UNESCO Ecohydrology Program for Sustainable Management of Lakes and Ecosystem Services

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UNESCO in Asia and the Pacific Region

- 2 Regional Bureaus
- 7 Cluster Offices
- 7 National Offices
- A Large Network of Category 2 Centres and Chairs

R&D, Capacity Building, Training, Networking, and Policy Advice

Regional Sciences Bureau for Asia and the Pacific - UNESCO Office, Jakarta
Contribution to International Research and Capacity Building on Natural Sciences

Promote the 5 UNESCO's intergovernmental and international programmes

Support 10 UNESCO's major Programmes, Initiatives and Bodies

Regional Sciences Bureau for Asia and the Pacific - UNESCO Office, Jakarta
UNESCO IHP is the only intergovernmental programme of the UN system devoted to water research, water resources management, and education and capacity building.
Asia-Pacific Water Family

14 UNESCO Field Offices
6 UNESCO Cat. II Centres
6 UNESCO Water Chairs

UNESCO Water Family in Asia Pacific Region
Water Networking in the Region

27 Countries

7 LDCs

IHP National Committees in Asia Pacific Region

Asia-Pacific Water Forum
Evolution of IHP: From Hydrological Science to Integrated Science, Policy, and Society

Experimental Basins, Categorization of Large Floods, World Water Balance

International Cooperation in Hydrological Sciences

Hydrology and Water Resources Sustainable Development in a Changing Environment

Hydrology and Water Resources Development in Vulnerable Environment

Water Interactions: Systems at Risk and Social Challenges

Water Dependencies: Systems under Stress and Societal Responses

Water Security: Responses to Local, Regional, and Global Challenges

International Hydrological Decade (IHD)

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IHP-VIII 2014-2021

Axis 1
Mobilizing International cooperation to Improve knowledge and innovation to address water security challenges

Axis 2
Strengthening the Science-Policy interface to reach water security at local, national, regional, and global levels

Axis 3
Developing institutional and human capacities for water security and sustainability

1. Water Related Disasters and Hydrological Changes
2. Groundwater in a Changing Environment
3. Addressing Water Scarcity and Quality
4. Water and Human Settlements of the Future
5. Ecohydrology Engineering Harmony for a Sustainable World
6. Education, Key to Water Security
ECOHYDROLOGY, ENGINEERING HARMONY FOR A SUSTAINABLE WORLD
5.1 - Hydrological dimension of a catchment—identification of potential threats and opportunities for a sustainable development.

5.2 - Shaping of the catchment ecological structure for ecosystem potential enhancement—biological productivity and biodiversity.

5.3 - Ecohydrology system solution and ecological engineering for the enhancement of water and ecosystem resilience and ecosystem services.

5.4 - Urban Ecohydrology—storm water purification and retention in the city landscape, potential for improvement of health and quality of life.

5.5 - Ecological regulation for sustaining and restoring continental to coastal connectivity and ecosystem functioning.
The regulation of water level in eutrophic reservoir for change of excess nutrients allocation toward the reduction of toxic algal blooms.
System solutions: BIOTECHNOLOGIES
the sequential biofiltration system (SBS) for urban stormwater purification on Sokołówka river
Molecular biology for ecohydrological biotechnologies

Diagnosis of quality of environment
Identification of pathogenic bacteria
Increase of the effectiveness of stormwater purification

Bacterial diversity in different zones of the Sequentional Stormwater Purification System (SSPS) assessed by the TRS-PCR (1-3) and partial 16S RNA gene sequencing

(Zalewski, Mankiewicz-Boczek, Parniewski et al., 2012)
The progress in water purification efficiency

(Zalewski, Szklarek, Lont 2013)
Multilevel flow and biota regulation
System solutions for harmonisation of society needs with water and environment quality and economical sustainability

Reduction of fossil fuel use decreases CO₂ emission

Tourism development stimulates economic growth of the region

Employment opportunities

Sewage treatment plant

constructed wetland - willow plantation

water quality improvement

(Zalewski, 2000)
ECOLOGICAL ENGINEERING

CONSERVATION

RESTORATION

"Design of ecosystems for the benefit of humans and society needs" (Mitsch 1999)

ECOHYDROLOGY

Dual regulation

Regulation water biota interplay for enhancement ecosystem potential and its harmonisation with society needs

Catchment hydrological mezocycle

REGULATION of water biota interplay for sustainable catchment and coastal zones
The Ecohydrology Approach

- **HARMONIZATION** of ecohydrological measures with necessary hydrotechnical infrastructure
- **INTEGRATION** of various regulations acting in a synergistic way to stabilize and improve the quality of water resources

"DUAL REGULATION"
- Regulation of biota by altering hydrology
- Regulation of hydrology by shaping biota

**BIOTA**

**REGULATION**

**HYDROLOGY**
16 + 2 Projects

3 Operational

12 Evolving

2 new to be establish in 2016

Main Research Themes:
- Ecohydrological tools in watershed management
- Ecohydrological processes
- Ecohydrology in multiple catchments
- Ecohydrology for Lake and Wetland Management

Asia Pacific Ecohydrology Projects
Contributing to International Research

CHINA

PHILIPPINES

INDONESIA

MALAYSIA

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Ecohydrology for Lake and Wetland Management

Population Dynamics
Growth, Migration, Density, Distribution, Urbanization, Morbidity, Mortality.

Water Use
Agriculture production, Industry, Household use, Sanitation & waste disposal, Hydroelectricity, Fish farming.

Environment Outcomes
Depletion of surface & groundwater, Water pollution, Land degradation, Ecosystem degradation, Decline of fisheries, Disruptions to the hydrological cycle.

Human Outcome
Food shortage, Water-borne illness, Social & political instability, Conflicts over water, Economic growth or decline, Population displacement.

Lakes and population dynamics

Modified from SARDI
Transdisciplinary Research

- People, Policy and Planning
- Social, Economic and Environmental Interactions
- Engagement and Education
Integrated Approach

**EXPLORE**
Identify the needs and future challenges

**DISCUSS**
Raise political interest and public awareness

**BRING TOGETHER**
Provide a platform for the involvement of the water community
Building Bridges for a Sustainable Future

Different Sectors

Different Groups

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Ecohydrology Wisdom for Sustainable Future

**Problem solving**

- **Reductionistic**
  - Problem identification
  - Monitoring – sectoral science
  - Experimental testing -interdisciplinary science

- **Holistic**
  - System solutions – Transdisciplinary science
  - Use of information and knowledge for problem solving – Formulation of principles for action

**Knowledge**

- Understanding patterns and processes,
- Understanding structure, states and relationships

**Wisdom**

- Use of information and knowledge for problem solving – Formulation of principles for action
- System solutions – Transdisciplinary science
- Use of information and knowledge for problem solving – Formulation of principles for action

Zalewski 2012 changed

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UNESCO

Partner in Building

the future we want for all

Thank You!