Lake Management Strategies in Malaysia

Prof. Fatimah Md Yusoff, PhD, FASc
LAKE MANAGEMENT IN MALAYSIA

Vision:
All lakes and reservoirs in Malaysia are managed and conserved on a sustainable basis

Mission:
To advance sound management of lakes and reservoirs in Malaysia
Chronology

1. **Lake Eutrophication Desk Study – 2005**
   - Inventory – 90 lakes: 55 water supply/irrigation; 35% lakes for hydropower, flood control. 62% were eutrophic.

2. **Colloquium on Management of Lakes and Reservoirs in Malaysia**: 2nd to 3rd August 2007
   - 8 case studies by lake managers and researchers from Malaysia focusing on lakes in Malaysia used for various purposes

   - Strategies for the lake management in Malaysia

   Strategy 2 - NAHRIM, lead agency for ILBM Research

   (Strategi II: Institut Penyelidikan Hidraulik Kebangsaan Malaysia (NAHRIM) menjadi Pusat Penyelidikan dan Sumber bagi Tasik dan Empangan Air Kbg)

5. NAHRIM prepared Detailed Action Plan for Sustainable Management of National Lakes and Reservoirs, and was endorsed by NRE - 2013


7. Workshop on ‘Development of National Lake Research Blue Print’

Strategies for Sustainable Development & Management of Lakes & Reservoirs in M’sia

1. Empower NRE as the Lead Ministry & JPS as the Executing Agency at the Federal level
2. Establish a National Lake Resource Centre to undertake R&D associated with lentic systems placed under the NRE Ministry overseen by NAHRIM in the initial phase
3. Establish a Standing Committee on Lakes within the purview of the National Water Resources Council
4. Establish Lake Management Committees at State Level
5. Development of a Detailed Lake Management Action Plan led by JPS working with all other lake owner/operator agencies
6. Support the Role of Local Communities in Lake Management
7. Pass appropriate legislation to strengthen existing legal framework.
8. Enhance networking and strengthen international strategic alliances
Action Plan: NRE

- **Objective 1**: Enhance Lake Governance & Management
- **Objective 2**: Build & Strengthen Capacity at All Levels for Sustainable Lake Basin Management
- **Objective 3**: Enhancement of Integrated Lake R&d Activities Towards Sustainable Management of Resources
- **Objective 4**: Enhanced Management of Lakes and Lake Catchment In Malaysia.
- **Objective 5**: Enhanced Information Management of Lakes and Reservoirs in Malaysia)
- **Objective 6**: Enhance Stakeholder Awareness and Knowledge in Lake and Reservoir Management.
The National Lake Strategic Management Plan – 2 main committees

1. Committee on Technical Management aspects led by the ‘Jabatan Pengairan dan Saliran (JPS) – Dept of Irrigation and Drainage – River section - IRBM

2. Committee on Research Programs - led by the National Institute of Hydraulics, Malaysia (NAHRIM).
Activities on Lake Mgt in Msia

- Lake Mgt Strategies – NRE, NAHRIM, ASM, Putrajaya Corp (PJC) & various stakeholders – Policy papers
- Lake research – Universities and Research Institutes (NAHRIM).
- Securing funds – NAHRIM (11th Malaysian Plan 2016-2020), PJC.
- Lake briefs – Lake owners (e.g. TNB, Jor and Mahang).
- International networking – participation in World Lake Conferences etc. - PJC
- Training – Lake Mgt – PJC, NAHRIM.
Terms of Reference
National Research Committee for Lake and Reservoir Basins

JK Penyelidikan Kebangsaan Bagi Tasik, Empangan Air & Kawasan Tadahannya

1. Develop *National Lake Research Blue Print*
2. Identify & plan comprehensive R&D programs for lake and reservoirs including the financial support and implementing agencies involved.
3. Provide relevant technical response for lake research and innovation
4. Identify relevant research needed to measure the vulnerability of lakes and reservoirs.
5. Identify research plan formulation for sustainable protection and conservation lakes, reservoirs and their respective catchment areas
6. Identify economic evaluation studies and costing of the conservation and sustainable development of the lakes including factoring the cost of impact, treatments and restoration.
7. Coordinate the involvement of the consortium research and development (R & D) comprising institutions of higher learning and research institutions.
THE BLUEPRINT:
Represents one of the outcomes of the policy document: *Strategies for the Sustainable Development and Management of Lakes and Reservoirs in Malaysia*, developed by ASM and NAHRIM.

96 major lakes/reservoirs
Overall Goal of the Research Blueprint

To extend the extent and depth of our understanding of Malaysian lakes and reservoirs so as to enable them to be managed sustainably towards conservation and development goals and their benefits optimized in the interests of the nation.

Embedded Values

1. Sustainable Mgt: Meet the needs of the present without compromising the ability of future generations to meet their own needs.
2. Optimization of benefits: Potentials for economic development and wealth creation must be pursued without undermining the sustainability of the resource.
<table>
<thead>
<tr>
<th>No.</th>
<th>State</th>
<th>Number</th>
<th>Area (km²)</th>
<th>Volume (M m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Perlis</td>
<td>2</td>
<td>13.33</td>
<td>40.00</td>
</tr>
<tr>
<td>2.</td>
<td>Kedah</td>
<td>7</td>
<td>105.63</td>
<td>1384.76</td>
</tr>
<tr>
<td>3.</td>
<td>Perak</td>
<td>11</td>
<td>285.69</td>
<td>6794.26</td>
</tr>
<tr>
<td>4.</td>
<td>Selangor</td>
<td>14</td>
<td>27.25</td>
<td>531.56</td>
</tr>
<tr>
<td>5.</td>
<td>Pahang</td>
<td>10</td>
<td>94.69</td>
<td>355.71</td>
</tr>
<tr>
<td>6.</td>
<td>Terengganu</td>
<td>2</td>
<td>370.80</td>
<td>13,600.00</td>
</tr>
<tr>
<td>6.</td>
<td>Kelantan</td>
<td>3</td>
<td>11.34</td>
<td>76.80</td>
</tr>
<tr>
<td>7.</td>
<td>Johor</td>
<td>13</td>
<td>108.26</td>
<td>986.24</td>
</tr>
<tr>
<td>8.</td>
<td>Labuan</td>
<td>3</td>
<td>1.20</td>
<td>4.58</td>
</tr>
<tr>
<td>9.</td>
<td>Melaka</td>
<td>4</td>
<td>11.41</td>
<td>78.60</td>
</tr>
<tr>
<td>10.</td>
<td>N. Sembilan</td>
<td>6</td>
<td>11.69</td>
<td>182.83</td>
</tr>
<tr>
<td>11.</td>
<td>P.Pinang</td>
<td>4</td>
<td>2.95</td>
<td>45.44</td>
</tr>
<tr>
<td>12.</td>
<td>Sabah</td>
<td>8</td>
<td>7.18</td>
<td>66.41</td>
</tr>
<tr>
<td>13.</td>
<td>Sarawak</td>
<td>7</td>
<td>793.74</td>
<td>46,496.88</td>
</tr>
<tr>
<td>15</td>
<td>Federal Territory</td>
<td>2</td>
<td>7.63</td>
<td>45.00</td>
</tr>
</tbody>
</table>

| Total | 96 | 1,852.79 | 70,692.06 |
Summary of Issues/Challenges Facing Selected Lakes in Malaysia

- Unplanned Catchment Development
- Pollution
- Proliferation of Aquatic Weeds
- Endangered/Declining Biodiversity
- Alien Invasive Species
- Sedimentation
- Declining fish catch
- Absence ILBM based mgt. plan
- Absence of a Central management Authority
- Impairment of lakeside community values

- Timah Tasoh
- Terip
- Bukit Merah
- Loagan Bunut
- Tasik Pedu/Muda
- Kenyir
- Chini
- Putrajaya
### Table 3. Proposed work plan for the completion of Lake Briefs

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DID/NRE</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>TNB</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MOA</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>SPAN Water supply</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Recreational lakes</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>OTHERS</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8</strong></td>
<td><strong>17</strong></td>
<td><strong>16</strong></td>
<td><strong>16</strong></td>
<td><strong>13</strong></td>
<td><strong>9</strong></td>
</tr>
</tbody>
</table>

All 92 lake briefs to be completed within the 10th Malaysia Plan period (2011-2015).
Completed Lake Briefs - 26

• **Series 1**: Bukit Merah, Chini, Kenyir, Pedu, Muda, Loagan Bunut, Putrajaya Lake and Wetlands, Sg Terip and Timah Tasoh Reservoirs.

• **Series 2** - Bera, Beris, Ringlet, Paya Indah, Sembrong, Klang Gate and Sg Selangor Reservoirs

• **Series 3** - Batang Ai, Babagon, Pergau, Durian Tunggal, Subang, Langat, Jor, Bukit Kwong, FRIM and Taiping Lakes

66 lakes/reservoirs to be done.
Integrated Lake Basin Management

IL²BM

Masahisa Nakamura, ILEC
**IWRM** (integrated water resource mgt)

**IRBM** (integrated river basin mgt)

**What is missing?**

**Lentic Ecosystems**

For sustainable management and use of aquatic ecosystem resources, need to include the lentic systems – lakes & reservoirs

**Integrated Lake Basin Management (ILBM)**

*Save Water, Save Lakes*

ILEC
Problem Tree

Consequential Impacts

Decline in ecotourism and recreational values
Decline in resources and economic assets

Lack of research

Immediate Impacts

Lacustrine ecosystem under threat
Reduction in use values for water, agriculture & ecosystems
Lost of natural resources & biodiversity
Poor optimization of lake resource use

Core problem

Poor understanding of lake dynamics by managers
Deterioration of lake environment
Discharges do not meet standards

Deficient Outputs

Lack of research
Lack of mechanisms
Lack of fund
Lack of Expertise

Sub-cause

No public information/education programs available
Inadequate participation by agencies in charge of littoral areas
Differing state and Federal agencies involved
No R&D priority
Inadequate levels of capital investment
Existing regulations inadequate
Unclear research policy & No political commitment
(Heartware)
## National Priority Areas (NPA)

<table>
<thead>
<tr>
<th>National Priority Areas (NPA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Security</td>
</tr>
<tr>
<td>Energy Security</td>
</tr>
<tr>
<td>Plantation Crops</td>
</tr>
<tr>
<td>Cyber Security</td>
</tr>
<tr>
<td>Water Security</td>
</tr>
<tr>
<td>Bio Diversity</td>
</tr>
<tr>
<td>Healthcare and Medicine</td>
</tr>
<tr>
<td>Environment &amp; Climate Change</td>
</tr>
<tr>
<td>Transportation &amp; Mobility</td>
</tr>
</tbody>
</table>

Lakes are related to most of NPAs
ILBM Research Philosophy and Areas

• Demand-driven research for evidence-based policies:
  1. Ecosystem services & socioeconomics – resource provision and regulating services
  2. Governance - Policy and regulation

• Sustainable management and ecological technology:
  3. Physical limnology and hydrodynamics
  4. Pollution and water quality
  5. Sustainable (green) technology

• Resources, Biodiversity, Conservation & sustainable utilization:
  6. Biodiversity and natural products
  7. Lake ecology and basin management
Research Themes:

i. Governance
ii. Ecosystem services & Economics
iii. Physical limnology & hydrodynamics
iv. Lake Ecology & basin mgt
  v. Biodiversity & natural products
vi. Pollution and water quality
vii. Sustainable Technology
Formation of Research Clusters

- **Group 1:** Physical Limnology and Hydrodynamics  
  (Prof. Dr. Mashhor Mansor, USM)
- **Group 2:** Sustainable Technology  
  (Prof. Ir. Dr. Ahmad B. Jusoh, UMT)
- **Group 3:** Governance  
  (Dr. Sarah Aziz, UKM)
- **Group 4:** Pollution and Water Quality  
  (Prof. Wan Ruslan Ismail, USM)
- **Group 5:** Ecosystem Services & Socio-economics  
  (Tn Hj. Akashah Majizat, PPJ)
- **Group 6:** Biodiversity and Natural Products  
  (Prof. Fatimah Md Yusoff, UPM)
- **Group 7:** Lake Ecology and Basin Management  
  (Prof Dr Zulkifli Yusop, UTM)
Research Objectives & Time Frame

Phase 1

Short-term objectives: 1-3 years

- To undertake a detailed inventory of specific lakes in Malaysia including small and minor lakes and their categorization in terms of size, volume and environmental quality.

- To expand the extent and depth of our knowledge of representative lake types.
Research Objectives & Time Frame

Phase 2

Mid Term Objectives : 3 - 7 years

• To pursue closure of knowledge gaps where the representative lake types studied earlier are concerned.
• To expand research to other reservoirs and lakes.

Putrajaya lake
Research Objectives & Time Frame

Long Term Objectives – > 7 years

- To expand our knowledge of or pursue closure of knowledge gaps where all lakes are concerned.
- Based on the information thus obtained:
  - To strengthen lake basin management plans where these already exist.
  - To frame new lake basin management plans where required.

Endemic Malaysian Golden Arowana
Interdisciplinary Focus

Primary Thrust Areas:
1. Hydraulics & hydrodynamics
2. Pollution & water quality.
3. Ecohydrology.
4. Biodiversity & natural products
5. Ecosystem services

Cross Cutting Areas:
1. Governance
2. Climate change
3. Sustainable technology
4. Socio-economics
5. Basin management
Inter-Disciplinary Focus for Lake Research and Development
Spatial Focus

Perlis
1. Timah Tasoh
Kedah
2. Pedu/Muda/Ahning
3. Dayang Bunting

Penang
4. Mengkuang

Perdana
Negeri Sembilan
12. Terip-Kelinchi-Upper Muar

Perak
5. Bukit Merah
6. Chenderoh
7. Temenggor

Selangor
8. Sg. Selangor
9. Batu

Federal Territory
10. Putrajaya
11. Tasik Botani

Pahang
13. Ringlet
14. Chini
Spatial Focus

Melaka
15. Durian Tunggal

Johor
16. Layang
17. Sembrong

Sarawak
18. Batang Ai
19. Loagan Bunut
20. Bakun

Terengganu
21. Kenyir

Kelantan
22. Pergau
23. Tok Uban

Sabah
24. Danau Pitas
25. Babagon
Major Outcomes

• To strengthen lake basin conservation and development plans where these already exist or have been developed in the earlier phase of the study.

• To frame new lake basin conservation and development plans for newly identified lakes.

• To develop an overall conservation and development framework for all lakes in the country.