* as well as temporary *waqf*. The current view gives the two types of *waqf* (perpetual and contemporary) the same weight of importance, and it is allowed.

The permissibility of temporary cash *waqf* bases on (i) the General permissibility of putting conditions that do not contradict the Quran and Sunnah. (ii) The permissibility of temporary *waqf* and cash *waqf*. (iii) The benefit that temporary cash *waqf* provides to the waqif and society.

The diagram (**Figure 6.3**) below outlines the proposed structure of CWS.

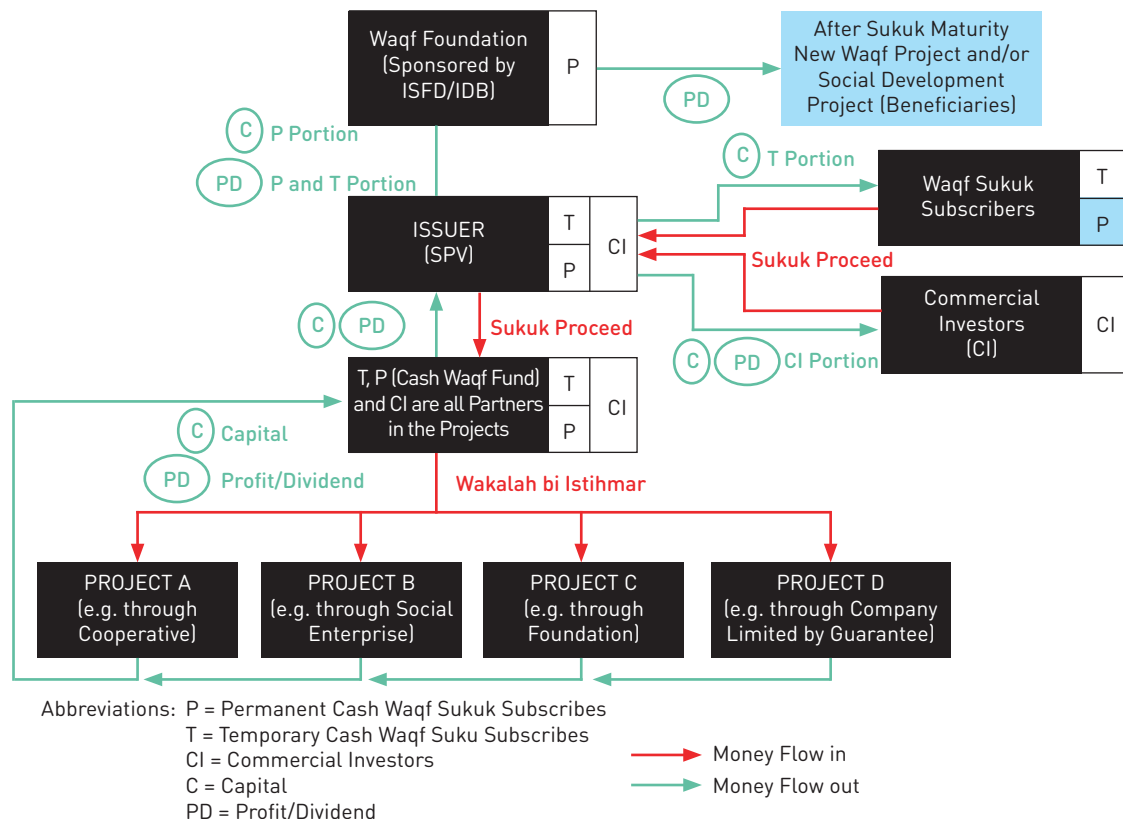


Figure 6.3: Proposed Structure of Cash *Waqf Sukuk*

1. Issuer SPV issues *Sukuk* to the following:

- commercial investors
- temporary cash *waqf* subscribers
- permanent cash *waqf* subscribers

Which represent an undivided ownership interest in the underlying Project investments. They also represent a right against the Issuer SPV to payment of the periodic distribution amount. The *Sukuk* also represent a right against the dissolution amount, i.e. only in respect of the commercial investors and temporary cash *waqf* subscribers.

2. The investors subscribe to the *Sukuk* and pay the proceeds to the Issuer SPV (the “Principal Amount”). Issuer SPV declares trust over the *Sukuk* proceeds and the Project assets and acts as the Trustee on behalf of the investors.
3. Proceeds from the *Sukuk* is channelled into a Cash *Waqf* Fund of the Issuer SPV or *Waqf* Foundation.
4. A Trustee, acting on behalf of the temporary and permanent cash *waqf* subscribers, holds and administers the Cash *Waqf* Fund.
5. The temporary, permanent cash *waqf* investors and commercial investors are partners in the investment projects.
6. The Issuer SPV uses the *Sukuk* proceeds to acquire or assume interests in the identified Projects, e.g. via equity ownership, membership, agreements, etc.
7. Profits from the Projects will be distributed in dividends or any other form of agreed distribution ratio. The profit will be channelled to the Issuer SPV and *Waqf* Foundation
8. At regular intervals, corresponding to regular distribution dates, the Issuer SPV needs to make a periodic distribution for the amount payable to the commercial investor, permanent and temporary cash *waqf* subscribers. However, permanent and temporary *Sukuk* subscribers shall waive their right to the profit.
9. At maturity, excess distribution amounts (C and PD) arising from the Projects are used to repay the Principal Amount to the *Sukuk* holders (as represented by the temporary cash *waqf* subscribers and commercial investors).
10. The investors and temporary *Sukuk* holders have an opportunity to convert their *Sukuk* (wholly or partially) to a permanent *Sukuk*. In this case, no repayment of capital is required.
11. The asset/project will finally be declared as *waqf* asset perpetually.

The proposed structure combines commercial and *waqf* elements to make it more practical and viable. We propose to structure the *Sukuk* as a retail *Sukuk* to attract the general public’s participation in this noble effort.

It is worth highlighting that:

- a. Even though the *waqf* begins on a “temporary” arrangement, it ends as a perpetual *waqf*.
- b. The utilisation and distribution of *waqf* assets and proceed are quite flexible. Combining the structure with a similar concept of “endowment” from all religions (other than Islam) is possible. Consequently to attract the participation of all.

Below is the summary of the value propositions of the CWS model (**Figure 6.4**):

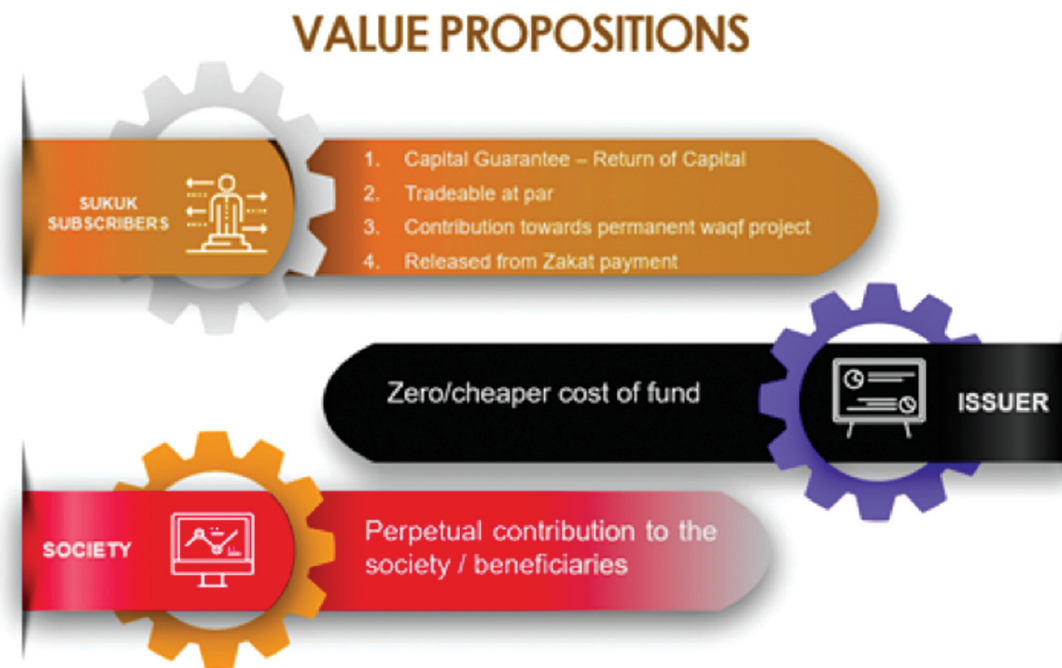


Figure 6.4: Value propositions of Cash *Waqf Sukuk* Model

Operational Challenges

Among the main challenges in structuring Cash *Waqf Sukuk* in the water-related industry in Malaysia are as follows:

- Eligible *waqf* project:** The project must have a good cash flow to provide a competitive return to the *Sukuk* subscribers. It is challenging in our current environment, where the water tariff is controlled at a low rate. It might be overcome if the cash flow does not come from the consumers. Among others, the Public-Private Partnership (PPP) model could be applied. The only difference is that the partner in CWS is not a private entity but a *waqf* entity.
- The ownership of the *waqf* asset:** In Malaysia, the authority in *waqf* related matters is the Majlis Agama Islam Negeri (state religious councils). Discussion with the councils to facilitate the registration of the asset (if any). However, suppose the concept of *waqf* is widening to an endowment that covers similar practices across religions. In that case, there shall be a further study on whether the state religious councils still govern it.

Waqf, from Syariah perspective, could be opened to all regardless of the religion of the subscribers or the recipients. Indeed, the CWS project shall be a project for all Malaysians.

- Rating:** The higher rating of the *Sukuk*, the cheaper the funding cost would be. In addition, the excellent rating attracts institutional investors to subscribe to the *Sukuk*. Most institutional investors have strict guidelines on the subscription of the *Sukuk*. For instance, they only subscribe to *Sukuk* that are rated A- and above. Without institutional investors, it would be very challenging to have a full subscription through retail subscribers. The government may assist in this regard by issuing a "Government Guarantee" on the project. It will be a contingent liability to the government.

6.4.8 Green Climate Fund

The Green Climate Fund (GCF) was set up by the 197 country Parties to the United Nations Framework Convention on Climate Change (UNFCCC) in 2010 to fund the climate mitigation and adaptation efforts. GCF

is an operating entity of the Financial Mechanism of the UNFCCC to meet its ultimate objective of stabilising greenhouse gas concentration in the atmosphere at a level that would not cause an anthropogenic impact on the climate system (Green Climate Fund, 2020).

GCF provides a full range of financing instruments, covering loans, equity, guarantees and grants to reduce the investment risk and crowd in public and private investment to achieve transformative results.

Malaysia is a party to the UNFCCC under the Non-Annexe I developing country category and is eligible for the GCF. KASA is Malaysia's national designated authority (NDA) to work with the fund to develop projects.

The AWF sub-sector proposed that Malaysia utilises the GCF as one of the financing models for climate adaptation projects on water, such as projects on water-related disaster risk reduction.

GCF invests in eight areas of action for both mitigation and adaptation efforts. Water infrastructure projects fall under the area of water security which has four key sub-sectors:

- i. **Integrated water resources management (IWRM)**
Proposed projects for this category must include green or grey infrastructure improvement that can deliver quantifiable short- and medium-term benefits.
- ii. **Climate-resilient water, sanitation, and hygiene (CR-WASH)**
Eligible projects include building and rehabilitating WASH facilities to be climate-resilient, small-scale community or household WASH facilities, such as latrines and rainwater harvesting systems.
- iii. **Integrated drought management (IDM)**
IDM is a critical component of the disaster-risk reduction programme. Projects that could apply under this modality include developing multi-purpose water infrastructure to suit multi-users, handpumps designed for domestic water use, small-scale irrigation systems and livestock watering.
- iv. **Integrated flood management (IFM)**
IFM aims to maximise the use of floodplains and coastal zones while minimising the impact of floods on human life, livelihoods and properties through defensive efforts (Green Climate Fund, 2020).

The proposed projects for this fund must also have a paradigm shift potential component that is scalable and replicable to achieve a systemic change in the country to meet water security. The projects must be owned by the country and participated by all the relevant stakeholders. In this sense, some of the infrastructure projects under the WST2040 are eligible for the fund.

There are four project sizes funded under GCF:

- i. Medium sized projects (USD50-250 million)
- ii. Large projects (more than USD250 million)
- iii. Small projects (USD10-50 million)
- iv. Micro projects (less than USD10 million)

The GCF also approves grants and loans for a country's development bank to set up a climate finance facility to finance cross-cutting projects. For Example, the Development Bank of Southern Africa obtained USD170.6

million in grants, loans and co-financing for 20 years to de-risk and improve the bankability of climate projects to crowd in private sector investment (Green Climate Fund, 2021).

The DBSA programme is the first private sector climate finance facility in Africa using a green bank model. The proposed DFI Water or the Bank Pembangunan could emulate this facility. However, the terms and conditions of the grants and loans must be evaluated before any decision.

6.5 Incentives

Most of the financing for the water sector comes from the public fund, especially in the non-revenue-based industry, such as agriculture and flood mitigation projects with almost no revenue stream.

The water sector falls under the sustainable and green sectors in some national and international financing instruments, such as Sustainable and Responsible Investment *Sukuk* (SRI *Sukuk*). The government provides incentives in the form of a grant to encourage the issuance of SRI *Sukuk*. However, the projects must have a guaranteed revenue stream to pay back the investors.

There is also a lack of incentives to consumers who purchase water-efficient products or rainwater harvesting systems to reduce overall water demand.

Moving forward, the sub-sector proposed that the government must ensure water-efficient products and rainwater harvesting systems are more easily accessible in the market and provide incentives to consumers who purchase these products.

The government to change policy to allow greater private participation in the water sector to extend the license period of the public water supply system and wastewater treatment system from three years to up to 20 years.

In general, the water sector lacks incentive tools for mass group participation, which attracts the policy makers, regulators, consultants, contractors, manufacturers, operators, consumers and the general public.

The AWF sub-sector could pick up some ideas from the WST2040 Working Group on Awareness Raising, Advocacy and Capacity Development (AACB) on the levels of incentives that would propel and paradigm shift in this sector. A think tank group could be set up to formulate the various incentive schemes and programs to make this water sector much more participative.

6.6 Institutions

The National Water Council (MAN) has been established to deliberate interstate water transfer and inter-basin water management matters. However, MAN has not been effective for several reasons. MAN has been set up as an 'administrative' arm at the federal level with no legal backing in the form of an act of Parliament. As such, its decisions have no legal binding. Furthermore, matters related to rivers are sensitive to the State Government. MAN also has no financial means to implement some of its decisions.

Many State Governments do not have a dedicated water regulatory body with enforcement capability to govern water resources. The law used in the State is the Water Act 1920, or equivalent that has not incorporated the concept of integrated water resource management (IWRM).

There needs to be a paradigm shift to view the water sector as the national security and a strategic asset to be given the highest priority. It is worth noting that the National Security Policy 2021-2025, launched in July 2021, placed water security as the top component in the Core Value 7 Sustainable Environment of the policy. It also set strategies on natural resources management, water and energy security (Majlis Keselamatan Negara, 2021).

KASA planned to set up the Water Department (Jabatan Air Negara) end of 2021 to streamline the governance of water-related matters at the federal level.

As a way forward, KASA proposed setting up the interstate River Authority (iSRA) to be the sole authority to handle interstate river-related matters. The sub-sector also proposes setting up a Water Bank to be the primary lender to water projects. Besides, it is worth exploring consolidating all the water companies under one operation to reduce costs and achieve economies of scale.

6.6.1 Establishing Interstate River Authority

Malaysia has 189 river basins; 17 are shared between two or more states. Managing them involves a complex political and economic consideration as the power over water resources and rivers is with the State Governments as enshrined under Schedule 9 of the Federation Constitution.

Political incompatibility between State Governments and the need to ensure water is sustainably shared between all users to support economic development have called for better management of interstate rivers. For instance, the ongoing saga between Penang and Kedah over the Muda River basin has proved that both states cannot resolve it amicably for mutual benefits.

As a result, the economic development in the Northern corridor (Perlis-Kedah-Penang) might have to be compromised as more than 4 million inhabitants rely on water for the Muda River basin to fuel economic growth. Other river basins that need equal attention include Sg. Muar (Johor-Melaka-Pahang-N. Sembilan), Sg. Linggi (N. Sembilan-Melaka) and Sg. Bernam (Perak-Selangor).

KASA has proposed setting up an interstate river authority (iSRA) to manage interstate rivers more efficiently. Formed by and reported to the Ministry responsible for water management, iSRA will be entrusted to manage the development and management of water resources shared between two or more states. In addition, iSRA will be the secretariat for Federal-States engagement on water resources governance and other matters of mutual interests.

The main functions of iSRA include (i) to identify and formulate action plans for efficient interstate river management based on IRBM; (ii) to review the effectiveness of existing measures; (iii) to coordinate with other interested stakeholders, including State Governments and (iv) to manage water allocation among various economic sectors fairly and efficiently. However, active engagement with State Governments is paramount to realise the formation of iSRA.

It is the first step towards setting up River Basin Organisations (RBOs) for the 189 major river basins that can integrate all the available resources from different agencies to deal with localised challenges each river basin faces. Greater cooperation between Federal and State Government agencies at the river basin level could build trust and officers' capacity to handle natural and financial resources.

It could be done without much interference to the current laws and institutional framework by establishing an overarching body equivalent to the Auditor General functions to oversee and drive the development and well-being of the water sector transformation. This entity formed via the Federal-State co-operations shall be self-financed via innovative financing methods overseeing the river basins in an integrated manner. Water shall be seen as a commodity, and circular economy principles within the river basin shall apply.

6.6.2 Establishing a DFI Water or Water Bank

Limited public funds for the water sector and its low bankability require a mechanism to mobilise liquidity to cater specifically for the industry and the players such as State Governments, relevant agencies, contractors, and water operators. It provides greater access for funding, which can be limited via commercial banks, or even from Development Financial Institutions such as Bank Pembangunan Malaysia Berhad (BPMB).

The establishment of a water bank is justified due to the industry's sheer size of funding requirement, which PAAB does not currently cover. It includes projects for water resources, flood mitigation, coastal erosion, sewerage, climate mitigation, water reclamation, so on and so forth. Due to challenging government fiscal positions, these projects typically funded via development expenses may be affected. Failure to speed up the implementation of these projects has dire consequences to our economy in general.

Concept

The concept of a dedicated bank for the development of a specific economic sector is not new. Bank Pertanian was formed in 1969 to develop all agricultural sectors such as plantation, farming, fisheries, and paddy field irrigation projects. Later known as Agro Bank, this is one of the development financial institutions (DFI), also focused on the downstream activities and later been transformed as Islamic Banking Institution.

A closer example for this initiative is forming the Nederlandse Waterschaps Bank (NWB Bank) or Nederland Water Board Bank, founded in 1954, to provide funding to the public organisation (Water Board) for flood mitigation projects. As time went by, NWB Bank progressed into other economic sectors after the water industry became sustainable. As a water specialist financial institution, NWB bank can better assess the risk involved in the water project and structure the financing to improve bankability.

Shareholding Structure

Ideally, the DFI Water or water bank must be wholly or majority-owned by the government. A certain amount of equity can be offered to the State Governments or statutory bodies such as EPF. It can be an excellent platform to involve in water-related investments. State Governments involvement as shareholders is naturally relevant as they are the prime beneficiaries of this bank. Shareholdings may vary from one state to another. Having the Federal Government as majority shareholder is crucial to reflect strong credit and financial support.

Capital Structure

In the initial stage, the bank is capitalised by paid-up capital from the Ministry of Finance, and subsequent capital injection may come from new shareholders. As the bank's balance sheet increases, it requires additional funds to support the business and to comply with the regulator's regulatory requirement.

Capital raising may come in many forms, such as via issuance of preferred shares and rights issues. Capital raising via debt can be in subordinated *Sukuk* or a hybrid form such as convertible *Sukuk*, allowing *Sukuk* holders to convert their debt into shares that qualify as capital.

Prospect for the initial public offering (IPO) or to go public is not considered to ensure the bank remains in complete control of the government.

Interestingly, when the NWB Bank was initially set up, it raised capital from participating local water boards and other government organisations. This pooling of resources was to achieve a cheaper possible source of borrowing for government entities.

Funding Resources

Unlike the PAAB's funding mechanism via *Sukuk* issuance, a bank operates as an intermediary institution with access to banking system liquidity with a banking licence. It accepts deposits from corporate entities, statutory bodies or even government deposits. The funding gap for the water sector can be narrowed by channelling these funds to the water bank for onward lending to the industry in a more secure manner. The government monies tend to be constantly circulated within the system with a more significant amount and cheaper rate.

Besides deposits, banks can borrow from the interbank money market. For longer-term funding, the bank can consider issuing its *Sukuk*.

Regulatory Issues

The bank requires a banking licence to operate as a bank or DFI. It must establish the organisational set-up and be subject to various regulatory requirements regarding lending, liquidity, capitalisation, and other areas such as risk management. It would be good if this specialised bank is given different treatment on accounting or exemptions in certain area without compromising the bank's safety to reduce compliance costs to offer relatively cheaper funding to the water industry.

Main Benefits

- i. Improve bankability of the water projects due to better risk assessments done by water specialists.
- ii. Greater participation from the private sector.
- iii. Relieve some of the guaranteed obligation of the Federal Government to the borrowing related to the water sector financing.
- iv. Overcome risk of undersubscribed in *Sukuk* issuance.
- v. Lower cost of water financing as the deposit rates tend to be cheaper and deposits are more stable than *Sukuk*.
- vi. The bank act as a growth engine for the industry.

Justifications

- i. To complement the existing public funding, PAAB and serve as a bank for the public and private sectors
- ii. More sustainable funding alternative.
- iii. To mobilises government surplus funds within the banking system.
- iv. To improve regulatory framework and control based on the existing bank operating model.
- v. To overcome lending limitations in the DFIs due to legacy loans, high non-performance loan rates, and capitalisation.
- vi. A newly established bank provides financing facilities, estimated as a multiplier of ten times based on its capital.
- vii. Speed up the full cost recovery of the water industry.

Bank Negara Malaysia's Concern

Bank Negara Malaysia has expressed concern over the proposal of the DFI Water and Water Bank. It is of the view that creating a new specialised entity does not guarantee a reduction of the government's financial burden in financing the water sector.

Instead, it opined that the over specialisation of DFIs might lead to concentration risk within the DFI, a mismatch risk between liabilities and assets where low-risk deposits are used to fund high-risk activities, and issues of poor economies of scale.

BNM suggested that the government leverage on the existing institutions that can support the water services industry, i.e. Bank Pembangunan Malaysia Berhad (BPMB) and Danajamin, through various financing instruments such as financing, guarantees and credit wrap services to enhance access to the capital market.

On the proposed water bank, BNM believed that establishing another fund-raising vehicle that duplicates the current role of PAAB could be an inefficient use of resources.

The central bank believed it might be more productive for the Ministry of Finance (MoF) to provide additional capital into PAAB to address the leverage issue and revise the mandate in line with the new objectives of supporting the sewerage services and mitigation climate-related risks.

Alternatively, the MoF may wish to assess the feasibility of crowding in private investors through widening the shareholder pool for PAAB.

By widening PAAB's mandate, it allows specialisation and fund-raising knowledge that already resides with PAAB to be applied towards supporting the broader mandate rather than fragmentation of scarce resources across different institutions.

Lastly, the government may consider leveraging these institutions to develop a blended finance scheme where the funding source consists of Government grants and internal funding of the institutions to support the sector, which may lower the financing rate proportionate to the cash flows of the water companies/contractors.

Conclusion

Water services are regarded as a backwater industry with little progress, compared with other utility sectors such as electricity and communications, which experienced leaps and bounds in revenue generation, CAPEX build-up and profitability. The achievement has contributed to a high standard of services and GDP to the national economy.

The country cannot afford to have the essential utility sector left partly due to investment. It is timely for the industry to have a transformation road map for full cost recovery and establish a dedicated financial institution to overcome its bankability as one of many strategies to adopt.

Over-reliance on the public fund for the industry and lack of private sector participation in the development see little progress in future. Alternative funding sources are urgently needed to complement PAAB, which serves water operators within the asset-light migration framework, excluding the sewerage and others. With the ongoing CAPEX requirement, in no time, the balance sheet size of around RM23 billion will surpass Bank Pembangunan.

6.6.3 Setting up the National Water Company

The Sub-Sector sees the synergy in consolidating water supply (and sewerage) providers into a single water company that can provide both water supply and sewerage services to emulate the Tenaga Nasional Berhad in the power sector.

It could begin with the consolidation of water companies at the regional level, such as Northern (Pulau Pinang, Kedah and Perlis), Southern (Johor, Negeri Sembilan and Melaka), East Coast (Pahang, Kelantan and Terengganu) and West Coast (Selangor, Kuala Lumpur, Putrajaya and Perak). The consolidation could be realised in the form of equity participation between water providers based on the share in the industry. In addition, the consolidated company facilitates the management of interstate river basins – ie. Muda River catchment between Kedah-Penang-Perlis. It will soften the state tension as such catchment is now a subject of mutual interests.

The consolidation could optimise the operations, human resources and asset management to save costs. More importantly, it allows the company to achieve economies of scale, resulting in cost savings and efficiency in service delivery.

As most State Governments own the water companies, the Sub-Sector needs to explore the idea further.

6.7 Interaction

The partnership between the Federal and State Government agencies are patchy as the water management is sectorial based and fragmented.

The Federal Government has set up an inter-agencies enforcement unit (UCJAS) to combat environmental crime in the Klang Valley. The team brings together officers from the Department of Environment (DOE), Department of Biosafety (DOB), SPAN, and Royal Malaysia Police. It allows integrated enforcement to improve monitoring and prevention of pollution. The involvement of various departments and agencies, especially the police force, is crucial in this effort. Other states could replicate the model to improve the partnership.

The Federal and State Government agencies must strengthen their cooperations in water resources management and effectively utilise financial resources for a more significant impact on the water sector.

Besides, ministries such as KASA, MAFI, MPIC, KPLB, KPKT, FELDA must improve their partnership and information sharing to manage water holistically.

The way forward is the integrated water management via river basins at state and inter-state levels and establish a “One Water Vision” to reap the benefits unseen in the current water management setup. Everyone gains from good interactions.

The concepts of polluter pay, beneficiary pay, licensing fees, cess charges, incidental incomes, environmental taxes, levies, and royalties favour better management of an integrated water sector management. Hence, coordinated and good interaction is the key.

6.8 Internationalisation

Malaysia is in tune with international best practices on IWRM water resource governance. Still, the implementation remains slow due to the inherent constitutional set-up, financial constraints, and a lack of institutional capacity. There are too many players in the water sector but no single leadership. Leadership will drive the water towards one national and global direction. With solid leadership, Malaysia could become a Regional Water Hub and export diverse expertise and experiences.

The country opens to different financing instruments and has developed relevant legal and institutional frameworks to attract foreign direct investment. It also explores various financing mechanisms to encourage public-private partnerships or reduce the reliance on the public fund.

The financing mechanisms proposed in this report are part of the policy learning from the international organisations and other countries and adapted to suit the local context.

The way forward, the knowledge and lesson learned from implementing the proposed financing mechanisms on different projects could be shared with other countries in the region and beyond.

The Sub-Sector proposed setting up a centre for knowledge transfer or sharing with other countries around the globe on innovative water financing mechanisms from 2040 onwards at par with some of the more noticeable current international players. The water sector in 2040 is envisaged to be like our Telcos, O&G and electricity industries active in the stock exchange and global markets.

In a way, the water players could expand their business abroad with the innovative financing model to develop water projects for countries hoping to close their financing gaps for the water services delivery.

7.0 CONCLUSIONS AND RECOMMENDATIONS OF THE SUB-SECTORAL STUDY (PROPOSED MISSION CRITICAL PROJECTS IN LINE WITH THE ROADMAP REQUIREMENTS, INCLUDING KPIS AND TARGETS (FOR EVERY STRATEGY) AND IMMEDIATELY IMPLEMENTABLE PROPOSALS/PROJECTS FOR EACH SUBSECTOR, TO BE ACHIEVED DURING EACH PHASE AND THE IMPLEMENTATION TIME FRAMES)

Conclusion

The AWF Study reviewed existing policies and developed workable financing models to fund the water infrastructure across the whole value chain to spur the water sector into an economic sector. The Study estimated that Malaysia requires about RM411.66 billion to develop water infrastructure for the entire value chain, including KASA, KPLB, MPIC and MAFI projects.

Most investment for the infrastructure, and 100% in some sectors, has been provided by the government through a five-year development plan. Due to budgetary constraints and competition from other economic sectors, public funds could no longer support the required financing for the water sector. Therefore, it is paramount that alternative financing mechanisms including private investment, public-private initiatives and others be explored to create a vibrant and robust water sector for the future.

The Study proposed a two-pronged strategy – improving the financial capability of the water services providers for greater access to financing and implementing alternative financing mechanisms to diversify the sources of funding. The core idea is to mitigate the risk of long-gestation infrastructure projects across the supply chain and attract private investors into the sector to co-share the responsibility of ensuring national water security.

Recommendation

The AWF Study focused on developing and implementing the alternative water financing models in meeting the funding requirements of the water infrastructures across the supply chain. Besides, operationalise and optimise existing funds provided under Act 655, Water Industry Fund and Sewerage Capital Contribution Fund, and the expediate the implementation of projects under Wakaf Air are vital in this strategy.

A list of immediately implementable financing models (**Table 7.1**) and a timeline to realise the financing models (**Table 7.2**) is as below.

The financing models could be mix and match to suit the needs of a particular project to reduce the investment risks.

Table 7.1: Immediately implementable alternative water financing models for 12th MP

Alternative Water Financing Model	Remarks
Wakaf Air	Wakaf Air is launched in December 2020 to fund small-scale (below RM50,000) rural water supply and sewerage services projects. Wakaf Air raised contributions from individuals and organisations. As of 23 Sept 2021, 7 projects were implemented with RM266,486, benefitting about 2,880 people in 6 states.
Public-Private Partnership (PPP): land swap	The Federal Government uses land in exchange for a project. Currently, it is being used in 3 ongoing wastewater treatment plant upgrading projects.
Performance-based contract (PBC)	PBC would be used for NRW reduction projects that can be used with the National NRW Reduction Programme.
Private Finance Initiative (PFI) (BOT/BOOT/Concession)	The improved PFI financing model under SPAN's regulation would be used for water supply, wastewater treatment, and water reclamation projects. It requires an amendment to Act 654, Act 655 and Regulations to extend the licencing period and expand the regulator's purview to reclaimed water.
Public-Private partnership: Hybrid Annuity Model (PPP: HAM)	The PPP: HAM model is a performance-based deferred payment model that could be used for wastewater projects and could be implemented immediately.
Green Climate Fund (GCF)	GCF finances adaptation projects and could be utilised to implement IWRM projects, climate-resilient water, sanitation and hygiene, integrated drought management and integrated flood management projects. KASA is the national designated authority (NDA) to apply for the fund.

Table 7.2: Alternative Financing Models to be Realised in 12th-15th MP

	12 th MP	13 th MP	14 th MP	15 th MP
Alternative Water Financing Models in placed	• Wakaf Air • PPP: land swap	• Wakaf Air • PPP: land swap • PFI: BOT/BOOT/Concession • PPP: HAM • PBC • GCF	• Wakaf Air • PPP: land swap • PFI: BOT/BOOT/Concession • PPP: HAM • PBC • GCF • Minimum exposure policy (through education)	• Wakaf Air • PPP: land swap • PFI: BOT/BOOT/Concession • PPP: HAM • PBC • GCF • Minimum exposure policy (through education) • Cash <i>Waqf Sukuk</i>
Alternative Water Financing Models to be introduced	• PFI (BOT/BOOT) • PPP: HAM • PBC • GCF	• Minimum exposure policy (through education)	• Cash <i>Waqf Sukuk</i>	• DFI Water/ Water Bank

The AWF Study recommended strategies and targets for the five focus areas: People, Governance, Information, Finance, and Infrastructure and Technology stipulated in **Table 7.3**.

I. Empowering people in transforming the water sector

1. **Improve public awareness on the value of water to save water** usage by reducing national average water usage from 245 litres per capita per day (LCD) in 2020 to 180 LCD in 2025 and 160LCD in 2030. It is targeted to reduce further to 158 LCD in 2035 and 155LCD in 2040. Besides, it is expected to increase the consumers' willingness to pay for water services and the adoption of water-efficient products labelled with the Water Efficient Product Labelling Scheme (WEPLS) and rainwater harvesting systems. It is also vital to highlight the linkages between water consumption and wastewater disposal to the environment. In this respect, reducing water consumption would mean less wastewater produced, thus reducing the impact on the environment and vice versa.
2. **Encourage public participation in *Wakaf Air* to finance rural water supply and sewerage projects** to complement the scope of KPLB. The *Wakaf Air*, launched in December 2020, accumulates about RM3.5 million. It is targeted to increase its fund size by 100% in every Malaysia Plan, growing RM7 million in 12th MP, RM14 million in 13th MP, RM21 million in 14th MP and RM28 million in 15th MP. The implementation cadences of *Wakaf Air* projects would also be strengthened to carry out 20 projects a year, spending RM1 million a year.
3. **Create awareness amongst the financial institutions or investment funds to invest in water sector-related projects** for the national agenda in fulfilling water supply sustainability and security. The funds' existing investment strategies still gear towards return generation to its shareholders or members. The funds must prioritise investments in local green portfolios to meet national aspirations through a minimum exposure policy. It must be highlighted that the water sector is a regulated industry, including the return to investors. Therefore, investors must be aware of the risks associated with short term borrowing to fund long-term water infrastructure. However, low-risk investment in the water sector as a regulated industry is sustainable in the long run. For example, an operation & maintenance contract to operate and maintain a water treatment plant

Table 7.3: KPI and targets for AWF sub-sector

FOCUS AREAS	TRANSFOR- MATION ITEM	MEASUREMENT	TARGET	BASELINE	12 th MP	13 th MP	14 th MP	15 th MP
Governance	Tariff Setting Mechanism for Water Services	Implementation and number of tariff review	4 cycle of tariff review under TSM (Water)	Pending Cabinet Approval	1 st cycle implemented	2 nd cycle implemented	3 rd cycle implemented	4 th cycle implemented
	Tariff Setting Mechanism for Water Sewerage Services	Implementation and number of tariff review implemented	2 cycle of tariff review under TSM (Sewerage) implemented	Pending Cabinet Approval	Implementation of tariff review based on current tariff structure	Development of TSM for sewerage services	1 st cycle implemented	2 nd cycle implemented
	Alternative Mode of Water Financing **	Number of alternative water financing	9 mode of alternative water financing to support existing source of financing	2 mode alternative water financing (Land Swap, Wakaf Air	6 mode of alternative water financing (Land Swap, Wakaf Air, PFI, PPP, PBC, GCF)	7 mode of alternative water financing (Land Swap, Wakaf Air, PFI, PPP, PBC, GCF, Minimum Exposure Policy)	8 mode of alternative water financing (Land Swap, Wakaf Air, PFI, PPP, PBC, GCF, Minimum Exposure Policy, Cash Waqf Sukuk, Water Bank/ Development Bank for Water)	9 mode of alternative water financing (Land Swap, Wakaf Air, PFI, PPP, PBC, GCF, Minimum Exposure Policy, Cash Waqf Sukuk, Water Bank/ Development Bank for Water)
	Price Setting Mechanism for Raw Water	Implementation of the framework	3 Price Setting Mechanism for Raw Water developed and implemented	-	Established and implemented the Intra-State price setting mechanism for raw water	Established and implemented the Inter-State price setting mechanism for raw water	Established and implemented the International price setting mechanism for raw water	Revision of Intra-States, Interstates and International Price Setting Mechanism for Raw Water Framework

continue

continued

FOCUS AREAS	TRANSFOR- MATION ITEM	MEASUREMENT	TARGET	BASELINE	12 th MP	13 th MP	14 th MP	15 th MP
Finance	Financial capability of Water Operators (WOs)	Number of water operators achieve OPEX recovery & Full Cost Recovery	4 WOs achieve 35% Full Cost Recovery	4 WOs achieve OPEX recovery	7 WOs achieve OPEX recovery	10 WOs achieve OPEX recovery	8 WOs maintain OPEX Recovery	4 WOs achieve 35% Full Cost Recovery
			3 WOs achieve 25% Full Cost Recovery				4 WOs achieve 25% Full Cost Recovery	3 WOs achieve 25% Full Cost Recovery
			5 WOs achieve 10% Full Cost Recovery					5 WOs achieve 10% Full Cost Recovery
	Financial capability of IWK as national sewerage service providers	Progress of IWK towards OPEX recovery (%) and Full Cost Recovery	IWK achieve 35% Full Cost Recovery	83% OPEX Recovery	90% OPEX Recovery	100% OPEX Recovery	IWK achieve 25% Full Cost Recovery	IWK achieve 35% Full Cost Recovery
	Contribution (%) of AWF in financing water infrastructure projects	Value of contribution (%) of AWF towards overall value of water infrastructure projects (estimates RM118.56 billion 12 th to 15 th MP)	40% (est RM63.57 bil)	-	10% (est. RM6.34 bil)	20% (RM16.33 bil)	30% (RM32.32 bil)	40% (RM63.57 bil)
People	Public participation in Wakaf Air	Percentage of growth of contributions	100% for each 5 years	RM3,500,000	100% (est. RM7.00 mil.)	100% (est. RM14.00 mil.)	100% (est. RM21.00 mil.)	100% (est. RM28.00 mil.)
	Domestic Water Consumption	Litre/capita/day (LCD)	155	245	180	160	158	155

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continued

FOCUS AREAS	TRANSFOR- MATION ITEM	MEASUREMENT	TARGET	BASELINE	12 th MP	13 th MP	14 th MP	15 th MP
Infrastructure & Technology	Reduction in non-revenue water (NRW)	Level (%)	10.0	36.4	25.0	20.0	15.0	10.0
	Increase in treated water reserve [by building more water storage infrastructure such as off-river storage, coastal reservoir etc]	Reserve Margin (%)	20	-	15	20	20	20
	Availability of alternative water from water reclamation projects	Millions of Litres/day (MLD)	2,500	<5	150	1,500	2,000	2,500
	Urban connected Sewerage Services	Population covered (%)**	100%	78%	85%	95%	100%	100%
	Water Supply Coverage (Urban)	Percentage population covered (%)**	100	97	98	99	100	100
	Water Supply Coverage (Rural)		98.5	96.8	97	97.5	98	98.5
	Water Supply Coverage (Total)		99.25	96.9	97.5	98.25	99	99.25

has a low risk that guarantees a return via the bulk sale of treated water to water operators. It is contrary to high-risk investments such as long-term contract BOT, BOOT.

4. **Develop flood mitigation projects to protect lives and property.** The projects aim to reduce the risk and impact of monsoonal floods on the people. The DID had developed the Flood Mitigation Plan and identified a list of projects. The initiative's target is based on the people protected from flood risk. The target is to protect 2.29 million people from floods in 2025, 3.0 million in 2030, 3.2 million in 2035 and 3.5 million in 2040.
5. **Develop National River Trail to ensure the rivers' sustainability and beauty and controlling river pollution activities.** The effort aims to create a shared responsibility among the various stakeholders in protecting the river. It also encourages nature-based activities among the local community and stimulates the local economy through river eco-tourism. The target is to build 5000 km of river trail by 2025, 10,000 km by 2030, 10,500 km by 2035 and 11,000 km by 2040.

II. Strengthening governance at all levels

1. **Implement a transparent and fair TSM to improve financial sustainability in the water sector.** A systematic tariff revision process creates a chain effect in water usage reduction, reserve margin improvement, which leads to production cost decrease, and more cash for the operator to invest back into enhancing the water supply system. It is the crux of a conducive environment to attract private investment into the sector. In addition, the proposed TSM takes into account the interest and right to water of the B40 group. It safeguards a family's lifeline consumption for 80% of users who use up to 20 cubic metres of water a month. In contrast, wasteful users to be fairly charged with higher tariff rates. It is targeted that a cycle of water tariff revision would be carried out at each Malaysia Plan.

The TSM would also be extended to the sewerage services sector. It is targeted for implementation in 13th MP, while a tariff revision based on current structure would be carried out in 12th MP. Similarly, a cycle of tariff revision would be carried out in 14th MP onwards.

2. **Implement seven financing mechanism including *Wakaf Air*, and set up a water bank for water infrastructure development as below:**
 - a. An improved private finance initiative (PFI) with a build-own-transfer (BOT)/concession model under SPAN's regulation for large-scale water supply and wastewater projects to be realised in the 12th MP.
 - b. Three public-private partnership models, namely performance-based contract (PBC) for non-revenue water (NRW) reduction projects, land swap model and hybrid annuity model (HAM) for wastewater projects to be realised in the 12th MP.
 - c. Green Climate Fund for adaptation projects to be utilised in the 12th MP.
 - d. An innovative Cash *Waqf Sukuk* model for large water projects to be realised in 14th MP.
 - e. Establish a water bank as an enabling institution to lend for water projects to be realised in the 15th MP.
3. **Establish a raw water price mechanism for water resources conservation.** The price is based on the water quality of the resources, as higher quality water (Class I) is pricier than water with Class III and below. It aims to encourage the State Government to preserve and conserve water resources to obtain higher revenue from raw water extraction. The target is to set a pricing mechanism for

intra-state river in 2025, inter-state rivers in 2030 and international rivers in 2035. A revision of the three price setting mechanisms for raw water framework is targeted to be carried out in the 14th MP.

4. **Strengthen existing laws to create a conducive environment for private investment.** KASA shall develop appropriate policies and laws, including amending the existing Water Services Industry Act (Act 655) and Regulations, the Environmental Quality Act (Act 127) for better environmental protection within the 12th MP. It includes providing a long licencing period to cater for different risk portfolios, punishing environmental crime with severe punishment, creating more business opportunities in the water sector.
5. **Enhance river quality through greater enforcement and generating a smart partnership with relevant stakeholders.** The DOE would carry out more significant enforcement efforts and river monitoring programmes. The initiative also includes human capacity development to increase “Competent Persons” in the water pollution control system and implementing communication, education and public awareness (CEPA) activities. The target is to have a 10% increase of clean rivers in 2025 compared to the baseline of 375 clean rivers in 2020. In 2030, 25% increment, 35% in 2035 and 50% in 2040.
6. **Set up Interstate River Authority** to integrate all the available resources from different agencies to deal with localised challenges each river basin faces. Greater cooperation between Federal and State government agencies at the river basin level could build trust and officers’ capacity to handle natural and financial resources. As a starting point, KASA proposed to set up an interstate river Authority (ISRA) for the Muda River basin to resolve river-related matters. The Murray-Darling River Basin Authority in Australia will be used as a model.
7. **Develop Integrated River Basin Management Plan (IRBMP)** to maximise the socio-economic benefits of water resources sustainably and conserve and restore water resources’ natural ecosystem. The IRBMP could assist the State Government and local authorities in their development planning to accelerate IWRM implementation. The target is based on the 50 plans in KASA Strategic Plan (2020-2030). In 2025, the target is to complete 79% of IRBMP under the Plan and 100% in 2030. Another 25 new IRBMPs are to be completed in 13th MP and 14th MP.
8. **Strengthen the cooperation between the Federal and State Government agencies and the Federal government agencies** in water resources management, data sharing, and effectively utilising financial resources to impact the water sector significantly. It includes re-examining Majlis Air Negara’s (MAN) roles and other institutional arrangements to enhance the Federal-State cooperation in water resources.

III. Enhancing capacity in data-driven decision-making

1. **Set up a data centre to store financial data** for benchmarking, water assets projects, water balance of river basins to support decision making. Data collection and monitoring must be improved by installing sensors in the water supply system, and the discharge of pollutants into the water body provides real-time data.

IV. Ensuring sustainable financing

1. **Maximise the value of existing assets for water security investments.** Improving the operational efficiency and effectiveness of existing infrastructure and service providers can delay investment

needs and is a prerequisite to further investment in water security. In addition, better operation and maintenance of infrastructure, demand management, and engagement with stakeholders can enhance the assets.

KASA has set the below targets:

- i. Increase the number of water operators that achieved OPEX recovery from four in 2020 to seven in 2025 and 10 in 2030. From 2030 onwards, KASA expected the operators to move towards full cost recovery. The ministry targeted 8 water operators to maintain 100% OPEX recovery, 4 water operators to achieve 25% full cost recovery in 2035; 4 operators to attain 35% full cost recovery, 3 water operators achieve 25% full cost recovery, and 5 operators reach 10% full cost recovery in 2040.
- ii. Improve the OPEX recovery of sewerage service providers from 83% in 2020 to 90% in 2025 and 100% in 2030. KASA also targeted IWK to attain 25% full cost recovery in 2035 and 35% in 2040.

Inevitably, these targets have to be supported by the sustainable tariff setting regime to help water operators cover OPEX, CAPEX and make decent profits to continue serving the customers. Without that, investment in the water sector will be severely jeopardised and will fail to cope with increasing demand from domestic and non-domestic sectors.

2. **Increase the alternative financing from 10% in 2025 to 40% in 2040**, increasing 10% in every Malaysia Plan. It is estimated that funding from alternative financing mechanism would be amounted to RM6.34 billion in 2025, RM16.33 billion in 2030, RM32.32 billion in 2035 and RM63.57 billion in 2040.
3. **Upscale the financing through improved risk-return frameworks** to allow the public and private actors (including water users) to earn returns proportional to the risks they take.
4. **Set up of the Water Industry Fund (WIF) for water resources conservation.** The fund's establishment is provided for in Section 171(1) of the Water Services Industry Act (Act 655) is to be set up, controlled, and managed by SPAN. The proposed WIF prescribes that the fund's contributors include consumers from the residential, commercial, industrial, and institutions private systems for water and sewerage categories. It is suggested that the quantum of the levy is between 1%-1.6% on water bills per month. It requires an amendment to Act 655 as the current law states that the fund contributor is licensees or persons authorised under the law and based on the prescribed rates.
5. **Select investment pathways that maximise water security returns over time.** It requires rigorous triple bottom line analysis on projects' sequences (or portfolios) and carefully considers the effect of pursuing a specific project in foreclosing or enabling future investment options. It also needs an analysis of the performance of the system over time under different scenarios.
6. **Explore the feasibility of establishing a national water company** to achieve operational efficiency and economies of scale, emulating the Tenaga Nasional Berhad in the power sector. It could begin with the consolidation of water companies at the regional level, such as Northern (Pulau Pinang, Kedah and Perlis), Southern (Johor, Negeri Sembilan and Melaka), East Coast (Pahang, Kelantan and Terengganu) and West Coast (Selangor, Kuala Lumpur, Putrajaya and Perak). Each water operator has equity participation in the company based on criteria agreed by all parties. It is anticipated that this move smoothen the formation of the RBO as each water operator has a mutual interest in the shared river basins.

V. Developing sustainable infrastructure with cost-effective technology

1. **Plan and develop water infrastructure across the value chain from source to source** to ensure synergies and complementarity with investments in other sectors, especially urban development, food, and energy. Some initiatives include maintaining existing infrastructure, developing new water assets to improve reserve margins in meeting future demand, adopt nature-based approach such as constructed wetlands for wastewater treatment, reducing water loss, increasing connectivity of reticulation system via a Water Grid, reclaiming wastewater for non-potable use, utilising groundwater and harvesting rainwater as alternative sources.

KASA has set policies and several targets to achieve this aspiration:

- i. **Reduce national non-revenue water (NRW) level** from 36.4% in 2020 to 25% in 2025, 20% in 2030, 15% in 2035 and 10% in 2040, focusing on a holistic approach such as establishing a DMZ and GIS, active leakage control, pressure management and pipe replacement. In addition, the management of NRW will also be strengthened at the water operators' level. It includes mandating water operators to form a dedicated NRW Team, upskilling workforces, using approved materials and products, and better understanding NRW and its effects on water operators.
- ii. **Increase treated water reserve margins** to 15% in 2025 and 20% in 2030 by building more water storage infrastructure such as off-river storage, under-ground dams, coastal reservoirs, constructing more water reservoirs and developing a Water Grid to connect the inter-catchment reticulation systems. The reserve margins would be maintained at 20% to ensure it does not incur more costs.
- iii. **Embark on water reclamation projects** to produce reclaimed water for non-potable usage. Initial projects are set in Klang Valley then slowly expand to other states. The target is to generate 150MLD in 2025, increase to 1,500 MLD in 2030, and grow 500MLD in each Malaysia Plan to 2,000 MLD in 2035 and 2,500MLD in 2040. The investment cost of producing 1MLD reclaimed water is RM2.5 million.
- iv. **Expand the urban connected sewerage services coverage to protect public health.** It aims to overcome pollution issues caused by untreated effluent and optimise the existing sewerage system. It is measured by the percentage of connected sewerage services to the centralised sewage treatment plant (CSTP) and multi-point STP. The target is to connect 85% population to the nearest public sewerage network in 2025, 95% in 2030 and achieve 100% coverage in 2035.
- v. **Protect vulnerable coast** in Peninsular Malaysia, Sabah and Sarawak using the structural and non-structural approaches stated in the Integrated Shoreline Management Plan (ISMP). The infrastructure works include coastal erosion control and beach nourishment through constructing revetment, breakwater and bioshield. The target is to achieve 30 km shoreline protection in 2025 and onwards.
- vi. **Increase utilisation of rainwater and groundwater as alternative water resources.** The initiative is to develop a rainwater storage system for potable and non-potable use. It could be installed at government buildings, schools and hospitals. The target is to increase the volume of rainwater used to 10 MLD in 2025, 100MLD in 2030, 200MLD in 2035 and 300MLD in 2040. On groundwater utilisation, the goal is to develop underground off-river storage for

agricultural, residential and industrial users. It would contribute to increasing water reserve margins. The target is to increase the volume of underground water to 500MLD in 2025 to 100MLD in 2030, 3,500MLD in 2035 and 4,000MLD in 2040.

- vii. **Expand national water supply coverage** to ensure urban and rural users' access to clean, safe and affordable water. It requires good demand and supplies planning, the solid financial capability of the services providers, and adequate investment in water infrastructures to meet future demand. The target is to expand total water supply coverage to 97.5% of the population in 2025, 98.25% in 2030, 99% in 2035 and 99.25% in 2040. It also includes expanding urban water supply coverage to 98% of the population in 2025 and 100% in 2035. Meanwhile, rural water supply coverage to be expanded to 97% of the population in 2025 to 97.5% in 2030, 98% in 2035 and 98.5% in 2040.

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