the international water association

SUSTAINABLE COASTAL AND ESTUARINE DEVELOPMENT

19 SEPTEMBER 2023

inspiring change

AGENDA

- Welcome & Poll
  Muttucumaru Sivakumar, University of Wollongong
- Housekeeping Rules & Introduction
  Fang Yenn Teo, University of Nottingham
- Towards Nature-based Solutions for Sustainable Coastal and Estuarine Development
  Arthur Mynett, TU Delft
- Ecohydrology implementation for Sustainable Estuaries and Coastal Water: Towards Achieving Water Security
  Elfithri Rahmah, UNESCO
- Q&A Discussion
  Fang Yenn Teo, University of Nottingham
- Close
  Sivakumar Muttucumaru, University of Wollongong

SUSTAINABLE COASTAL AND ESTUARINE DEVELOPMENT SPECIALIST GROUP

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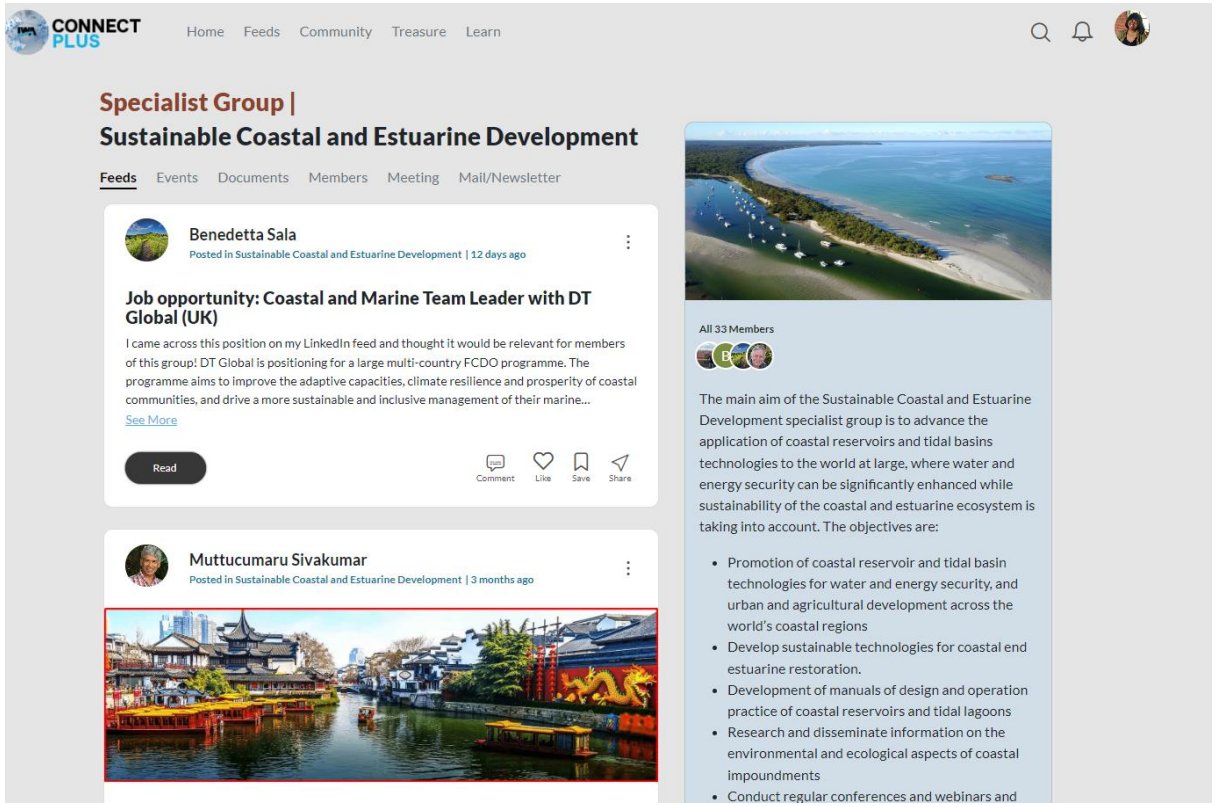
The main aim of the Sustainable Coastal and Estuarine Development specialist group is to advance the application of coastal reservoirs and tidal basins technologies to the world at large, where water and energy security can be significantly enhanced while sustainability of the coastal and estuarine ecosystem is taking into account.



1ST IACRR/IWA INTERNATIONAL CONFERENCE ON COASTAL RESERVOIRS AND SUSTAINABLE WATER MANAGEMENT

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ABSTRACT DEADLINE EXTENDED:
15 September 2023

Highlights:

14 world renowned keynote speakers,10 invited lectures, one full day interactive workshop and one day technical tour to the world's largest coastal reservoir situated at the Yangtze Estuary in Shanghai.

Conference Themes:

- Coastal infrastructures, climate change
- Sustainable water management, water security
- Ecological impacts, water quality, sediment transport
- River, Estuarine and Reservoir processes
- Water-energy-food nexus, water policy

6-9th November 2023
Hohai University, Changzhou, China

Visit: www.iacrr2023.com or

https://iwa-network.org/events/1st-iacrr-international-conference-on-coastal-reservoirs-and-sustainable-water-management/

WEBINAR INFORMATION

- This webinar will be **recorded and made available "on-demand"** on the IWA Connect Plus platform, with presentation slides, and other information.
- The **speakers** are responsible for **securing copyright permissions** for any work that they will present of which they are not the legal copyright holder.
- The opinions, hypothesis, conclusions or recommendations contained in the presentations and other materials are the **sole responsibility of the speaker(s)** and do not necessarily reflect IWA opinion.

WEBINAR INFORMATION

- **'Chat' box**: please use this for general requests and for interactive activities.
- **'Q&A' box**: please use this to send questions to the panelists. (We will answer these during the discussions)

Please Note: *Attendees' microphones are muted. We cannot respond to 'Raise Hand'.*

MODERATORS & SPEAKERS

Assoc. Prof.
Muttucumaru
Sivakumar
University of
Wollongong
Australia
(Moderator)

Dr Fang Yenn Teo
University of
Nottingham,
Malaysia
(Moderator)

Emeritus Professor
Arthur Mynett
TU Delft
Netherlands

Dr Elfithri Rahmah
UNESCO
France

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Towards Nature-based Solutions for Sustainable Coastal and Estuarine Development

A CASE STUDY FOR THE NETHERLANDS

EM/PROF ARTHUR E MYNETT
UNESCO IHE DELFT &
DELFT UNIVERSITY OF TECHNOLOGY
THE NETHERLANDS

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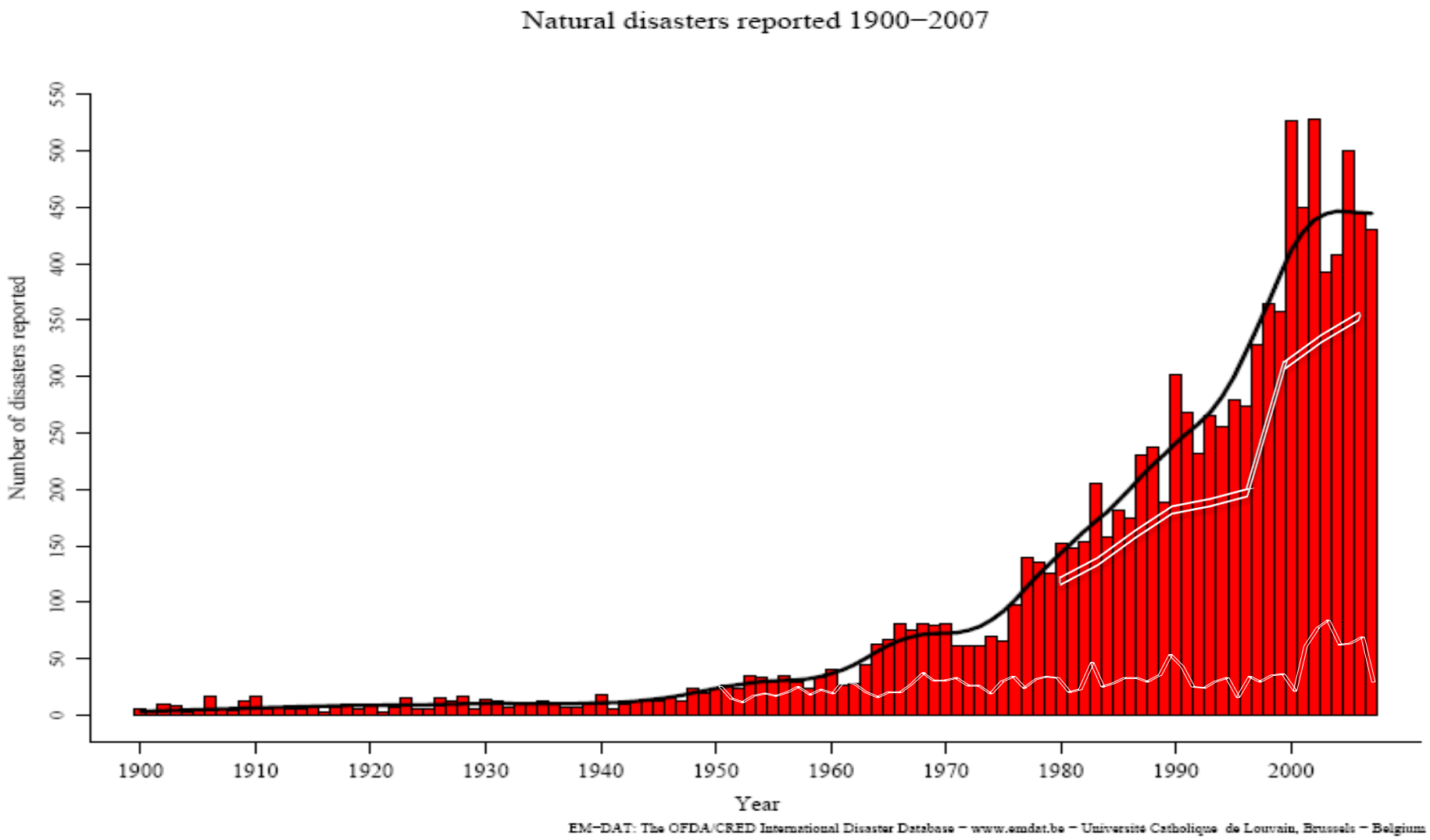
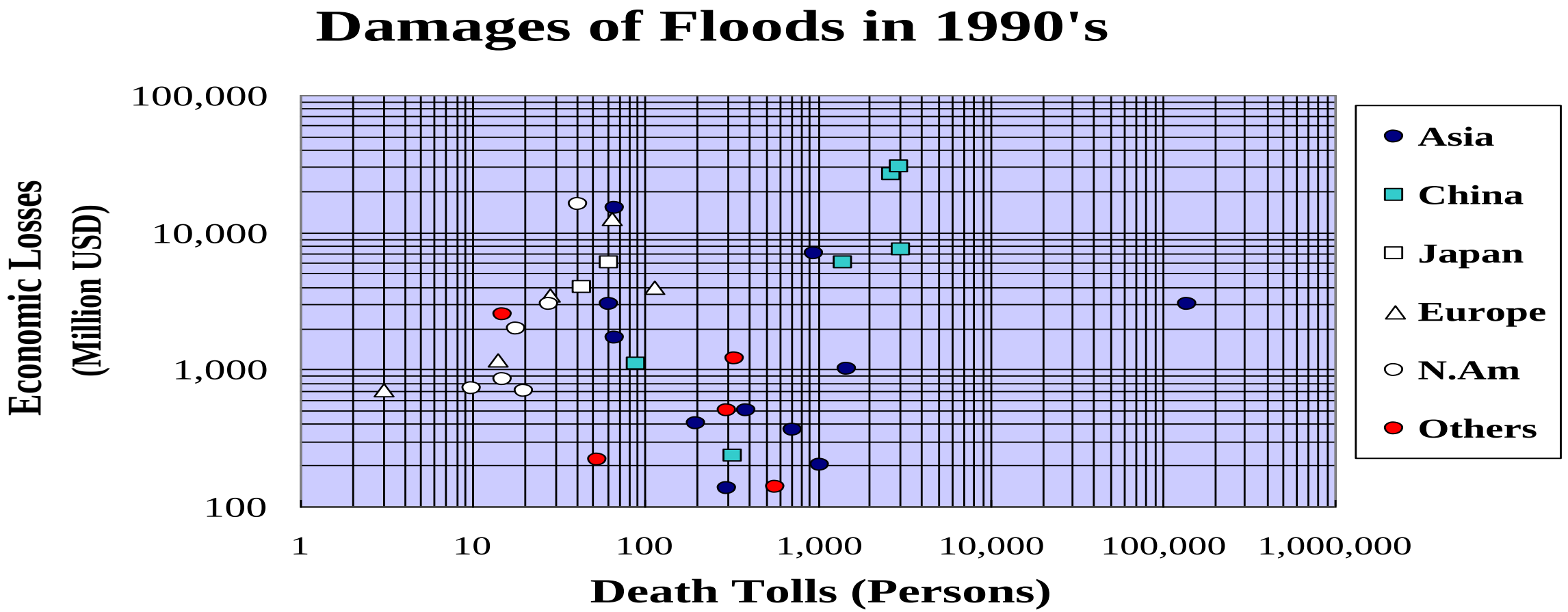
NUMBER OF NATURAL DISASTER EVENTS REPORTED FROM 1900 - 2007



DAMAGES DUE TO FLOODS IN 1990'S



IMPACT OF FLOOD LOSSES IN % GDP

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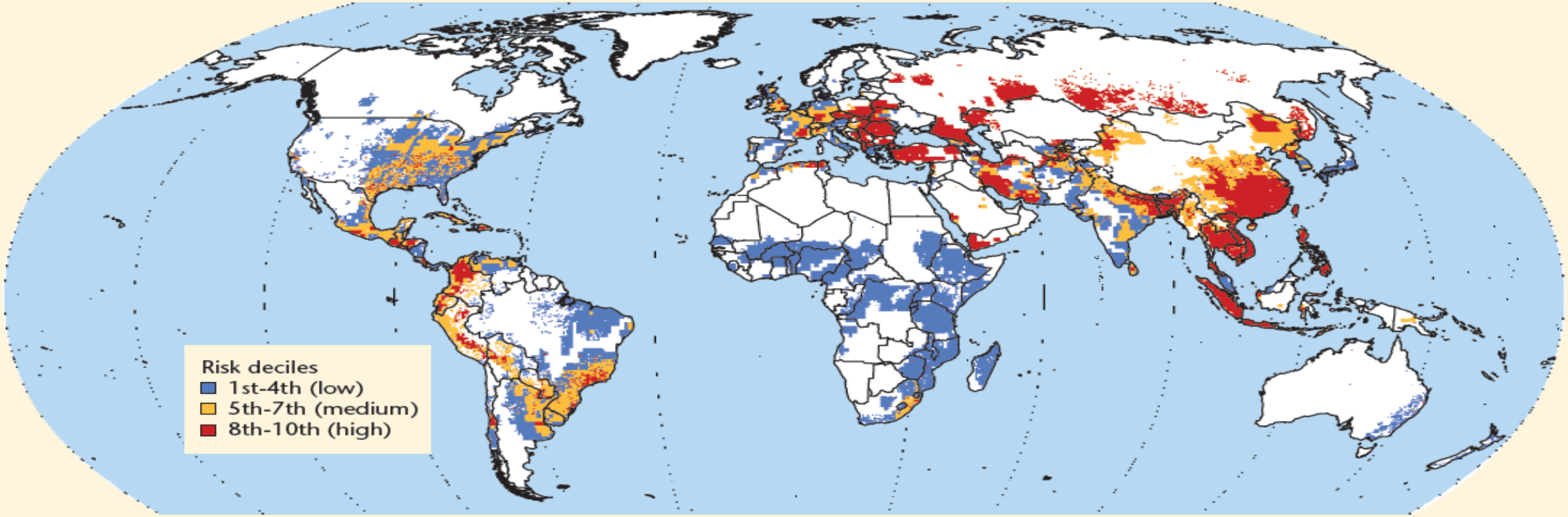
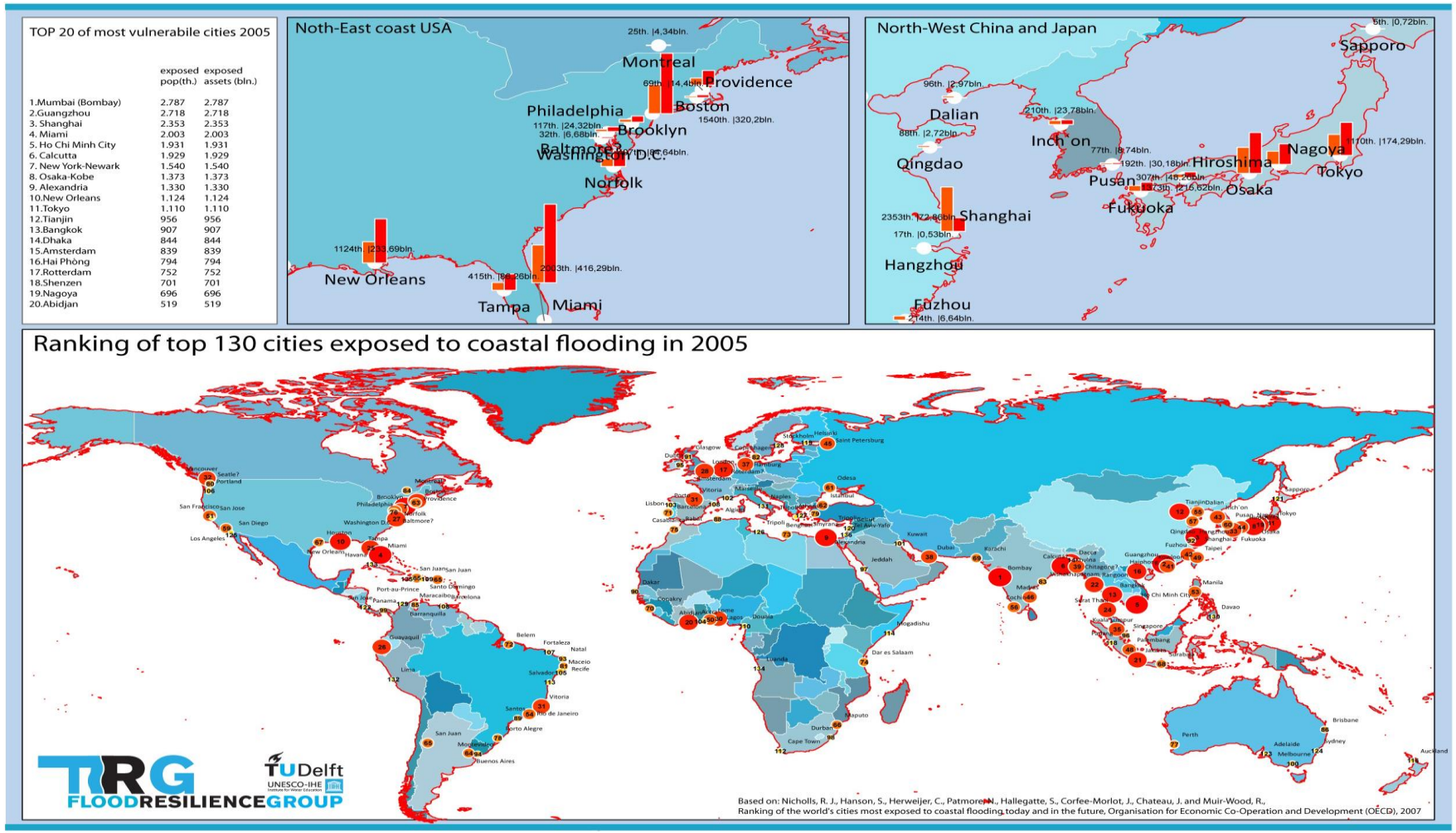
Map 10.3 **Impact of flood losses (comparative losses based on national GDP)**

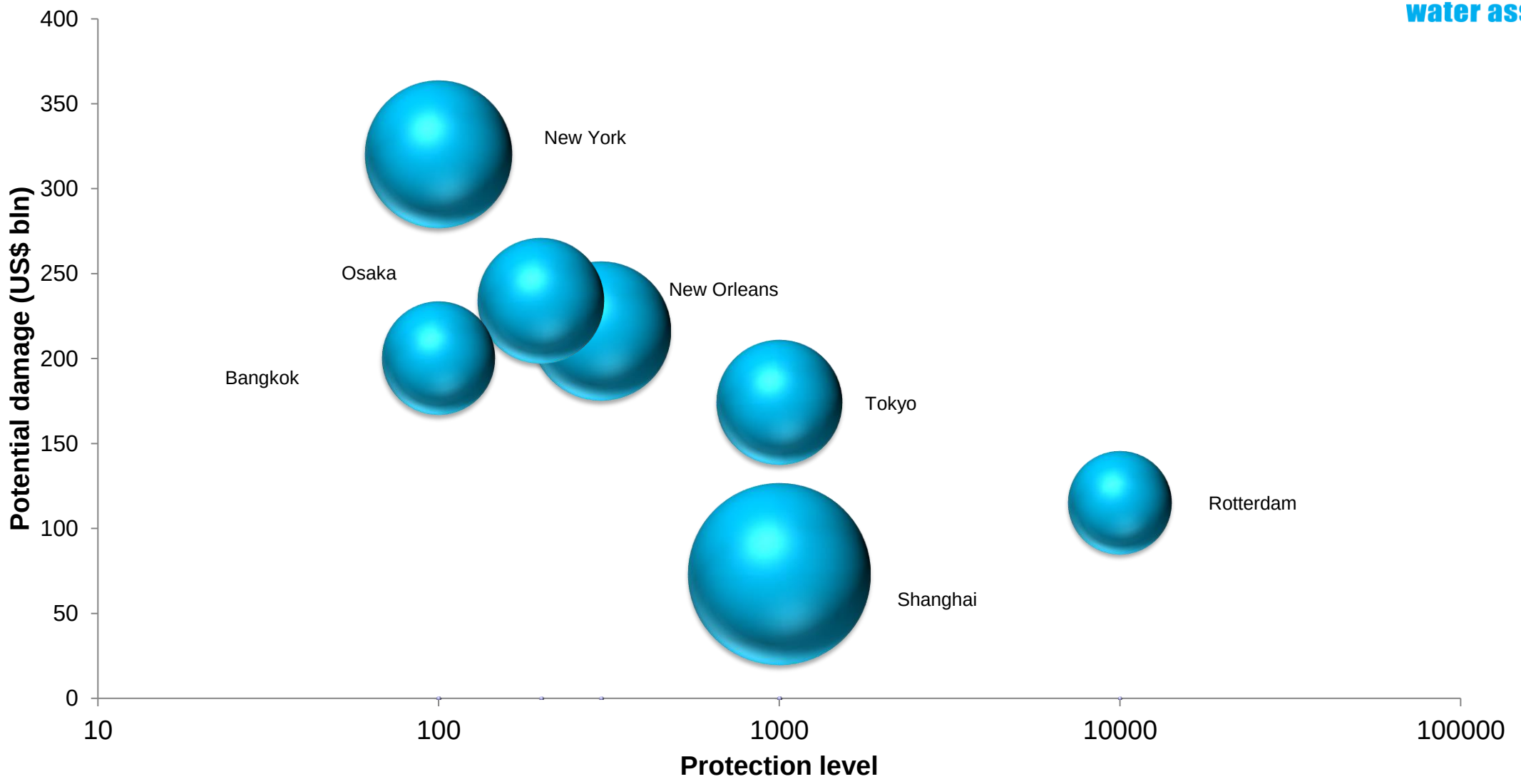


Note: Deciles refer to the level of risk, normalized for comparing 10 categories.
Source: Based on Dilley et al. 2005.

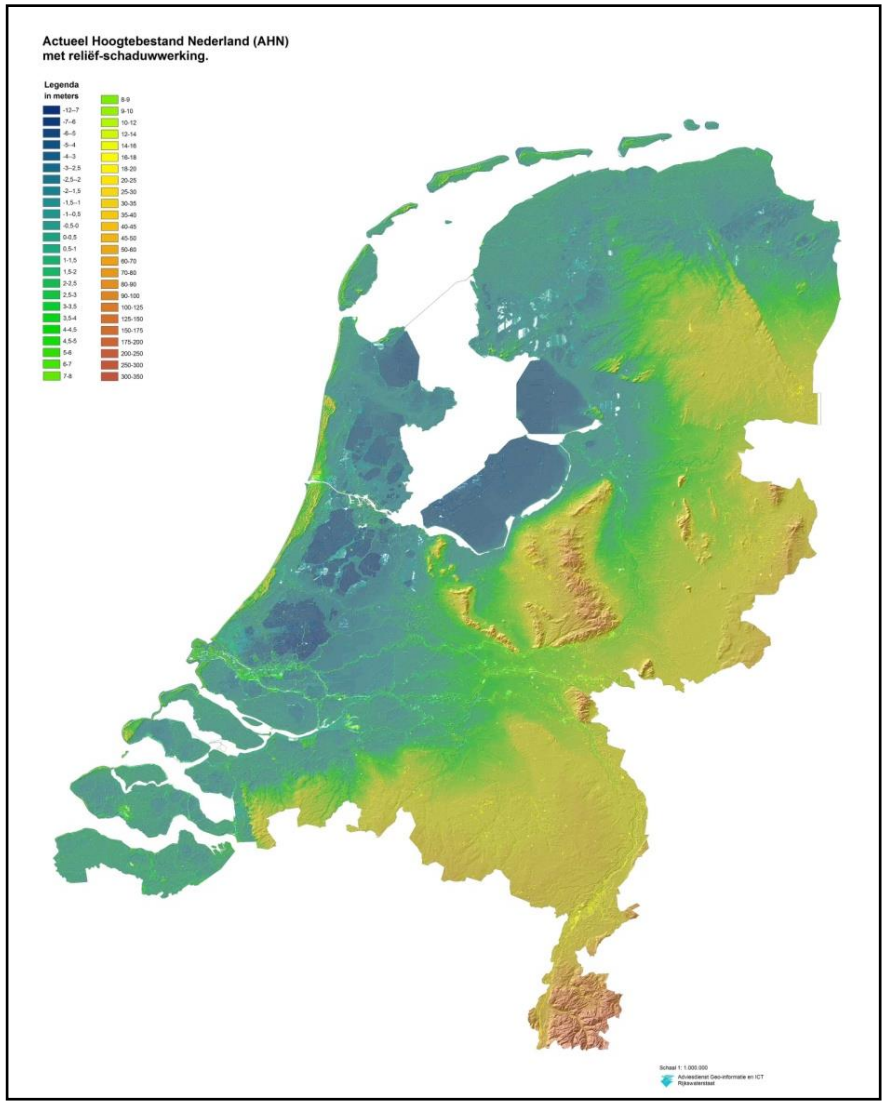
COASTAL FLOODS (2005)

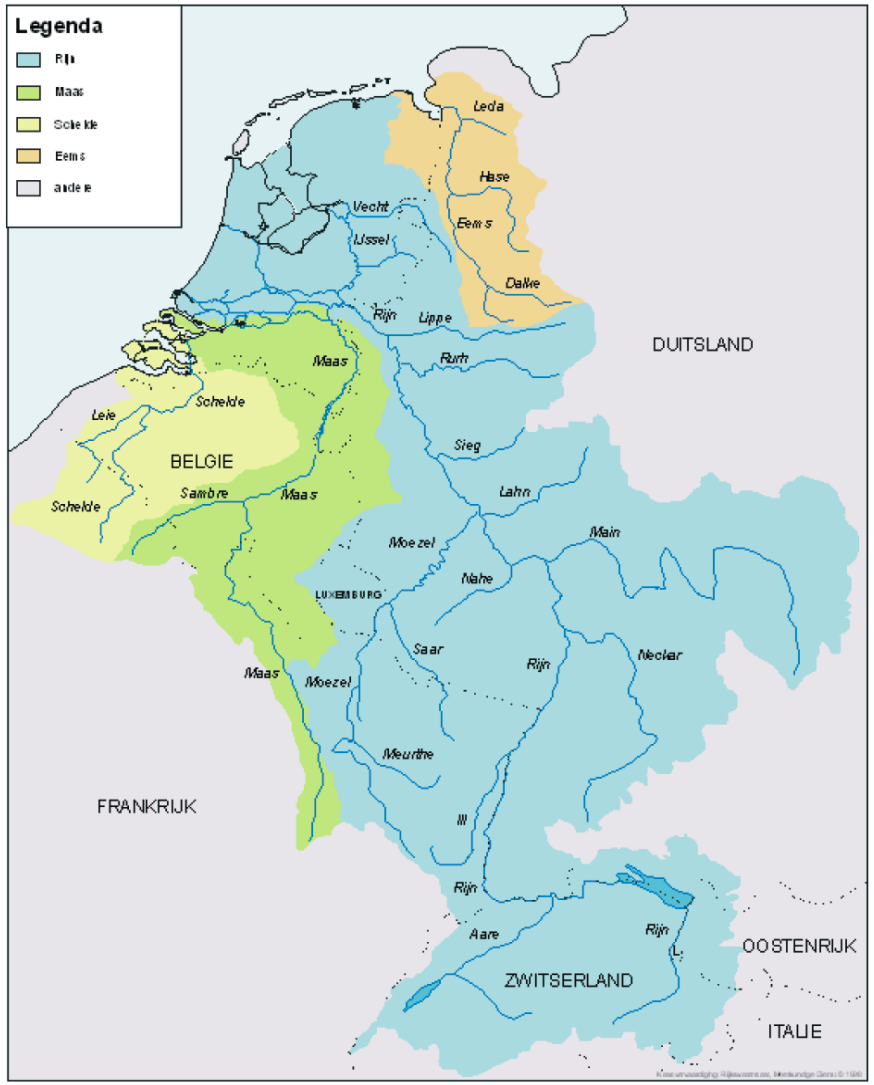


POTENTIAL DAMAGE / PROTECTION LEVELS FOR SAMPLE COASTAL MEGA CITIES



LOW LANDS OF THE RHINE-MEUSE-SCHELDT ESTUARY





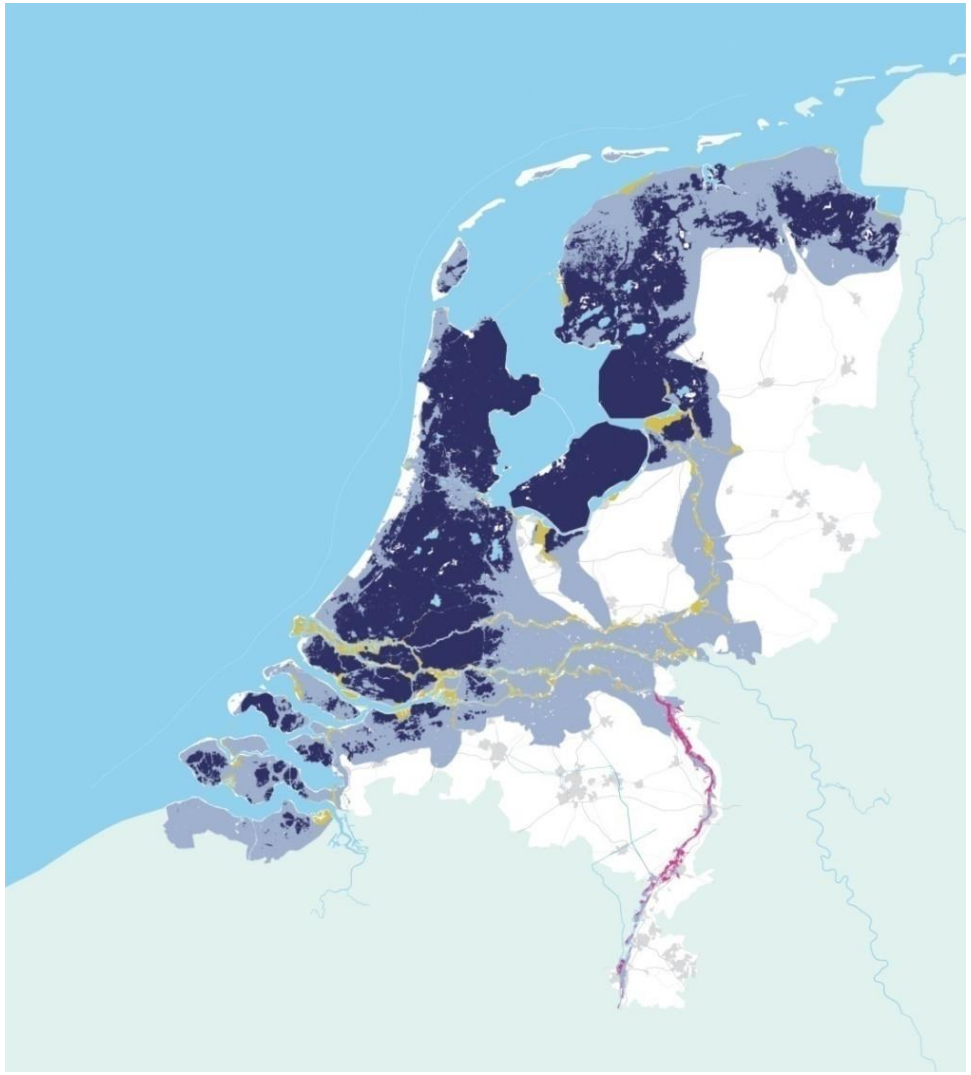
Dutch Delta:

10 million people living in floodprone areas

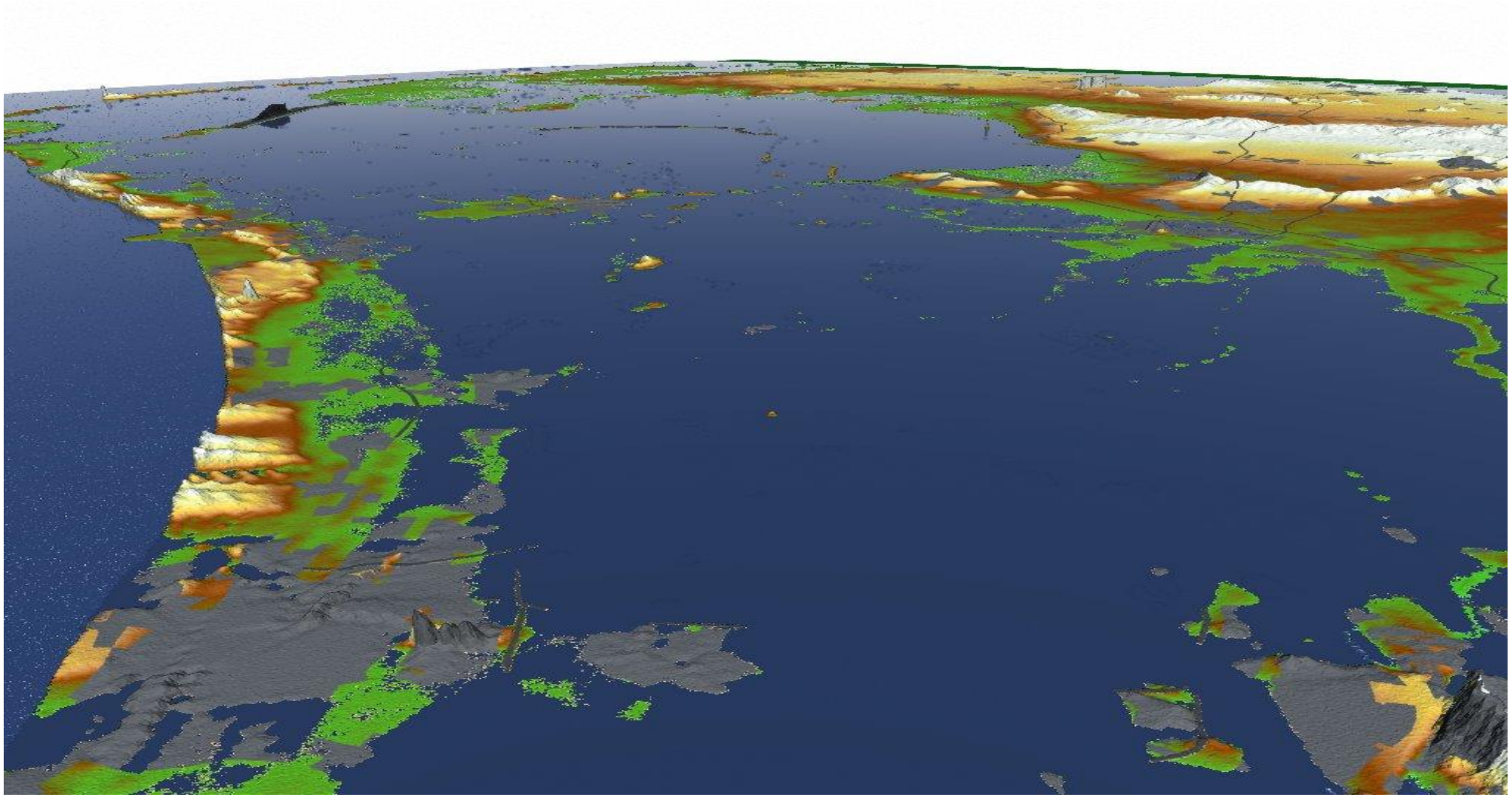
(deepest location MSL – 6,76 m …)

FLOODPRONE AREAS

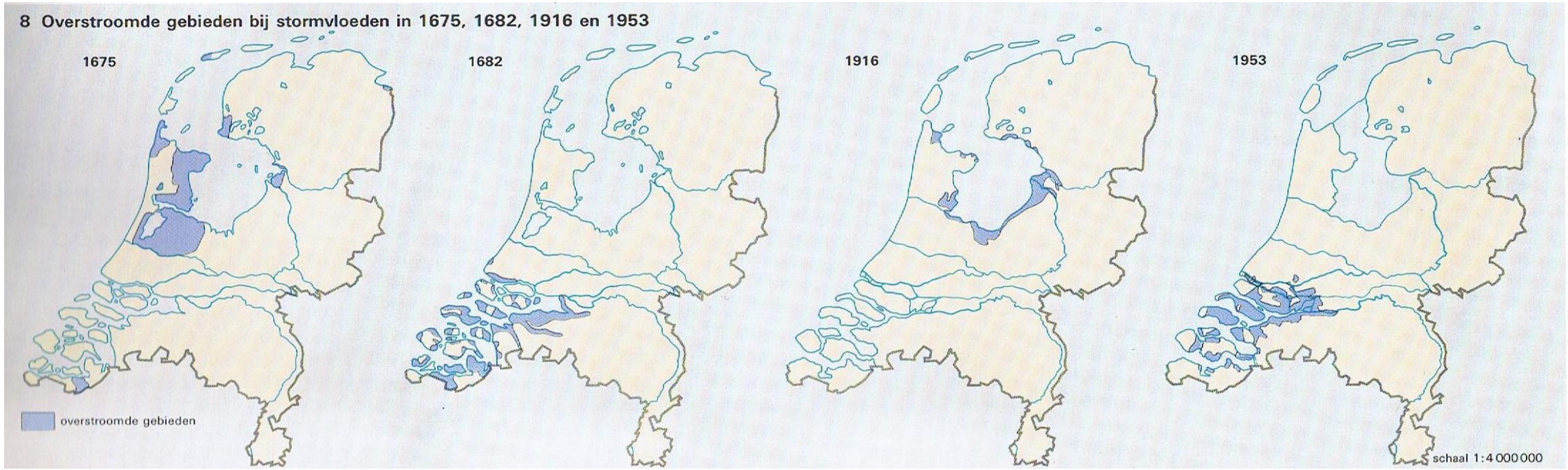
General statistics	
Surface area	33,948 km^2
Population	16.66 million
GNP/capita	€ 34,661
Main water system	
Coast line	642 km
Dykes/dams	470 km (e.g. Afsluitdijk/ closure dam 32 km)
Lake IJsselmeer	1813 km^2 (1500 km^2 polders)
Banks	2706 km
Weirs	16
Storm surge barriers	4
Liable to flooding	59%



NETHERLANDS: AREAS POTENTIALLY FLOODED (WITHOUT PROPER WATER MANAGEMENT)



MAJOR STORM SURGES AND FLOODS



1675 1682 1916 1953

Original DUTCH DELTA DESIGN …

Netherlands

with

and

without

flood

protection

EASTERN SCHELDT STORM SURGE BARRIER

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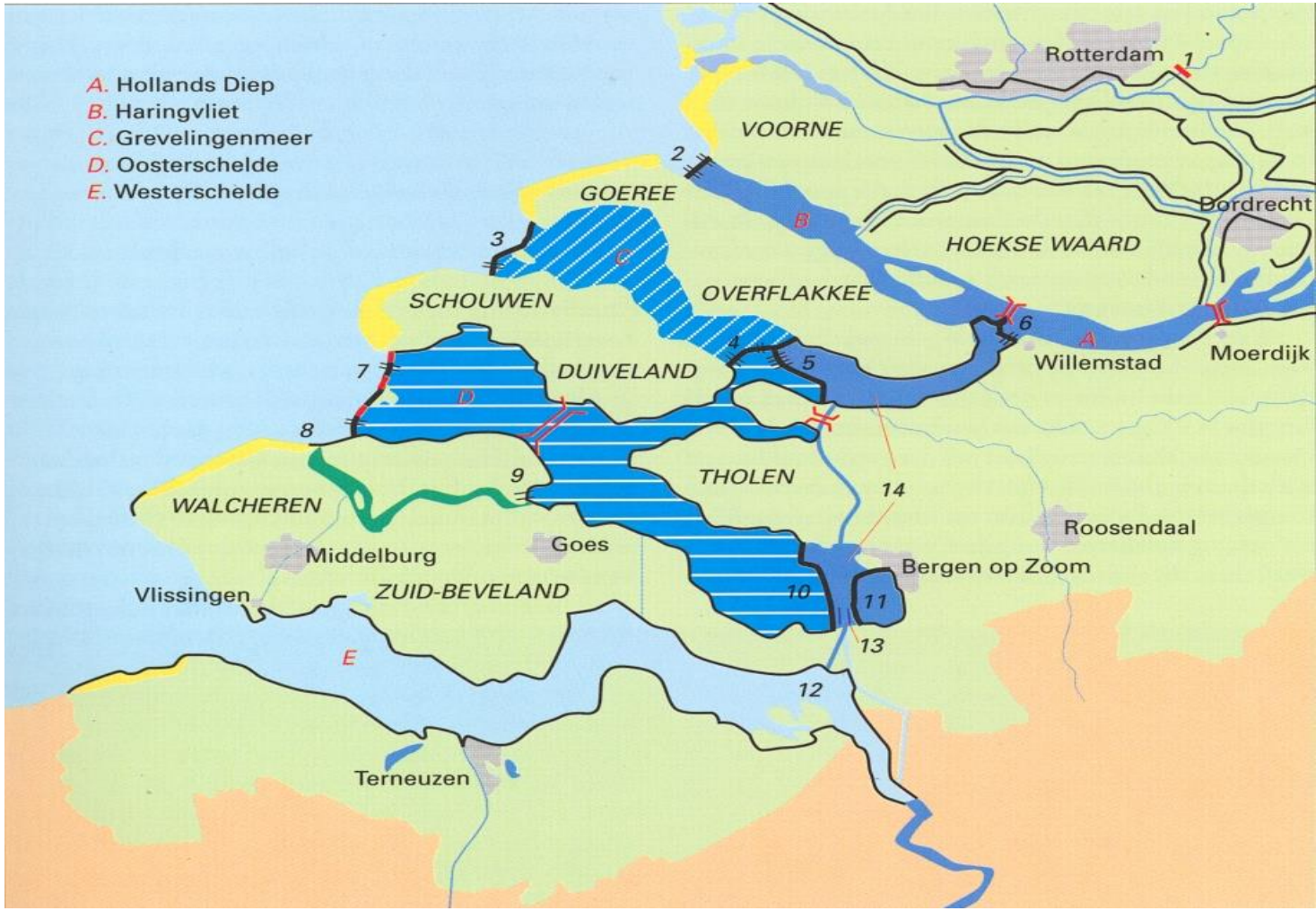
CHANGING PERSPECTIVES ON DELTA DEVELOPMENT

- The final closure of the Eastern Scheldt deferred in 1970s
- 1986: Eastern Scheldt remained tidal with storm surge barrier
- Oyster banks, recreation, environment conserved at high costs
- 1987: New dams to separate fresh from saline
- 1987: New sluices for navigation between fresh and saline systems
- 2019: Re-opening the Haringvliet leaving a small opening for fish migration
- Reintroduction of tide in the Grevelingen because of water quality problems (future plans)



FLOOD RISK MANAGEMENT IN THE NETHERLANDS

- Long tradition
- Stringent safety standards

- Old paradigm: predict and control regime
- Emerging paradigm: integrated and adaptive regime

- **Governance: *the Polder model***

DUTCH DELTA

under pressure …

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More extreme storms

More intense rainfall

Spatial / economic development

Increased river discharge

Increased erosion

Land subsidence

Decreased river discharge

Sealevel rise

Salinity intrusion

"should we LEAVE or STAY … ?
… and at what COST… ?!"

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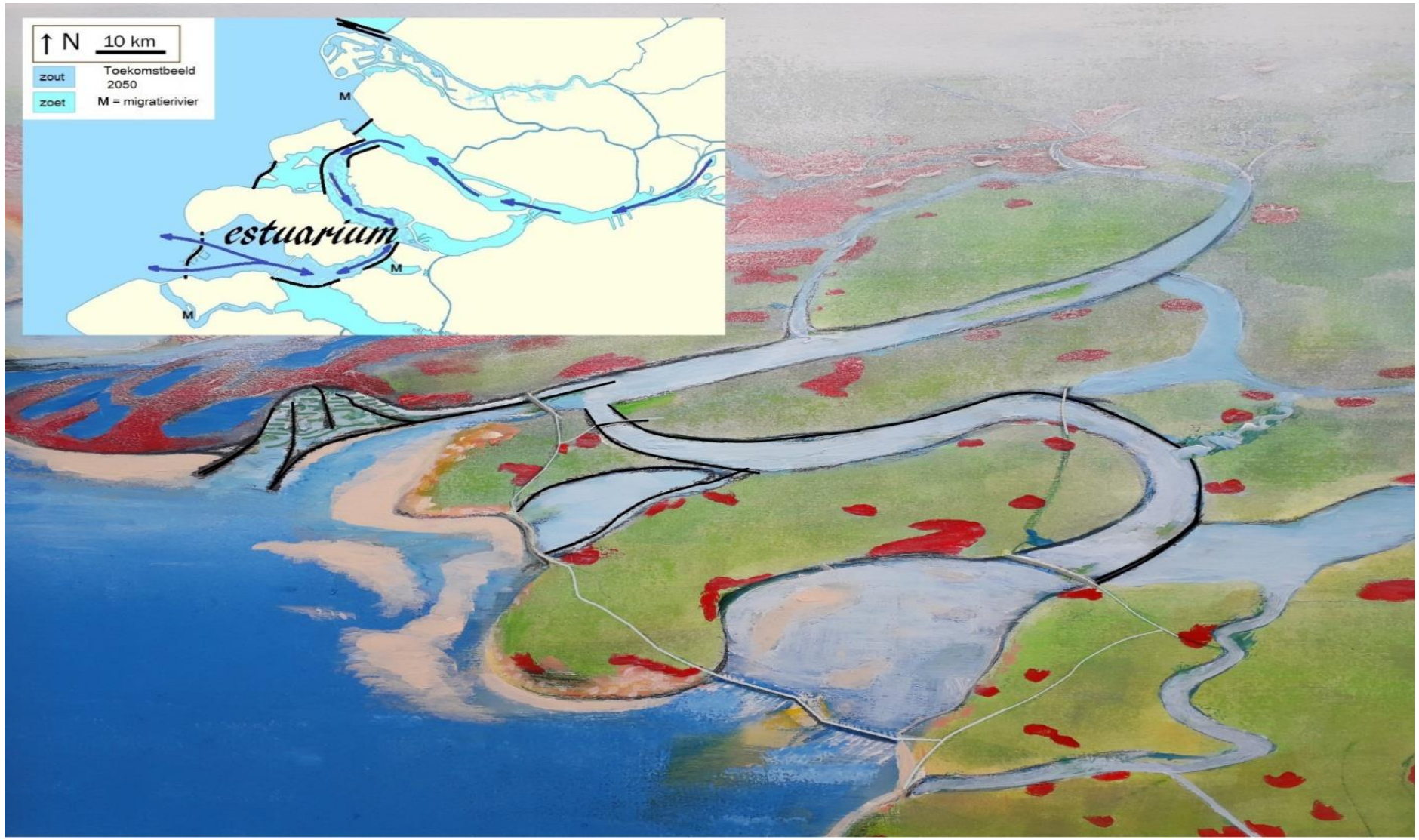
Delta Committee 2 (Cie Veerman)

Living with *water,*

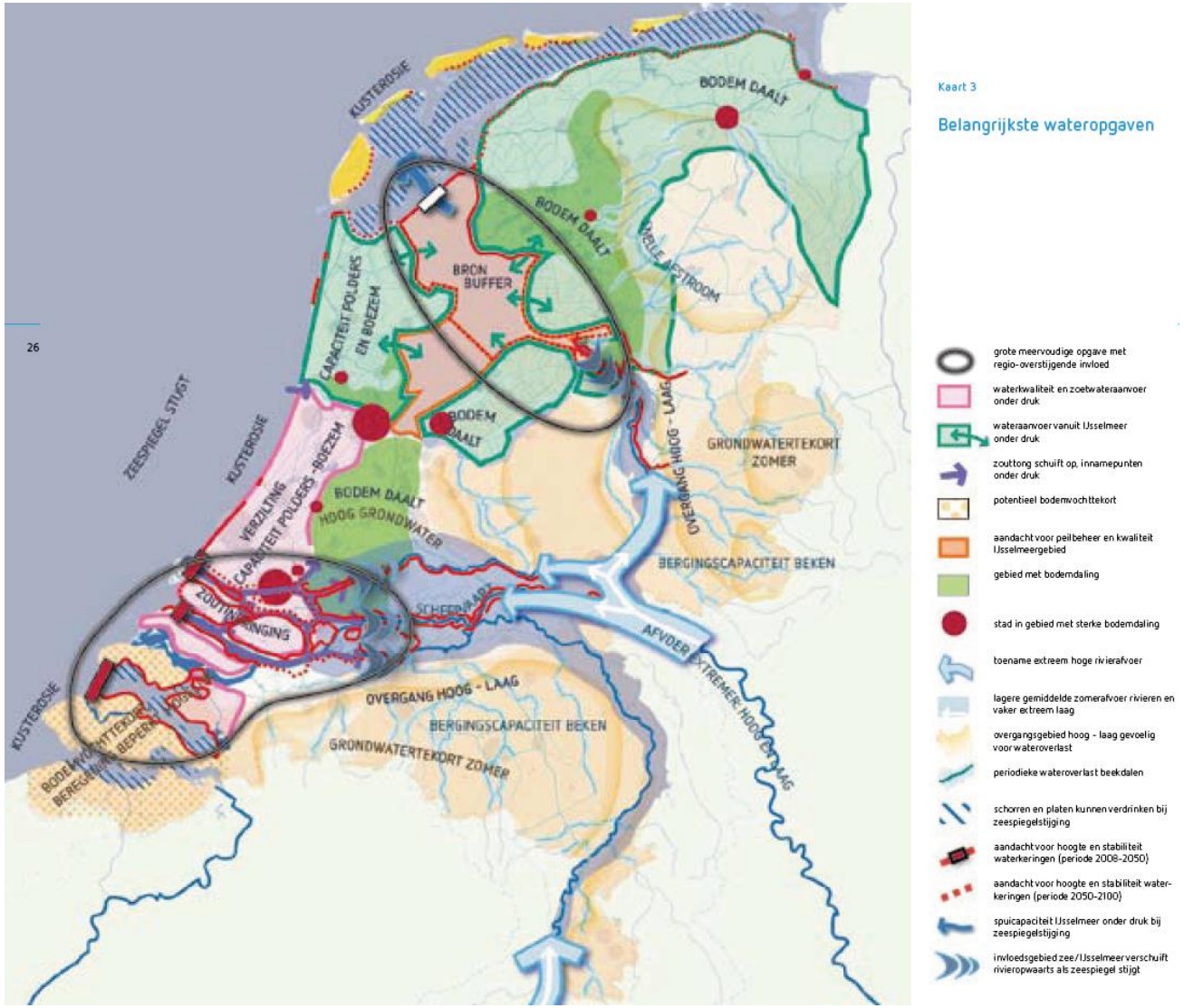
Working with *water*

DELTA COMMISSIE

RECREATING THE ESTUARY – *MORE NATURE-BASED*



Towards *sustainable* delta development



CHANGING PERSPECTIVES ON COASTAL RESERVOIRS

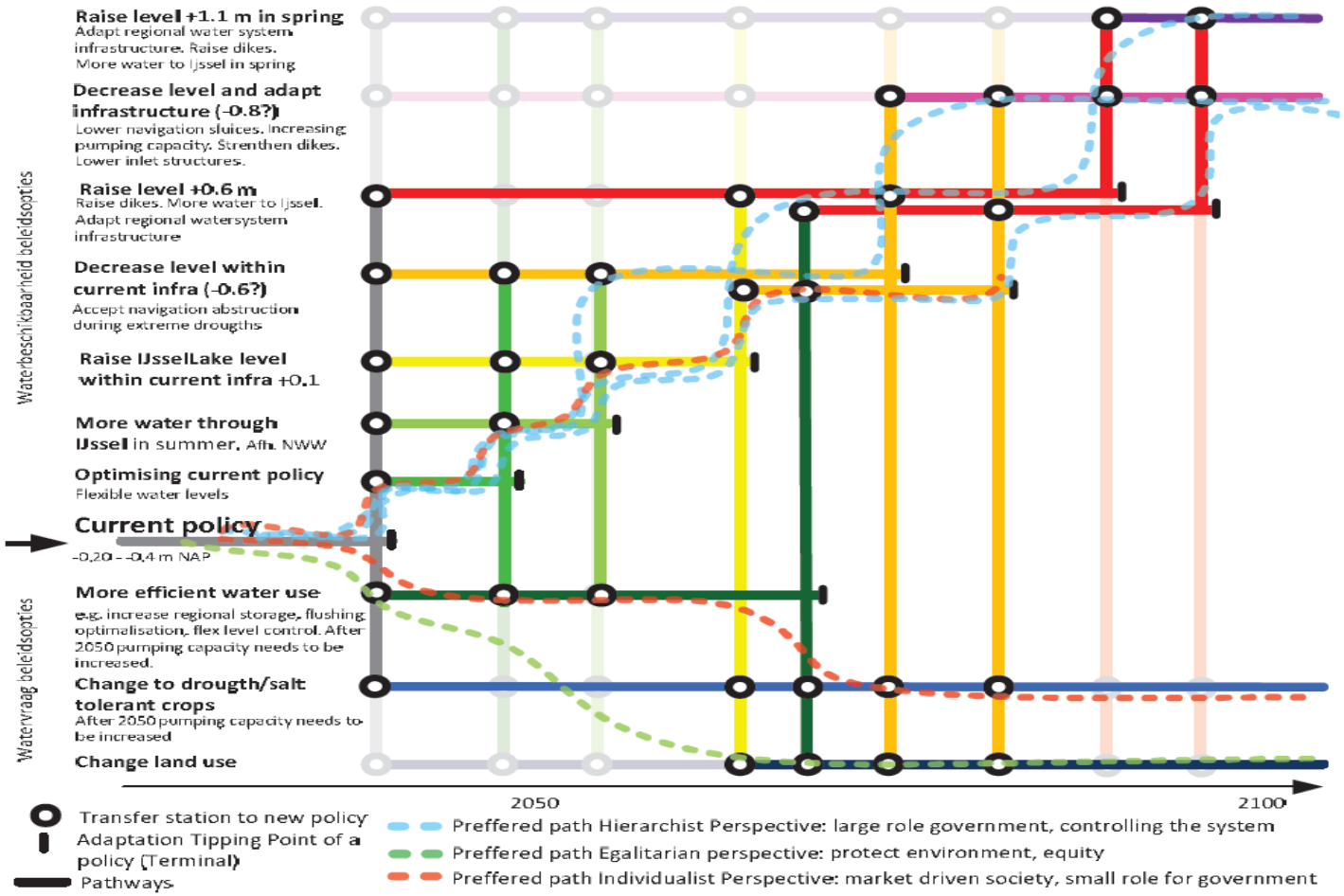
- Flood Control
  - From hard closures to open structures
- Land Reclamation
  - From agriculture to urbanisation and nature development
- Reservoir Development
  - Reintroduction of islands for birdlife and nature development
- Changing priorities and operating rules
  - Resalination for ecosystem health (conflict with farmers)
  - Reintroduction of tides for ecosystem health and tidal energy (conflict with farmers)
  - Opening tidal barriers for fish migration (conflict with farmers)
  - Removal of dikes for ecosystem health (conflict with farmers)
  - Raising closure dams to account for sea level rise
  - Setting up operational level to follow sea level rise (conflict with harbours and marinas)
  - Reintroduction of a natural estuary in the delta

‘Living with Water’

new concepts in spatial planning

the international water association

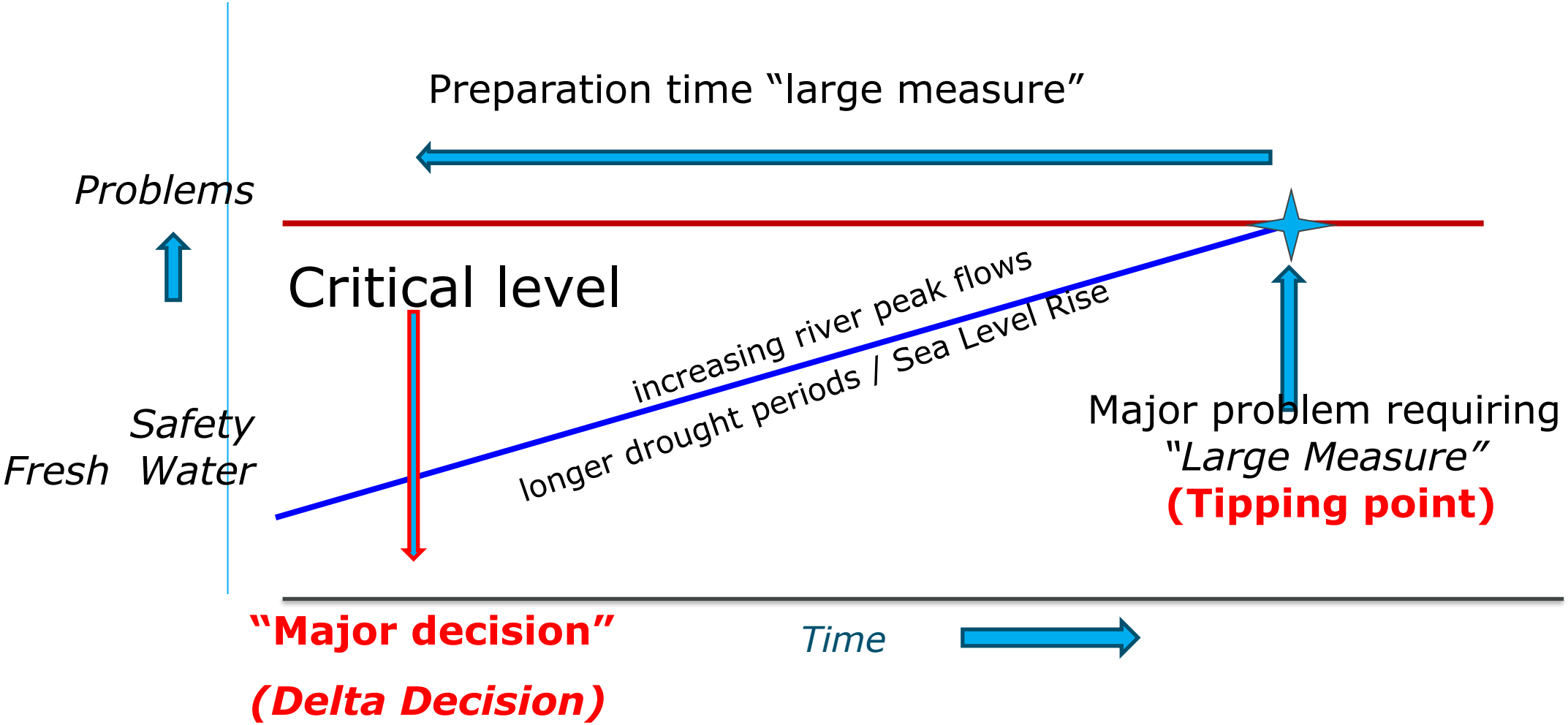
adaptive delta management



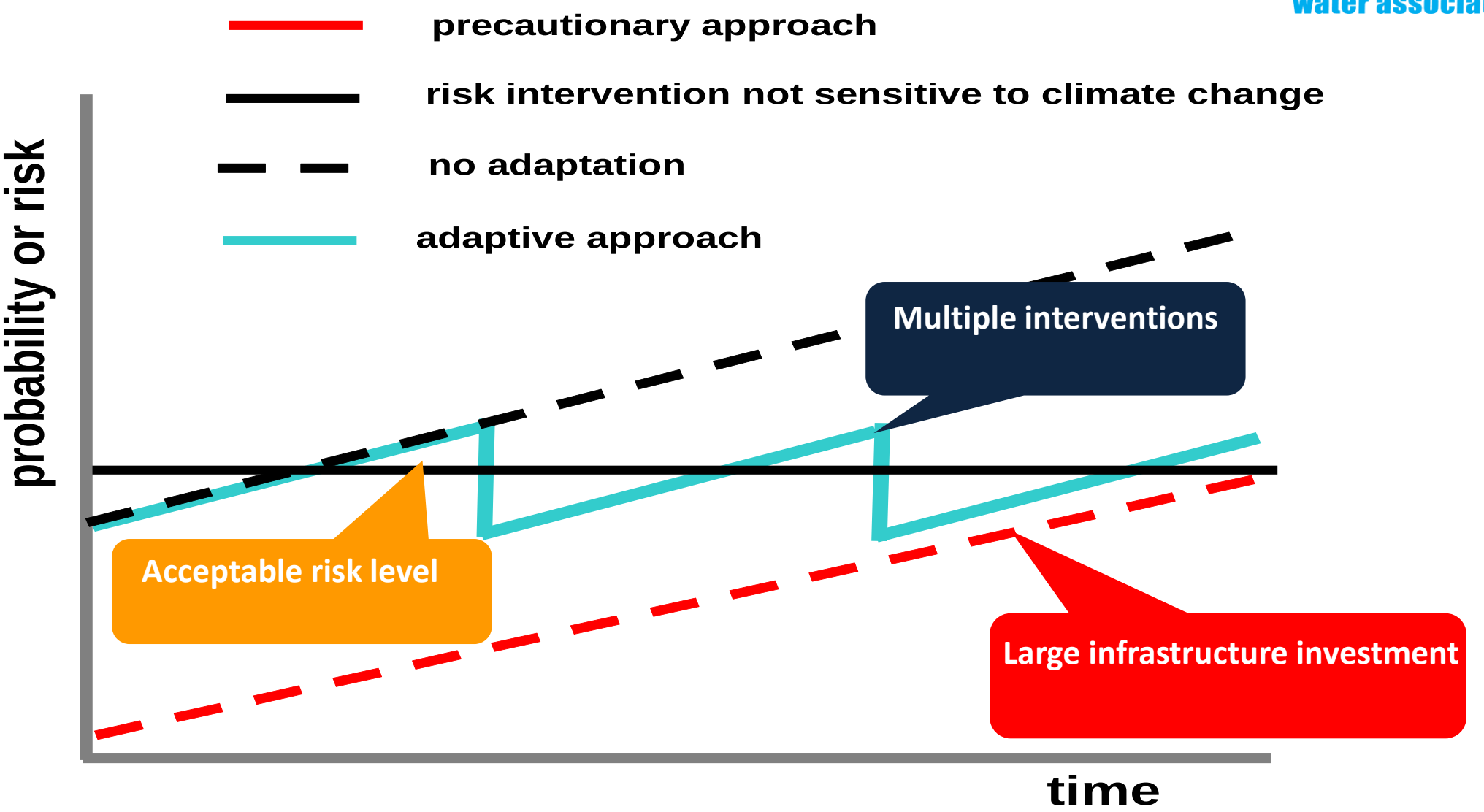
- identify ‘tipping points’
- develop logical path ways
- avoid over-investment, (only do now *“no regret”*)

combine with other agendas (regional socio-economic developments)

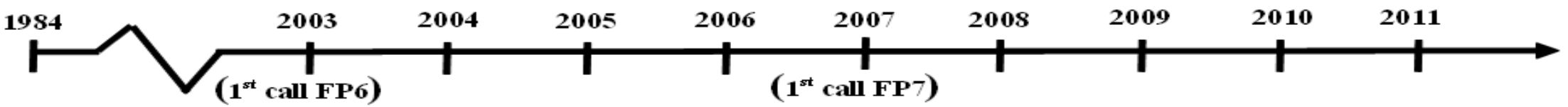
tipping point analysis



real value options



EU FLOOD RESEARCH: *TOWARDS ADAPTIVE MANAGEMENT*

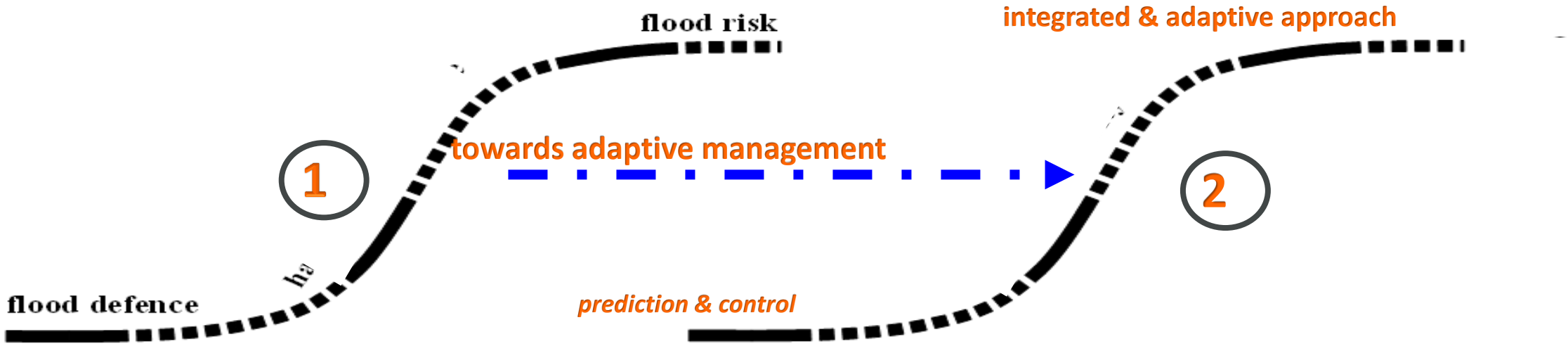


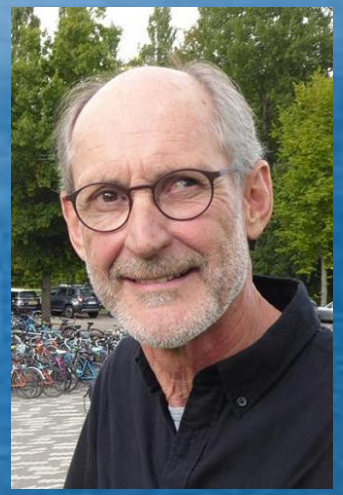
(FP1 – FP5)

Assessing the problem

Managing the problem

(FP6 & FP7)





Prof Hubert Savenije
IAHS / IACRR
IWA-SG

... introduce
FLEXIBILITY
in the design !

Prof Arthur Mynett
IAHR / IACRR
IWA-SG

… work towards *Nature-based Solutions* for Sustainable Coastal & Estuarine Development

the international water association

Towards Nature-based Solutions for Sustainable Coastal and Estuarine Development

A CASE STUDY FOR THE NETHERLANDS

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THE NETHERLANDS

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unesco
Intergovernmental Hydrological Programme

ecohydrology programme

the international water association

Ecohydrology Implementation for Sustainable Estuaries & Coastal Water: Towards Achieving Water Security

WITHIN THE UNESCO-IHP IX (2022-2009)

DR. RAHMAH ELFITHRI
CHIEF OF SECTION
CAPACITY DEVELOPMENT AND WATER FAMILY COORDINATION
DIVISION OF WATER SCIENCES
UNESCO-IHP, PARIS, FRANCE

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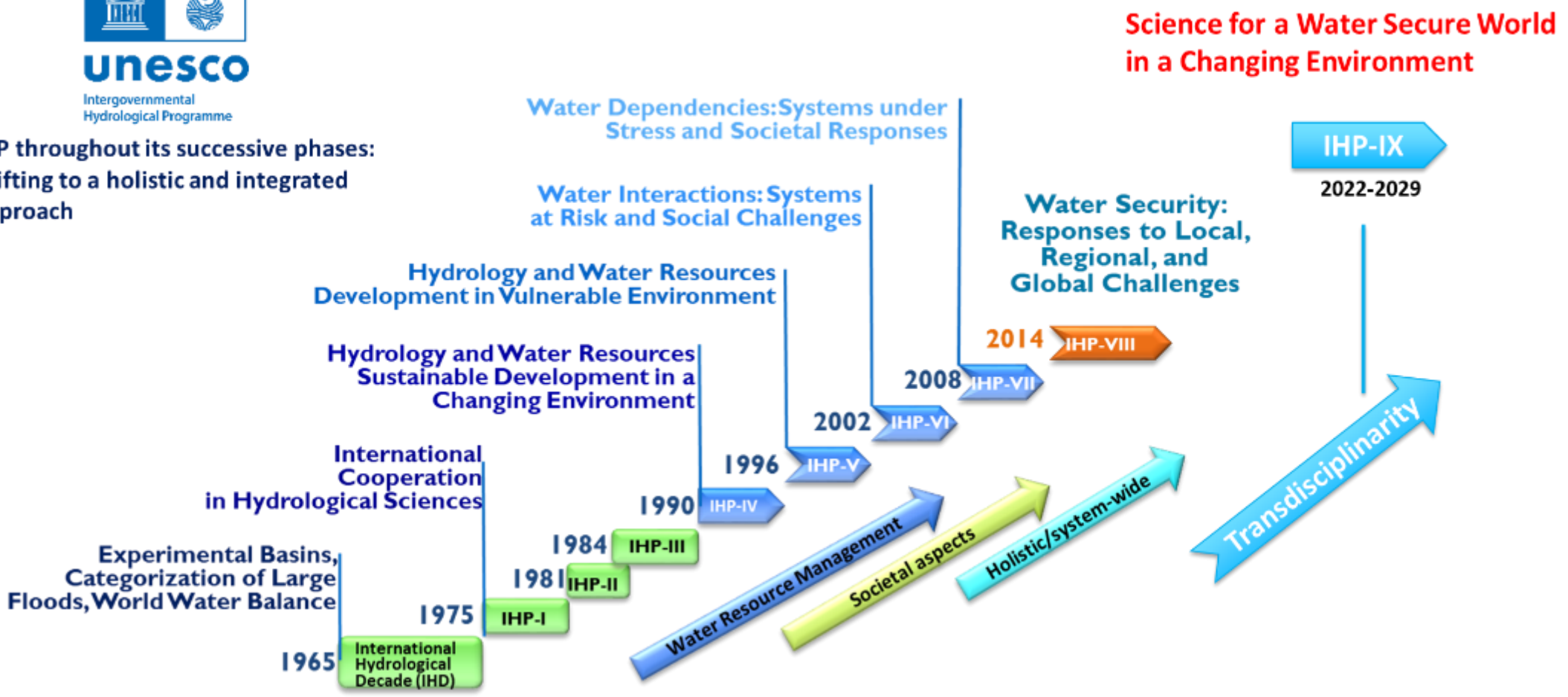
EVOLUTION OF UNESCO-IHP

unesco
Intergovernmental Hydrological Programme

IHP throughout its successive phases: shifting to a holistic and integrated approach



EVOLUTION OF ECOHYDROLOGY WITHIN THE IHP PHASES

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ecohydrology programme

IHP-IX (2022-2029)

"Ecohydrology for Water Security"
Promoting the implementation of Ecohydrology in the Designated sites (BR, WHS, and GG)

IHP-VIII (2014-2021)

"Ecohydrology as an Integrative Science from Molecular to Basin Scale"
Revitalization of Ecohydrology programme

IHP-VII (2008-2013)

"Ecohydrology for Sustainability'
Launching of Ecohydrology Demonstration Project

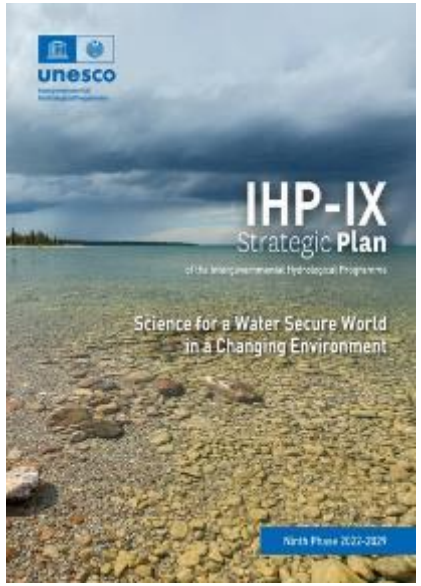
IHP-VI (2002-2007)

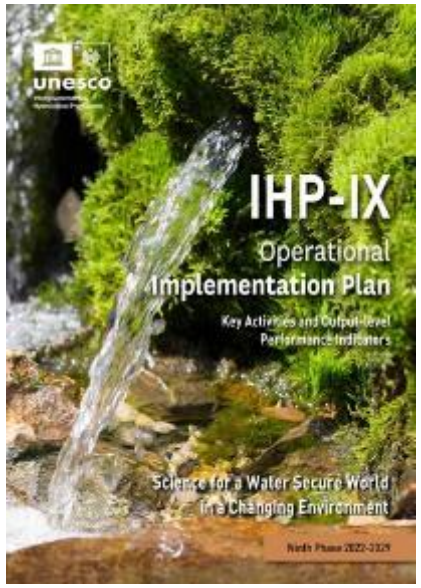
"Ecohydrology as an Integrative Science to Solve Issues Surrounding Water, Environment and People"

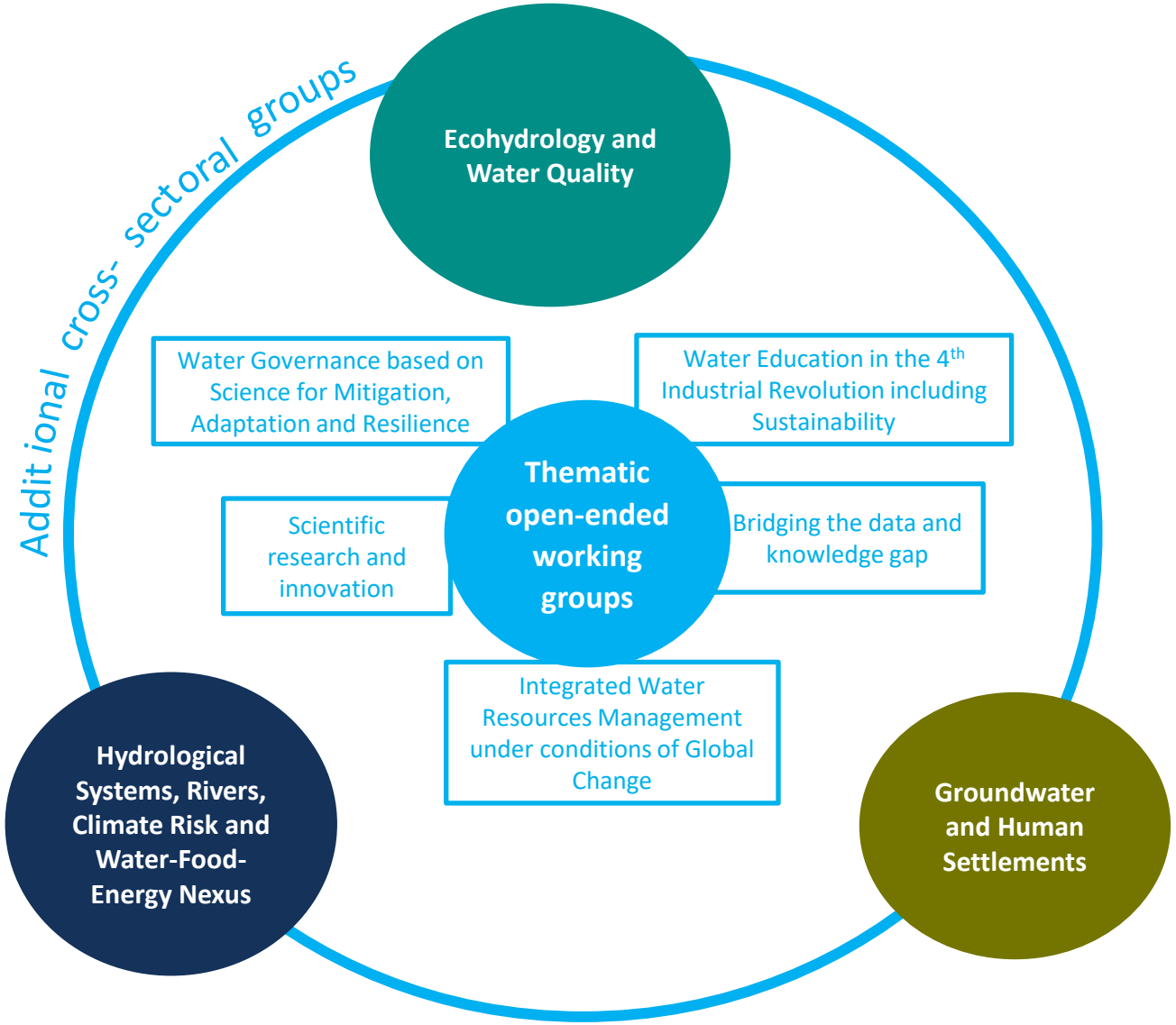
IHP-V (1996-2001)

"Ecohydrological processes in small basins"
"Ecohydrology as a new paradigm for the sustainable use of aquatic resources"

INTERGOVERNMENTAL HYDROLOGICAL PROGRAMME (9TH PHASE – 2022-2029)







UNESCO'S ECOHYDROLOGY APPROACH

- There is an urgent need to accelerate the implementation of water-related SDG through water science and education **-** the use of **ecosystem properties as innovative management tools => Nature Based Solutions (NBS).**

- The most important challenge for water management is how to increase water resources quantity and improve its quality by **reducing the pressure (impacts)** to ecosystems at all scales.

- The answer is by using the holistic approach based on the understanding of water-biota interplay **"Dual Regulation",** which can be translated into **Nature Based Solutions (NBS).**

- Ecohydrology as a transdisciplinary sustainability science is promoted strategically within the UNESCO Water Family and Demosites Network towards achieving a water secure world in a changing environment.

THE UNESCO WATER "FAMILY"

Aims to advance hydrological knowledge by supporting scientific research programmes and building capacities

172 IHP National Committees and Focal Points

70 Water-related Chairs & UNITWIN Networks

17 IHP Flagship Initiatives

1 IHP Secretariat

Regional Hydrologists & Science Officers in Field Offices

30 Water-specialized Centres (C2C)

1 World Water Assessment Programme (WWAP)

THE UNESCO ECOHYDROLOGY "FAMILY"

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UNESCO Water Family on Ecohydrology (Category 2 Centres under the auspices of UNESCO):

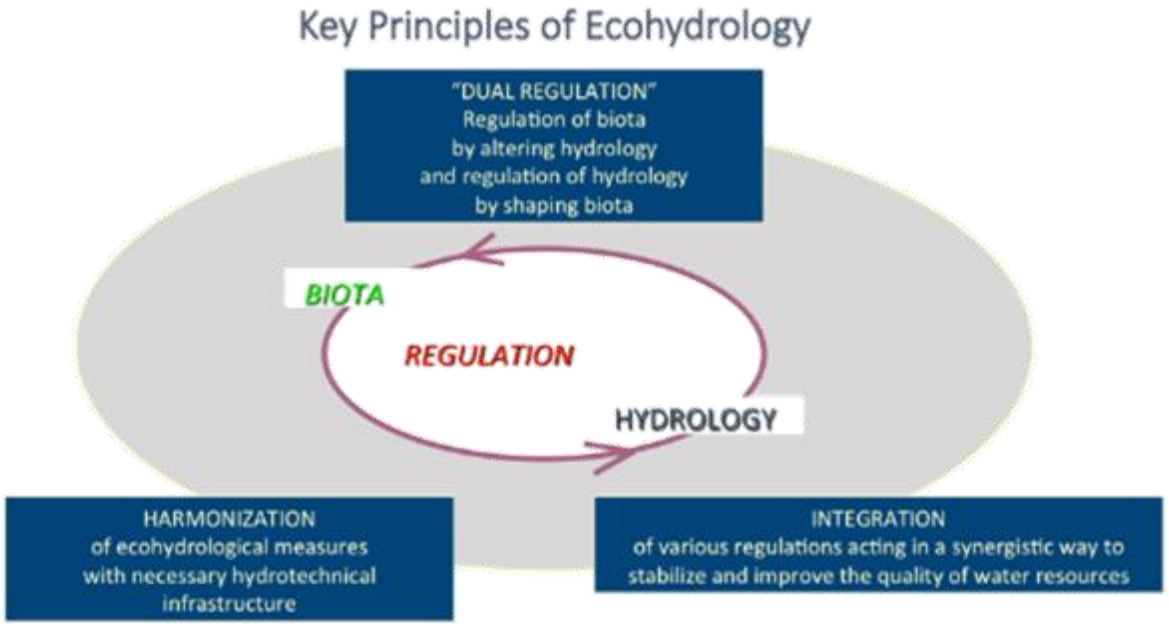
- European Regional Centre on Ecohydrology (ERCE), Poland;
- African Regional Centre for Ecohydrology (ARCE), Ethiopia;
- Asia Pacific Centre on Ecohydrology (APCE), Indonesia;
- International Centre for Hydroinformatics (CIH), Brazil & Paraguay.

UNESCO Water Family on Ecohydrology (Chairs and UNITWIN Networks)

- UNESCO Chair in Ecohydrology: Waters for Ecosystems and Societies @University of Algarve (Ualg), Portugal;
- UNESCO Chair on Ecohydrology and Applied Ecology @Lodz University, Poland;
- UNESCO Chair on Ecohydrology and Transboundary Water Management @Sokoine University of Agriculture, Tanzania.
- UNESCO Chair in Water Sciences and UNITWIN Cooperation Programme with the International Network for Ecohydrological Interfaces under Change, UK
- UNESCO Chair River Culture/ Fleuves et Patrimoine, France
- UNESCO Chair on Ecohydraulics for Sustainable Water Infrastructures for SDG 6 in the Asia and the Pacific Region, Malaysia

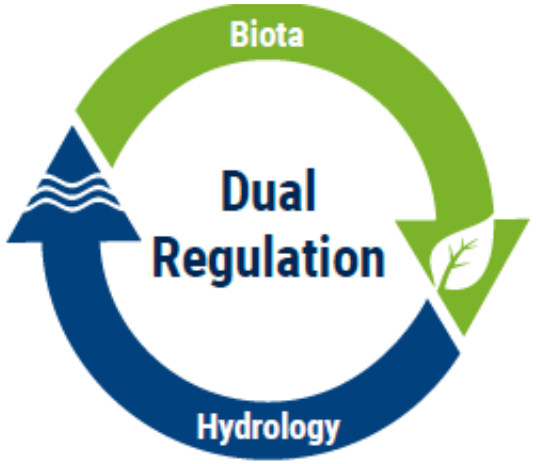
ECOHYDROLOGY AS AN INTEGRATIVE TRANSDISCIPLINARY SCIENCE

- **Ecohydrology (EH)** is the holistic approach of the analysis (understanding of processes) and regulation ("dual regulation") of water-biota interplay. It is a scientific field inside the sciences of ecology and hydrology which specifically studies the **interactions between water bodies and different ecosystems**.
- **Ecohydrology** by definition is a trans-disciplinary and applied science, a sub-discipline of hydrology that seeks to understand the **ecological processes** controlled by the **hydrological cycle** (Zalewski 2000, 2009).



UNESCO'S ECOHYDROLOGY APPROACH (DUAL REGULATION – WBSR + CE + LPG)

Water
Biodiversity
Ecosystem **S**ervices
Resilience to climate and impacts



Culture
Education

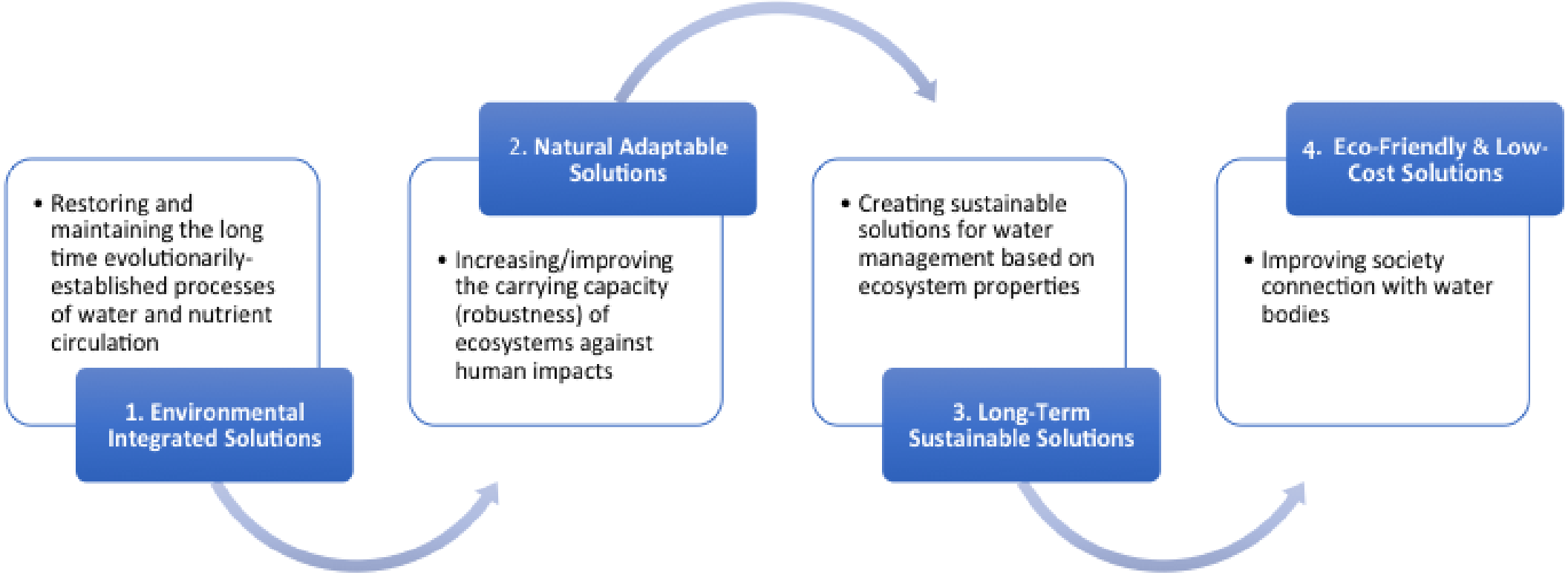
Law
Policy
Governance

WBSR+CE+LPG

- UNESCO's IHP developed Ecohydrology as a transdisciplinary, scientific approach to achieve **water quality improvement, biodiversity enhancement and sustainable development** by using the understanding of relationships between hydrological and biological processes at the scale of **water catchment** basins.
- Ecohydrology as an **integrative transdisciplinary science** providing **Nature Based Solutions (NBS)** not only for reduction of impacts, but also **enhancement of the catchment sustainability potential**.

WHY ECOHYDROLOGY?

- EH aims to **finding solution-oriented** methods for reducing anthropogenic impacts and **restoring aquatic ecosystems**, aiming to improve the ecosystem services they provide, as the connection with humans, and becoming sustainably managed by applying EH concept at the **catchment scale.**



nature water
Nature Water 1, 301 (2023) | Cite this article
647 Accesses | 10 Altmetric | Metrics

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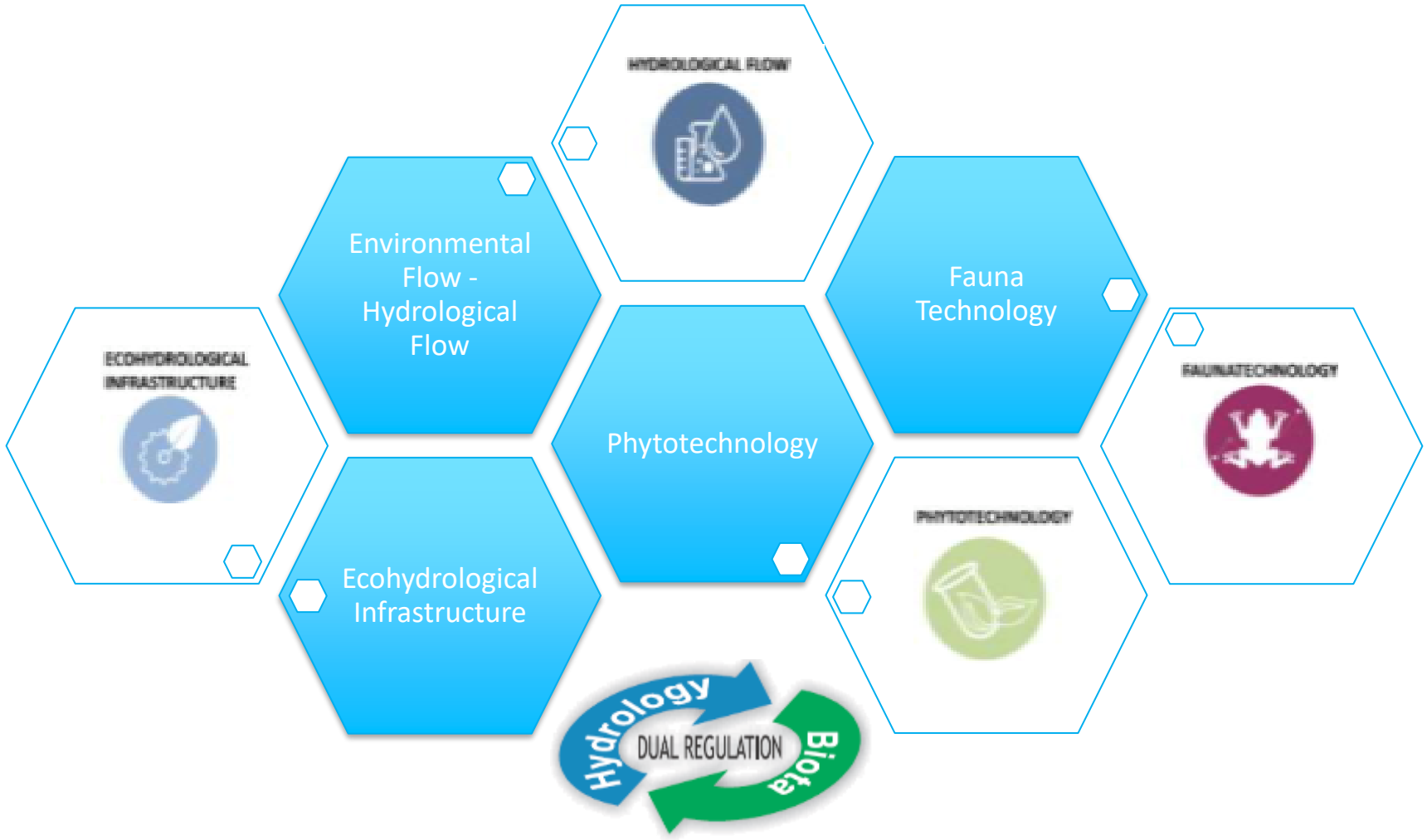
Diagnosis and Key Messeges

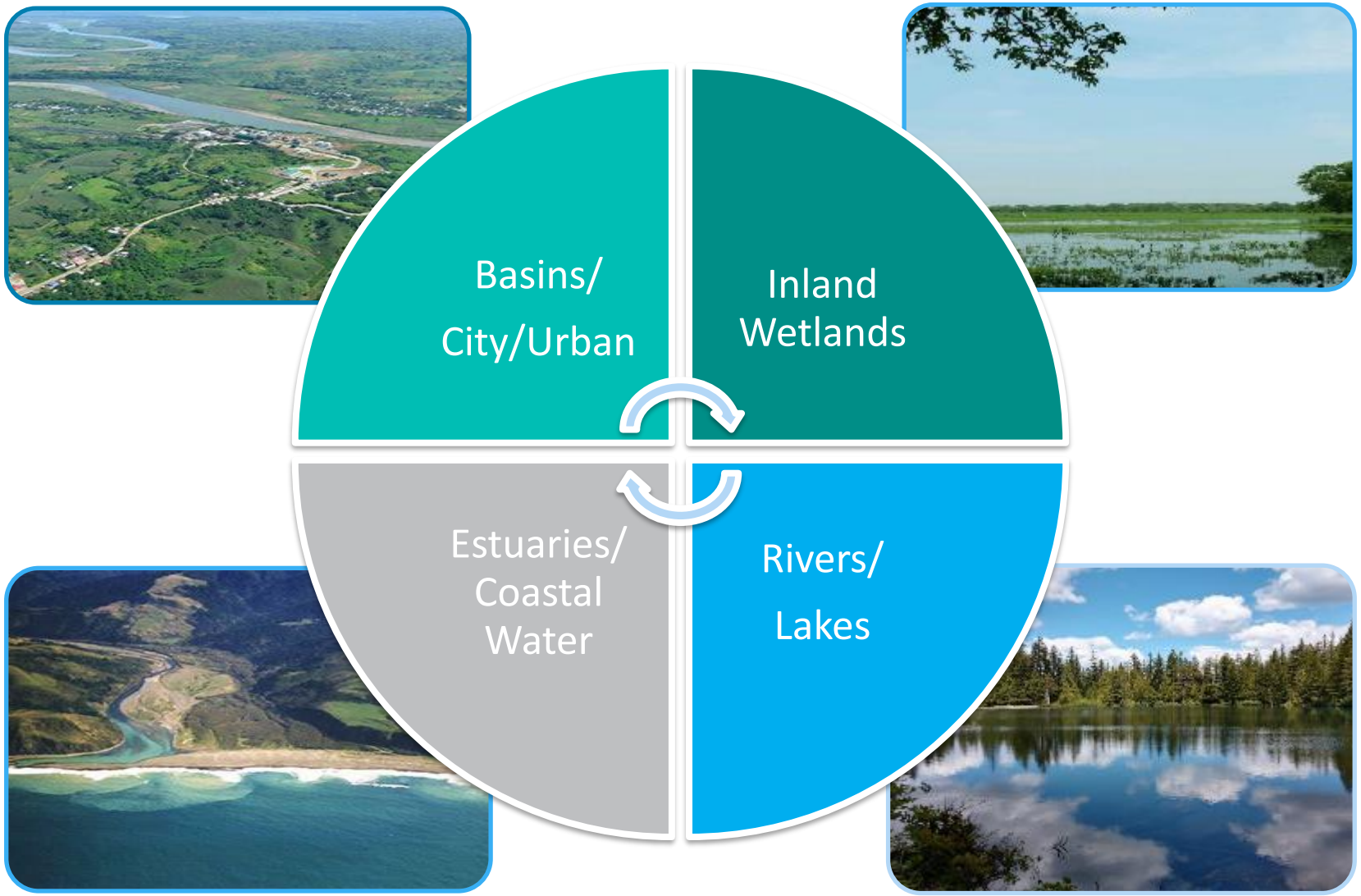
- 1/ GOVERNANCE „a **radical reshaping of the water governance that moves away from the current fragmentation"**
- „Climate and water actions must be coordinated „ „ reduction in subsidies for water and agriculture that create overconsumption and aquifere depletion
- **2/ ECOHYDROLOGY** **„**..it is essential better understand and use the relationships between hydrological and ecological processes… „**Ecohydrological Nature-Based Solutions, which use or mimic these proces, play a key role in enhncing biodiversity, reducing risks associted with hydroclimatic extremes, and ensuring water-food-nergy security and carbon cycling"**
- 3/ SOCIETY „…**necessity of involving in the decision-making processes those groups that can potentially be most affected by the water crisis.."**

ECOHYDROLOGY METHODOLOGY

"Dual regulation" (regulation of water-biota and/or biota-water interplay)



IMPLEMENTATION AT THE CATCHMENT SCALE



ECOHYDROLOGY KEY STAKEHOLDERS

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ENHANCEMENT OF THE CATCHMENT SUSTAINABILITY POTENTIAL @PUTRAJAYA UNESCO ECOHYDROLOGY DEMOSITE, MALAYSIA

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The Use of **W**etland for Improving Water Quality

Biodiversity Enhancement in Putrajaya

Ecosystem **S**ervices Enhancement

Putrajaya Lake - **R**esilient to Climate and Impact

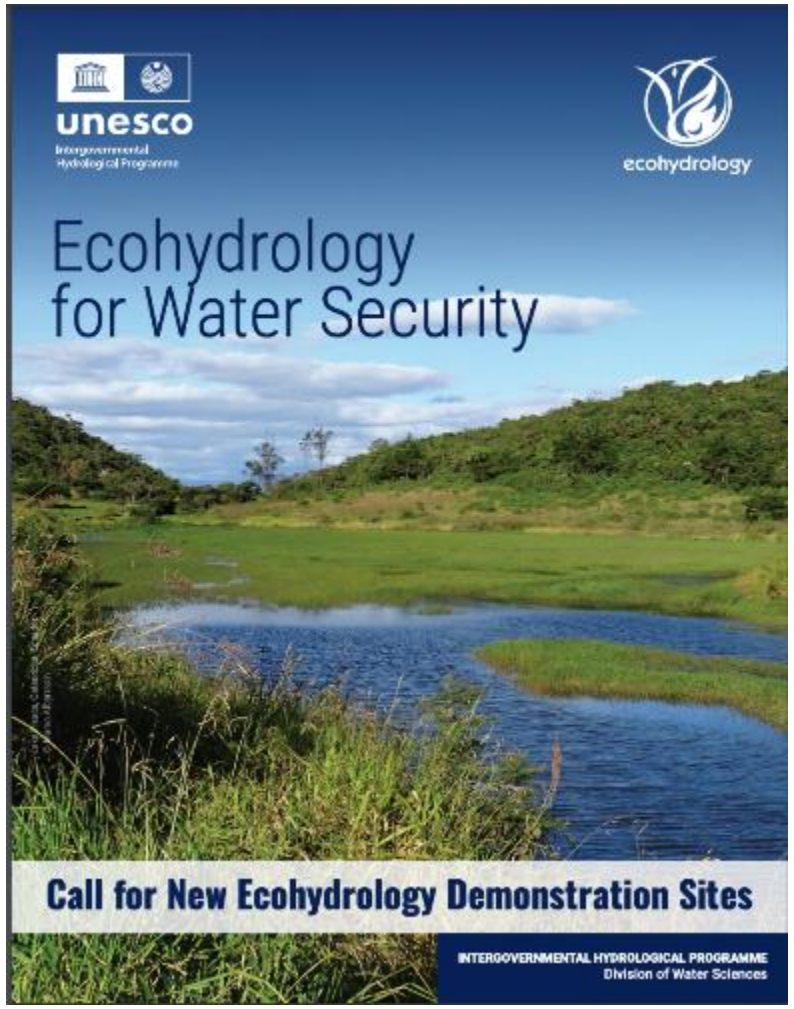
Culture & **E**ducation - Series of Community Participation & Awareness Programmes

Law, **P**olicy & **G**overnance - Local Agenda 21 Putrajaya (LA21), Towards Low Carbon Green City

Enhancement of ecosystem resilience and catchment sustainability potential

Improving "WBSR+CE+LPG" in Putrajaya for Sustainable Water Management

UNESCO'S ECOHYDROLOGY APPROACH



- UNESCO-IHP promotes the establishment of **Ecohydrology Demonstration Sites** around the world **since 2010** to apply ecohydrology solutions in various catchments at all scales.
- UNESCO launched the **Call for New Ecohydrology Demonstration Sites in 2022 –** in order to **promote** Ecohydrology approach, **stimulate action** to implement NBS and **disseminate** the acquired information to UNESCO's Member States and the general public, **globally to all countries and regions** in the world.
- The demonstration sites include the concept of **enhanced ecosystem potential** through the application of ecohydrological strategies to achieve **sustainability of ecosystems** closely related to water to improve IWRM in specific areas.
- The UNESCO Ecohydrology Demonstration Sites currently consist of **37 Demosites in 26 countries** (including 11 in Asia-Oceania, 12 in Europe, 9 in Latin America and the Caribbean and 5 in Africa.

See more at:
ECOHYDROLOGY WEB PLATFORM
ecohydrology-ihp.org

The current composition of UNESCO Ecohydrology Demonstration Sites consist of 37 Demonstration Sites in 26 countries around the world.

Africa | 5		Asia - Oceania | 11		Europe | 12		Latin America and the Caribbean | 9	
2	Ethiopia	2	Australia	1	Croatia	1	Argentina	1	Bahamas
1	Kenya	1	Indonesia	1	Germany	2	Ecuador	2	Colombia
1	Sierra Leone	1	Philippines	3	Poland	1	Costa Rica	1	Brazil
1	Tunisia	5	China	1	Spain	1	Chile		
		1	Malaysia	1	United Kingdom				
		1	Pakistan	1	France				
				2	Italy				
				1	Portugal				
				1	Sweden				

Designated sites

- Biosphere Reserves (4)
- Natural World Heritage Sites (2)

Flagship initiatives

- HELP River Basins (8)

Nordstrom Drainage Basin, **Sweden**
Kielstau Lowland River Catchment, **Germany**
Eddleston Water, **United Kingdom**
Sokolowka River Catchment, **Poland**
Pilica River Catchment, **Poland**
Radom City, **Poland**
Urban Periphery of Lyon, **France**
Kaštela Bay, **Croatia**
Val Di Comia, **Italy**
Guadiana Estuary, **Portugal**
Tiber River Basin, **Italy**
Sierra Nevada, **Spain**
Sustainable Eco-technologies of NUST, **Pakistan**
OMELI Ghar El Melh Lagoon, **Tunisia**
Victoria Pond Wetland, **Bahamas**
Three Gorges Reservoir, **China**
Suburban Area of Metropolitan Beijing, **China**
Fengxi Sponge City, **China**
Sanjiang Plain, **China**
Rana ICE, Reventazón River, **Costa Rica**
Asella Lake-Burkitu Reservoir, **Ethiopia**
Hongfeng Lake, **China**
Ribb Watershed and Lake Tana, **Ethiopia**
Pelican Bay Watershed, **Galapagos, Ecuador**
Teusaca River Basin, **Colombia**
Western Area Peninsula National Park, **Sierra Leone**
Putrajaya Lake and Wetland, **Malaysia**
Davao City, **Philippines**
Zapatosa Wetland Complex, **Colombia**
Paltas Catacocha, **Ecuador**
Santo Antonio River, **Brazil**
Lake Naivasha, **Kenya**
Saguling Reservoir in the Upper Citarum River basin, **Indonesia**
Quebrada Parque, **Chile**
Lacar Lake Basin, **Argentina**
Murray-Darling Basin, **Australia**
Peri Urban Landscapes, **Australia**

Demonstration sites

- 15 Basin | City
- 12 River | Lake
- 6 Inland Wetlands
- 4 Estuaries | Coastal Water

UNESCO ECOHYDROLOGY DEMONSTRATION SITES 2023 (TOTAL 37 IN 26 COUNTRIES)

Region	Country	Site
Latin America and the Caribbean (9)	Argentina	Lacar Lake Basin
	Bahamas	Victoria Pond Wetland
	Brazil	Santo Antonio River
	Chile	Quebrada Parque
	Colombia	Teusaca River Basin
	Colombia	Zapatosa Wetland Complex
	Costa Rica	Rana-Ice study
	Ecuador	Pelican Bay Watershed, Santa Cruz, Galapagos
	Ecuador	City of Catacocha, Southern Ecuador
Asia and the Pacific (11)	Australia	Murray-Darling Basin
	Australia	Peri Urban Landscapes (Western Sydney)
	China	Hongfeng Lake Area in Guizhou Province
	China	Sub Urban Area of Metropolitan Beijing
	China	Sanjiang Plain (Northeast China)
	China	Fengxi Sponge City
	China	The Three Gorges Reservoir (TGR)
	Indonesia	Saguling Reservoir in the Upper Citarum River Basin
	Malaysia	Putrajaya Lake and Wetland
	Pakistan	Sustainable Eco-technologies of NUST Main Campus
	Philippines	Davao City
Europe and North America (12)	Croatia	Kaštela Bay
	Germany	Kielstau Lowland River Catchment
	France	Urban Periphery of Lyon
	Italy	Tiber River Basin
	Italy	Val Di Cornia
	Poland	Pilica River Catchment
	Poland	Sokolowka River Catchment
	Poland	Radom City
	Portugal	Guadiana Estuary
	Sweden	Nordstrom Drainage Basin
	Spain	Sierra Nevada
	UK	Eddleston Water
Africa and Arab States (5)	Ethiopia	Ribb Watershed & Lake Tana Shore
	Ethiopia	Asella Lake/Burkitu Reservoir
	Kenya	Lake Naivasha
	Sierra Leone	Western Area Peninsula National Park
	Tunisia	OMELI Ghar El Melh Lagoon

ECOHYDROLOGY @GUADIANA ESTUARY, PORTUGAL

the international water association

ECOHYDROLOGY WEB PLATFORM

UNESCO ECOHYDROLOGY OPEN ONLINE COURSES | WHAT IS EH | DEMOSITES | EVENTS | APPLY TO THE EH NETWORK | FUNDING OPPORTUNITIES | EH-FAMILY | ABOUT | CAREER NETWORK

SUSTAINABLE ESTUARINE ZONE MANAGEMENT FOR CONTROL OF EUTROPHICATION, TOXIC BLOOMS, INVASIVE SPECIES AND CONSERVATION OF BIODIVERSITY (GUADIANA ESTUARY, PORTUGAL)

- Guadiana River Basin is the 4th largest basin in the Iberian Peninsula: 83% in Spain and 17% in Portugal.
- There exists 1824 dams in the basin. The Guadiana estuary and the coastal areas are affected by the biggest one called the Alqueva dam. It modified the hydrological regime of the estuary and also its ecological functions reducing the ecosystem service of water regulation.
- There are three main protected areas in Guadiana estuary and its floodplains: RAMSAR site, National Reserve, Special Protection Zone (ZPE), Important Bird Area.

Demosite Location

Country: Portugal

Contact

Name: Luis Chicharo

Email: luis.chicharo@icce-unesco.org

Organization: International Centre for Coastal Ecohydrology

Website:

CLICK HERE TO SEE COMPLETE DEMOSITE INFORMATION

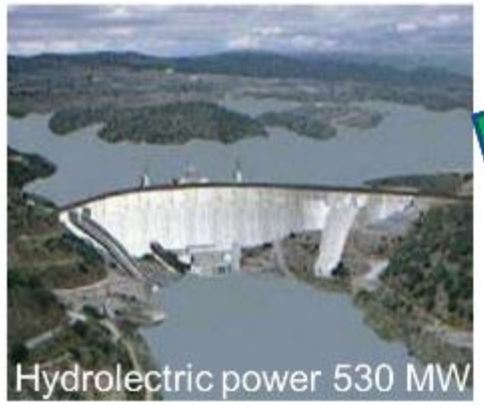
Updated in: 23/06/2021

4th largest river basin at the Iberian Peninsula 67.500 km2
83% in Spain +17% in Portugal
1824 small-medium reservoirs
Mediterranean climate – dry years

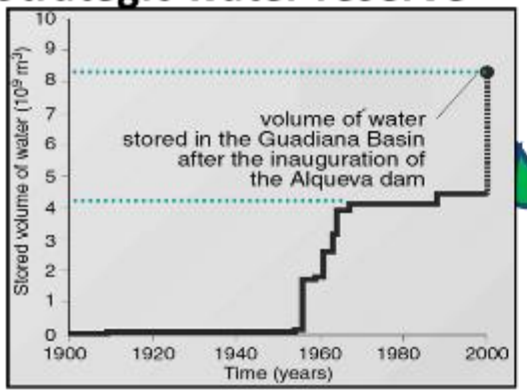
ECOHYDROLOGY @GUADIANA ESTUARY, PORTUGAL

the international water association

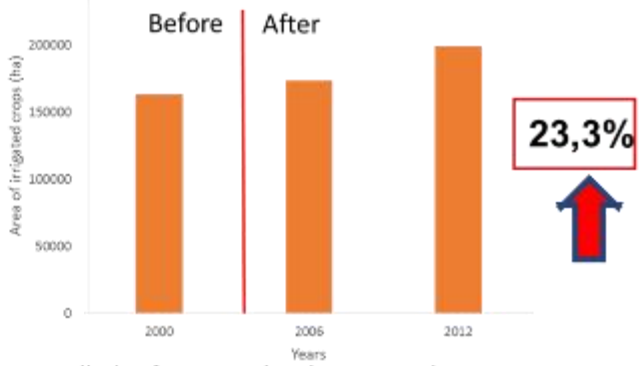
Hydroelectric production



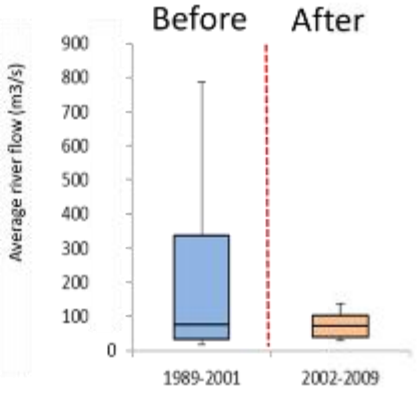
Strategic water reserve

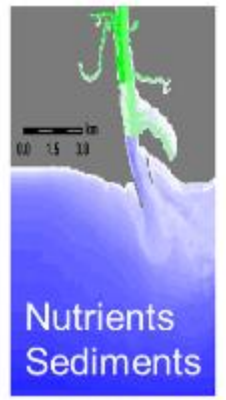


Agriculture irrigation



Areas (ha) of irrigated cultures in the Portuguese part of the Guadiana basin (MA, 2014)

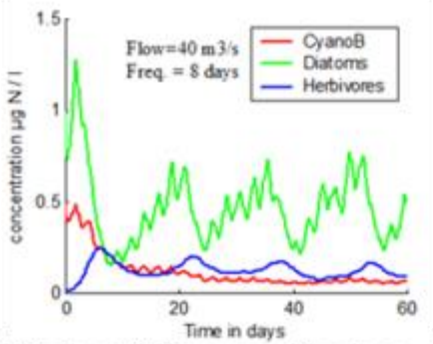




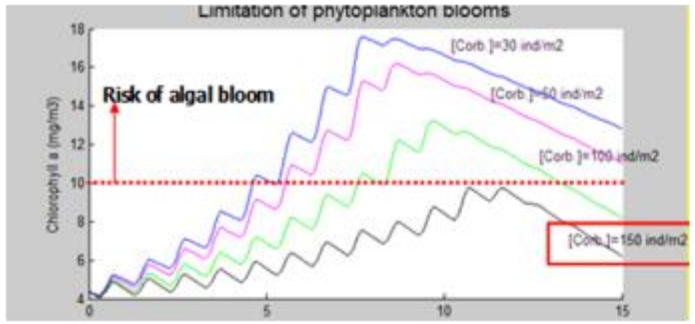
ECOHYDROLOGY @GUADIANA ESTUARY, PORTUGAL

the international water association

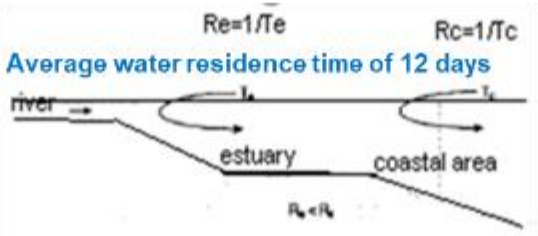
A – Establish the flood pulses values required to promote planktonic diversity and productivity (reduce HABs and eutrophication risks)



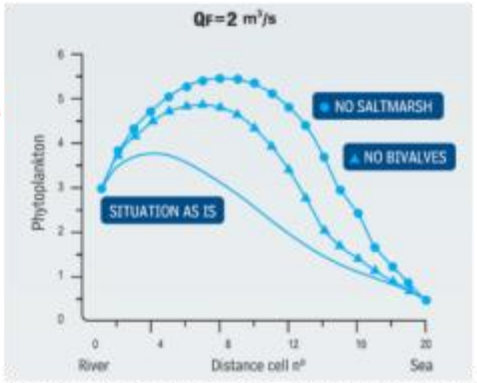
B – Establish minimum bivalve density to filtrate microalgae (reduce HABs and eutrophication risks)



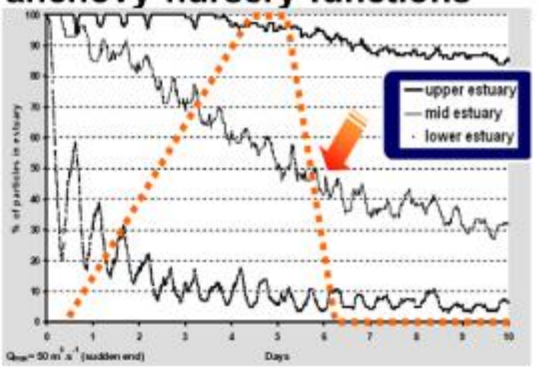
C – Determine the required residence time (reduce coastal eutrophication and HABs risks)



D – Restore wetlands to: (1) sustain nursery functions and; 2) reduce HABs and eutrophication risk



E – Establish volume and timing for dam discharge to restore river plume and anchovy nursery functions



Biota to control hydrological processes and hydrology to regulate biota

ECOHYDROLOGY @KASTELA BAY, CROATIA

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ECOHYDROLOGY WEB PLATFORM

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Europe and North America

SUSTAINABLE ESTUARINE ZONE MANAGEMENT FOR CONTROL OF EUTROPHICATION, TOXIC BLOOMS AND CONSERVATION BIODIVERSITY IN THE KAŠTELA BAY (CROATIA, ADRIATIC SEA)

- Kaštela Bay is one of the largest bays on the eastern Adriatic coast. Most of the freshwater enters the bay from the River Jadro (average annual inflow of 10 m^3/s) and from numerous submarine springs.
- Until 2005, the Bay received high quantities of organic matter and nutrients due to the discharge of untreated sewage waters from multiple rivers especially from the river Jadro.
- ECO Project is the Integral Project of Kaštela Bay Protection and it is one of the widest ecological project in the Adriatic and the Mediterranean Seas.

Demosite Location

Country: Croatia

Contact

Name: Ivona Marasovic

Email: marasovic@izor.hr

Organization: Institute of Oceanography and Fisheries

Website: www.izor.hr

CLICK HERE TO SEE COMPLETE DEMOSITE INFORMATION

Updated in: 23/06/2021

This project on **Sustainable estuarine zone management for control of eutrophication, toxic blooms and conservation of biodiversity in the Kaštela Bay** foresees comprehensive solution to assure unhindered development of the tourism and general economy, through realization of main project objectives: **the protection and preservation of water quality**; the creation of conditions for **safe development of economy**; and the maintenance and improvement of achieved level of environment protection.

ECOHYDROLOGY @VICTORIA POND WETLAND BAHAMAS

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ECOHYDROLOGY WEB PLATFORM

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RESTORATION OF VICTORIA POND WETLAND HABITAT IN HISTORIC GEORGE TOWN, GREAT EXUMA FOR SUSTAINABLE MANAGEMENT TO CONTROL POLLUTION AND ENHANCE NEAR SHORE FISH HABITAT (BAHAMAS)

- Great Exuma is the largest island in the Exuma island chain, with just fewer than 8,000 people living on the island in six major settlements. George Town is the largest and oldest settlement, located at the southwestern shore of Elizabeth Harbour. Victoria Pond is the largest wetland complex in Elizabeth Harbour;
- Ecosystem services are linked to coastal ecology – protection of near-shore environment to support fish production and reduce flooding in George Town – degraded by the destruction of coastal wetlands (mangrove habitats).
- There is one on-going program involving the restoration of Victoria Pond called Ramsar Caribbean Wetlands Initiative.

Demosite Location

Country: Bahamas

Contact

Name: John A. Bowleg

Email: wcjbowleg@wsc.com.bs

Organization: The Water and Sewerage Corporation of the Bahamas

Website: http://www.wsc.com.bs/

CLICK HERE TO SEE COMPLETE DEMOSITE INFORMATION

Updated in: 23/06/2021

ECOHYDROLOGY @GHAR EL MELH, TUNISIA

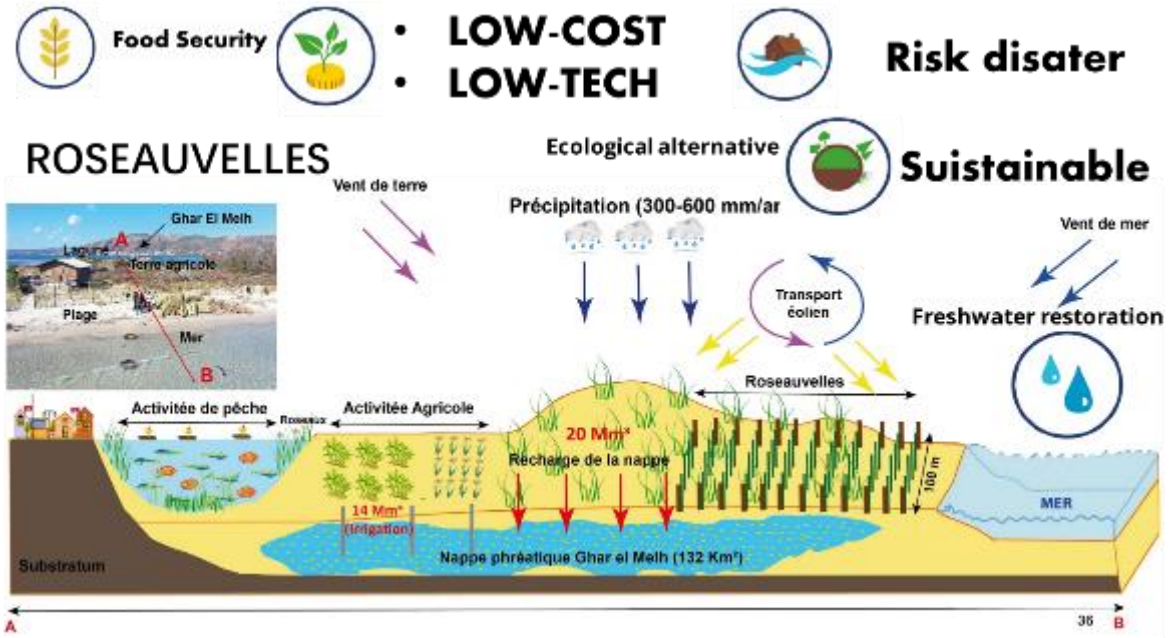
OMELI Ghar El Melh Lagoon, Tunisia

The OMELI Ghar El Melh Lagoon Ecohydrology Demonstration Site in Tunisia focuses on the study of the physico-chemical and environmental evolution of the northern coastline of the Gulf of Tunis. The project involves the implementation of an observatory of the coastal area of the North Gulf of Tunis, Ghar el Melh lagoon, which is experiencing a rapid degradation of its environmental conditions, beach retreat, water quality, marine submersion.

ECOVAL Innovative Solutions

Implantation of OMELI Observatory,
Ghar El Melh lagoon, Tunisia
UNESCO DEMOSITE, December 2022

- Participative science with local community.
- Nature Based Solutions
- Shared data (water, socioeconomic and environnemental)



The ecohydrological approach reveals

- **Extreme vulnerably of coastal zone in arid regions**
- **Mediterranean lagoons are undergoing severe biodiversity degradation.**
- **Degradations are driven by changes in sea surface salinity (SSS) and sediments grain sizes.**

DEVELOPMENT OF ECOHYDROLOGY APPROACH WITHIN UNESCO DESIGNATED SITES

- UNESCO Designated sites constitute a network of living laboratories.
  - UNESCO Biosphere Reserves
  - UNESCO World Heritage Sites
  - UNESCO Global Geoparks
- As such these sites can also be used to demonstrate the application of the ecohydrology solution in addressing of issues surrounding water, environment, and people - this is among the main focus on UNESCO Ecohydrology Programme within IHP IX.

Galapagos Islands - Natural Sites under the World Heritage Sites

Langkawi UNESCO Global Geopark

Lake Tana Biosphere Reserve

BUILDING CAPACITY FOR IMPROVED WATER MANAGEMENT

26 Ecohydrology Workshops	7 in Africa (Tanzania (2), Nigeria, Tunisia, Senegal (2) and Cabo Verde), 7 in Europe (Poland, Spain, Germany, Italy, Romania, Portugal, and France), 2 in Latin America and the Caribbean (Brasil and Uruguay), 6 in Asia Pacific [Indonesia (2), Malaysia (2) and China (2)].
11 UNESCO designated sites	Tanzania (2), Madagascar (2), Ghana, Indonesia, Malaysia (2), Cape Verde, Guinea Bissau & Sao Tome and Principe
45 MS involved/ benefited	Tanzania, Austria, Nigeria, Benin, Côte d'Ivoire, Gambia, Ghana, Guinea, Liberia, Niger, Senegal, Sierra Leone, Togo, Kenya, Ecuador, Portugal, Poland, UK, Tunisia, Morocco, Cameroon, Egypt, Gabon, Algeria, Cabo Verde, France, Tunisia, Uganda, Nairobi, Madagascar, Indonesia, Malaysia, Guinea Bissau, Sao Tome and Principe, China, Brasil, Uruguay, Bahamas, Costa Rica, Ethiopia, Chile, The Netherlands, Italy, Romania, Germany
More than 1000 experts	Capacity of around 10**00 experts** of member states enhanced on ecohydrology through various organized workshops.

PROMOTING ECOHYDROLOGY IN ALL REGIONS

23 March 2023
9:30 - 10:45 EDT
ECOSOC, UNHQ Conference Room 6

UN2023 WATER CONFERENCE SIDE EVENT

TRANSDISCIPLINARY ECOHYDROLOGY FOR ACCELERATION OF SDG – METHODOLOGY OF SCIENCE AND PATTERNS OF IMPLEMENTATION

Enhancement of sustainability potential by transdisciplinary Ecohydrology and Advanced Nature-Based Solutions.

Ministry of Infrastructure · unesco · unesco · Water4All · UN 2023 WATER CONFERENCE

To participate, please register via the link **https://bit.ly/40A1Omv**

Call for Participants

UNESCO
Chinese Academy of Sciences

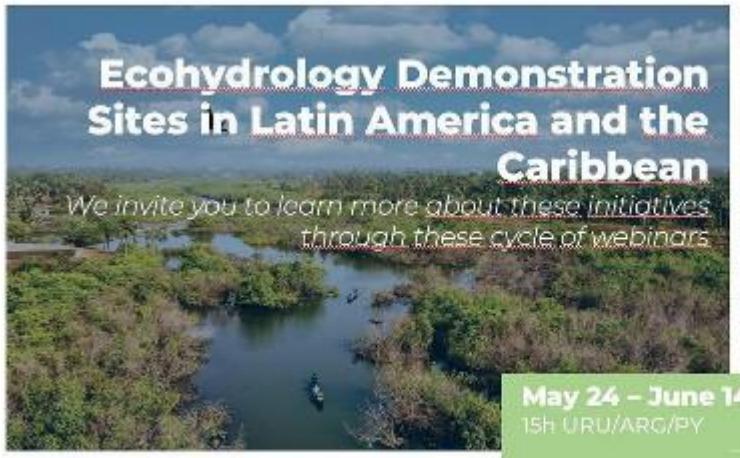
2023 International Workshop on Frontiers in Ecohydrology

4 – 22 September 2023
Chongqing, China

XVIII World Water Congress Special Session

Ecohydrology: Harmonising Water for Humans and Nature

Session Number: SS-1-29
Date/Time: Sept 14, 2023/11.00 – 12.30
Location: Room 14
Lead Organiser: UNESCO IHP, Paris, France
Co-organiser: UNESCO Beijing Office
University of Algarve (UAlg), Portugal
Chinese Academy of Sciences (CAS)
Wuhan University, People's Republic of China
Moderator: Dr. Rahmah Elfikri, Chief of Section, Capacity Development and Water Family Coordination, UNESCO-IHP



The Ecohydrology demonstration sites are spaces where applications of ecohydrological solutions are presented in different types of hydrographic basins to solve environmental and social challenges related to water and strengthen water security.

unesco · ecohydrology

May 24 – June 14 – July 12
15h URU/ARG/PY

VIRTUAL SESSIONS

REGISTRATION: https://bit.ly/3BCvt3D

PROMOTING ECOHYDROLOGY FOR YOUTH

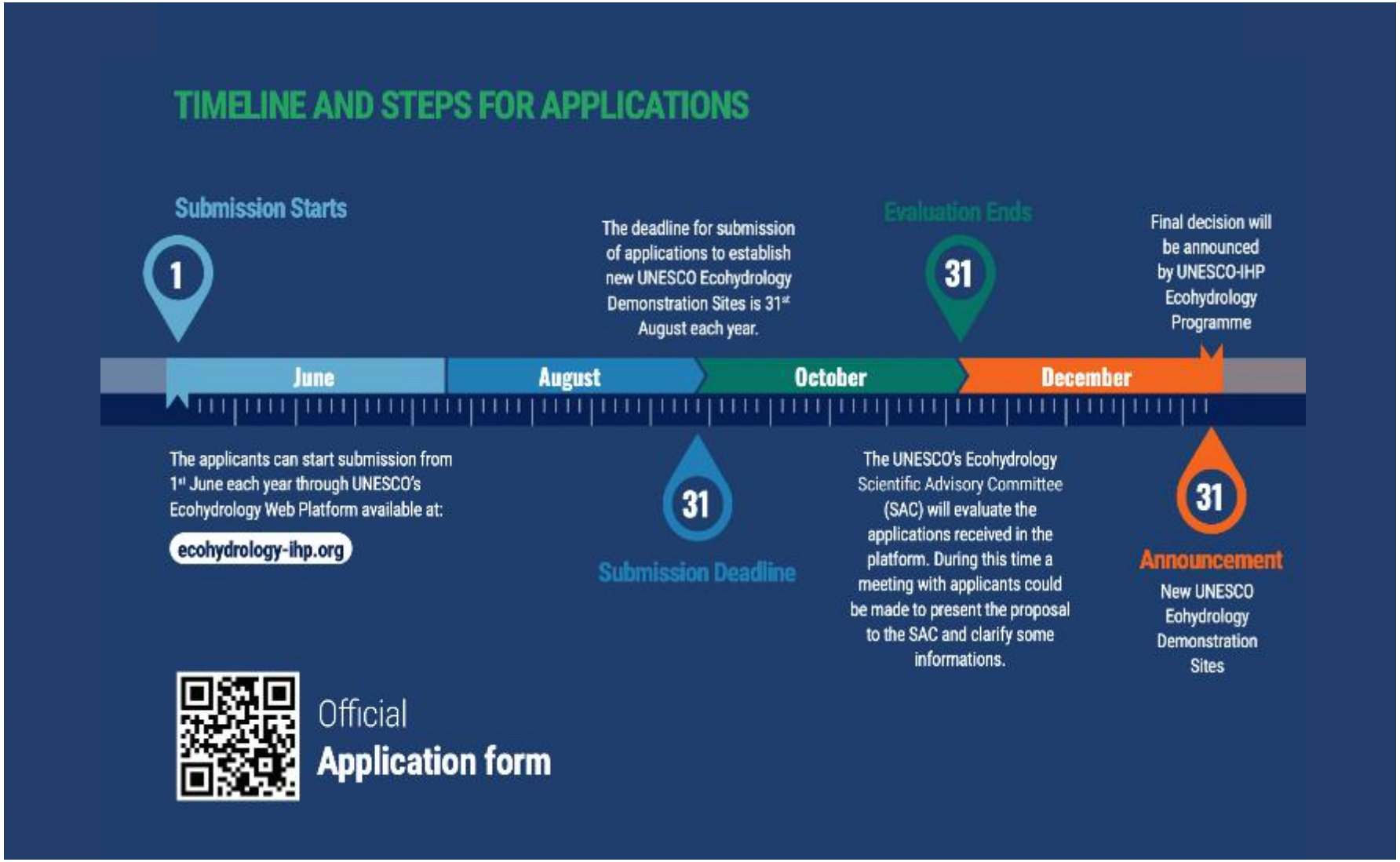
- Support to young water leaders and facilitation of spaces for their exchange processes and discussions.

ERASMUS MUNDUS MASTER IN APPLIED ECOHYDROLOGY (MAEH)

Erasmus Mundus Master in Applied Ecohydrology (MAEH)

- Started in 2021 – supported by UNESCO.
- UNESCO participated in the opening of the 2nd intake of the students, held on 6-7 October 2022, at University of Algarve (UAlg), Faro, Portugal.
- The technical visit to UNESCO HQ in Paris, France was conducted on 9 November 2022 to learn Ecohydrology and other water sciences related activities directly from experts in UNESCO.
- Total 44 students from 29 countries are part of MAEH.

CALL FOR NEW ECOHYDROLOGY DEMONSTRATION SITES – DEADLINE 31 AUGUST (ANNUALLY)



WAY FORWARDS & FUTURE OPPORTUNITIES

- ✓ Establishing the New Ecohydrology Demonstration Sites / promoting Nature-based Solutions (NBS) Approach at the designated sites of UNESCO (Biosphere Reserved, Natural World Heritage Sites, Global Geopark).
- ✓ Exploring new UNESCO water-related Chairs and Category 2 Centres.
- ✓ Strengthening the Youth Ecohydrology Network!
- ✓ *Welcome for further collaborations and partnerships in water related activities.*

unesco
Intergovernmental Hydrological Programme

ecohydrology programme

the international water association

THANK YOU! MERCI ☺

R.ELFITHRI@UNESCO.ORG

DR. RAHMAH ELFITHRI
CHIEF OF SECTION
CAPACITY DEVELOPMENT AND WATER FAMILY COORDINATION
DIVISION OF WATER SCIENCES
UNESCO-IHP, PARIS, FRANCE

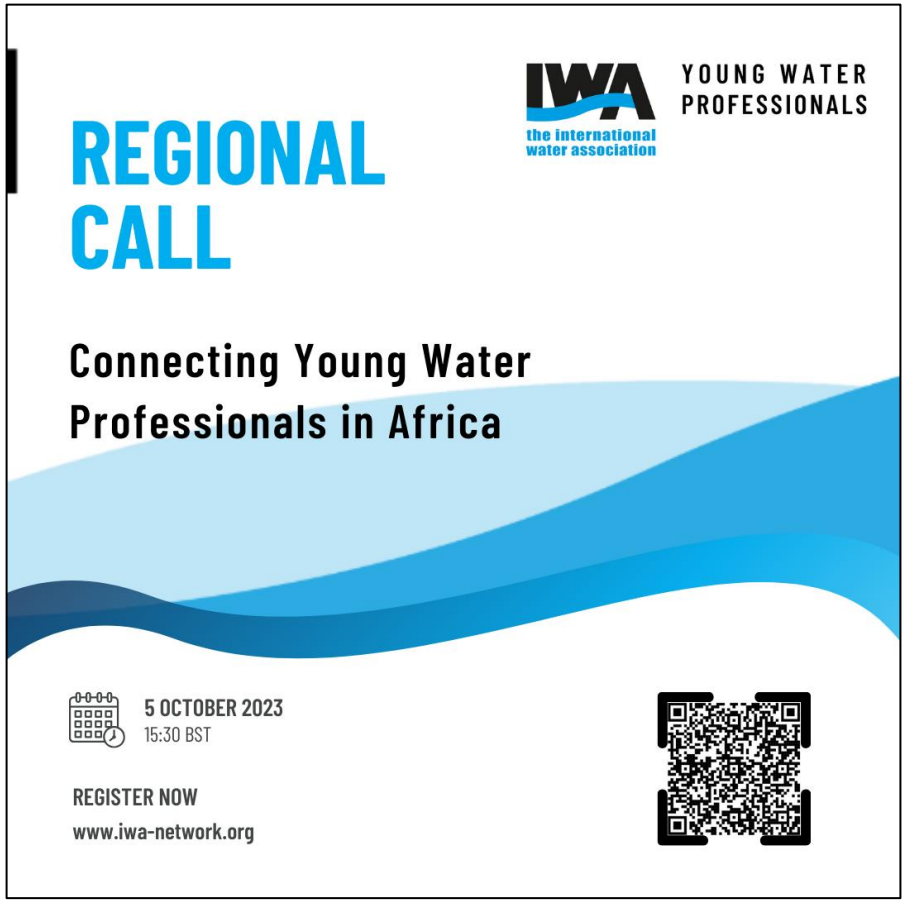
inspiring change

the international water association

Q&A Discussion

MODERATOR: FANG YENN TEO

UPCOMING IWA WEBINARS & EVENTS



Learn more about future online events at
http://www.iwa-network.org/iwa-learn/

UPCOMING IWA WEBINARS & EVENTS

Learn more at
https://nssconference.org/

1ST IACRR/IWA INTERNATIONAL CONFERENCE ON COASTAL RESERVOIRS AND SUSTAINABLE WATER MANAGEMENT

the international water association

ABSTRACT DEADLINE EXTENDED:
15 September 2023

Highlights:

14 world renowned keynote speakers,10 invited lectures, one full day interactive workshop and one day technical tour to the world's largest coastal reservoir situated at the Yangtze Estuary in Shanghai.

Conference Themes:

- Coastal infrastructures, climate change
- Sustainable water management, water security
- Ecological impacts, water quality, sediment transport
- River, Estuarine and Reservoir processes
- Water-energy-food nexus, water policy

6-9th November 2023
Hohai University, Changzhou, China

Visit: www.iacrr2023.com or

https://iwa-network.org/events/1st-iacrr-international-conference-on-coastal-reservoirs-and-sustainable-water-management/

UPCOMING IWA WEBINARS & EVENTS

Find out more at:

https://digitalwatersummit.org/

UPCOMING IWA WEBINARS & EVENTS

Find out more at:

https://waterdevelopmentcongress.org/

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