Global Promotion of Integrated Lake Basin Management

(ILBM)

- ILEC's Strategy, Challenges and Prospects-

Masahisa Nakamura

Chairman ILEC Scientific Committee, and
Professor, Shiga University Center for Sustainability and Environment

What is ILBM?

·M. Nakamura, RCSE Shiga University, Chairman ILEC Scientific Committee

Ecosystem Services

Resource Provision Service

- **Water Supplies**
- **Fish**
- **Irrigation Crops**
- **Wood and Fiber**
- **Fuel**
- **Hydropower Potential, etc.**

Cultural Service

- **Aesthetic and Scenic Values**
- **Religious Sites and Spiritual Values**
- **Historic Sites**
- **Educational Resources**

16 Types of Lake problems

Unsustainable fishing practices	In-lake
Introduced faunal species	
Salinity changes	
Weed infestations	
Nutrients from fish cages	
Shoreline effluent discharges	Littoral
Shoreline industrial discharges	
Shoreline water extraction	
Loss of wetlands	
Excess sediment inputs	Basin origin
Non-point source nutrients	
Agro-chemicals	
Water abstraction	
Changes in run-off	
Effluent and stormwater	
Industrial pollution	
Atmospheric nutrients	Regional/ Global
Atmospheric industrial contaminants	
Climate change	

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Let’s look at some Asian Lake Basins

Bhoj Wetlands

Figure 1.1 GEF-MSP Lake Basin Management Initiative: Project Lake Basins

15 Laguna de Bay
16 Malawi/Nyasa/Niassa
17 Naivasha
18 Nakuru
19 Ohrid
20 Peipsi/Chudskoe
21 Sevan
22 Tanganyika
23 Titicaca
24 Toba
25 Tonle Sap
26 Tucurui
27 Victoria
28 Xingkai/Khanka

Bhoj Wetlands

- Severe eutrophication
- Heavy metal pollution
- Water hyacinth infestation
- Sedimentation
- Solid waste pollution

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Bhoj Wetlands

- Severe eutrophication
  - laundry washing
- Heavy metal pollution
  - idol emersion
- Water hyacinth infestation
- Sedimentation
  - agricultural soil erosion
- Solid waste pollution

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Laguna Lake

Figure 1.1 GEF-MSP Lake Basin Management Initiative: Project Lake Basins

8	Chilika Lagoon	15	Laguna de Bay	22	Tanganyika
9	Cocibolca (Nicaragua)	16	Malawi/Nyasa/Niassa	23	Titicaca
10	Constance	17	Naivasha	24	Toba
11	Dianchi	18	Nakuru	25	Tonle Sap
12	Great Lakes (Laurentian)	19	Ohrid	26	Tucurui
13	Issyk-kul	20	Peipsi/Chudskoe	27	Victoria
14	Kariba Reservoir	21	Sevan	28	Xingkai/Khanka

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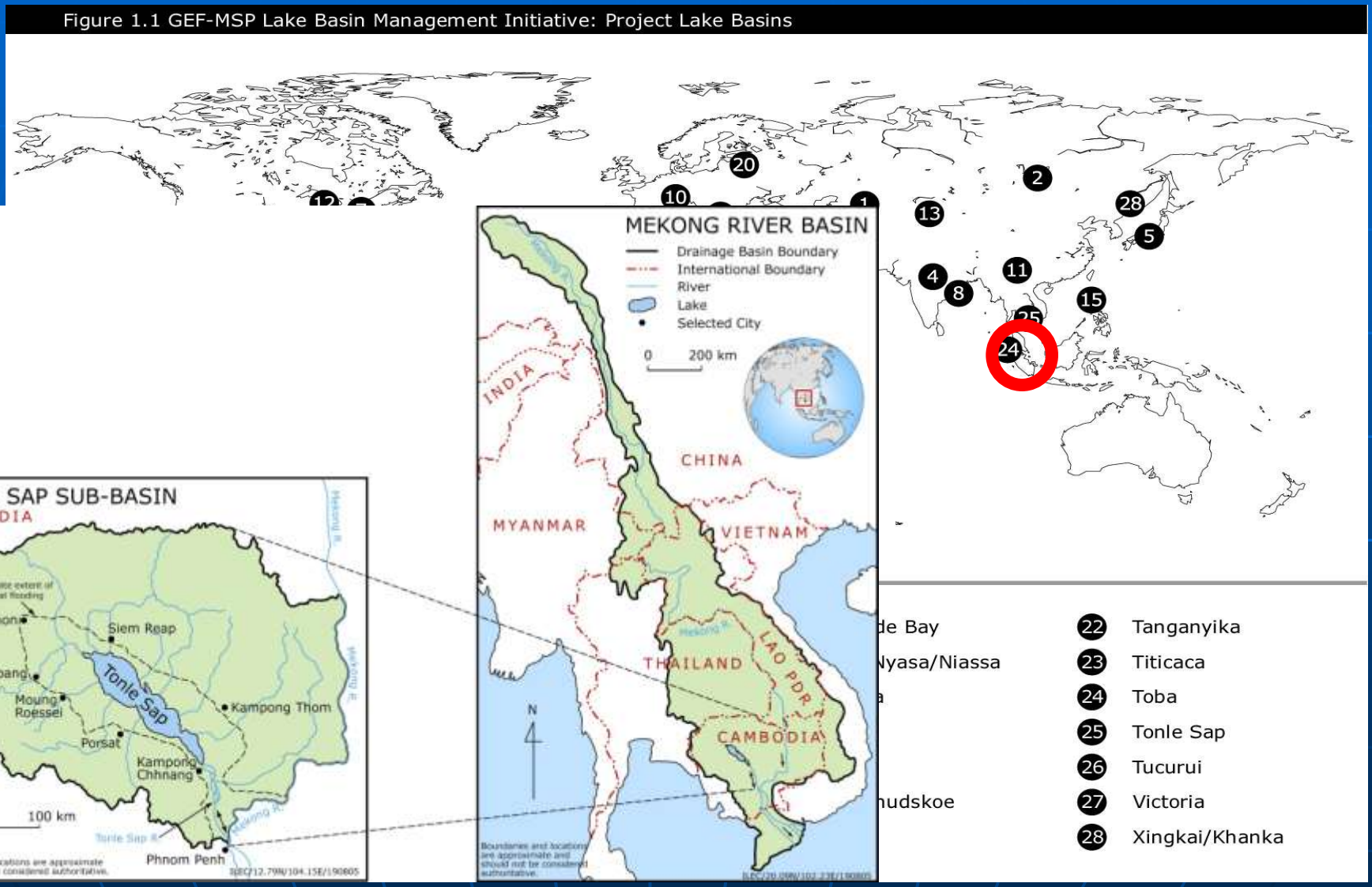
Laguna Lake

- Eutriphication
  - Urbanization/industrization
  - Serious catchment degradation
- Sector Conflicts
  - Fishery, Agriculture, Water Supplies, Flood Control
  - Operation of hydraulic gates
- Shoreline Enchroachment
  - Political and Jurisdictional Issues

Lake Tonle Sap



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Lake Tonle Sap

Threatend Traditional Life-Style

- Degradation of terrestrial and aquatic ecosystems
- over-exploitation of coastal and in-lake resources
- Health threats
- human waste disposal in water and on land

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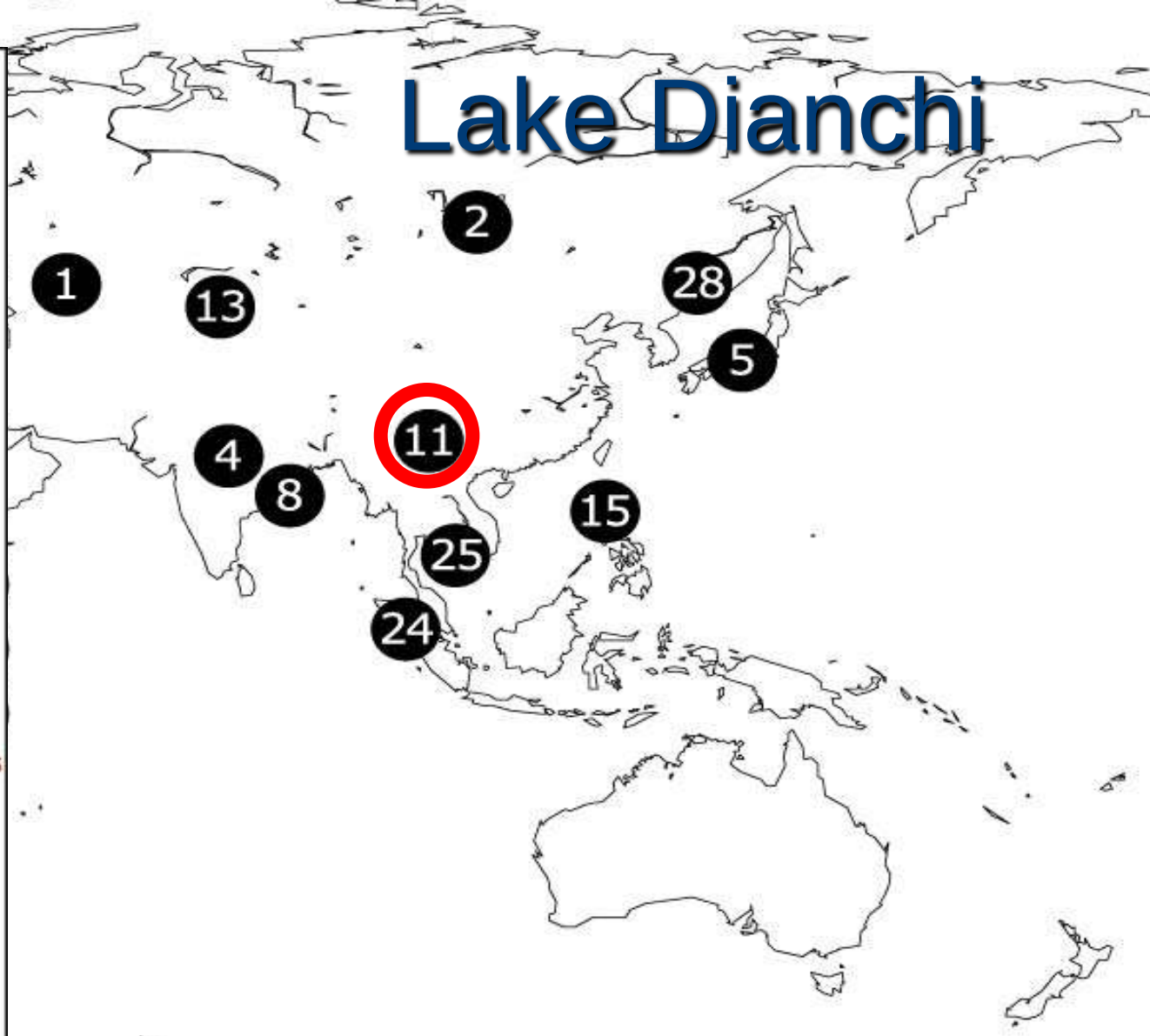
Lake Dianchi



Lake Dianchi - Issues

- Water scarcity
  - Urban and industrial demand
- Water quality degradation
  - Wastewater discharges
  - Diffuse nutrient source
  - Industrial pollution
  - Severe eutrophication
- Environmental and ecological deterioration
  - Reclamation of littoral zone
  - Soil erosion
  - Lake siltation
  - Fish biodiversity threatened

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Lake Dianchi is facing many challenges:

having important implications to others lakes in the world !

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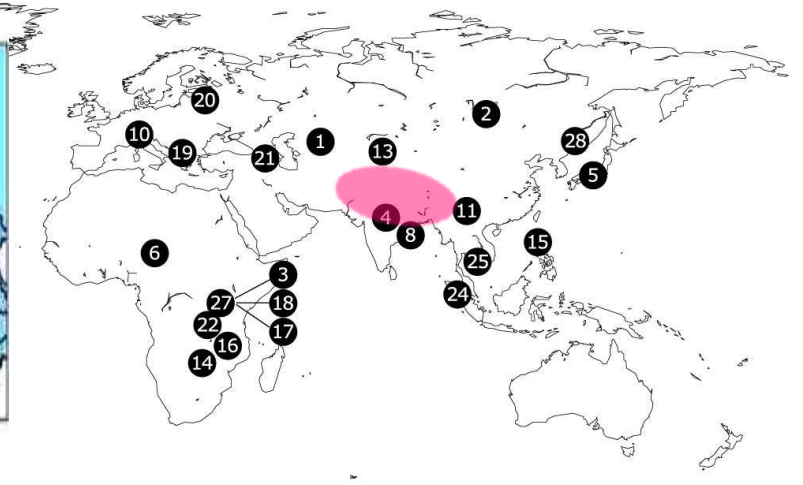
ILBM-Governance Project

Nepal
Malaysia
India
Russia
Mexico
Philippines
……..

a. Nepalese Lakes- Issues

Figure 1.1 GEF-MSP Lake Basin Management Initiative: Project Lake Basins



goon		15	Laguna de Bay	22	Tanganyika
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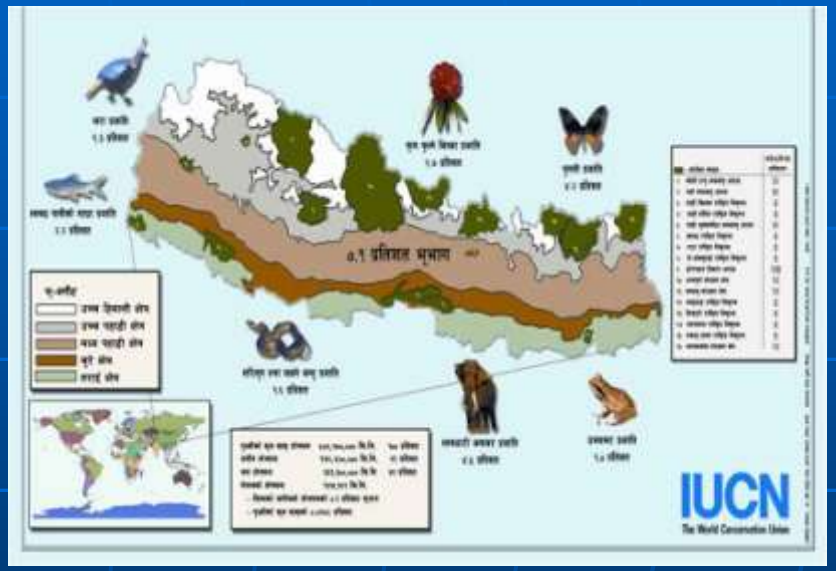
a. Nepalese Lakes- Issues

- Degrading Global Aesthetic and Cultural Assets
  - Biodiversity loss



- 6000 rivers
- 3252 Glaciers
- > 10 Reservoirs
- 234 Lakes (!)
- > 23,000 Ponds
- Marshy lands
- Paddy fields

·High Mountain: 182

·Mid Hills: 6

·Terai: 46

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a. Nepalese Lakes- Issues

- Degrading Global Aesthetic and Cultural Assets
  - Biodiversity loss
- Diminishing Livelihood for Ethnic Villagers
  - Deforestation
  - Unsustainable agriculture
  - Soil erosion
  - Exploitative practices

•5% of Nepal's land is under wetlands.

a. Nepalese Lakes- Issues

- Degrading Global Aesthetic and Cultural Assets
  - Biodiversity loss
- Diminishing Livelihood for Ethnic Villagers
  - Deforestation
  - Unsustainable agriculture
  - Soil erosion
  - Exploitative practices
- Resource Provisions for Downstream Polulation Centers
  - Increasing urbanization
  - Increasing population
  - Tourism development

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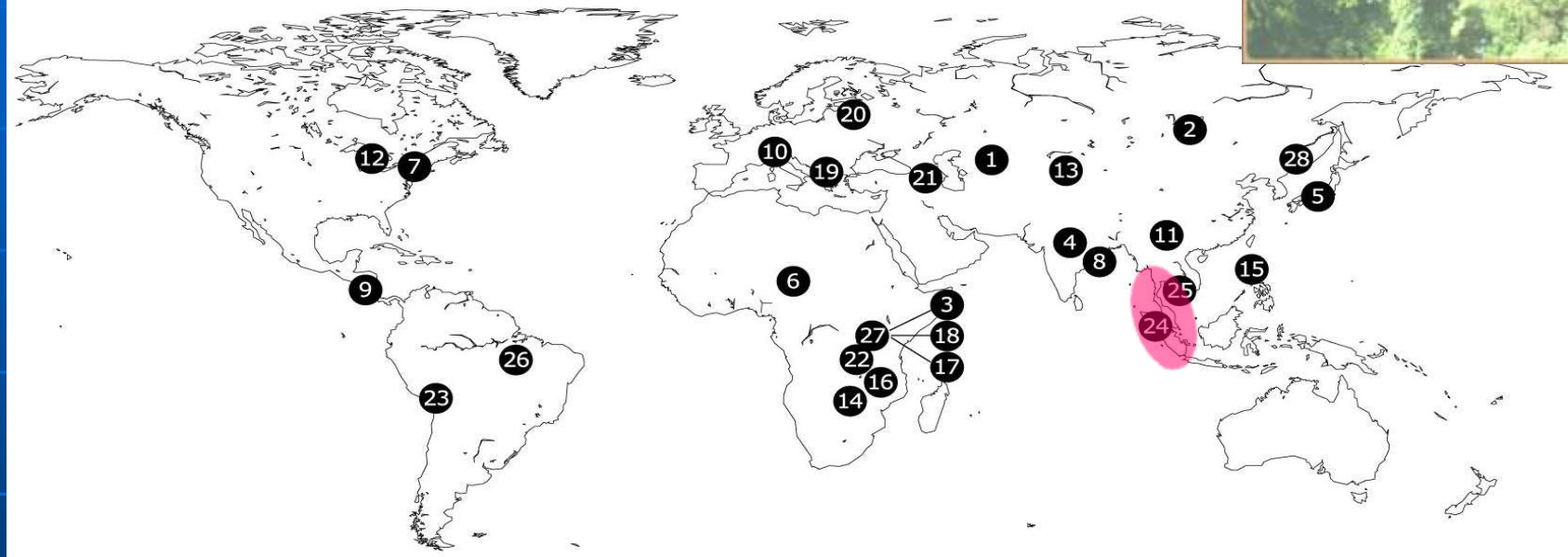
b. Malaysian Lakes and Reservoirs

Figure 1.1 GEF-MSP Lake Basin Management Initiative: Project Lake Basins



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3	Baringo	10	Constance	17	Naivasha	24	Toba
4	Bhoj Wetland	11	Dianchi	18	Nakuru	25	Tonle Sap
5	Biwa	12	Great Lakes (Laurentian)	19	Ohrid	26	Tucurui
6	Chad	13	Issyk-kul	20	Peipsi/Chudskoe	27	Victoria
7	Champlain	14	Kariba Reservoir	21	Sevan	28	Xingkai/Khanka

b. Malaysian Lakes and Reservoirs

- Diminishing Tropical Wetlands
  - Loss of indigenous species
- Land Use Change and Its Impacts
- Point and nonpoint source pollutions

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- Diminishing Tropical Wetlands
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- Land Use Change and Its Impacts
  - Massive soil erosion
  - Expanding palm oil and rubber estates
  - Urban and industrial developments
- Point and nonpoint source pollutions

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- Diminishing Tropical Wetlands
  - Loss of indigenous species
- Land Use Change and Its Impacts
  - Massive soil erosion
  - Expanding palm oil and rubber estat
  - Urban and industrial developments
- Point and nonpoint source pollutions
  - Shortage of sewerage coverage
  - Need for nutrient removal
  - Agricultural chemicals

a Global Profile of the State of Lake Basins

Figure 1.1 GEF-MSP Lake Basin Management Initiative: Project Lake Basins

1	Aral Sea	8	Chilika Lagoon	15	Laguna de Bay	22	Tanganyika
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Table 3.2 Summary of Problems Affecting the 28 Study Lake Basins as Described in the Briefs[1].

Lake Basin	In-lake					Littoral				Basin origin							Regional/ Global		
	Unsustainable fishing practices	Introduced faunal species	Salinity changes	Weed infestations	Nutrients from fish cages	Shoreline effluent discharges	Shoreline industrial discharges	Shoreline water extraction	Loss of wetlands	Excess sediment inputs	Non-point source nutrients	Agro-chemicals	Water abstraction	Changes in run-off	Effluent and stormwater	Industrial pollution	Atmospheric nutrients	Atmospheric industrial contaminants	Climate change
Aral Sea			→						→				→						
Baikal						↓	→			↓								→	
Baringo	→									↓			↓	↓					↓
Bhoj Wetland				→		→	↓			→	→	→			→				
Biwa									↓		→	→	↑[2]		↑				↓
Chad									↓	↓			↓						↓
Champlain						↑					↑				↑			→	
Chilika Lagoo			↑	↑						↓	↓	↓	↓		↓				
Cocibolca/ Nic						↓				↓		↓			↓				
Constance		↓				↓			→		→	→			→				
Dianchi					↑	→	→		↓	↓[3]	↓[3]	↓[3]	↓		↓			→	
Great Lakes (N		↓				↑	↑				→	→			↑	→		→	
Issyk-kul		→								↓	↓	↓				↓[4]			↓
Kariba Reserv					↓	→					↓								↓
Laguna de Ba	→	↓	→	→	↓	→	→			↓	↓				↓	→			
Malawi/Nyasa	↓[5]			↓						↓	↓	↓		↓	↓		↓		↓
Naivasha	↑	→		↑		↓		→	→	↓							↓		
Nakuru										→	→		↓	↓	↓				
Ohrid	→	↓				→	↓		↓	↓	↓	↓			↓				
Peipsi/Chudsl	↓			→		→					→[6]				↓	→[6]			
Sevan	↓	↓				↓			→	↓			↓						
Tanganyika	↓[5]					↓	↓			↓					↓				↓
Titicaca		↓				→	↓			↓					↓	↓			
Toba	↓	↓		↓	↓	→			↓	→	→	↓	↓	→	↓		↓		
Tonle Sap	↓	↓								↑[7]					↓				
Tucurui Reservoir				→						→									
Victoria	→	↓[8]		↑		↓	↓		↓	↓	↓				↓	↓[4]	↓		
Xingkai/Khanka	↓					→	→		↓	↓		↓			↓	↓[9]			
Total Occurrences	12	10	3	9	4	18	10	1	11	21	16	12	9	4	19	7	4	4	7

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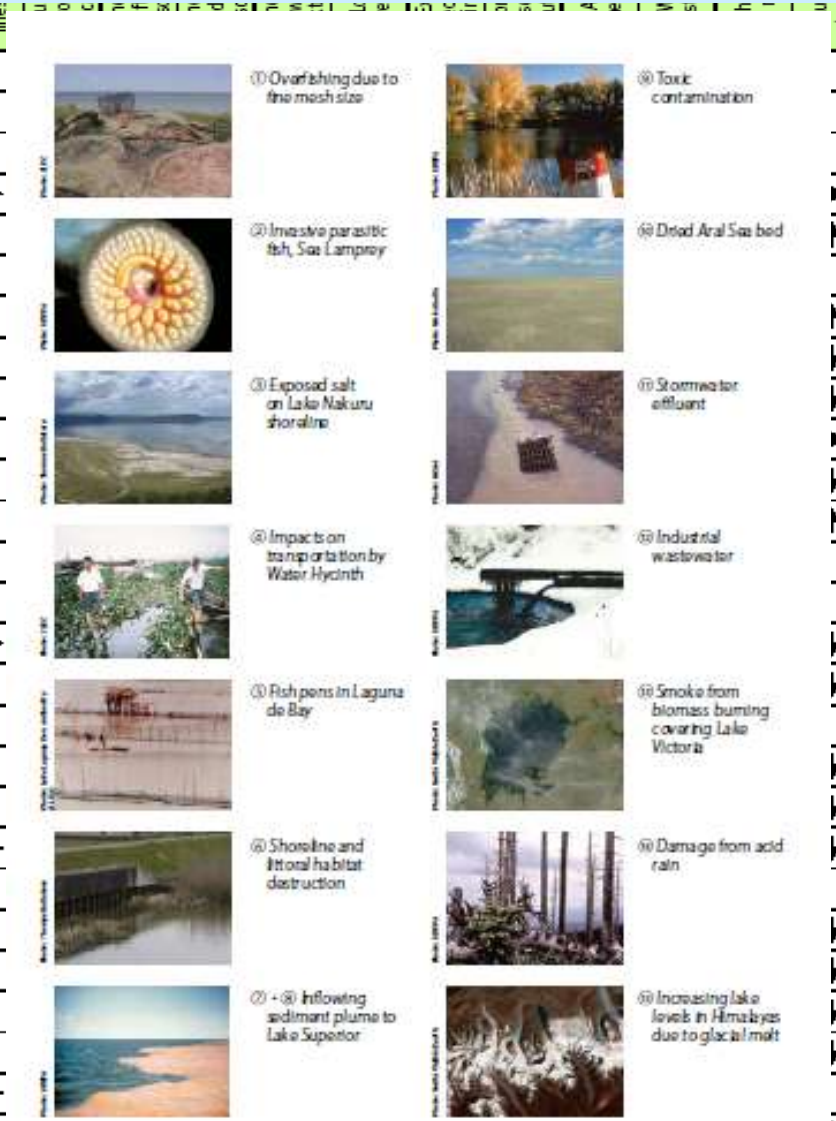
16 Types of Lake problems

Lakes in the World

Lake Basin	Unsu fi pr	Intr fa st	St ch	V infe												Ind po	Atm nu	Atm ind conte	Cl change
Aral Sea			→																
Baikal																		→	
Baringo	→																		↓
Bhoj Wetland				→															
Biwa																			↓
Chad																			↓
Champlain																		→	
Chilika Lagoo			↑	↑															
Cocibolca/ Nic																			
Constance		↓																	
Dianchi																		→	
Great Lakes (N)		↓														→		→	
Issyk-kul		→														↓ 4			↓
Kariba Reserv																			↓
Laguna de Ba	→	↓	→	→												→			
Malawi/Nyasa	↓ 5			↓													↓		↓
Naivasha	↑	→		↑													↓		
Nakuru																			
Ohrid	→	↓																	
Peipsi/Chudsl	↓			→												→ 6			
Sevan	↓	↓																	
Tanganyika	↓ 5																		↓
Titicaca		↓														↓			
Toba	↓	↓		↓													↓		
Tonle Sap	↓	↓																	
Tucurui Reservoir				→															
Victoria	→	↓ 8		↑												↓ 4	↓		
Xingkai/Khanka	↓					→	→		↓	↓		↓			↓	↓ 9			
Total Occurrences	12	10	3	9	4	18	10	1	11	21	16	12	9	4	19	7	4	4	7



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Lake Basin	Unsu fi pro	Intr fa sp	Si ch	V infe	Nu fro c	Sh ef disc	Sh ind disc	Sh w ext	L we	E sec ir	Nor si nu	A cha	W abs	Ch in t	Efflu stor	Ind po	Atm nu	Atm ind conta	Cl change
Aral Sea			→						→				→						
Baikal						↓	→			↓								→	
Baringo	→									↓			↓	↓					↓
Bhoj Wetland				→		→	↓			→	→	→			→				
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Chad									↓	↓			↓						↓
Champlain						↑					↑				↑			→	
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Constance		↓							→		→	→			→				
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Issyk-kul		→									↓	↓				↓[4]			↓
Kariba Reserv					↓	→													↓
Laguna de Ba	→	↓	→	→	↓	→	→			↓					↓	→			
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Naivasha	↑	→		↑		↓		→	→								↓		
Nakuru										→			↓	↓	↓				
Ohrid	→	↓				→	↓		↓	↓	↓	↓			↓				
Peipsi/Chudsl	↓			→		→					→[6]				↓	→[6]			
Sevan	↓	↓				↓			→	↓			↓						
Tanganyika	↓[5]					↓	↓			↓					↓				↓
Titicaca		↓				→	↓			↓					↓	↓			
Toba	↓	↓		↓	↓	→			↓	→	→	↓	↓	→	↓		↓		
Tonle Sap	↓	↓								↑[7]					↓				
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Why do all of the world's lakes degrade ?

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Lakes and Basins

Made by T. Ballatore

Bhoj Wetland

Chilika Lagoon

Lake Xinghai/Khanka

Lake Biwa

Lake Dianchi

Lake Toba

Tonle Sap

Laguna de Bay

Lake Basins (Watersheds) are Lentic – Lotic Combinations

Globally,
90% of Water is
in Lentic form

Lotic water system

Natural lentic water system

Artificial water system

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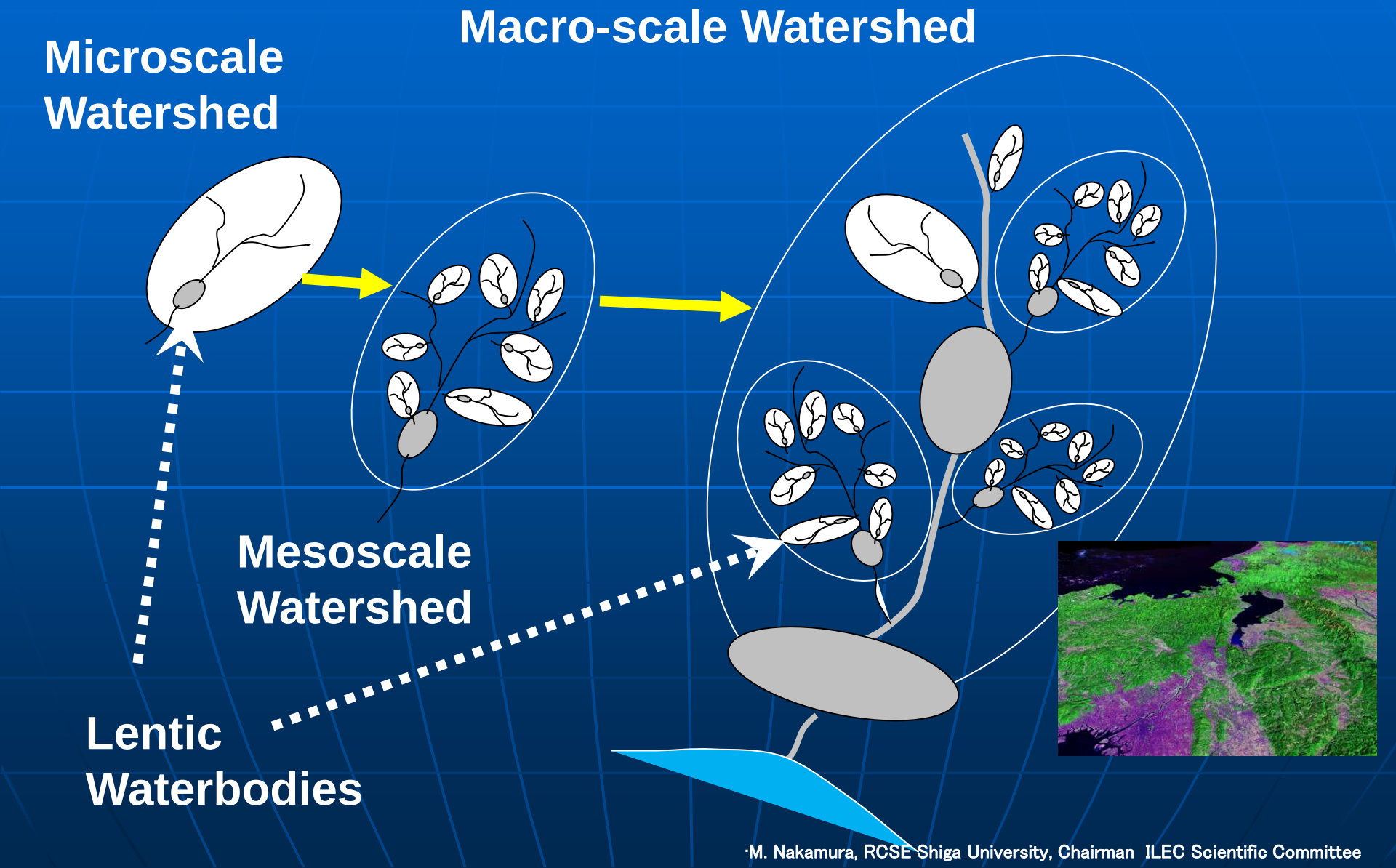
A Lake Basin consisting of Many Lake Basins



Integrated Water Resources Management (IWRM)

Integrated River Basin Management (IRBM)

But they cannot adequately take into account

90% of Earth's Waters !!!

What are missing ?

Unique Features of Lentic Water behaviors

……need for ILBM

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Integrated Water Resources Management (IWRM)

Integrated River Basin Management (IRBM)

But they cannot adequately take into account

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What are missing ?

We have to know of the Unique Features of Lakes

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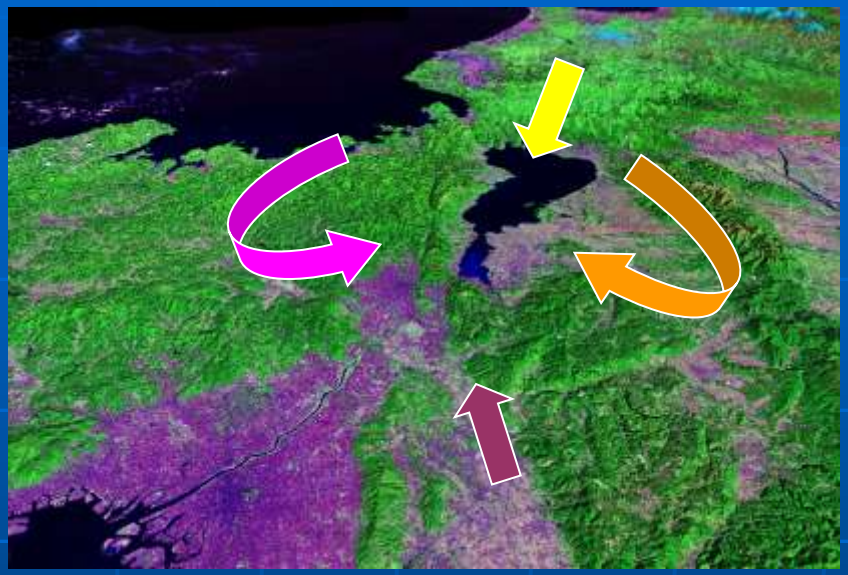
Unique Features of Lakes

- **Integrating Nature**
  (Everything comes together)



Unique Features of Lakes

- **Integrating Nature**
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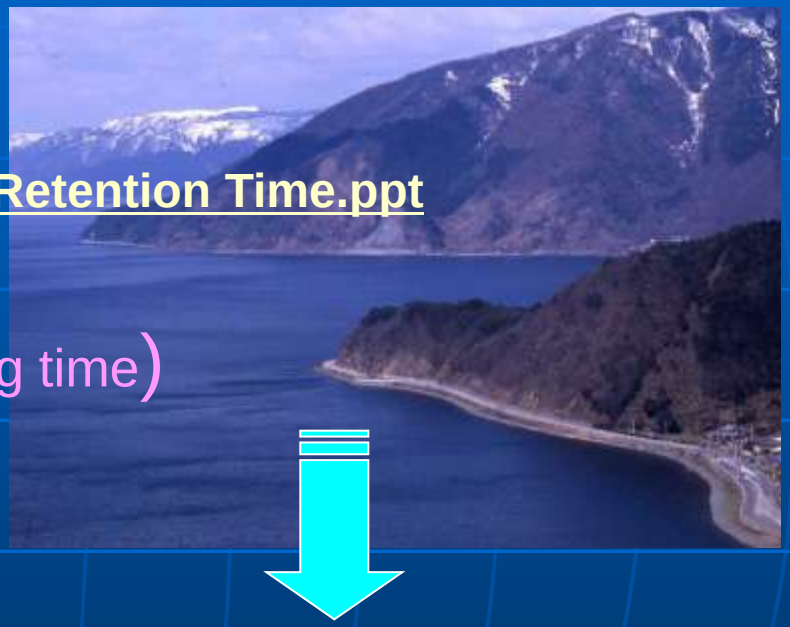
- **Long Retention Time** Retention Time.ppt
  (Problems remain long, and
- finding solutions also takes long time)



Unique Features of Lakes

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- **Complex Response Dynamics**
  (Everything affects
  everything else in water)

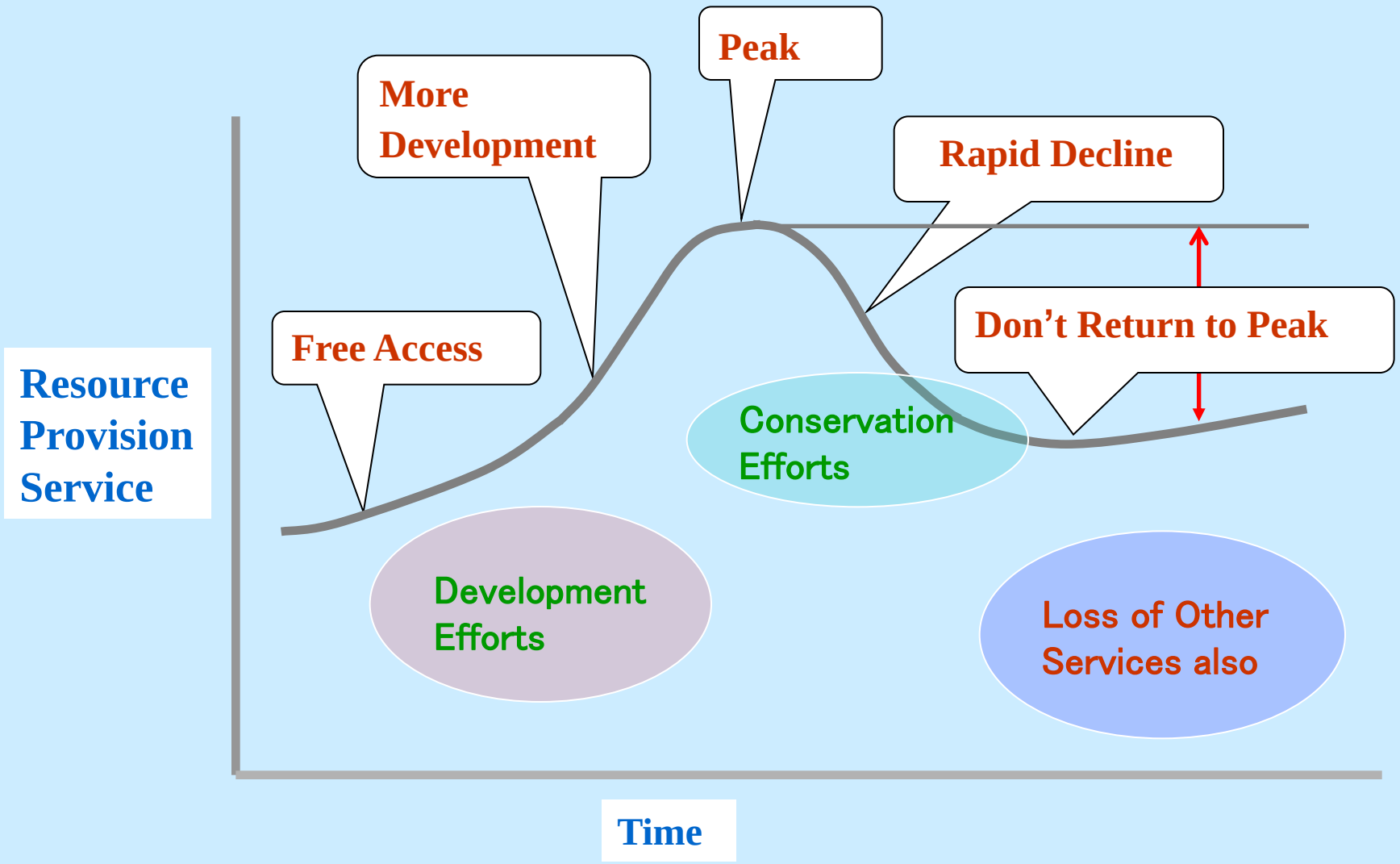
Unique Features of Lakes

- **Integrating Nature**
  (Everything comes together)
  → **1. Issues are mostly inseparable**
- **Long Retention Time** Retention Time.ppt
  (Problems remain long, and
  finding solutions also takes long time)
  → **2. Changes are gradual and invisible**
- **Complex Response Dynamics**
  (Everything affects
  everything else in water)
  → **3. Unpredictable and Uncontrollable**

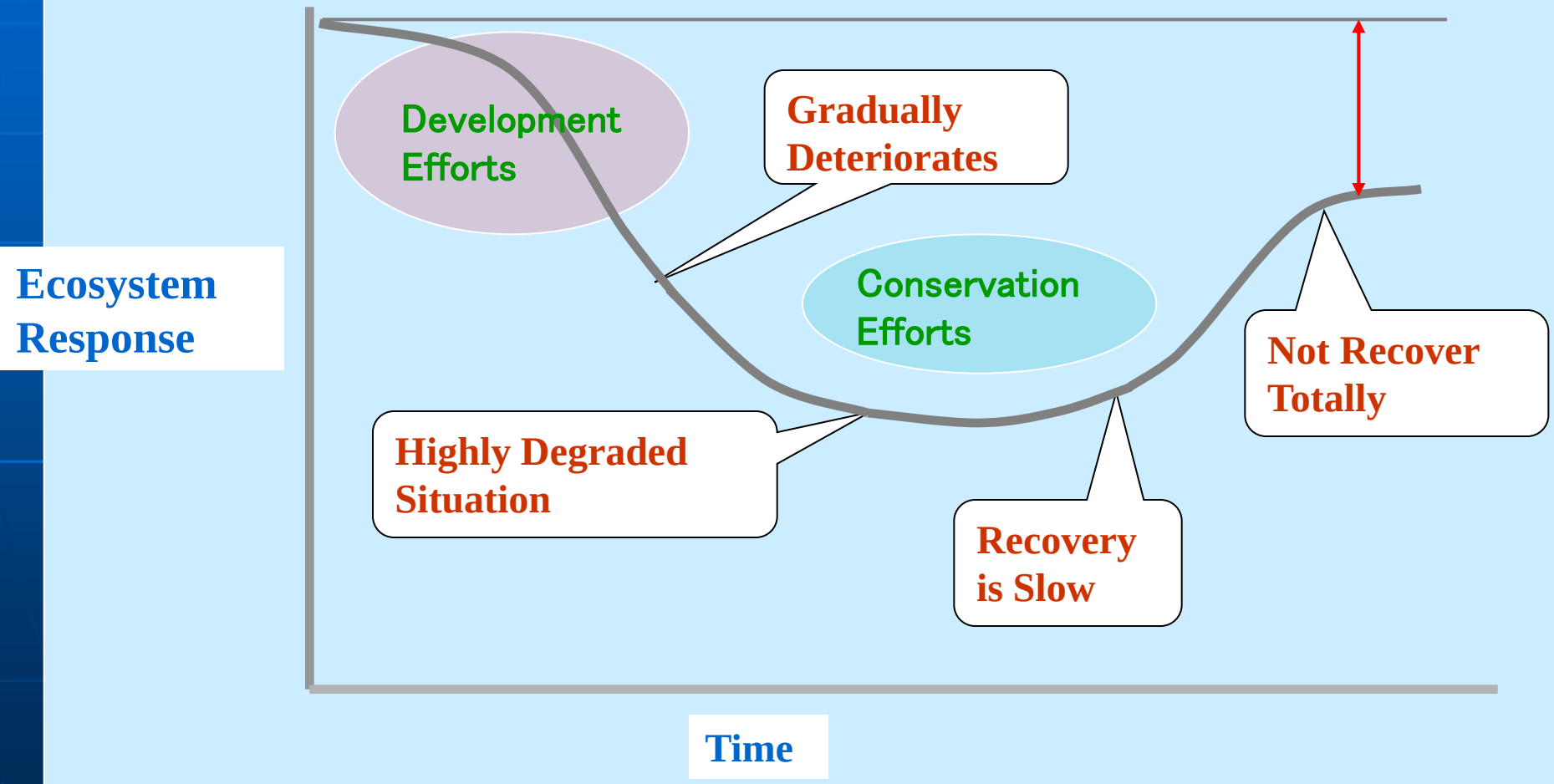
ILBM Principles:

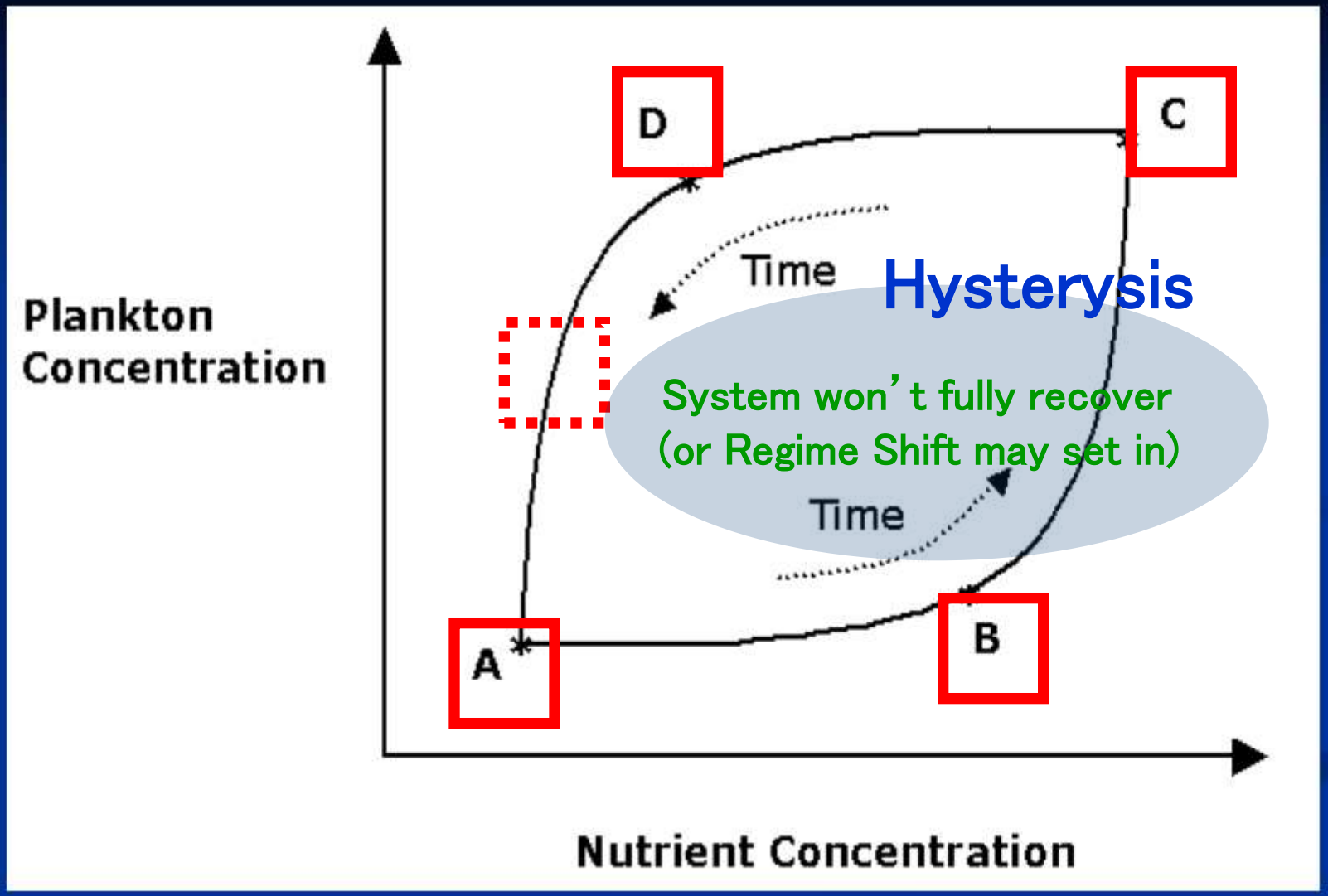
- “Lentic Water System” Principle
- “Change in Resource Value” Principle
- “Ecological Service” Principle
- “Governance Improvement” Principle

Let's Look at Resouce Values



What is going on inside the Lake?




Plankton Concentration
D
C
Time
Hysterysis
System won't fully recover
(or Regime Shift may set in)
Time
A
B
Nutrient Concentration

ILBM Principles:

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Ecosystem Services

Resource Provision Service

Regulating Service

Cultural Service

Supporting Service

- **Water Supplies**
- **Fish**
- **Irrigation Crops**
- **Wood and Fiber**
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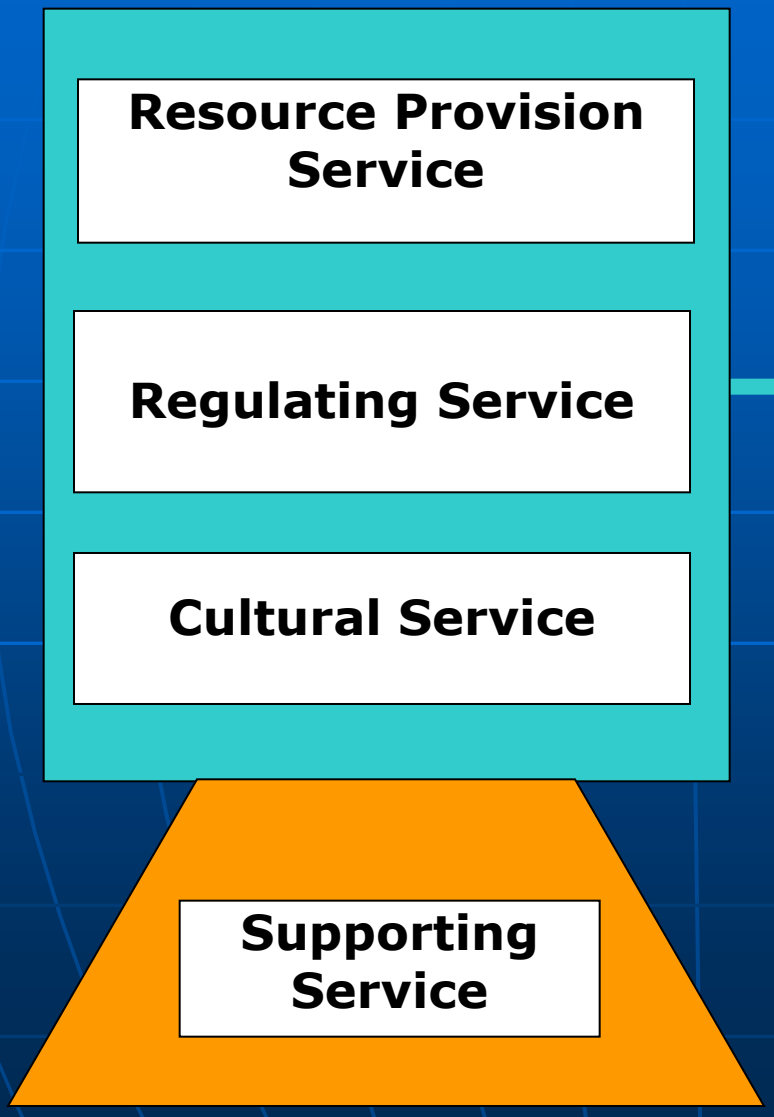
- **Hydropower Potential, etc.**

Ecosystem Services



- **Flood and Drought Mitigation Capacity**
- **Self-purification Capacity**
- **Health Provisions**
- **Navigation Routes**
- **Climate Mediation**
- **Aquatic Habitats**
- **Diverse Food-chains**
- **Coastal Ecotone Buffer Capacity**
- **Fertile Lands**

Ecosystem Services

Resource Provision Service

Regulating Service

Cultural Service

Supporting Service

·Indigenous Species

·Productive Riparian Ecosystem

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Ecosystem Services

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Supporting Service

- **Aesthetic and Scenic Values**
- **Religious Sites and Spiritual Values**
- **Historic Sites**
- **Educational Resources**

Ecosystem Services

Resource Provision Service

Regulating Service

Cultural Service

Supporting Service

- **Soil Properties**
- **Habitat formation**
- **Primary production**
- **Nutrient cycling**

Ecosystem Services

Resource Provision Service

Regulating Service

Cultural Service

Supporting Service

We all **want this value**

We tend to **forget these values**

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Without Timely Conservation, all Ecosystem Services may Disappear.

Resource Provision Service

Regulating Service

Cultural Service

Supporting Service

Without Timely Conservation, all Ecosystem Services may Disappear.

Exploitation of
Resource
Provision Service

Loss of
Regulating Service

Cultural Service

Supporting Service

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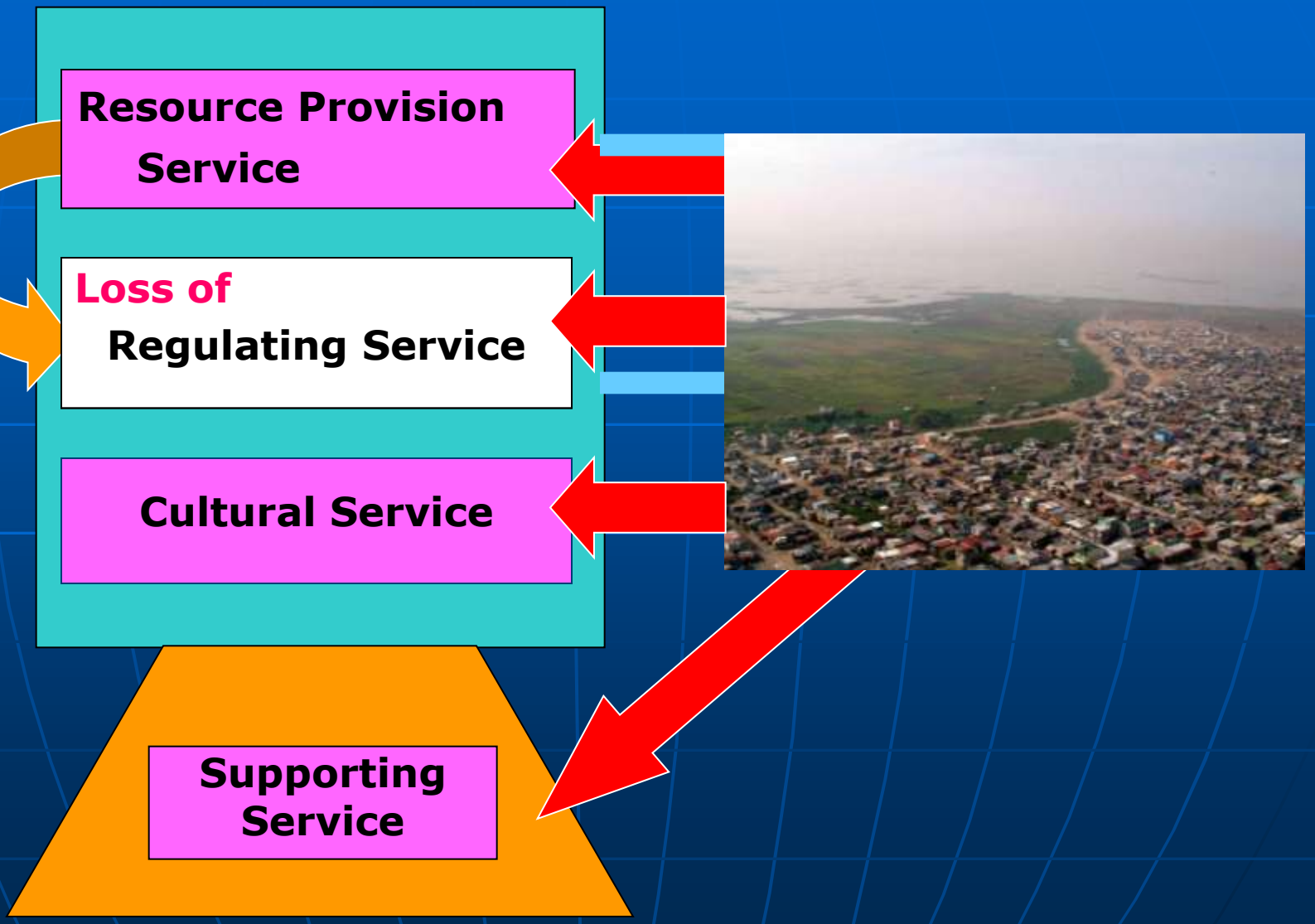
Without Timely Conservation, all Ecosystem Services may Disappear.



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How Do We Manage Lakes?

·M. Nakamura, RCSE Shiga University, Chairman ILEC Scientific Committee

ILBM Principles:

- “Lentic Water System” Principle
- “Change in Resource Value” Principle
- “Ecological Service” Principle
- “Governance Improvement” Principle

Lake Features lead to

Management Requirements, i.e.,

1. **Issues are mostly inseparable**
2. **Changes are gradual and invisible**
3. **Unpredictable and Uncontrollable**

so what do we Need to do?

and what are the Challenges?

·M. Nakamura, RCSE Shiga University, Chairman ILEC Scientific Committee

Let's look at Management Requirement 1.

1. Issues are mostly inseparable

➡ we **Need** to manage….

➡ but the **Challenges** are:

- across Political Jurisdictions
- not just Water, but Land and Air environments as well
- with Multiple Policies and Programs

Over Entire Basin

Let's look at Management Requirement 1.

1. Issues are mostly inseparable

➡ we **Need** to manage….

➡ but the **Challenges** are:

- across Political Jurisdictions
  (jurisdictions have competing needs)
- not just Water, but Land and Air environments as well
  (interactions are often very complicated)
- with Multiple Policies and Programs
  (implementation becomes quite complex)

Management Requirement 2.

2. Changes are gradual and invisible

➡ **we Need to ….**

- have Policy and Financial Commitments

Over LongTime

- have Monitoring and Applied Studies

Management Requirement 2.

2. Changes are gradual and invisible

➡ **we Need to ….**

➡ but the **Challenges** are:

- have Policy and Financial Commitments

  (the political and economic situations may change over time)

- have Monitoring and Applied Studies

  (politicians may demand quick results with limited funding)

Management Requirements

3. Unpredictable and Uncontrollable

➡ **we Need to have…**

- clear understanding of how People the Nature can work together

with good **Mind, Heart and Brain**

- Know when to take "Precautionary Approaches"

Management Requirements

3. Unpredictable and Uncontrollable

➡ **we Need to have…**

➡ but the **Challenges** are

- clear understanding of how People the Nature can work together

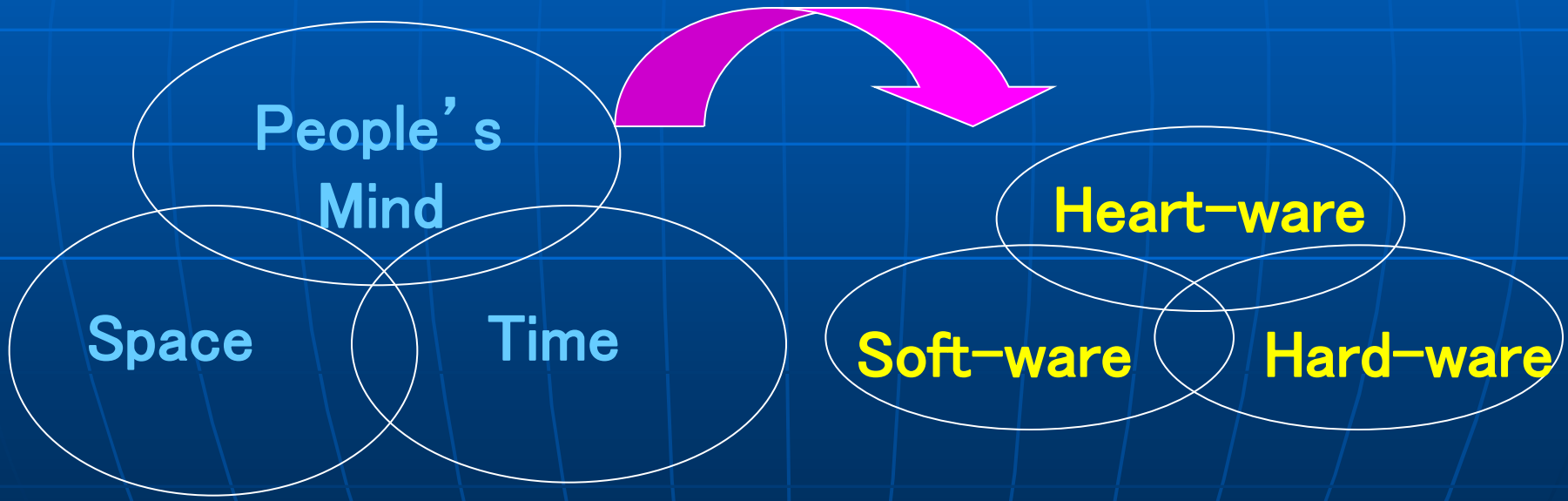
  (often policy application may be limited)

- Know when to take "Precautionary Approaches"

  (we tend to overlook early warnings, and lament over late lessons)

the Challenges encompass…

we need a systematic approach in:



Needs

- Need to management across jurisdictions
- Need to know air-land-water linkages
- Need to introduce multiple policies and programs
- Need to have long-term policy and financial commitments
- Need to have long-term monitoring
- Need Science
- Need "Precautionary Approach"

Challenges

- How can a balance be achieved?
- How can we attain partial linkages?
- Are there innovative ways to implement them satisfactorily?
- Can we develop innovating financing schemes?
- Collaborative monitoring may be possible and useful
- Integrate science in all plans and programs
- Be watchful of early warnings, but late lessons should not be ignored

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Question is Governance

Lessons Learned from 28 Cases:

Long-term policy with strong implementation
Sustained financial commitment

Flexible and collaborative institutional arrangements
Important participatory roles of citizens and the public

Focused and long-term scientific efforts
Well-balanced mix of technologies and policies

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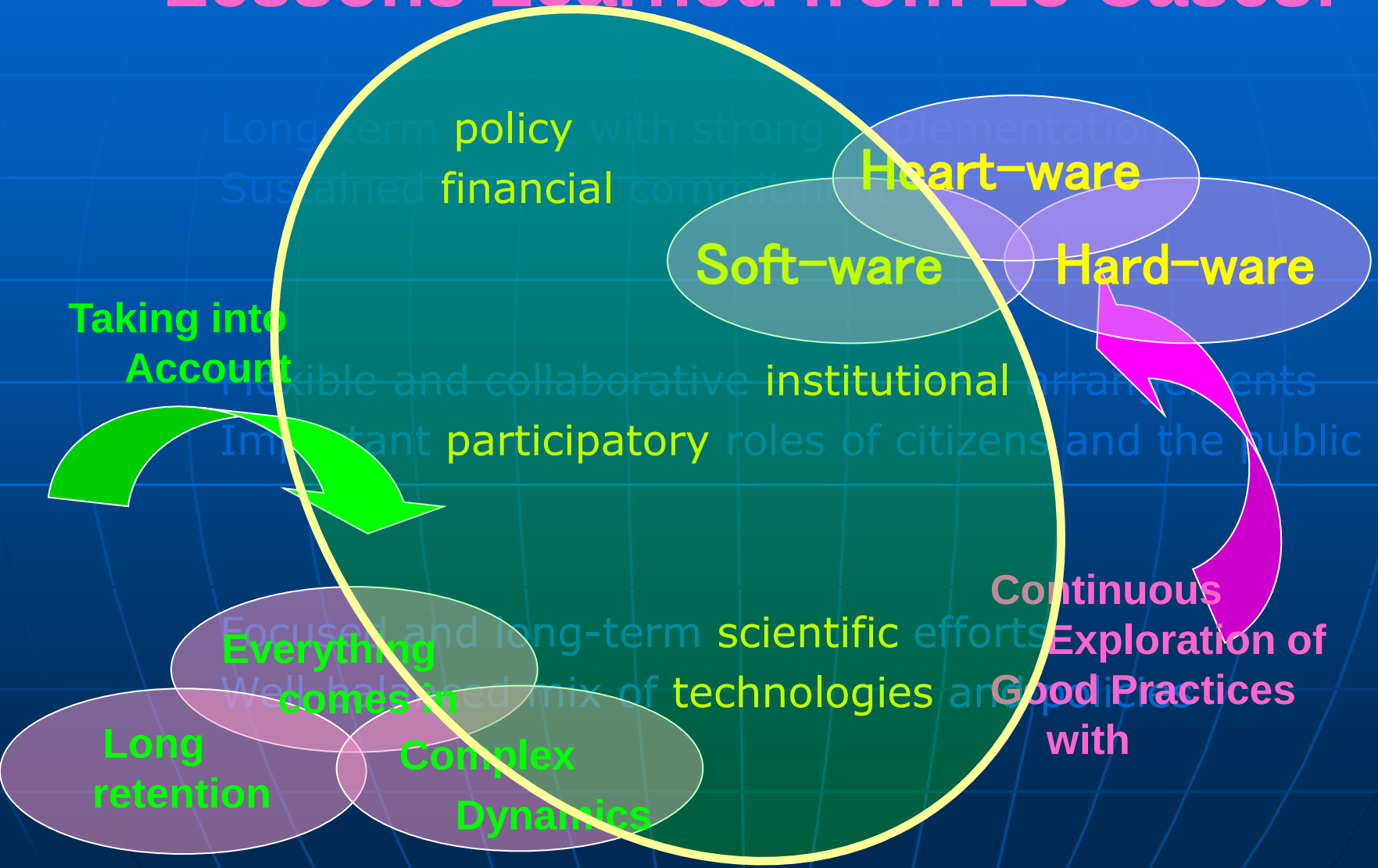
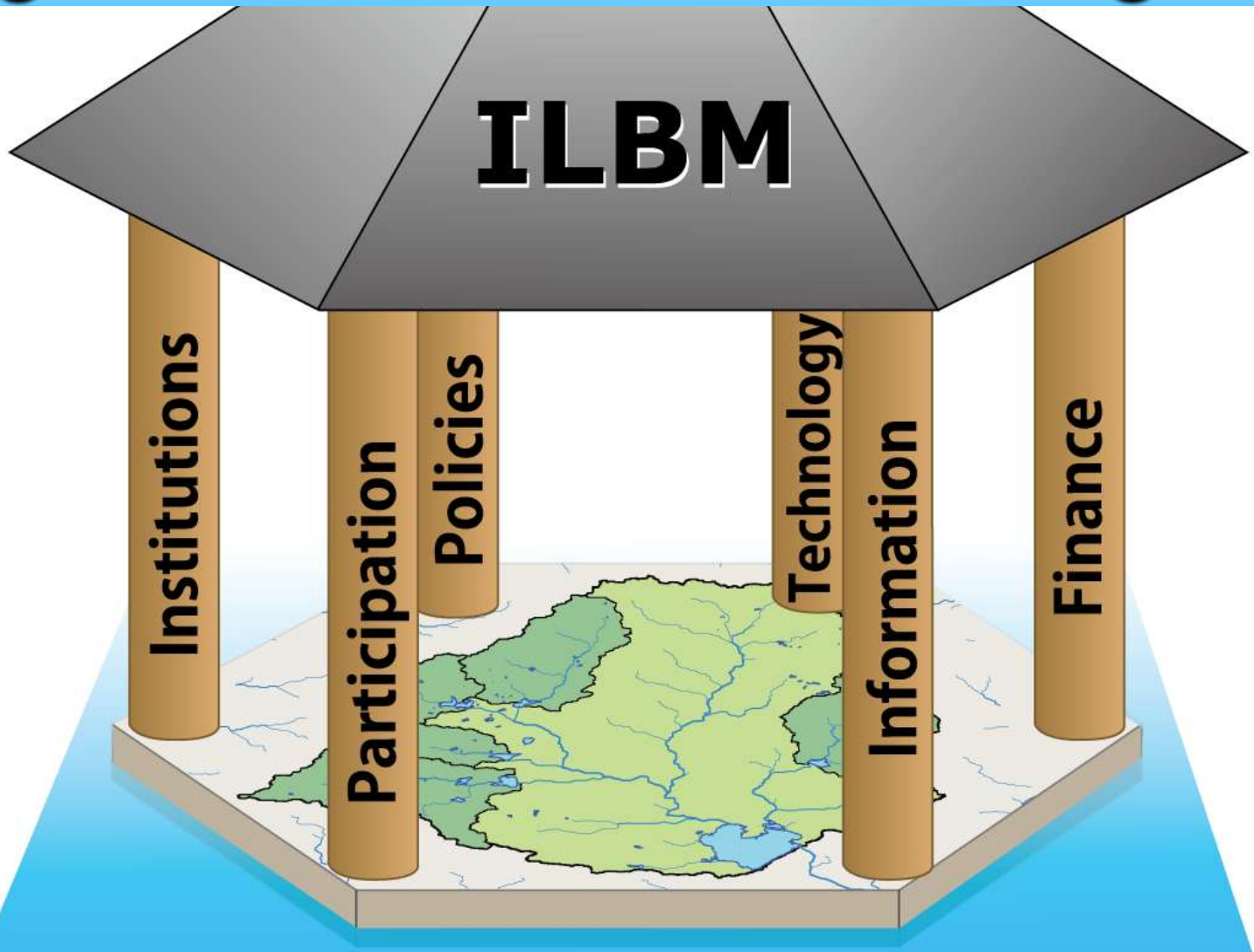
Question is Governance

Lessons Learned from 28 Cases:



Integrated Lake Basin Management



Preparation of a Lake Brief

("Guidliens for Lake Brief Preparation, downloadable from ILEC Website)

General Structure

1. Introduction
2. Description of the Lake (physical, chemical, biological…)
3. Management of the Lake and Its Basin
4. Major "Impact Stories" of the Lake
5. Major Lake Basin Governance Issues (examples provided as a Six Pillar questionnaire)
6. Key Challenges to Lake Governance
7. References

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Some Examples of Major “Impact Stories”

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Voluntary watershed rehabilitation by fishermen wives has been helping shellfish production at Lake Saroma, Japan.

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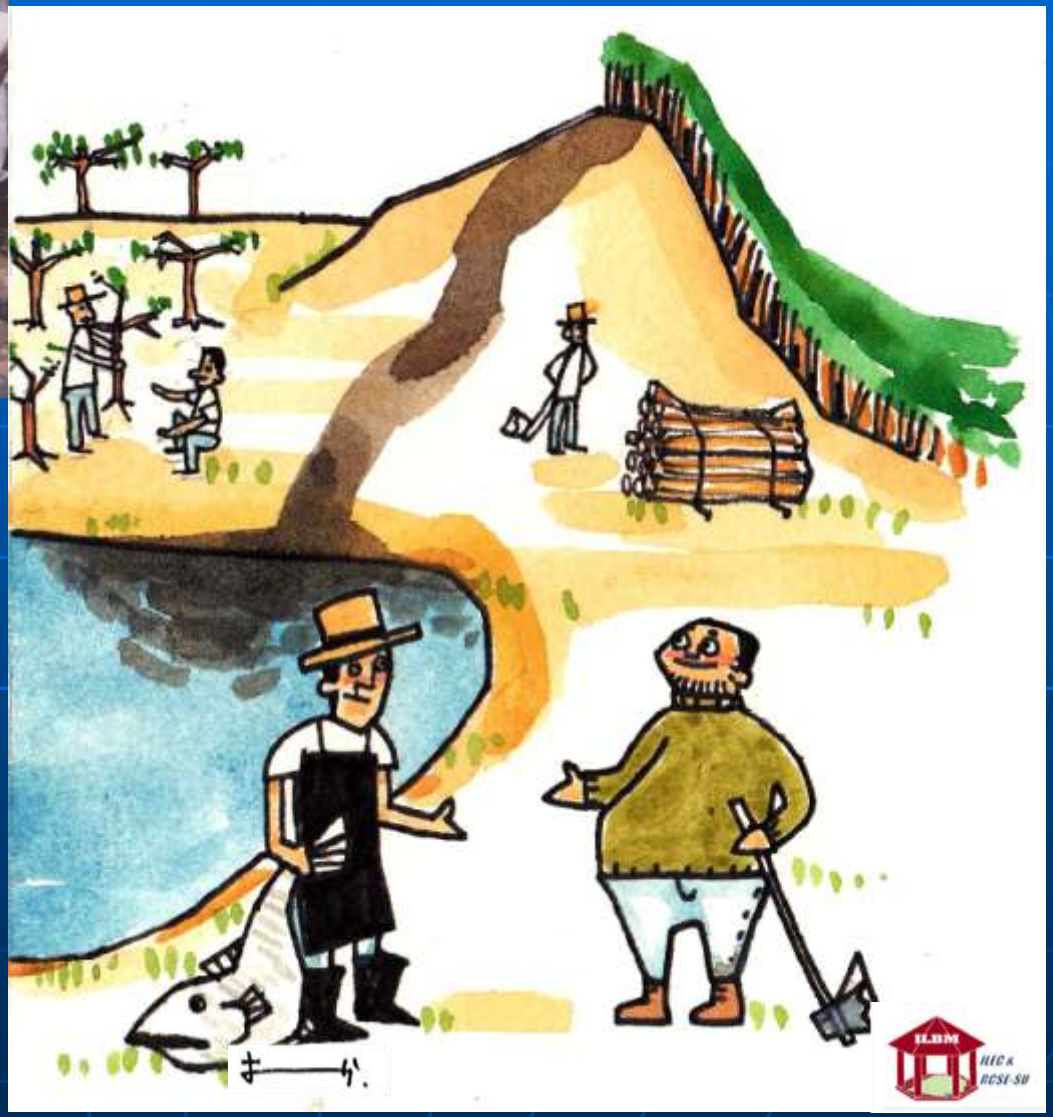
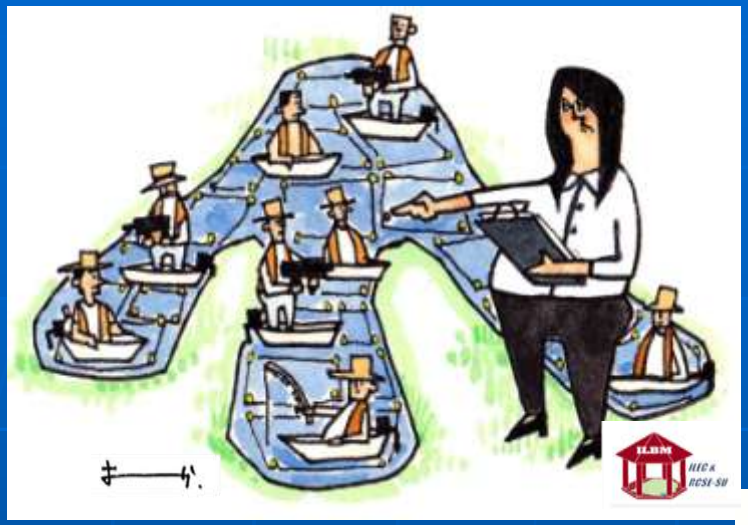
Payment for Watershed Services (PWS) helps, e.g., fishermen involving farmers through Coop in Rupa Lake, Nepal.



We make mistakes, but long and persistent efforts will eventually pay off, as in Lake Suwa, Japan.



Firm but flexible enforcement and voluntary compliance go hand in hand

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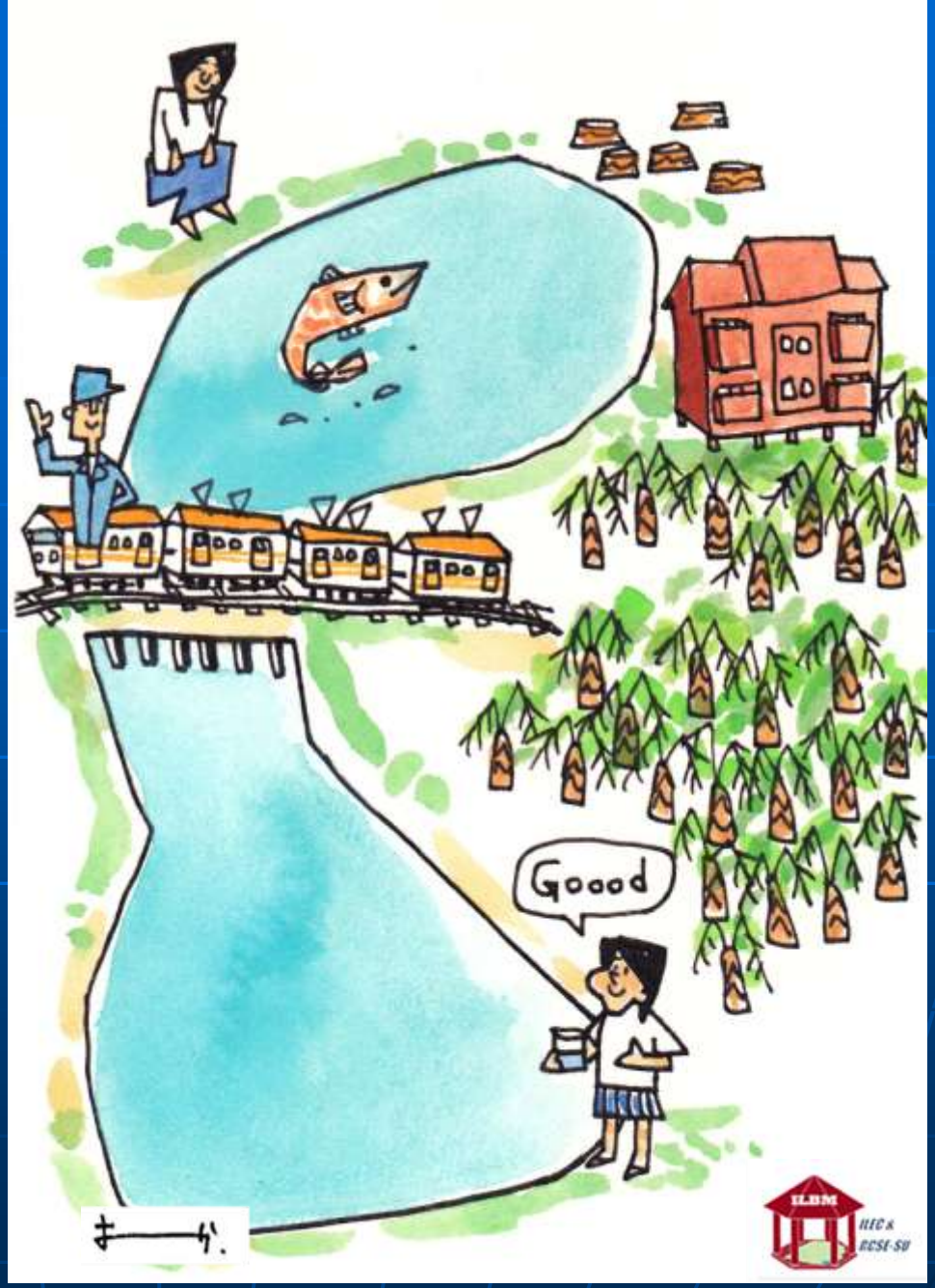

Consultative process for decongesting resource uses

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ILBM platform may help gradually resolve even contentious and conflicting situations.

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It was housewives who won over detergent industry, and led the "soap movement" in Lake Biwa, Japan.

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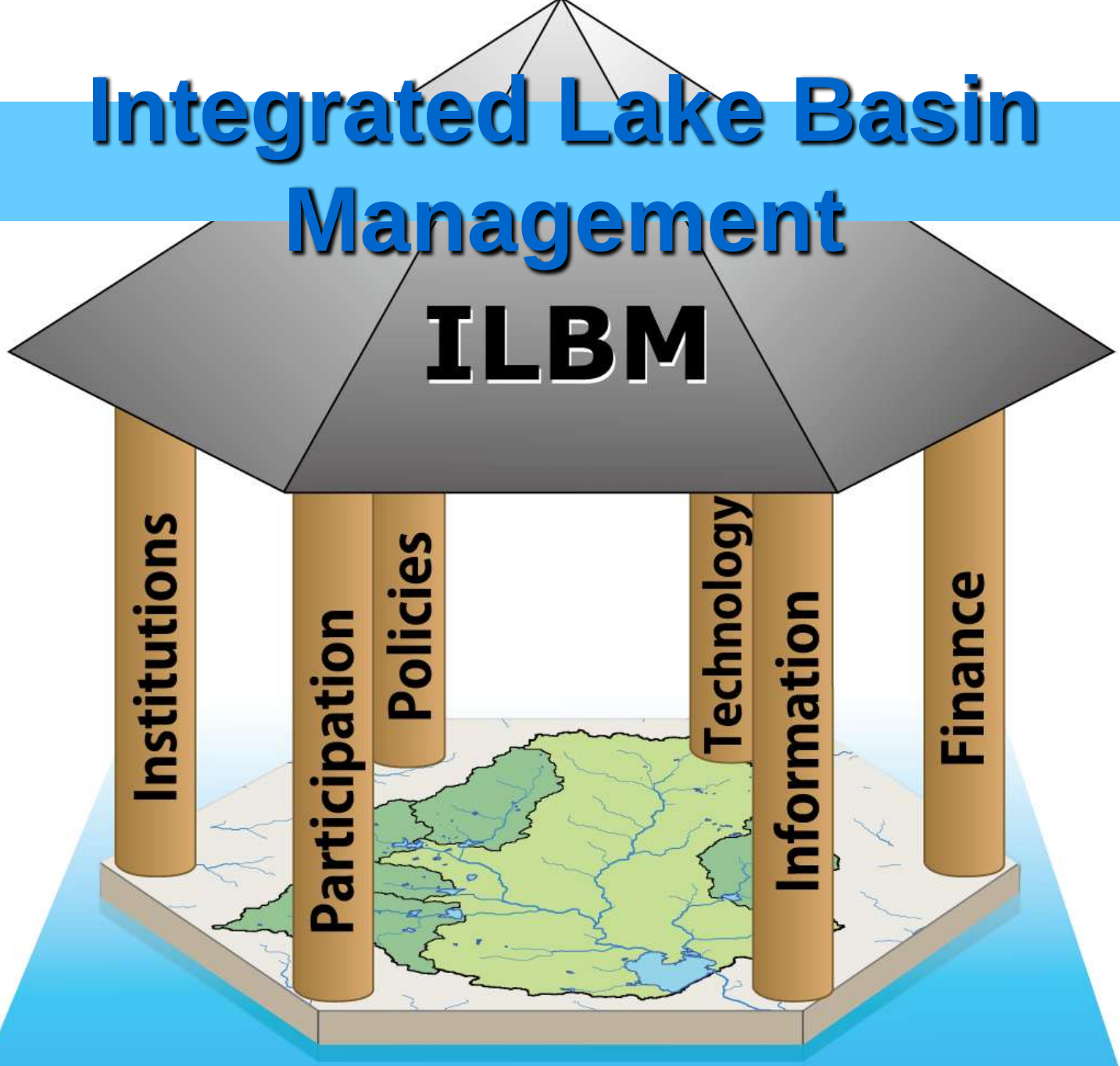
Integrated Lake Basin Management



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☐ "Ecological Service" Principle

A) Restoration of "RS" would be quite challenging.

Don't lose it in the first place.

B) Without "Regulating Service (RS)", "Resource Provision Service (RPS)" won't be sustainable.

We need to work on both.

C) "RS" itself is "RPS" in many micro-watershed communities.

It is the livelihood issue in many parts of the world.

D) Lentic-lotic "RSs" and upstream-downstream "RSs" are interconnected.

We have to work on linkages.

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“RSs” are interconnected.

We have to work on linkages.

☐ “Change in Resource Value” Principle

A) Long-term approach is needed to address long-term exploitation of “Resource Provision Service” of lentic waters.

Payment for ecosystem services (PES)

Payment for watershed services (PWS)

B) Development interventions produce values immediately

But the value may also be quickly lost.
Conservation/restoration takes long time but it also has lasting impacts.

□ "Lentic-Lotic Water System" Principle

A) 90% of surface freshwater on the globe is lentic water

Issues of heartware, dignity, ownership, sense of belongings

B) Lentic waters imply various life forms, history, culture, attachment, memories, etc.

Peace, poverty alleviation, local biodiversity

Governance Improvement Principle

A) ILBM governance framework may be illustrated with 6 components, i.e.,

Knowledge Base – LAKES

B) Making ILBM governance framework functional

ILBM Platform – under global promotion

C) Redirecting Global Water Debates

IWRM/IRBM inadequate → ILBM to complement

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Integrated Lake Basin Management

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Typical PDCA Cycle

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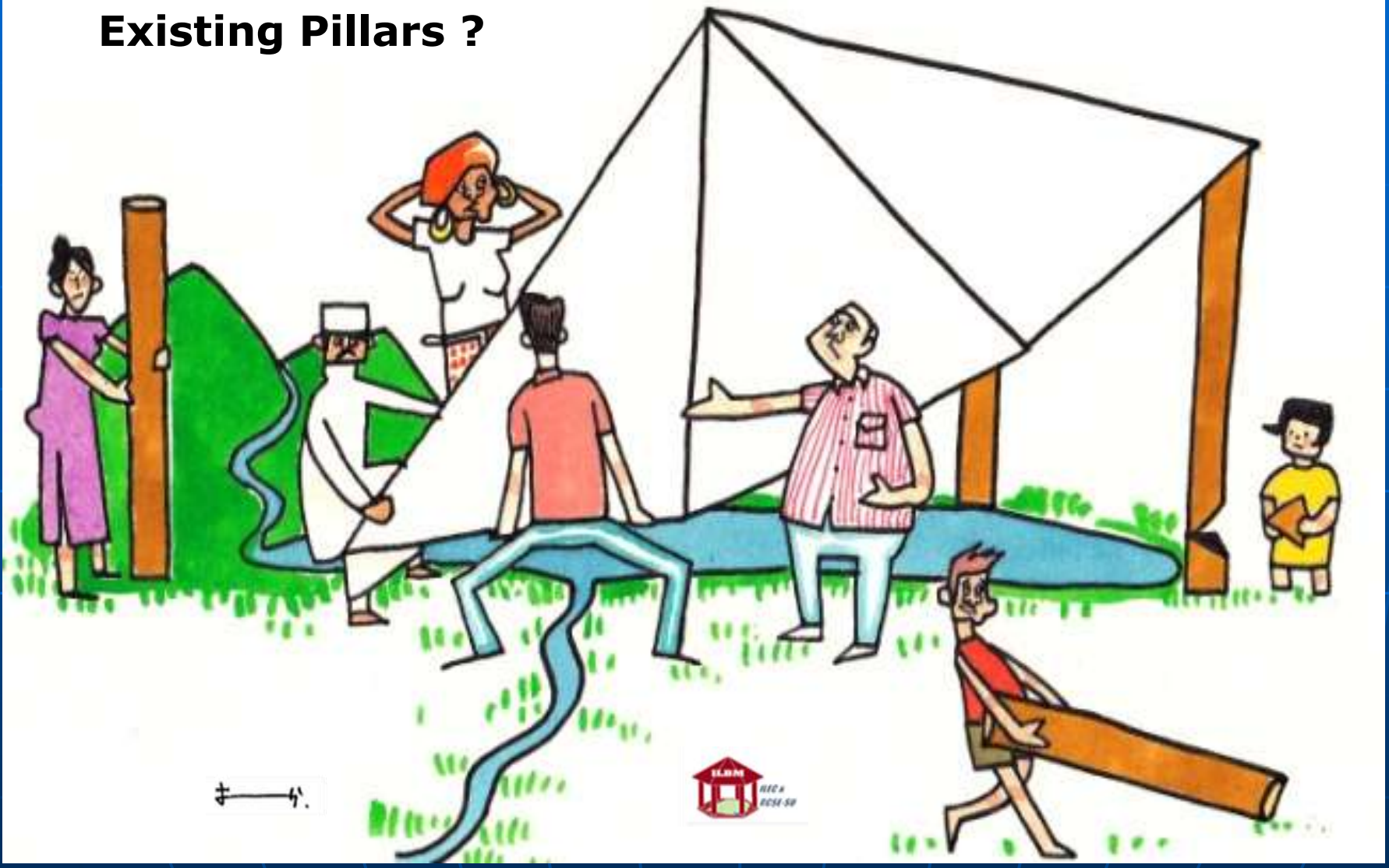
Existing Pillars ?



Do What We Can!

More Sustainable

Level of Sustainability

3. Seek ways to strengthen the governance pillars

5. Continue effort, eventually to reach the long-term goal

2. Identify issues, needs and challenges

Monitoring, Reconnaissance Survey, Inventory and Databases

4. Assess the governance improvements

1. Acknowledge the state of lake basin

Future

Time

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More Sustainable

Level of Sustainability

0. A Wishful Common Vision,

1. Acknowledge the state of lake basin

2. Identify issues, needs and challenges

3. Seek ways to strengthen the governance pillars

4. Assess the governance improvements

5 Evolve and Foster a Common Vision

Monitoring, Reconnaissance Survey, Inventory and Databases

6. Continue effort, eventually to reach the long-term goal

Time

Future

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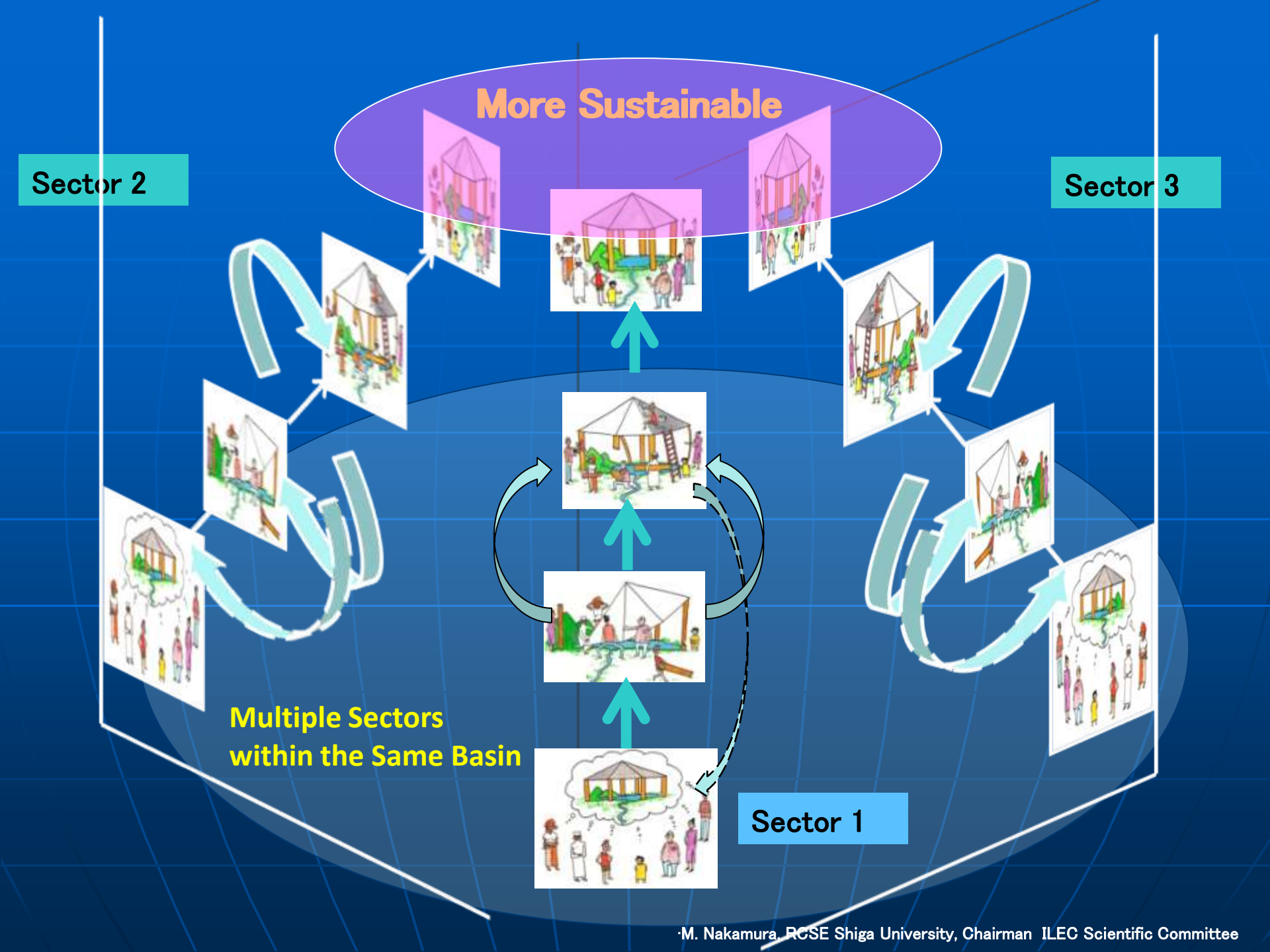

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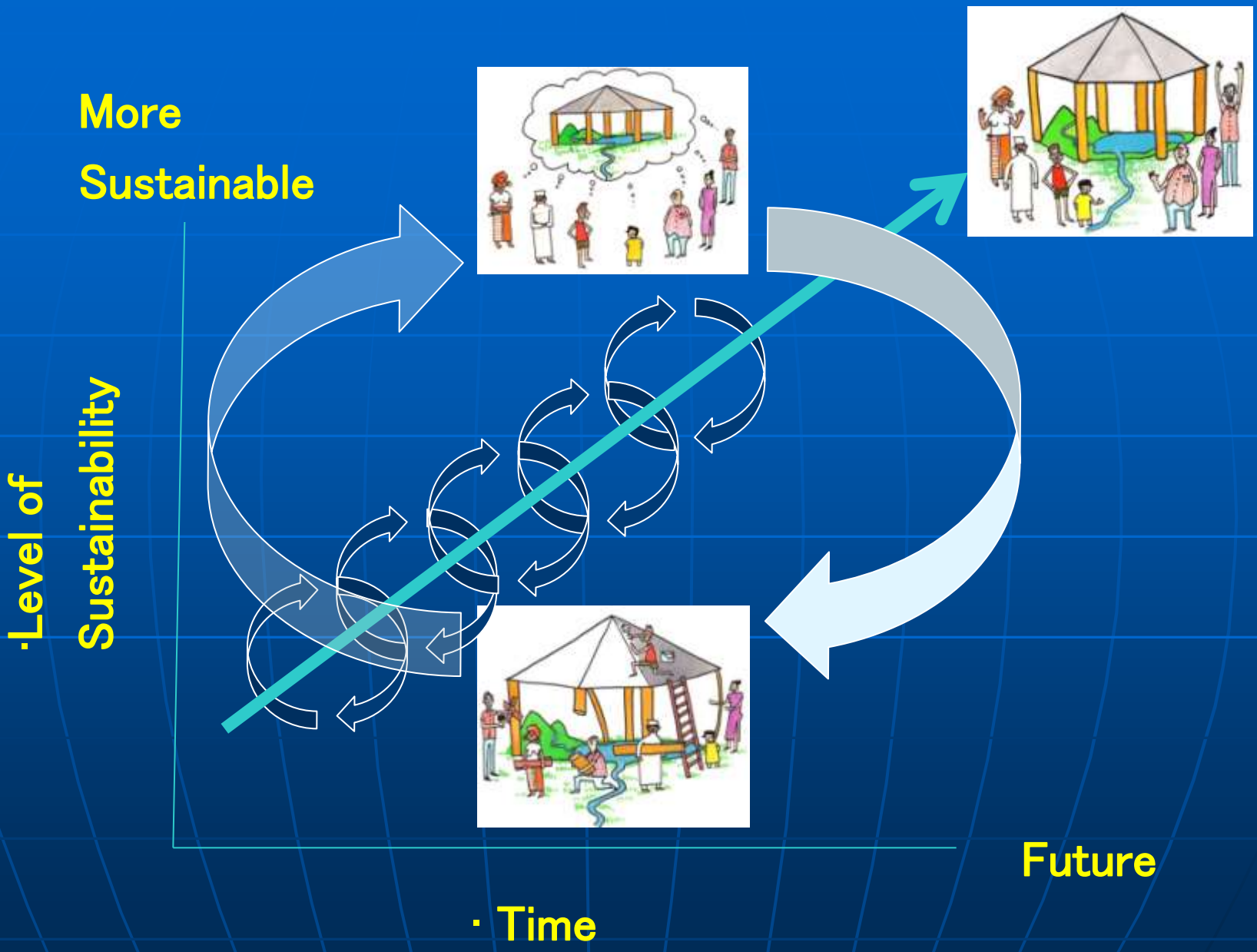

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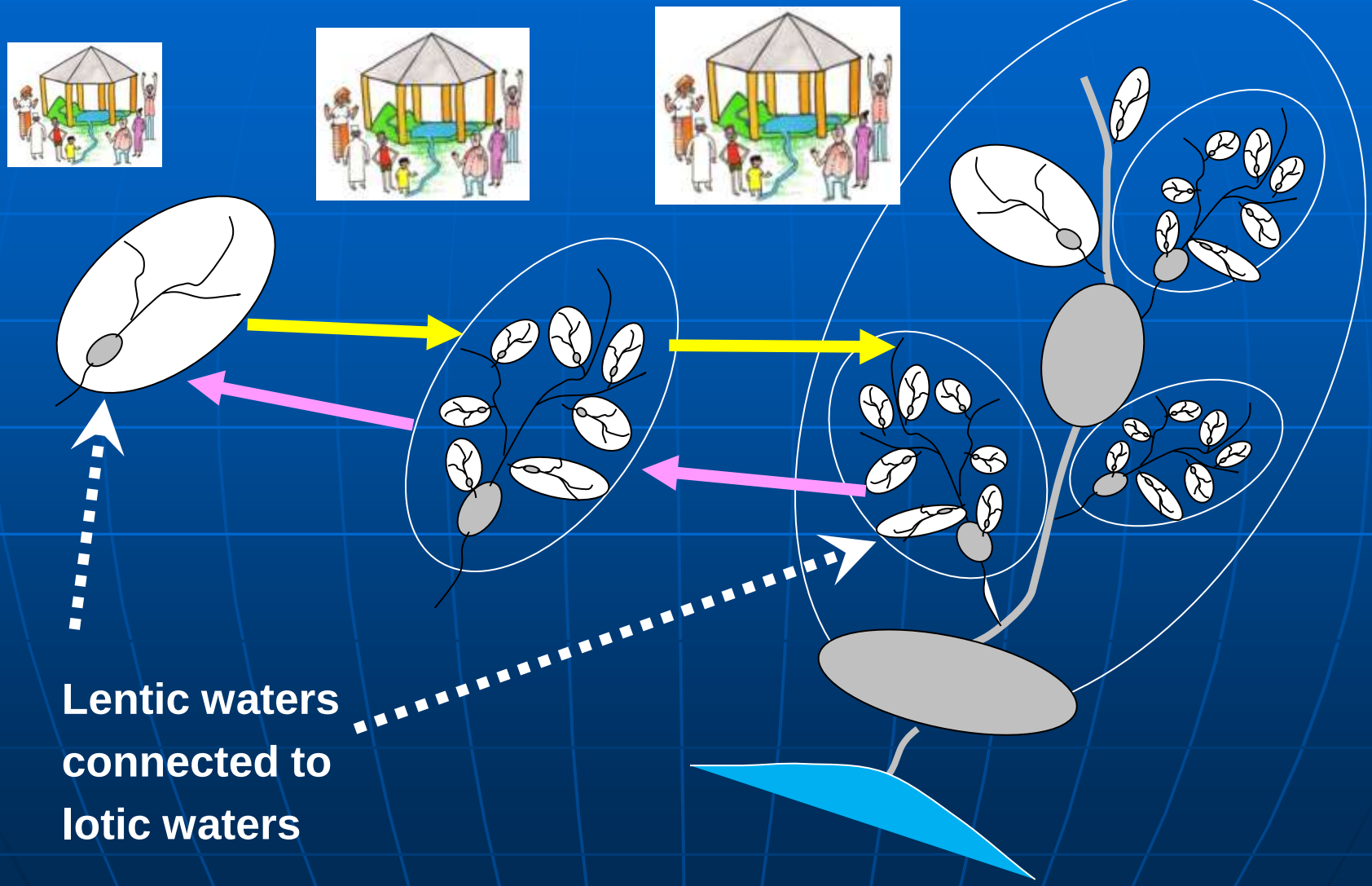
ILBM Platforms may need to be developed at micro, meso, and macro levels



What is ILBM's Role in the Global Water Challenge?

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“Lentic Water” perspective has been missing in the global water debates

- Globnl Water Resources Crisis

  → IWRM (Integrated Water Resources Management) :

  impact on policy reforms in water resources, particularly in developing countries

- Global Degradation of River Basins

  → IRBM (Integrated River Basin Management) :

  impact on policy and program development in basin management

Neither IWRM nor IRBM has focus on the degrading lentic water environment

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IWRM
IRBM

What is the missing link?

"lentic properties of water systems" on the globe!

↓

Integrated Lake Basin Management (ILBM)

Reasons for ILBM

May be IL^{2}BM ?

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ILBM Principles: Summary

- “Ecological Service” Principle
- “Change in Resource Value” Principle
- “Lentic Water System” Principle
- “Governance Improvement” Principle

“Ecological Service” Principle

A) Emphasis should shift from “Resource Provision” to “Regulating”

We need to work on both.

B) Don’t Lose any more “Regulating Service”
In many cases it is the Livelihood issue.

C) Restoration of “Regulating Service” is Quite Challenging

Restoration needs Nature’s Help.

“Ecological Service” Principle

A) Emphasis should shift from “Resource Provision” to “Regulating”

No regulating service, no resource provision.

B) Don’t lose any more “Regulating Service

No regulating service, no livelihood.

C) Restoration of “Regulating Service” is Quite Challenging

Only Nature can Restore.

“Change in Resource Value” Principle

A) Resource value degradation can be fast, but its restoration can take long time.

Lost time is lost money.

B) Resource value degradation is usually accompanied by invisible environmental degradation

Preservation make much better sense than rehabilitation.

Lentic Water Framework

A) Watersheds are made up of

multiple scales of “lentic-lotic” water systems

B) Lentic water system are most vulnerable, and

must have a central role in any watershed management

C) Watershed management requires decision on

appropriate spacial scale (multiple management units) and temporal scale (adoptive management over time)

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Governance Improvement Principle

A) ILBM governance framework may be illustrated with 6 components, i.e.,

B) ILBM governance framework is important, but there is no“correct” answers,

C) Time, efforts, and money are necessary, though not sufficient, for governance improvement, but…

Governance Improvement Principle

A) ILBM governance framework may be illustrated with 6 components, i.e., Policy, Institution, Participation, Information and Knowledge, Technology and Funding

B) ILBM governance framework is important, but

there is no“correct” answers, transfer of lessons learned elsewhere is imperative

C) Long-term and continuous effort in “Governance Improvement” will eventually pay off

The Major Challenge is:

"Lake Basin Governance"

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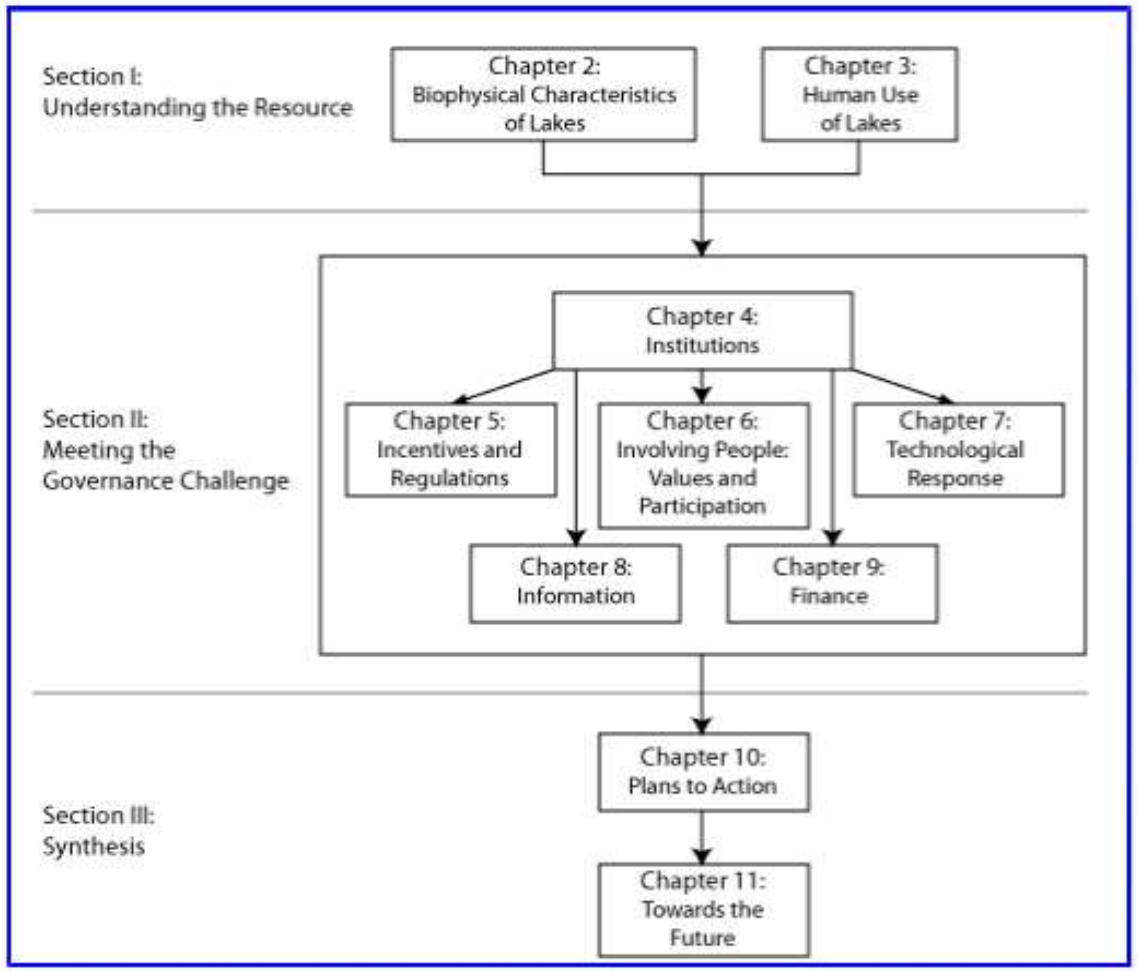
Outline

Below is a schematic outline showing how each of the training modules are related. You can click a given "chapter" to take you to the relevant documents for a given module. Please also note that for each module, JICA and ILEC have worked with international experts to add new reports to compliment the wide knowledge base generated during the LBMI project. These reports are available either by linking from within the boxes below or by clicking on the list of papers in the Authors at the top of this page.



Consultative Meetings and Workshops

Development of a Training Module

Lakes globally are facing serious problems

Table 3.2 Summary of Problems Affecting the 28 Study Lake Basins as Described in the Briefs[1].

Lake Basin	Unsus fis pra	Introd fa sp	Sa cha	W infes	Nu fror ca	Sho eff disc	Sho ind disc	Sho w extr	Lo wet	Ex sed in	Non so nut	A che	W abst	Cha in n	Efflu storr	Indi pol	Atmo nut	Atmo indi conta	Climate change
Aral Sea			→						→				→						
Baikal						↓	→			↓								→	
Baringo	→									↓			↓	↓					↓
Bhoj Wetland				→		→	↓			→	→	→			→				
Biwa									↓		→	→	↑[2]		↑				↓
Chad									↓	↓			↓						↓
Champlain						↑					↑				↑			→	
Chilika Lagoo			↑	↑						↓	↓	↓	↓		↓				
Cocibolca/ Nic						↓				↓		↓			↓				
Constance		↓				↓					→	→			→				
Dianchi					↑	→	→		↓			↓[3]	↓		↓			→	
Great Lakes (N		↓				↑	↑								↑	→		→	
Issyk-kul		→								↓	↓					↓[4]			↓
Kariba Reserv					↓	→					↓								↓
Laguna de Ba	→	↓	→	→	↓	→	→			↓	↓				↓	→			
Malawi/Nyasa	↓[5]			↓						↓							↓		↓
Naivasha	↑	→		↑		↓		→	→	↓							↓		
Nakuru										→	→		↓	↓	↓				
Ohrid	→	↓				→	↓		↓	↓	↓	↓			↓				
Peipsi/Chudsl	↓			→		→					→[6]				↓	→[6]			
Sevan	↓	↓				↓			→	↓			↓						
Tanganyika	↓[5]					↓	↓			↓					↓				↓
Titicaca		↓				→	↓			↓					↓	↓			
Toba	↓	↓		↓	↓	→			↓	→	→	↓	↓	→	↓		↓		
Tonle Sap	↓	↓								↑[7]					↓				
Tucurui Reservoir				→						→									
Victoria	→	↓[8]		↑		↓	↓		↓	↓	↓				↓	↓[4]	↓		
Xingkai/Khanka	↓					→	→		↓	↓		↓			↓	↓[9]			
Total Occurrences	12	10	3	9	4	18	10	1	11	21	16	12	9	4	19	7	4	4	7

Lakes in the World

Table 3.2 Summary of Problems Affecting the 28 Study Lake Basins as Described in the Briefs[1].

Lakes globally are facing serious problems

Lakes in the World

Lake Basin	Unsus fis pra	Introd fa sp	Sa cha	W infes	Nu fro ca	Sho eff disc	Sho ind disc	Sho w extr	Lo wet	Ex sed in	Non so nut	A che	W abst	Cha in n	Efflu storr	Indi pol	Atmo nut	Atmo indi conta	Climate change
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Bhoj Wetland				→		→	↓			→	→	→			→				
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Chad									↓	↓			↓						↓
Champlain						↑					↑				↑			→	
Chilika Lagoo			↑	↑						↓	↓	↓	↓		↓				
Cocibolca/ Nic						↓				↓		↓			↓				
Constance		↓				↓									→				
Dianchi					↑	→			↓	↓	↓	↓			↓			→	
Great Lakes (N		↓				↑	↑				→				↓	→		→	
Issyk-kul		→								↓	↓	↓				↓[4]			↓
Kariba Reserv					↓	→					↓								↓
Laguna de Ba	→	↓	→	→	↓	→	→			↓	↓				↓	→			
Malawi/Nyasa	↓[3]			↓						↓	↓	↓		↓	↓		↓		↓
Naivasha	↑	→		↑		↓		→	→	↓							↓		
Nakuru										→	→		↓	↓	↓				
Ohrid	→	↓				→	↓		↓	↓	↓	↓			↓				
Peipsi/Chudsl	↓			→		→					→[6]				↓	→[6]			
Sevan	↓	↓				↓			→	↓			↓						
Tanganyika	↓[3]					↓	↓			↓					↓				↓
Titicaca		↓				→	↓			↓					↓	↓			
Toba	↓	↓		↓	↓	→			↓	→	→	↓	↓	→	↓		↓		
Tonle Sap	↓	↓								↑[7]					↓				
Tucurui Reservoir				→						→									
Victoria	→	↓[8]		↑		↓	↓		↓	↓	↓				↓	↓[4]	↓		
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Biwa											→	→	↑[2]		↑				
Chad													↓						
Champlain						↑					↑				↑			→	
Chilika Lagoo			↑	↑															
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Constance									→		→	→			→				
Dianchi					↑	→	→											→	
Great Lakes (N						↑	↑				→					→		→	
Issyk-kul		→									↓								
Kariba Reserv					↓														
Laguna de Ba	→		→	→		→										→			
Malawi/Nyasa																			
Naivasha	↑	→						→	→										
Nakuru										→	→								
Ohrid	→					→													
Peipsi/Chudsl				→		→					→[6]					→[6]			
Sevan		↓							→				↓						
Tanganyika																			
Titicaca		↓				→									↓				
Toba						→				→	→			→					
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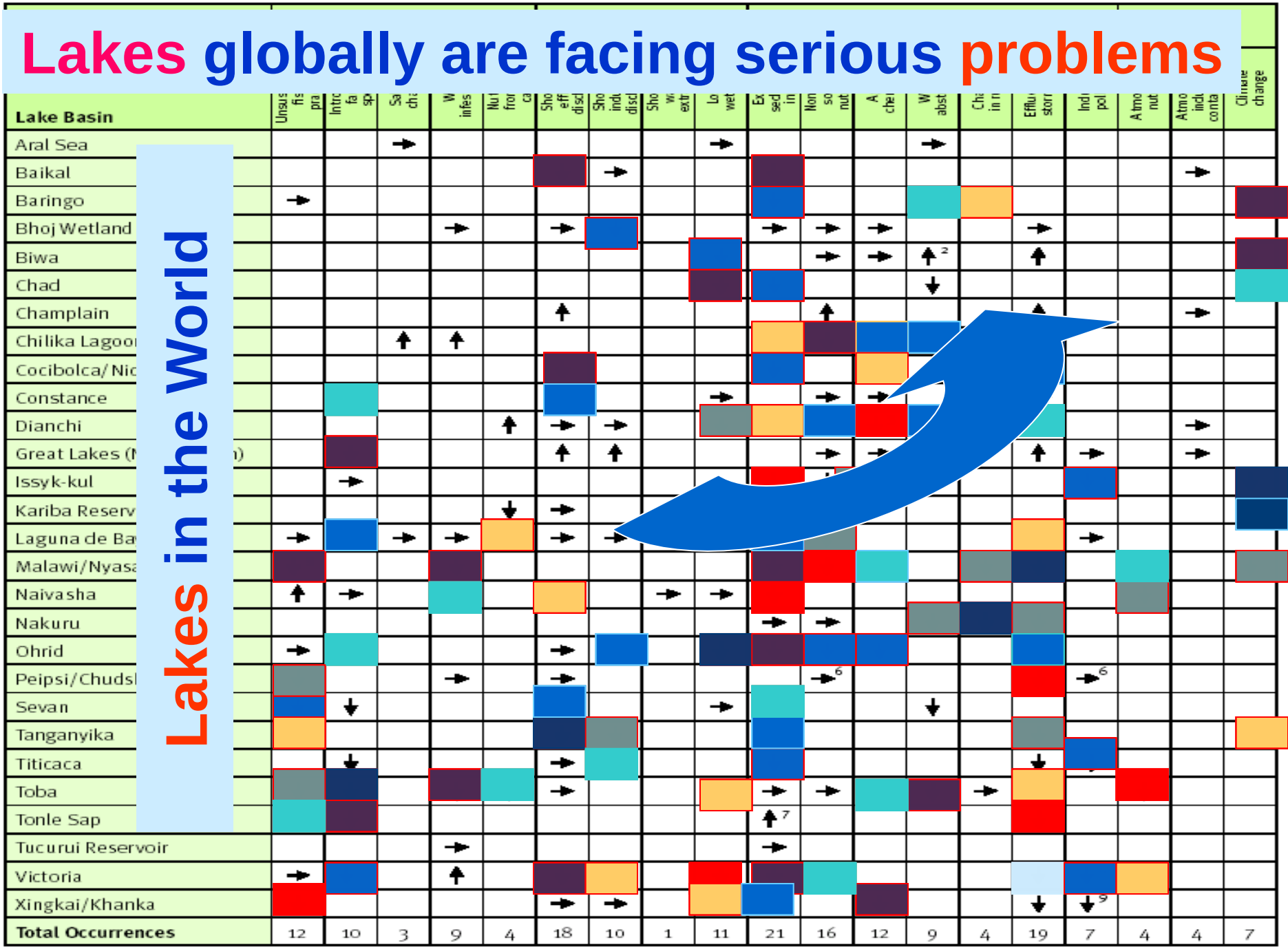

Can We?

Yes, We Can !