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ASEAN Forum on Water Management and Climate Change Toward Asia WEF Nexus & SGDs

ROLE OF ECOHYDROLOGY IN FACING WATER SECURITY CHALLENGES IN INDONESIA

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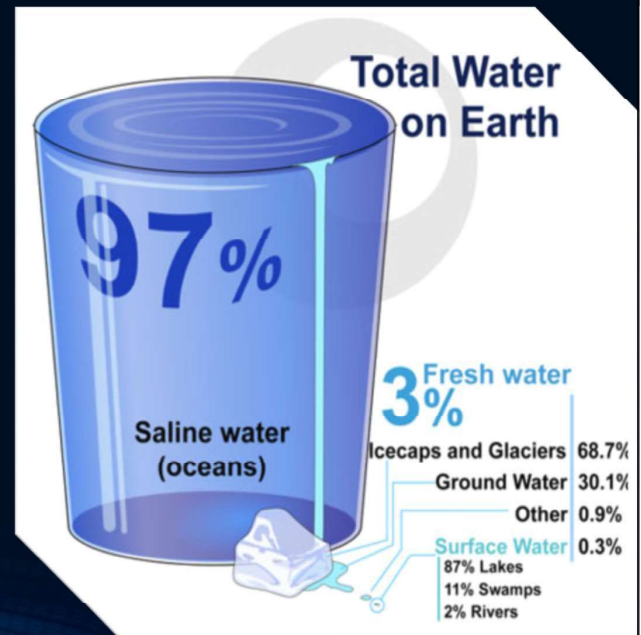
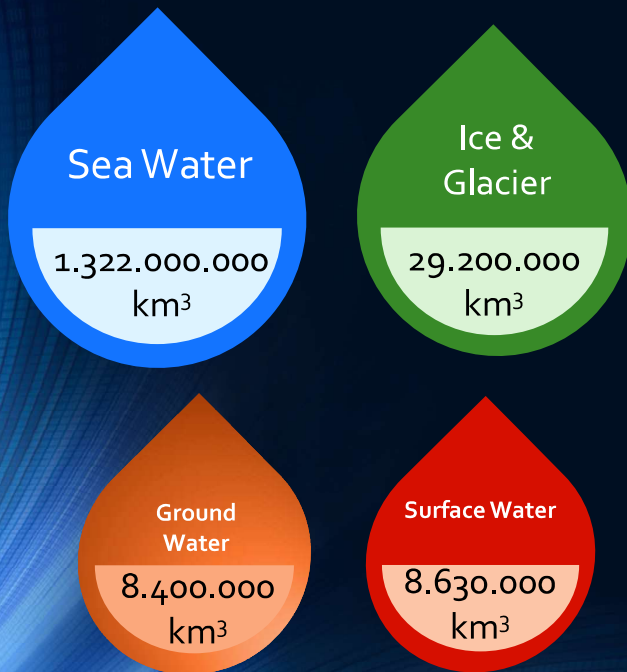
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Outline

- Background
- Strategic Environment
- Water Resources Contribution to National Development Dimension
- Water Scarcity Challenges in Indonesia
- UNESCO Platform on IHP and SGDs
- Ecohydrology Approach
- Conclusion

Water Distribution on Earth


We have to keep in mind that
Our water resources are not unlimited
The total volume of water is constant



How much water we need?

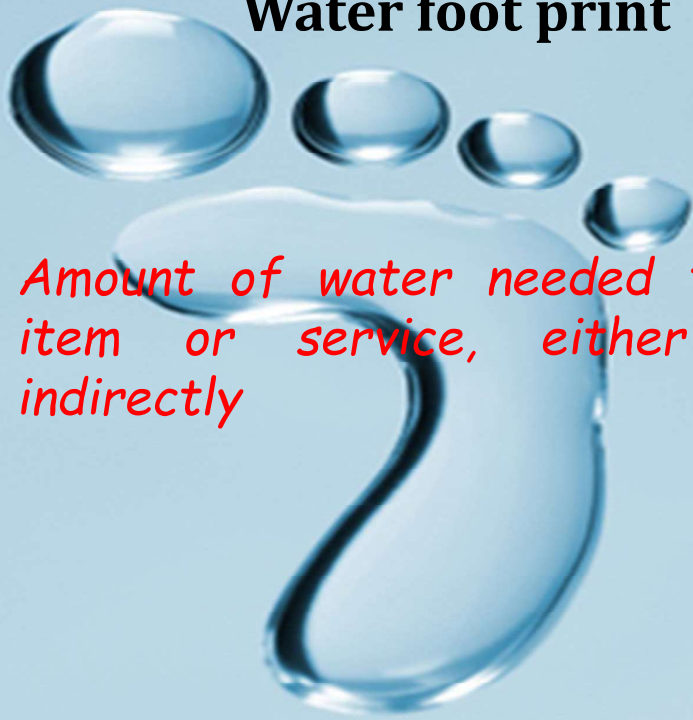
- Survival : 5 liters / person / day
- Food preparation: 10 liters / person / day
- Sanitation needs: 20 liters / person / day
- Hygiene requirements: 15 liters / person / day
- Amount recommended
 - 50 liters / person / day (minimum requirement)
 - 100 liters / person / day (medium city)
 - 150 liters / person / day (big city)


Sumber: Gleick, 1996



Water foot print

Amount of water needed to produce an item or service, either directly or indirectly



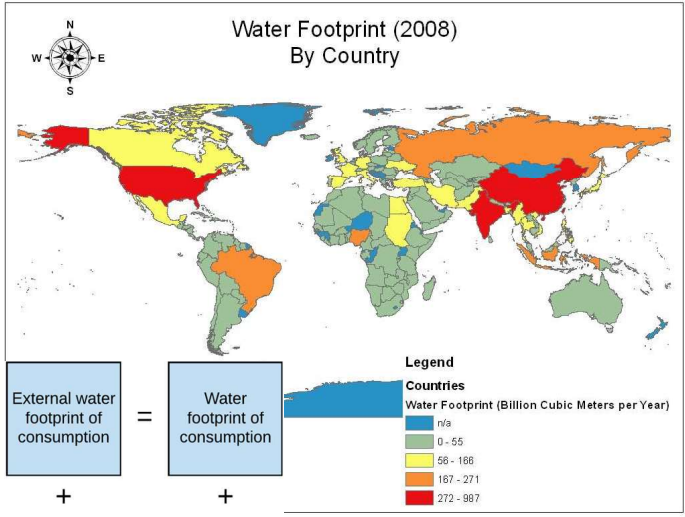


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Water Footprint

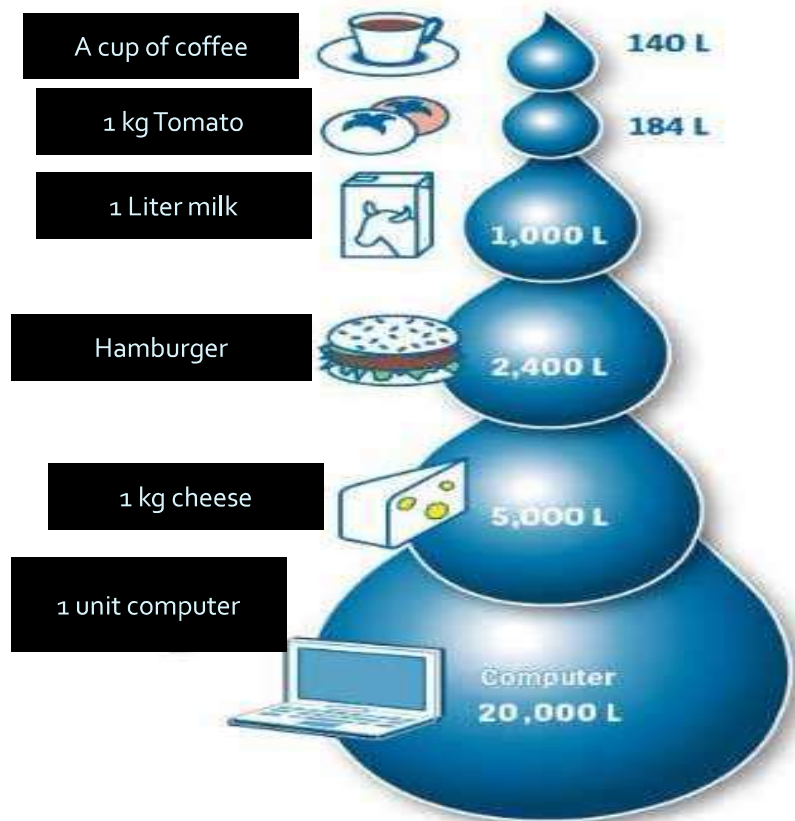
- Every day we use water for different purposes
- The water footprint : total volume of freshwater used to produce goods and services consumed by individual or community or produced by the business.
- Water use is measured in water volume consumed (evaporated) and/or polluted per unit of time.
- "The water footprint is an indicator of water use including both direct and indirect water use of a consumer or producer.



Internal water footprint of consumption	+	External water footprint of consumption	=	Water footprint of consumption
+		+		+
Primary virtual water export	+	Virtual water re-export	=	Virtual water export
=		=		=
Water footprint of production	+	Virtual water import	=	Total water budget



How much water needed ??



Sumber: www.educationaltechnologyinelt.blogspot



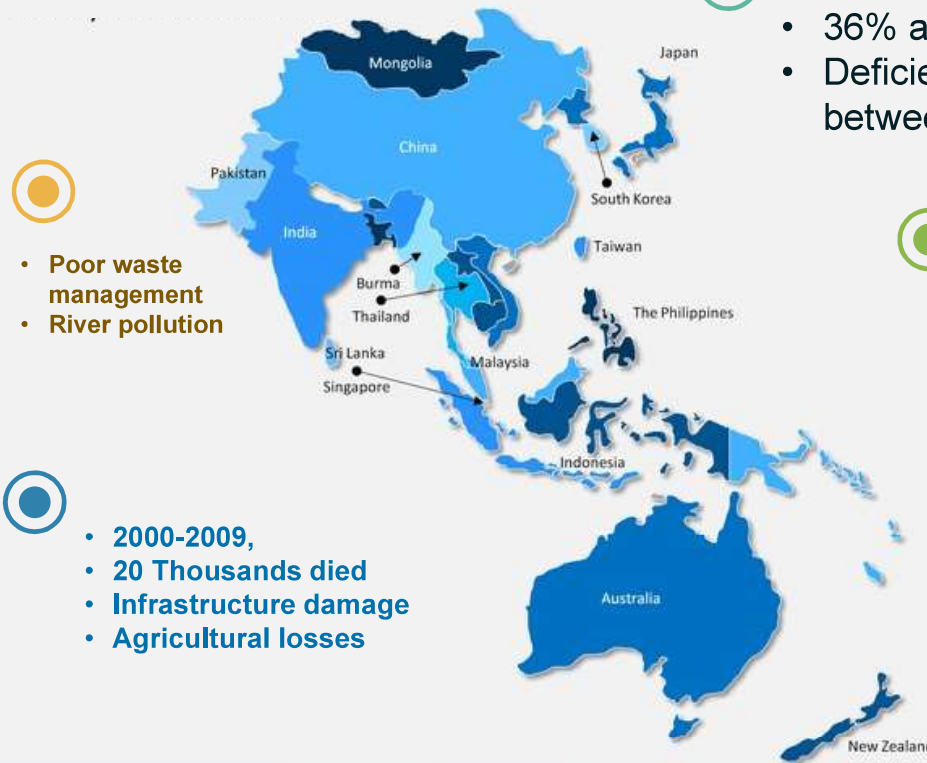
How many liter of water?



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ASIA PACIFIC MAP



extinct

- 126,000 species live in fresh water
- 30% of freshwater reptiles
- 50% of turtles

Predicting The Future Of Global Water Stress

2025

- 1.8 billion people are estimated to live in countries or regions with water scarcity
- 2/3 of the world's population will be in a state with lack of water. (UNESCO, 2012)

2030-2035

- The scarcity of water in some dry and semi-arid places will replace between 24 million and 700 million people. (UNCCD)
- The use of water for energy production increased by 20% and consumption by 85% (UNESCO, 2014)

2045-2050

- 70% of the world's population will live in cities (UNDESA, 2014)
- Urban population is predicted to increase from 3.9 billion people (UNESCO, 2012)
- Of the 52% of the world's population projections, people will live in conditions of lack of water
- Global water demand is projected to increase by 55% (UNESCO, 2014)
- Population growth in flood exposure areas, increasing the number of people vulnerable to floods to 2 billion (UNESCO, 2012)

2080

- land that is not suitable for agriculture in sub-Saharan Africa is dry due to severe climate, land or terrain constraints can increase by 30 to 60 million hectares

Water Stress By Country in 2040

WATER STRESS BY COUNTRY

ratio of withdrawals to supply

- Low stress (< 10%)
- Low to medium stress (10-20%)
- Medium to high stress (20-40%)
- High stress (40-80%)
- Extremely high stress (> 80%)

This map shows the average exposure of water users in each country to water stress, the ratio of total withdrawals to total renewable supply in a given area. A higher percentage means more water users are competing for limited supplies. Source: WRI Aqueduct, Gassert et al. 2013

AQUEDUCT

WORLD RESOURCES INSTITUTE

Future Condition

01 Water as Asset

02 New Energy Sources

03 Small World

Climate Change Impact 04

Robotic Era 05

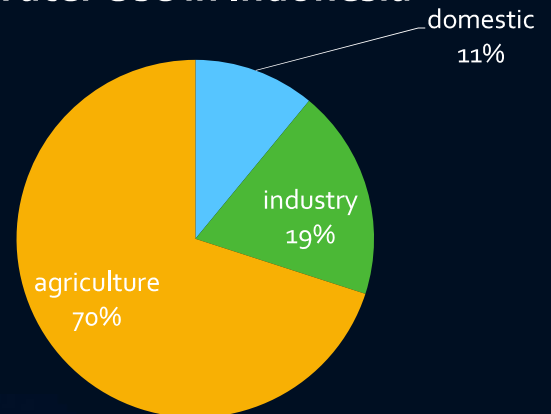
Advanced Medical Sciences 06



Global Water Consumers



Water Use in Indonesia



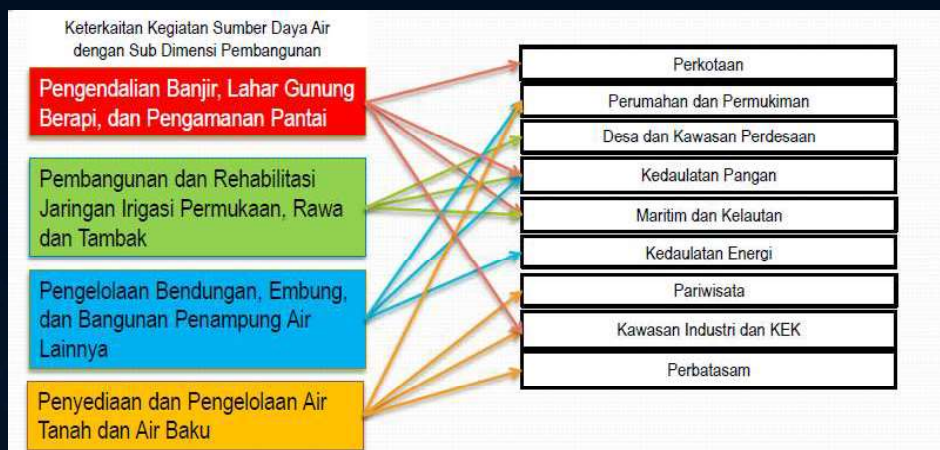
Conditions of Indonesia's Clean Water Access Service

- In 2010, Indonesia has the worst rating in the service of the availability of clean/drinking water in Southeast Asia.

Central Bureau of Statistics (2015) :
access to drinking water in Indonesia reached 70.97% (26% piping) and sanitation reached 62.14%



Contribution of water resources to the National Development Dimension

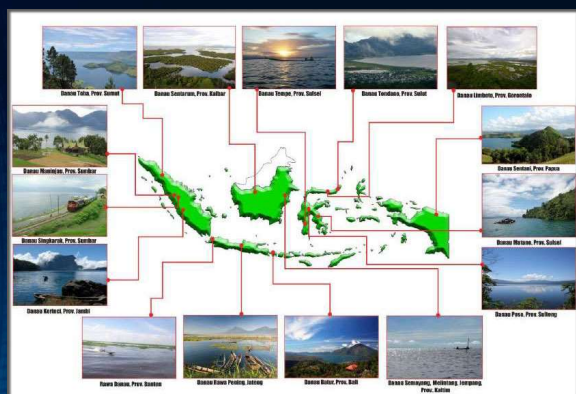


Inland waters of 13.85 million ha:

- 12 million ha of rivers and swamps
- Lake and situ 1.8 million ha
- Dam of 0.05 million ha

Contribution to the economy

- Fisheries Rp317.09 trillion rupiah
- Energy (76,000MW x USD 1.5 million)
- Agriculture 13.59% (IDR 10 T / year, irrigation)
- Clean water (Rp. 4 T / year)
- Tourism (IDR 5 T / year)



STATUS OF WATER RESOURCES

Ministry of Environment and Forestry:

- large lakes are in danger or being damaged.
- rivers
 - 75.25% is heavily polluted
 - 22.52% were moderately polluted
 - 1.73% slightly polluted

62 watersheds were damaged from a total of 470

Water Related Disasters



Floods



Droughts



Pollution



Pollution



Eutrophication

Efforts that have been made by various parties have not been optimal:

- Conflict of interest
- Lack of synergy / coordination
- Need to increase science and technology

Main Problems realated to Water Resources Management in Indonesian

Increasing threats to the sustainability of the carrying capacity of water resources, both surface water and groundwater.

Imbalance between supply and needs in the perspective of space and time

Declining ability to provide water

Un-optimal level of irrigation network services

Weak coordination, institutions, and management

Low quality of data management and information systems.

Water conflicts Trend increasing

Projection of Indonesia's Condition 2045



- Population growth rate of 1.49% per year
- In 2045, Indonesia's population is projected to be 318 - 450 million (BKKBN, 2017)

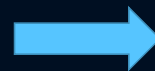
Water requirements per person : 130 liters / person / day



**55.9 million m³ / day or
20.5 billion m³ / year**



- Improving access to clean water and sanitation services for the community is able to contribute to GDP by 3.7% annually (WHO, 2005).
- For every US \$ 1 investment in the protection of the catchment area, it can save US \$ 7.5-US \$ 200 in making clean water treatment and screening facilities.
- On the other hand, according to World Bank research (2015), the lack of access to clean water causes state losses of 7% of GDP each year



**Improving
Indonesia's
clean water
access services
is very
important**

Water scarcity challenges and issues

Temperatures increase higher and more extreme and weather conditions that are less predictable

Floods and droughts are more intensive

Disasters related to water have direct and indirect impacts

Water scarcity will be exacerbated because of the rapidly growing urban areas

Although the level of access to water and sanitation is generally higher in urban areas than in rural areas, planning and infrastructure cannot balance many areas



International human rights law demands a special focus on people who do not fully enjoy their rights, which causes the development of 'pro-poor' explicitly in many countries.

Most of the fastest growing cities in the world are in low-income countries

Excessive exploitation of lakes, rivers and aquifers can endanger ecosystem services

Climate Change and Water Scarcity

Efforts to meet water scarcity for around 700 million people in 43 countries (Global Water Institute, 2013)



Disaster

Prevention, mitigation and adaptation efforts in Asia that are prone to water-related disasters, more than 45% and more than 90% of people affected by the disaster between 1980 and 2006. (UNESCO, 2009)



Water Quality and Ecosystems

- Efforts to improve water quality to reduce the risk of diarrhea which can kill around 2.2 million people / year (WHO)
- Protect the source of water in the form of: 20% of the drainage basin in the world shows the quality of clean water. (UNESCO, 2009)
- Prevent the number of lakes contaminated with dangerous algae which is predicted to increase by at least 20% until 2050. (UNESCO, 2015)
- Preventing naturally occurring arsenic pollution in groundwater now affects nearly 140 million people in 70 countries on all continents. (UNESCO, 2009)

Gender & Human Rights

- Increasing women's role in water resources management: women spend 25% less on activities. (UNESCO, 2012)
- Reducing the number of pregnant women (44 million) has hookworm infection related to sanitation. (UNICEF)
- Fulfilling human rights for sanitation that is explicitly recognized as a different right by the UN General Assembly in 2015. (UN, 2016)



Sanitation and Waste Water

- Improve waste treatment efforts: Globally, 80% of wastewater flows back to ecosystems without being processed or reused (UNESCO, 2017).
- Reducing population: 263 million people spend more than 30 minutes per trip to collect water (WHO / UNICEF 2017)
- Reducing population: 1.8 billion people use contaminated drinking water sources (WHO / UNICEF 2015)





Food and Energy

- Optimizing water use for:
- Agriculture accounts for 70% of global water withdrawals. (FAO)
- 90% of global electricity generation is solid water. (UNESCO, 2014)

Water conflicts and cross-regions

- 263 watersheds and around 300 aquifers (UNECE / UNESCO 2015)
- 2/3 of the cross-border rivers in the world do not have a cooperative management framework. (SIWI)

Urbanization

- Anticipating the problem of urbanization:
 - 39% of the global population (2.9 billion people) use sanitation services that are managed safely.
 - 3 out of 5 people live in urban areas (WHO / UNICEF, 2017)
 - In 2017, more than half of the global population lives in large and small cities. In 2050, the proportion is estimated to increase to 2/3. (UN-DESA, 2014)



Country and ESA participation in the GLAAS 2016/2017 surveys

Participation in 2016/2017 Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS)

- Bilateral donor
- Aid recipient country
- Not a participant
- Not applicable



Source: GLAAS 2016/2017 country and external support agency surveys.

Finance

- More than 50% of countries: household tariffs are insufficient to recover operating and maintenance costs, which leads to failure of clean water services (GLAAS 2017)
- 80% of countries report insufficient funding to meet national WASH (Sanitation and Hygiene) targets. (GLAAS 2017)

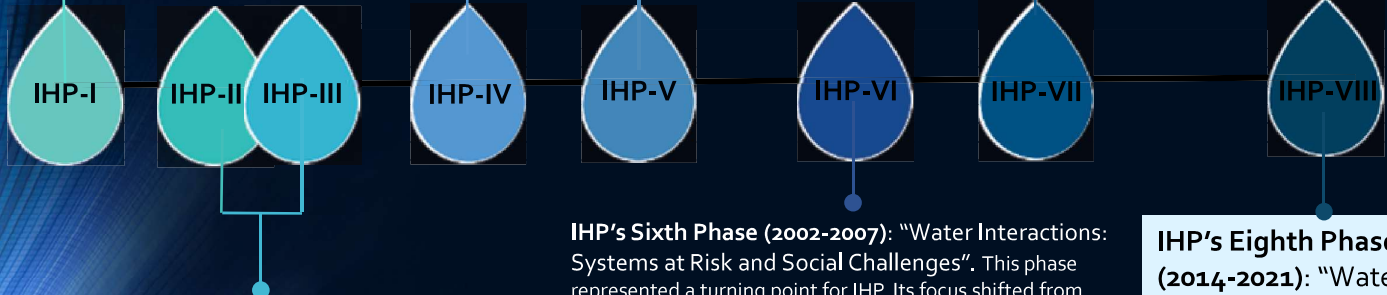
IHP UNESCO

IHP's First Phase (1975-1980): maintained the research orientation of IHD

IHP's Fourth Phase (1990-1995):
"Hydrology and Water Resources Sustainable Development in a Changing Environment"

IHP's Fifth Phase (1996-2001):
"Hydrology and Water Resources Development in a Vulnerable Environment"

IHP's Seventh Phase (2008-2013): "Water Dependencies: Systems under Stress and Societal Responses"



IHP's Second Phase (1981-1983) and Third Phase (1984-1989): planned under the theme "Hydrology and the Scientific Bases for Rational Water Resources Management"

IHP's Sixth Phase (2002-2007): "Water Interactions: Systems at Risk and Social Challenges". This phase represented a turning point for IHP. Its focus shifted from studying the occurrence and distribution of water in the environment towards societal aspects of water resources, highlighting the need for better assessment and management, in particular at transboundary level

IHP's Eighth Phase (2014-2021): "Water Security: Responses to Local, Regional and Global Challenges"

IHP Phase VIII

INTERNATIONAL HYDROLOGICAL PROGRAMME (IHP) EIGHTH PHASE

"WATER SECURITY: RESPONSES TO LOCAL, REGIONAL, AND GLOBAL CHALLENGES"

STRATEGIC PLAN

IHP-VIII (2014-2021)



Water Issues in SDGs



Goal 6: Ensure access to water and sanitation for all

Goal 13: Take urgent action to combat climate change and its impacts

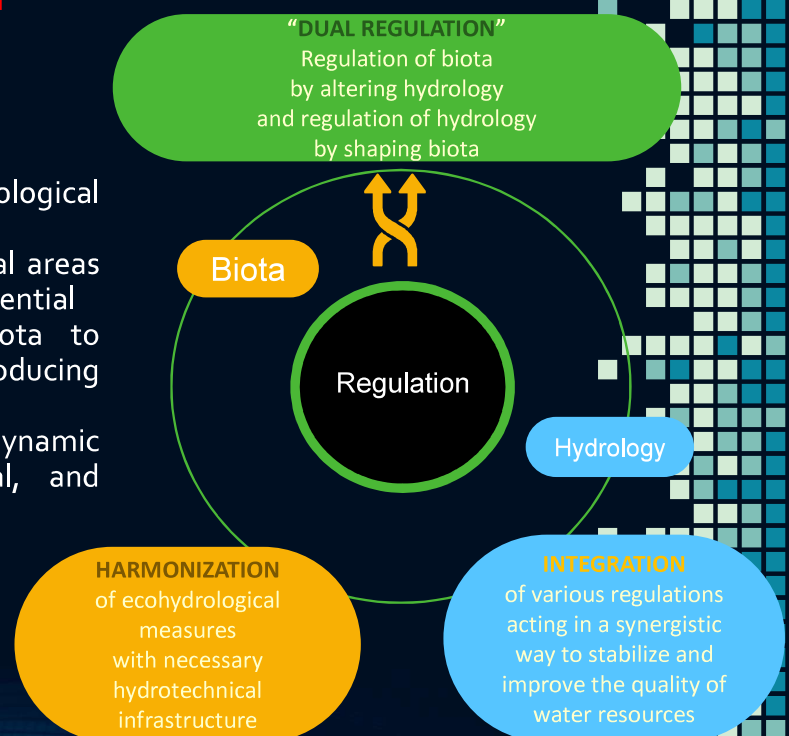
Goal 11: Sustainably cities and Communities

Goal 15: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss

Ecohydrology Approach

4 Ecohydrology Principles :

- **Hidrology Principle** : quantification of hydrological cycle, analysis, regulation, impacts
- **Ecology Principle** : identification of potential areas for ecosystem enhancement sustainability potential
- **Ecotechnology Principle** : managing biota to regulate hydrological process by introducing technology
- **Culture Principle** : enhance the dynamic relationships between hydrological, social, and ecological systems

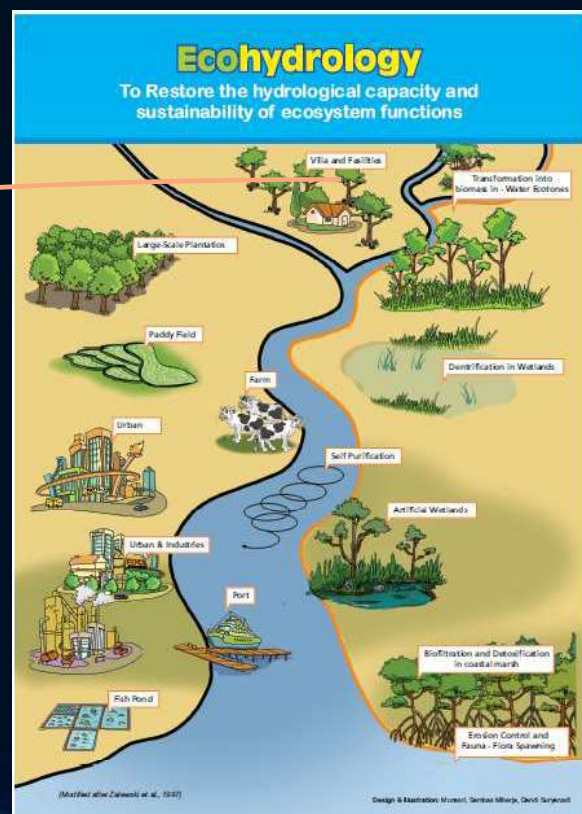


Direction of Water Resources Management :

- sustainable
- based on ecosystems carrying capacity
- community participation



- Sustainable: utilizing resources now and in the future
 - Efforts need to be improved
 - Focus on important and broad-impact problems
 - Coordination with stakeholders
 - Increased Science and Technology



Overcoming Water Resources Problems 2045?

- designing sustainable agricultural and economic systems
- Do research for plants that are more water efficient

- New technology innovations for raw water treatment
- Better disaster risk mitigation, innovation and mitigation
- Application of the concept of ecohydrology to restore ecosystems and improve water quality

Food and Energy

Water Quality and Ecosystems

Financial

Water conflicts and transboundary

Sanitation & Waste Water

Climate Change & water scarcity

Disaster

Urbanization

Gender & HR

- Improve energy efficiency
- Optimization of hydroelectric power plants
- wind energy technology innovation
- solar energy technology innovation

- Support the fulfillment of basic rights as a basis for national policy
- Gender sensitive approaches help improve the suitability, sustainability and reach of Air services



Conslusions

- The amount of water remains but the need for water continues to increase. There is a gap between the needs and availability of water.
- Challenges in increasing water security are: climate change, population growth in urban and rural areas, urbanization, environmental pollution, water conflicts and cross-regions, damage to ecosystems and water quality, disasters, human rights and gender and financial
- Future research directions: water-saving agricultural technology, development of raw water and wastewater management technologies, desalination, micro irrigation, water reclamation, rainwater harvesting, plants and genetic engineering automation
- Ecohydrology is new approach to support sustainable water resources management and environmental ecosystem restoration



Thank You