Summary and Key Messages from “Additional Reports” of the Training Modules for Integrated Lake Basin Management (ILBM)

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Outline

- Summarizes key messages of “additional reports” and presentations that accompany each of the 11 training modules for ILBM
- Various topics and real-world examples and applications are covered
    - Tools (GIS, modeling, etc.)
    - Concepts (environmental education, institutions, participation, policies, etc.)
    - Case Studies
    - Lake Science Subjects
    - Water Quality Management
    - Specific Special Subjects (e.g., climate change)
- Helps module users to identify additional materials for further study
- Provides a glimpse at various issues and cases, hence serving as an overview and introduction to the issues

No.	001
Title	African Lake Basin Management: Key Issues and Challenges
Author	Daniel Olago
Modules	1
Category	Case Study
Year	2019

Summary and Key Messages

Covers geophysical, climatological, and socio-economic features, geohistorical changes, and global political history of lake basin management in Africa

Biophysical and socio-economic context: Increasing human populations in lake basins are impacting lakes negatively

- Resulting problems: Sedimentation, eutrophication, overfishing, species introductions, pollution and habitat destruction and biodiversity loss
- Global warming and climate change pose the latest threat to the lakes

Geological context: The "amplifier" lakes of the East African Rift Valley are highly climate sensitive

- East African Rift Valley lakes are “amplifier lakes”, meaning that they are highly sensitive to climatic changes
- The basin morphology and precipitation-evaporation contrasts make the lakes very sensitive to climate change
- Amplifier lakes link long-term tectonic processes and short-term environmental fluctuations
    - Possibly explains why East Africa may have been the origin of humankind?

Governance context: Development of a National ILBM Strategy is ongoing in Kenya

- IWRM and IRBM approaches have been adopted in Africa, but these approaches have still not given lakes due attention
- A national ILBM strategy is under development in Kenya, and similar efforts are expected to be replicate in other countries
- Factors hindering implementation of ILBM plans in African lakes
    - Political jurisdictions with competing needs
    - Sectoral approaches to management
    - Overlapping and duplicated institutional roles
    - Inadequate decision-support tools
    - Low and uncoordinated participation by stakeholders
    - Inadequate levels of transboundary coordination, etc.

No.	002
Title	Cyanobacterial Problems in South American Reservoirs: Historical Background, Current Status and Prospects for Countermeasures
Author	Sandra Azevedo
Modules	2
Category	Lake Science Subjects
Year	2019

Summary and Key Messages

Overview of cyanobacterial problems in Latin American reservoirs

Causes and problems associated with cyanobacteria blooms and cyanotoxins in Latin America

- Cyanobacteria bloom is caused by impact from diverse human activities in the drainage basins
- Poor management of water prevails, with only about 20% of wastewater is safely managed
- Thus, public health is at high risk of waterborne diseases due to pollution of water bodies
- Harmful effects of cyanobacterial blooms include intoxication of humans and animals, crop contamination, fish mortality, oxygen depletion, odour, taste and aesthetic problems

Current knowledge and state of research in Latin America

- Cyanobacterial bloom occurrence and cyanotoxin analysis are well known, but there are few official reports and published data
- Researches are mainly undertaken by universities and are highly depend on availability of funding
- Monitoring programs are undertaken by Environmental Agencies, which lack technical expertise
- Molecular biology studies, which are fundamental to toxic cyanobacteria issues, lag behind because of high cost
- Modeling studies also lag behind because of lack of monitoring data

Critical gaps in research in Latin America and proposals for improvement

- Critical gaps in knowledge, management actions, and analytical methods lead to underestimation of impacts of cyanotoxins
- Proposed measures
  - Taxonomy and systematics: Identification and classification of cyanobacterial groups
  - Monitoring: Establish continuous monitoring programs to collect long-term data and local knowledge
  - Ecology: 1) How do environmental forces drive toxic cyanobacteria and their biological interactions?
    2) What are the effects of eutrophication and climate variability on the occurrence of toxic cyanobacterial blooms?
  - Improve facilities and expertise for analytical techniques

No.	003
Title	Lake Baringo: A Transient Physical Chemical Environment, Diversity and Livelihoods
Author	Jones Muli
Modules	3
Category	Case Study
Year	2019

Summary and Key Messages

Provides an overview of Lake Baringo Basin, Kenya and its management environment

Updates an earlier Lake Baringo Brief (Odada et al., 2006) with recent information on water quantity and quality, biodiversity, socio-economic and management environment

Threats to the Lake Basin Environment

- Sedimentation from land use changes (forests decreased by ca. 50% since 1976)
- Water level change (mean depth was 5.6m in the 1960s, and 10.6m in 2013)
- Overfishing
- Climate change/variability

Major Impact Stories

- Fishermen involvement was strengthened by legalizing Beach Management Units (BMUs)
- Lake depth has increased, even though Odada et al. (2006) had predicted a continuous decrease to 2050
- Recent studies demonstrate that the lake is climate sensitive
    - Lake water quality and fishing effort are highly variable because of the highly variable lake environment
    - Previously, water quality deterioration was assumed to be caused by sedimentation
    - Likewise, fluctuations in the fish production were attributed to fishing effort
    - Need for conclusive scientific explanation

Major Lake Basin Governance Issues

- Sectoral approach to management
- Lack of government strategy or plan for managing the lake
- Vandalism of water monitoring equipment

No.	004
Title	Into the Golden Year of Lake Basin Management in Laguna de Bay, Philippines
Author	Adelina Santos-Borja
Modules	4
Category	Case Study, Concepts (Institutions and Policies)
Year	2019

Summary and Key Messages

Focuses on institutional development and change for management of Laguna de Bay Basin, Philippines

Updates an earlier Laguna de Bay Brief (Santos-Borja and Nepomuceno, 2006) with new developments

Policy and Institutional Framework for implementing ILBM at sub-watershed scale

- The Philippine Clean Water Act of 2004 provides for designation of Water Quality Management Areas (WQMA)
- The Laguna de Bay Region was the first designated WQMA
- All 24 sub-watersheds are designated sub-WQMAs with an Integrated Watershed Management Program (IWMP)
- The Sta. Rosa sub-watershed was the first sub-WQMA to be organized since 2014
    - A common Action Plan was jointly formulated and conservation activities initiated
    - WMC (watershed management council) serves as a platform for continuous dialogue

Aquaculture conflicts, and the Fishery Zoning and Management Plan (ZOMAP)

- ZOMAP was introduced in 1983 to resolve conflicts between fish pen operators and traditional fishermen
- Recently, faced with a threat of a "**no fish pen policy**" the two groups agreed on the continuation of aquaculture
- The old ZOMAP was revised in 2019 following a presidential directive to give priority entitlements to fishermen

Heightened interest in the use of the lake as a source of domestic water for Metro Manila

- There is heightened interest to use the lake as a source of water for Metro Manila following a severe water shortage in 2019
- How to improve the water quality from Class C (for fisheries) to Class B (domestic supply) is an issue to be addressed
    - Eutrophication and toxic contamination are particularly of concern

No.	005
Title	Role of District-level Organization in Decentralized Arrangement of Irrigation Management: Lessons from Water Users Association of Farmers in Japan and Egypt
Author	Tsugihiro Watanabe
Modules	4
Category	Case Study, Concepts (Institutions and Participation)
Year	2019

Summary and Key Messages

Discusses decentralized participatory irrigation water management in Japan through Land Improvement District (LIDs)
Assesses how the Japanese lessons can be applied in developing countries
LIDs are shown to result in effective irrigation management and appropriate operation of irrigation systems

Land Improvement District (LID): Farmers' water management organization in Japan

- Irrigated paddy areas are institutionally divided into Land Improvement Districts (LIDs)
- LIDs are non-governmental entities legalized by the Land Improvement Act of 1949
- LID land size ranges from less than 100 ha to 10,000 ha
- Construction of irrigation facilities is carried out mainly by the government
- O&M of facilities is the main function of LIDs
    - LID responsibility is limited to facilities above tertiary level
    - Individual farmers and farmers' associations **voluntarily** manage facilities on-farm and at tertiary levels
    - The role of tertiary level farmers' association is indispensable to O&M
- LIDs work in close collaboration with the government

Lessons from Japan's Experience for Developing Countries

- Decentralization of irrigation management from governmental to district-level non-governmental organizations can lead to effective management
- A tertiary level association is indispensable to O&M of irrigation facilities, and it could function even if it is not legally authorized
- Cooperation between the government and non-governmental organization is essential

No.	006
Title	Sewerage Policy and Finances in Lake Basin Management, a Case of Lake Biwa, Japan
Author	Naoko Hirayama and Masahisa Nakamura
Modules	4, 7, 9
Category	Case Study, Concepts (Policies, Technology, Financing)
Year	2019

Summary and Key Messages

Overview of the sewerage policies and finances in lake basin management in Japan, particularly Lake Biwa Basin
Helps understanding of institutional and financial challenges of sewerage systems in developing countries

Historical Context

- Late 19th to mid-20th century: Occasional incidents of epidemics, with water pollution control still at infantry
- 1950s and 1960s: Rampant water pollution due to population increase and rapid industrialization
- Late 1960s to 1970s: Legal frameworks were aligned to accelerate environmental and sanitation infrastructure investment
- Mid-1990s: Fragmented sectoral policies and programs on sewerage management began to be unified

Institutional and Legal Framework

- Two pieces of national legislation particularly helped to accelerate the spread of sewerage systems in Lake Biwa Basin
- LBCDP Law (Special Measures Act for Lake Biwa Comprehensive Development, enacted in 1972)
    - Water resources development, Flood control and Infrastructure development (including Lake Biwa Regional Sewerage System)
    - Special financial arrangements involving the national government and downstream prefectural governments
- Lake Law (Law Concerning Special Measures for Conservation of Lake Water Quality, enacted in 1984)
    - Lake Biwa is one of the "**designated lakes**" for improvement
    - Requires implementation of **5-year cyclic plans** for lake water quality conservation

Financing

- Mobilization of financial resources is undertaken by the government
- Capital costs are mostly covered by the government; beneficiaries bear only the cost of developing end culverts
- Maintenance costs are shared based on the principle of public rainwater and private sewage
- Long term financing of sewerage infrastructure is a challenge given the declining population in Japan

No.	007
Title	Water Resources Management within the Climate Change Context in Africa
Author	Salif Diop
Modules	4
Category	Specific Special Subjects (Climate Change)
Year	2019

Summary and Key Messages

Overviews current knowledge of climate change/water resources interactions, with regional, national and local level case-studies

Discusses methodologies, institutional issues, and management approaches for water resources management

Africa's climate and Climate Change

- Seasonally variable hydrology and uneven distribution of water resources will be compounded by climate change
- There is a clear signal of warming since the 1960s, despite there being lave large margins of uncertainty
- Possibility of mix drought in the horn of Africa and increased tropical storm events in the southern Indian Ocean
- Streamflow will change from -15% to +5% by 2050 (IPCC)
- Risks & opportunities in Agriculture: Increased soil erosion and reduced crop production & Increased rainfall
- Risks to Blue Water use due to growing demand from urbanization under weak infrastructure and management systems

Challenges of water resources management in the context of Climate Change in Africa

- More frequent and more intense water-related disasters in many parts of Africa
- How to ensure flexible planning that incorporates adaptation measures to long-term climate change
- Need to properly manage surface water bodies as readily-usable sources of large volumes of freshwater

Measures for improved water resources management in the context of Climate Change in Africa

- Creating enabling policy and institutional frameworks
- Investing in ecological infrastructure
- Investing in climate smart infrastructure and technologies
- Improved science and information
- Working at different scales
- Decentralized adaptation at different levels
- Considering the water/energy/food and health nexus

No.	008
Title	Climate Change Adaptation and Mitigation Measures in the EU Water Environments
Author	Tiina Nõges and Peeter Nõges
Modules	5
Category	Specific Special Subjects (Climate Change)
Year	2019

Summary and Key Messages

Overview of water related measures tackling climate change causes and consequences in the European Union (EU)

The measures are grouped under 3 general principles of environmental suitability

Principle 1: Keep things in place

- Keep carbon in its present pools
- Keep water in the catchment by creating retention basins and slowing down the run-off
- Keep substances at source avoiding them becoming pollutants
- Keep species within their natural habitats

Principle 2: Keep things natural

- Protect and restore the natural regulating functions to manage water quality and to alleviate flood and coastal erosion risk
    - Flow modification, Floodplain reconnection, Riparian management, etc.
- Restoring degraded peat bogs and reforestation will also help to slow run-off and increase infiltration

Principle 3: Be informed and plan your actions

- Measures dealing with administrative issues, planning, and capacity building, education and stakeholder involvement
- Inherent Uncertainty calls for application of the **Precautionary Principle**
- Long-Term Capacity Development: Research is needed to decrease the uncertainty in climate change models
- Medium-Term Management: **Adaptive Planning** in the **RBMP Cycles** of 6 years
- Short-Term Operative Measures: Include development of **Early Warning Systems**
- Streamlining of strategies and avoiding potential cross-sectoral trade-offs in River Basin Management

No.	009
Title	Participation in Japan
Author	Shinji Ide
Modules	6
Category	Concepts (Participation)
Year	2019

Summary and Key Messages

Focusing on Community Based Organizations (CBOs), discusses Japanese citizens' participation in conservation of the water environment
Presents several case studies on Lake Biwa in particular and Japan in general
CBOs are not only spokespersons or agents of people but also important partners of governments

Community Based Organizations (CBOs) in Japan

- Traditional Japanese Community Organization (TJCO) & Western Style (Basin Consociations) CBOs play complementary roles
- Many CBOs established since 1970 through Community Building Activities (CBAs) supported by the government
- CBO activities also try to meet local people's diverse needs such as cultural needs and human services.

Lake Biwa Soap Movement

- Originated in 1970s from Use-Soap campaign due to concern about babies' diaper rash and housewives' eczema caused by synthetic detergents.
- In 1977, with an outbreak of red tide in the Lake Biwa, the movement shifting to a boycott campaign of phosphate-containing synthetic detergents.
- Led to enacted Eutrophication Control Ordinance by Shiga Prefecture in 1979

Other Water Environment Protection Movements in Japan

- Citizen activities, sometimes starting as protest movement, evolved into citizen activities for conservation the water environment
  - Isahaya Bay Reclamation Project
  - Nakaumi-Shinji-ko Reclamation and Desalination Project
  - Partnership in Yahagi River Basin
  - Watershed conservation of Shimanto River

Community Initiative and Basin Consociations at Lake Biwa

- 13 "Basin Consociations" established to implement the "Mother Lake 21 Plan" in 2000
- The consociations were typical CBOs that strived for conservation of Lake Biwa
- Regrettably, most of them had ceased their activities by 2020

No.	010
Title	Chilika Lake: Restoring Ecological Balance and Livelihoods through Re-Salinization
Author	Ajit K. Pattnaik
Modules	7
Category	Case Study, Concepts (Technology)
Year	2019

Summary and Key Messages

Focuses on successful technological intervention to re-salinize and restore ecological balance and livelihoods in Chilika Lake, India

Updates an earlier Chilika Lake Brief (Ghosh et al., 2006) with recent information

Background

- Problem: The unique ecosystem, biodiversity and productivity of the lake were on the decline in early 1990s
- Cause: Blockage of the lake's mouth by silt from upstream catchments, and oceanic long-shore transport

Approach Taken and Results

- Chilika Development Authority (CDA) was created by the Government of Odisha in 1992
- Salinity was restored by dredging a new mouth in 2000, based on results of modeling studies done by local experts
- Participatory micro-watershed management was adopted by CDA, with a “sustainable livelihood” approach
- Revival of the ecosystem and fishery resources leading to a rise in the incomes of fisherfolk

ILBM6 Principles as Viewed from this Case

- The strategy adopted by CDA for successful restoration and management mimics ILBM6
- The primary feature is the **active participation** of the **local communities**
- Another strong attribute is the presence of **enabling institutional framework**, **policy support** and “**good governance**”
- **Institutional coordination** mechanism is identified as the greatest strength of CDA
    - Headed by the Chief Minister of Odisha State hence able to coordinate among various stakeholders

No.	011
Title	Assessment of Pollution Load on the Kenyan Catchment of Lake Victoria Basin using GIS Tools
Author	Charles Kipkoech Cheruiyot
Modules	8
Category	Tools (Modeling, GIS)
Year	2019

Summary and Key Messages

A case study on modeling and assessment of pollution load in Lake Victoria, Kenya using GIS and remote sensing technologies
Under data scarce conditions

Background: Data scarcity is a major limitation to pollution load assessment in Lake Victoria

- Lack of data adversely affects the accuracy and reliability of results
- Nutrient export coefficients (UAL) are borrowed from other areas
- This paper develops a framework for estimating local coefficients based on observed water quality and quantity data
- It also simulates of hydrology, sediment, nutrients and effectiveness of various watershed management plans

Approach used

- Review of estimation methods of pollution load in Lake Victoria in past studies
- Derivation of nutrient export coefficients for three land covers
- Simulation of hydrology, sediments and nutrients (TN&TP) using SWAT
- Assessment of effectiveness of 3 watershed management plans

Findings

- Nutrient export coefficients were estimated with satisfactory performance
- SWAT model performance was satisfactory, data scarcity notwithstanding
- Agricultural and densely populated areas are hotspots for yielding high sediment, runoff, and nutrients
- Use of reforestation upstream and filters downstream was proposed as a watershed management strategy

No.	012
Title	GIS-based Lake Basin Delineation and Computation of Risk Indicators as part of the TWAP Project
Author	Khila Dahal
Modules	8
Category	Tools (GIS)
Year	2019

Summary and Key Messages

A GIS-based methodological tool for delineation of lake drainage basins and computation of risk indicators

Applied in the Transboundary Waters Assessment Project (TWAP)

Methodology

- Delineate the drainage basins of the lakes using GIS
- Overlay other relevant data (such as population) on top of the drainage basins
- Compute indicator data for each lake basin
- Normalize/standardize the indicator values into the same ranking scale such as 0 to 1
- Combine the indicators to get the composite risk/threat score for each lake
- The computed composite risk can be visualized as a risk/threat map in GIS

Results and Significance

- A comprehensive database of global transboundary lake basins was developed, as part of the TWAP Lakes Project
- The risk ranking developed will assist funding agencies such as GEF to prioritize funds

No.	013
Title	Open Source GIS-based Lake Basin Delineation Procedure: a Tutorial
Author	Khila Dahal
Modules	8
Category	Tools (GIS)
Year	2020

Summary and Key Messages

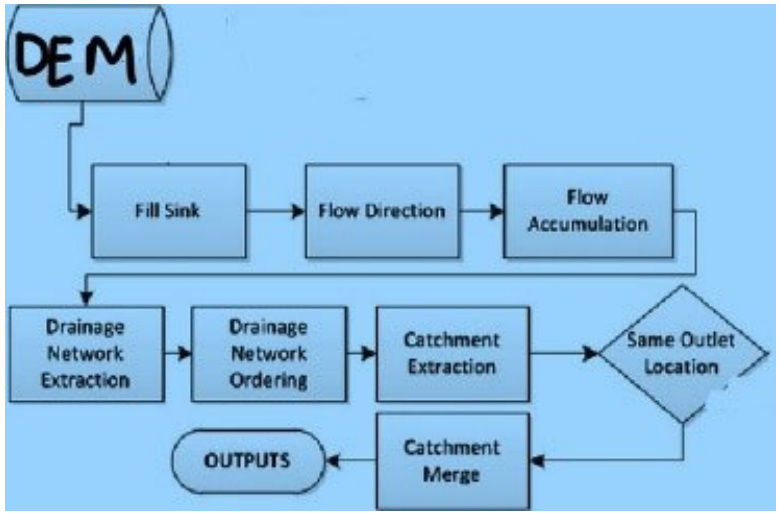
A detailed GIS-based procedure to delineate lake watersheds using open source GIS

Has an accompanying **video tutorial**

Best done as an actual **exercise on the computer**

Methodology

- QGIS is the selected open source GIS platform
  - It is a more comprehensive platform outperforming other open source GISs
  - It is user-friendly, highly reliable, faster, presents a better documentation
  - It consumes all GIS data type
  - It integrates external packages such as GRASS, GDAL and SAGA
- QGIS is used to generate basin boundary and stream networks
- SAGA tools are used because SAGA has an edge in terrain analyses and spatial statistics
- Hydrology operations such flow direction are run using both raster and vector datasets



No.	014
Title	Application of Remote Sensing to Generate Historical Water Quality Data to Support Lake Management in Indonesia
Author	Luki Subehi and Fajar Setiawan
Modules	8
Category	Tools (Remote Sensing)
Year	2019

Summary and Key Messages

Assessment of historical lake water quality in Indonesia using remote sensing

Development of an empirical model to capture long-term change of Secchi disk depth (SD) in Lake Maninjau, Indonesia

Objectives of the Study

- Develop an SD estimation model using in situ-measured SD values
- Evaluate the performance of the developed SD model using data for Lake Maninjau
- Generate a long-term SD database for Lake Maninjau using the developed SD estimation model
- Determine the water quality changes in Lake Maninjau using the generated SD database

Major Results and their Significance

- An empirical model to estimate SD values from Landsat TM/ETM+ data was developed
- Results confirmed that Landsat data can be used to generate a long-term SD database to monitor changes in Indonesian lakes
- These findings are applicable to other developing countries where lack of water quality data is a major problem

No.	015
Title	Environmental Education: Its Evolution, ESD, Participation and Governance
Author	Masahisa Sato
Modules	8
Category	Concepts (Environmental Education)
Year	2019

Summary and Key Messages

Discusses evolution of EE through historical development from EE to EPD to ESD
Highlights the role of Formal Education (FE) in the context of ESD

Evolution of EE

- EE has evolved from the concept of EE to the concept of EPD, and then to ESD

Thematic Areas Covered

- EE (Environmental Education): Focused on the improvement of environment and its quality
- EPD (Environment and Population and Information for Human Development)
    - Environment (quality and quantity)
    - Development (economy, education, social services, and capacity building)
    - Population (size, growth, distribution, and structure)
- ESD (Education for Sustainable Development): Expanded further, to include broader issues of Environment, Society and Economy

Approaches Employed

- EE: Quantity, knowledge transfer, formal education, cause-effect relationship and problem solving
- ESD: Participatory-dialogical learning, high-order thinking and action research to promote bottom-up approach

Education for Sustainable Development Goals (SDGs)

- SDGs consist of 17 goals to be achieved by the year 2030
- Education is both a goal in itself and a means for attaining all the other SDGs
- Therefore, education (including Formal Education) is an important strategy for SDGs

No.	016
Title	Monitoring and Evaluation of Water Quality and Ecosystem in Lakes, Rivers and Coastal Zones in Japan
Author	Shigekazu Ichiki
Modules	8
Category	Water Quality Management
Year	2019

Summary and Key Messages

Describes the process of monitoring water quality of surface water bodies in Japan

Institutional and Legal Framework

- Environmental Standards are set for “Protection of Human Health” and “Preservation of the Living Environment”
- Water Pollution Control Law requires constant monitoring of public water bodies and publication of results
- Water area managers are stipulated by various laws

PDCA Cycle of Monitoring

- Clarification of objectives
- Preliminary survey
- Formulation of survey plan
- Field work
- Laboratory analysis
- Data analysis
- Evaluation of and analysis
- Proposal for management

Monitoring Items, Equipment and Resources

- Water Quality, Plankton, Microorganisms, Macrophytes, Bentos, Fish Community
- A laboratory and/or experts are essential for each item

Public Participated Monitoring

- Ordinary citizens are involved in water quality survey activities for deepening involvement
- However, there are limitations on the methods that can be applied

No.	017
Title	Introduction to Lake Modeling
Author	Shinji Ide
Modules	8
Category	Tools (Modeling)
Year	2019

Summary and Key Messages
Introduces a modeling and assessment tool for nutrient balance in a lake
Designed to help readers understand how to develop and run a simple lake model
Provides a step-by-step guide on the modeling process
Includes a simple **Microsoft Excel** spreadsheet model

No.	018
Title	Assessment of Management of Lake Malawi Basin through Application of ILBM-Based Tools
Author	Clara L. Chidammodzi
Modules	10
Category	Tools (ILBM Assessment)
Year	2019

Summary and Key Messages

Explains development of an indicator framework for assessing the management of Lake Malawi basin through application of ILBM-based tools

Based on an assessment on the Lake Malawi Basin from which several publications and a doctoral thesis ensued

Overall Objective

- Conduct a comprehensive assessment and analysis of management of the Lake Malawi Basin based on the ILBM6 framework

Major Results

- An indicator-based framework for assessment of the ILBM6 pillars of governance was developed
- The current status of each of the ILBM6 pillars of governance in Lake Malawi Basin was determined
- Issues in the management of the Lake Malawi Basin were identified and analyzed through SWOT analysis
- Priority management issues were identified through application of systems thinking approach
- Provides a useful guide for lake basin assessment that can be flexibly adapted to specific basin situations

No.	019
Title	The Lake Cluster Pokhara Valley: An Overview of Lake Basin Environment and Governance Improvement
Author	Shaiendra Kumar Pokharel
Modules	10
Category	Case Study, Concepts (Planning)
Year	2019

Summary and Key Messages

Overview of lake basin environment and governance improvement in the Lake Cluster Pokhara Valley (LCPV), Gandaki State, Nepal
9 Lakes in LCPV: Phewa, Kamalpokhari, Gunde, Khaste, Neureni, Dipang, Maidi, Begnas, and Rupa
Tourist destination: Spectacular mountain scenery, rich cultural and biological diversity

Threats to Lake Basin Environment

- Reclamation of lake area and encroachment
- Sedimentation and siltation
- Pollution and eutrophication
- Spread of alien invasive species
- Overfishing and illegal wildlife poaching
- Climate change impacts

Major Drivers of Degradation

- Policy overlaps creating lack of institutional clarity
- Weak technical capacity and governance
- Weak knowledge management
- Political instability of the past

Major Milestones in Lake Basin Governance Improvement

- Gandaki State has shown interest in ILBM approach, following constant support from ILEC
- National Lake Conservation Development Committee (NLCDC) established 2007
- National Lake Strategy development initiated by NLCDC in 2013
- "Integrated Lake Basin Management Plan of LCPV, Nepal (2018-2023)" developed
- "Lake Conservation and Development Authority Act-2018" enacted by Gandaki State
- Establishment of a Lake Authority by Gandaki state is in progress

No.	020
Title	Strengthening Integrated Lake Basin Management Implementation in Malaysia through Research Framework
Author	Zati Sharip
Modules	10
Category	Case Study, Concepts (Planning, Information)
Year	2019

Summary and Key Messages

Outlines national efforts to establish an agenda for lake research and development (R&D) in Malaysia directed towards ILBM

Efforts anchored on recognition of the critical role of research in decision making for sustainable management of lakes

National Blueprint for Lake and Reservoir R&D

- A national blueprint was developed in 2015 to prepare a common research framework and identify priority research areas
- Involved assessing major issues and challenges, identifying research areas, and identifying priority lakes
- Led by NAHRIM (National Hydraulic Research Institute of Malaysia) and ASM (Academy of Sciences Malaysia)
- The blueprint is one of the Action Plans for implementation of the "Strategic Plan for Sustainable Lake Basin Management in Malaysia"

Research Thrusts

- 5 Primary thrusts: Hydraulics and hydrodynamics, Pollution and water quality, Eco-hydrology, Biodiversity and Ecosystem services
- 5 Cross-cutting thrusts: Governance, Climate change, Technology, Socio-economics and Basin management
- Emphasizes a collaborative, interdisciplinary approach

Outputs/Outcomes

- Lake management guidance documents, Scientific publications, Information database, Capacity building
- 30 priority lakes identified
- Integrated studies undertaken and ILBM Plans developed for Sembrong and Batang Ai reservoirs
- ILBM implementation in Sembrong and Batang Ai reservoirs
- National Lake Water Quality Criteria and Standards established in 2015
- Ultimate goal is to enhance R&D on sustainable lake basin management