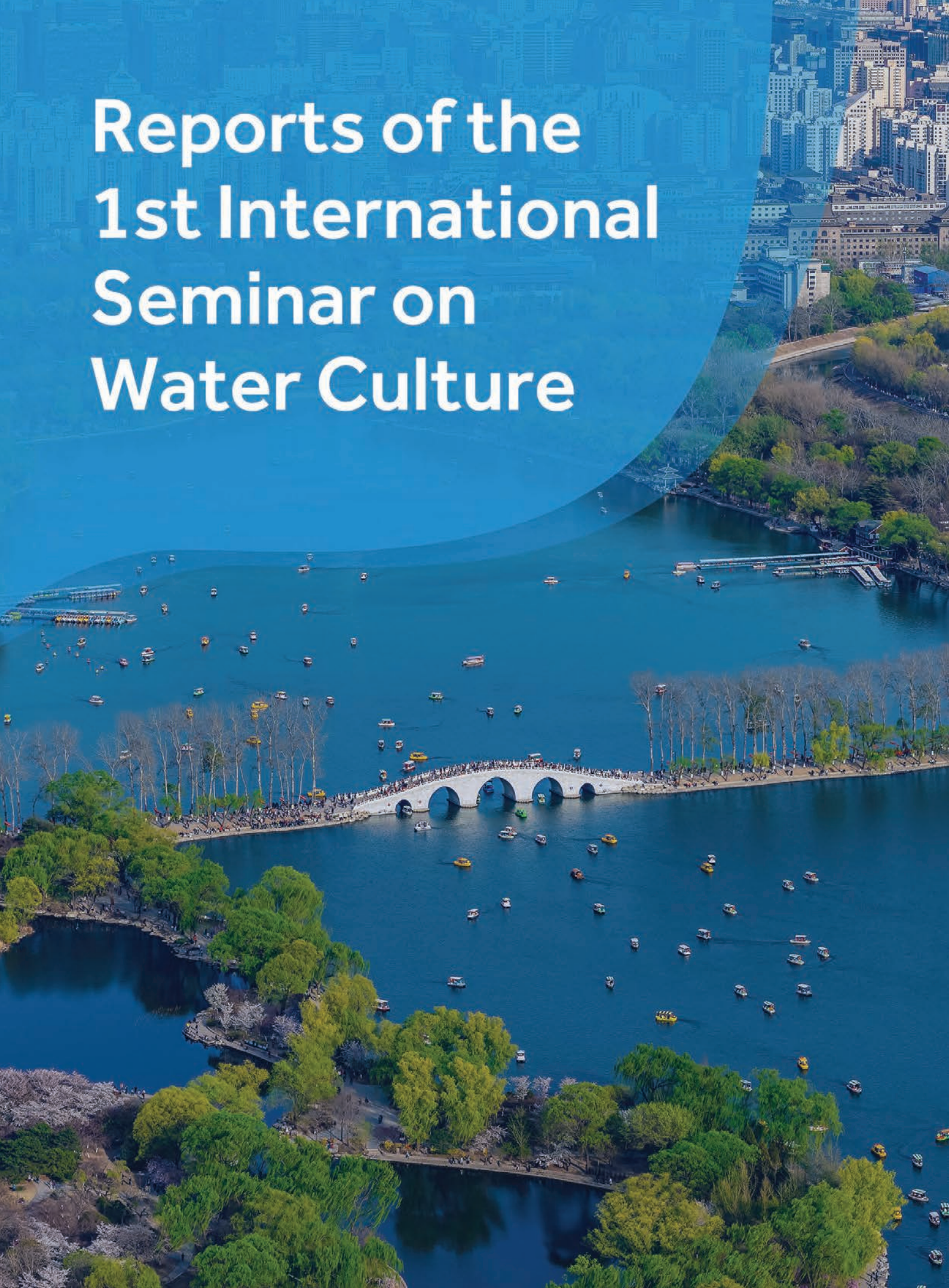
Reports of the 1st International Seminar on Water Culture



CONTENTS

Re-Aligning Water Culture to Address the Urgency of Climate Change

David Groenfeldt
Water-Culture Institute
Santa Fe, New Mexico, USA
www.waterculture.org

1st International Seminar on Water Culture
Nov. 18, 2021

1. What Is Water Culture?*

- **Attitudes, beliefs and Values** expressed through religion, literature, art, etc.
- **Institutions**, norms, customs and laws
- **Ethics and Behavior** towards water (management, use, protection)
- **Material culture** (built and natural infrastructure)

* Adapted from Prof. Zheng Xiao Yun

Why Is the Climate Changing ?

- Modern beliefs of the Anthropocene that…
  - Humans are separate from nature
  - Humans can and should control nature
  - We can create an artificial ecosystem for ourselves
  - We are not bound by the laws of nature, or science
- These same beliefs also apply to water even though…
  - We are 70% water (We are not separate!)
  - We cannot fully control our rivers and lakes
  - Ultimately we are still bound by the laws of nature.

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Lake Michigan last week…

The climate is changing…

But values are also changing

American Water Values in 1960	American Water Values in 2020
• Industries have a right to pollute rivers; • Dams add value to rivers; • Urban waterscapes not desirable. • Indigenous communities have no water rights • Water policies should be set by experts	• Water pollution is both illegal and immoral • Some dams should be removed and new dams should be avoided • Urban waterscapes connect people to water • Indigenous communities should control their traditional waters; • All stakeholders should jointly decide on water policies

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2. The same principles we are applying to the water crisis can also help the climate crisis

Water Principles	Climate principles
• Health of water ecosystems is #1 priority • Conserve and reuse water (Reduce water footprint) • Social justice - Ensure equitable access to water • Cultural justice - Respect traditional water rights • Governance matters!	• Health of planetary ecosystem is #1 priority • Conserve and reuse energy (Reduce carbon footprint) • Social justice - Ensure equitable access to energy • Cultural justice – Respect traditional land sovereignty • Governance matters!

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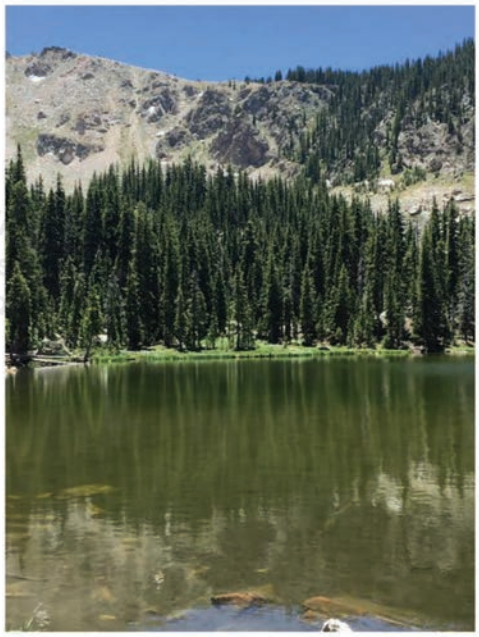
A single strategy for water and climate:

- Apply best practices to conserve water, reduce pressure on water ecosystems, and let nature heal.
- There is plenty of guidance about how to do more with less water
- And we already have many of the right values.
- What is missing is ”ethical courage” to operationalize the values that we already hold.



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Dry rivers do not reflect our Water Values

Rio Grande Near Mesilla, NM, March 2013

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Ethical Courage
• Our challenge is to act according to the values that we already hold.
• Ethics is the application of values; this is the purpose for engaging in "ethical reflection".
• "An ounce of reflection can be worth a pound of mitigation."
• To operationalize our values we need three things:
1. An awareness of our values
2. An understanding of ethics
3. Ethical reflection
4. Ethical courage
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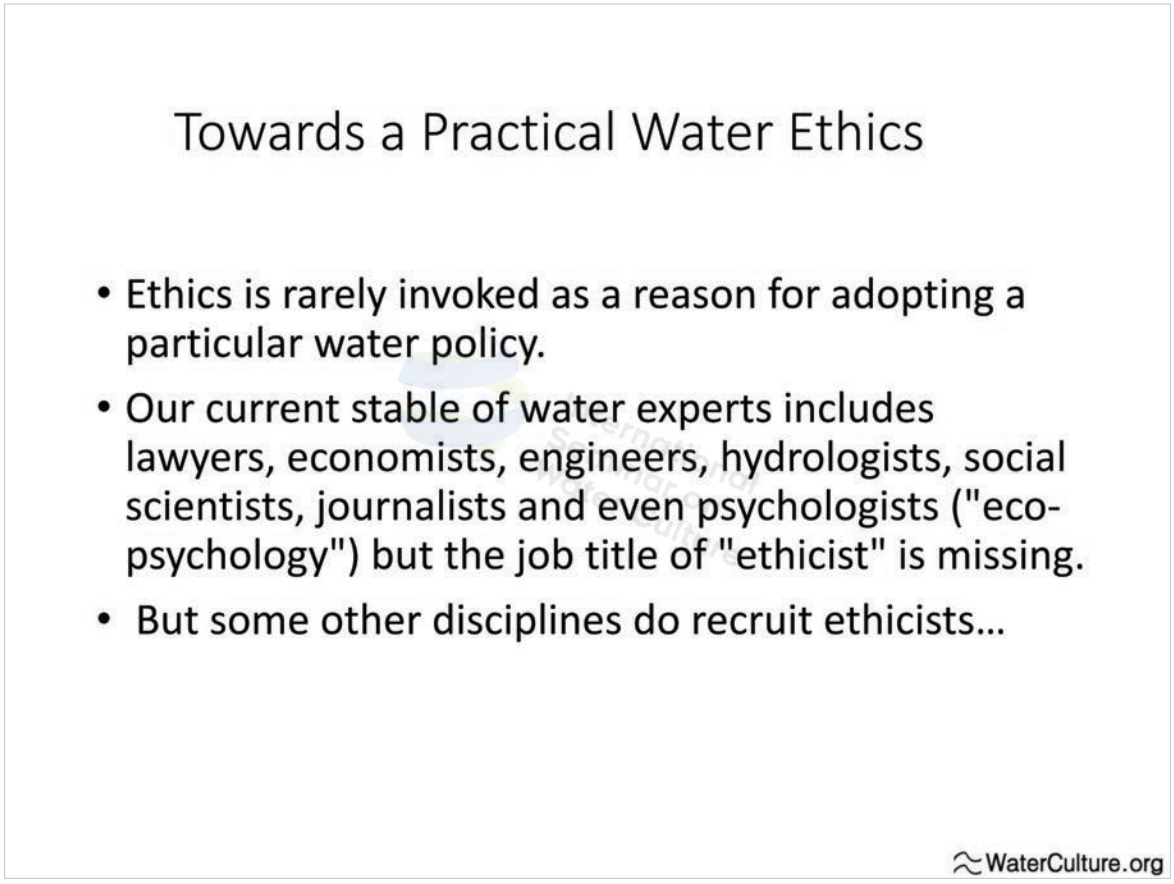
Towards a Practical Water Ethics
• Ethics is rarely invoked as a reason for adopting a particular water policy.
• Our current stable of water experts includes lawyers, economists, engineers, hydrologists, social scientists, journalists and even psychologists ("eco-psychology") but the job title of "ethicist" is missing.
• But some other disciplines do recruit ethicists…
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Is there an ethicist in the house?

- Medical ethicists advise hospitals. Technology ethicists are in demand to assess the constructive uses and dangers of using AI. Business and investment ethicists help companies develop ESG (Environment, Social, and Governance) strategies.
- The journal, *AI and Ethics*, "seeks to promote informed debate and discussion of the ethical, regulatory, and policy implications that arise from the development of AI.
- Both the AI and health fields deal with systemic threats to the sustainability of human life. Water is even more critical to survival of human and non-human life. Where are the water ethicists? We need them!

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- Recruiting an ethicist presumes that there is already a relevant field of ethics for the advisor to be guided by.
- For businesses there is a long established field of business ethics with dozens of academic journals and courses on business ethics in most business schools.

One of the more prestigious academic Journals on business ethics, since 1982.

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3. Towards a New Water Ethic

What guidance can we find for crafting a new water ethic and developing a cohort of water ethicists?

(1) Normative frameworks for water management
- Integrated Water Resources Management (IWRM) and the "One Water" concept
- Sustainable Development Goals (SDGs)
- Etc.

(2) Water Ethics Charter

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Normative Frameworks for Water Provide a Basis for a New Water Ethics

- IWRM and Nexus approaches ("Integration")
- Sustainable Development Goals (UN)
- Environmental Flow and Biodiversity (UN CBD)
- Water Integrity (Transparency Int'l)
- Human Right to Water (UN)
- Water Stewardship (Industry)
- 17 Principles for Water-Wise Cities (IWA)
- Rights of Nature Movement (Water Protectors)
- Commons Movement (IASC)
- Water Justice (EWN/WCC)
- Water Governance Principles (OECD)
- Cultural Diversity/Ontologies (UN-DRIP)
- Etc…

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SDG 6 – "The Water Goal"

- 6.1 equitable access to safe and affordable drinking water for all
- 6.2 sanitation and hygiene for all
- 6.3 improve water quality by reducing pollution and halving the proportion of untreated wastewater
- 6.4 increase water-use efficiency (domestic, agricultural, industrial) and ensure sustainable withdrawals
- 6.5 implement integrated water resources management at all levels
- 6.6 protect and restore water-related ecosystems

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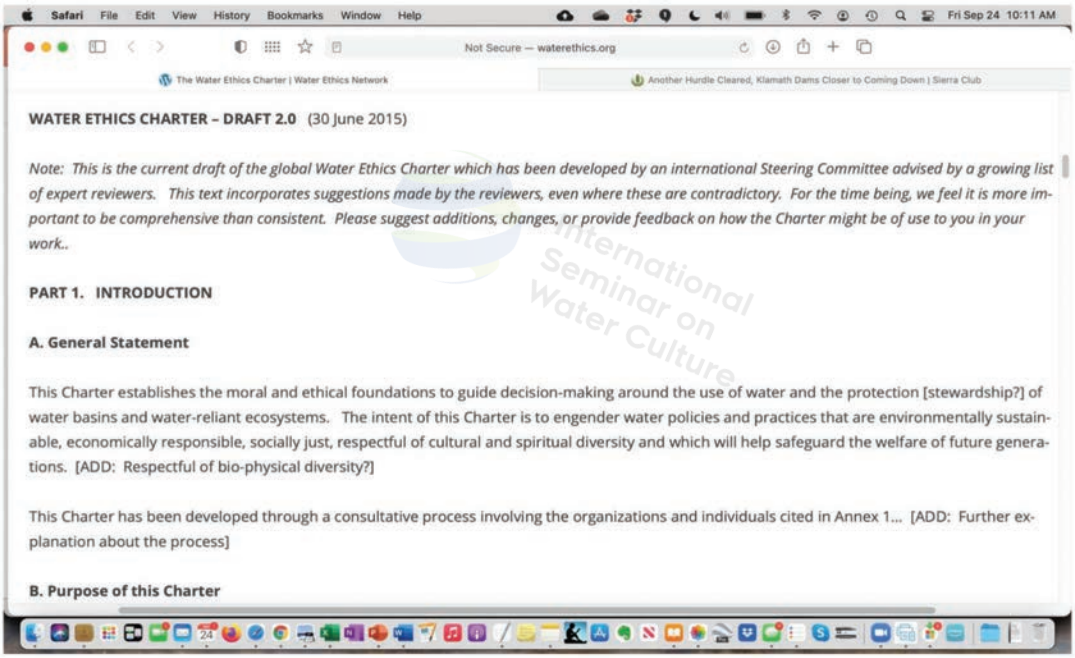
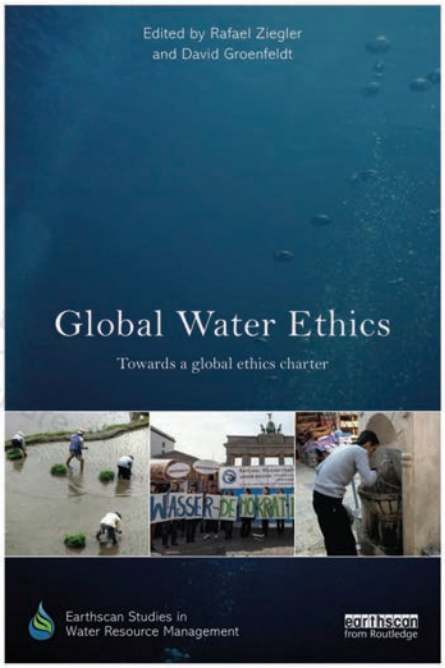
A Global Water Ethics Charter

http://waterethics.org/the-water-ethics-charter/



Global Water Ethics Charter

- Proposed by 2012 World Water Forum
- Initial Partners
  - UNESCO
  - French Water Academy
  - Botin Foundation
  - Water-Culture Institute
- Other Partners
  - Sustainable Water Futures
  - World Council of Churches
  - Alliance for Water Stewardship



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Global Water Ethics Charter (cont.)

- Builds on earlier UNESCO initiative on water ethics
- Seeks consensus across geographic and cultural lines
- Explicitly prescriptive (what *should* be)
- Intended as reference for water decisions / policies
- Serves as template for local water ethics charters
- Presented in 2015 World Water Forum (in S. Korea)
- Posted on Water Ethics Network (**waterethics.org**)

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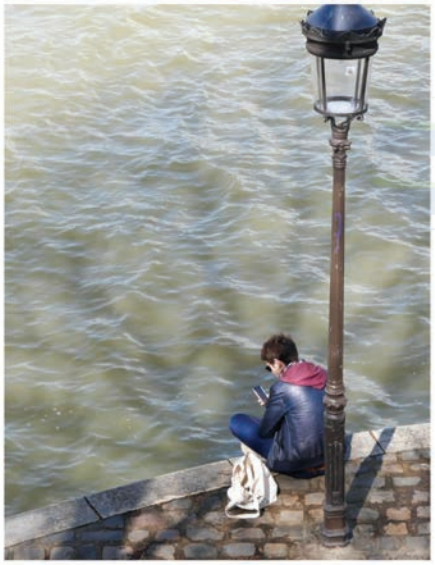
A new water ethic can emerge through clarifying our water values



- Restore river health
- Recognize water as a commons
- Equitable access to water (social justice)
- Free, prior and informed consent
- Reflect interests of all stakeholders

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Values guide our response to both the water crisis and the climate crisis

- Reflect on our water values
  - Environmental
  - Economic
  - Social
  - Cultural
  - Governance
- What are our ethics telling us?
  - Raise awareness
  - Acknowledge the crisis
  - Develop new messages and strategies
  - Act with urgency!

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Prioritize Environmental Water Values in response to the climate emergency

- Environment becomes central priority
  - Aquatic systems are collapsing and need protection/restoration
  - Intergenerational equity depends on ecosystem protection
  - Social and economic priorities also important; also culture and governance

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We need to **adopt** a new eco-centric paradigm for water

- Recognize rights of rivers
- Rights of future generations to healthy water ecosystems;
- Respect rights of Indigenous Peoples to protect the rivers they depend on;
- Environmental justice and participatory governance

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…and Reconcile with Nature…

Reconciliation Steps

- Recognize water as an ethical domain
  - Responsibility to protect aquatic systems
  - Bequeath healthy systems to future generations
- Acknowledge past/current water injustice to Nature and to Indigenous Peoples (and others)
  - Dams
  - Mine and oil/gas pollution
  - River, lake and wetland grabbing
  - Biodiversity loss
- Adoption of an eco-centric water ethic
  - We all need to become "water protectors"

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Thank You!
www.waterculture.org
waterethics.org

The 1st International Seminar on Water Culture

Revival of the water-related old practices in the East Asian region to modern ecological practices

Nov 18 2021

Hyoseop Woo

Gwangju Institute of Science and Technology

Contents

- NbS and similar modern practices
- The Yin-Yang and Five Elements Theory (陰陽五行說) – The old Chinese philosophy
- Water-related examples
  - ✓ China's *Beitang* and others
  - ✓ Japan's *Village and Mountain*
  - ✓ Korea's shelter (tree) belts and clusters
- Summary

NbS and similar modern practices

What's NbS?

- "Actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits (IUCN)
  → Utilization of ecological functions and services to address the societal challenges

- Societal environmental challenges: Safety from floods, Climate change, Water security, Human health, Disaster risk, and Socio-economic development

- Background
  - ✓Appeared first in 2008 from IUCN and World Bank.
  - ✓Emerged in the 2000s as measures for climate change adaptation

- **Then, is it new?**

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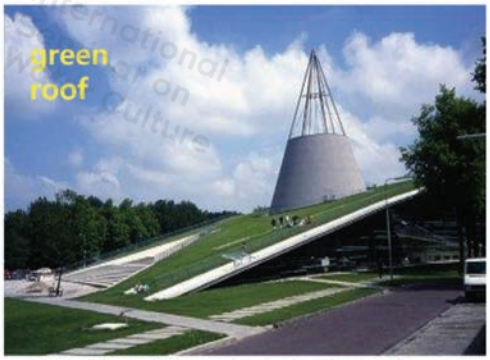
Similar concept Ⅰ: Ecological Engineering

- Design of sustainable ecosystems that integrate human society with its natural environment for the benefits of both (Mitsch and Jorgensen) → Started in the USA from 1960s → An academic discipline
- Recalling NbS to be the utilization of ecosystem providing the benefits of both,
  → EE is the design technology for NbS!

<Source: IEES homepage, https://iees.ch/polishing-wastewater-in-a-wetland-at-everstekoog-netherlands/>



<Source: H. van Bohemen, Ecological Engineering; Bridging between Ecology and Civil Engineering , Aeneas, Technical Publishers, AC Boxtel, The Netherlands (2005)>

Similar concept Ⅱ: GI (Green Infra)

- **(Narrow meaning)** A measure of water conservation and waterways restoration, such as rainwater harvesting, bio-swales, and permeable pavement (USEPA) ~ LID
  → First adopted in the USA in 1987 as a measure of rainwater management
- **(Broad meaning)** Also called **the blue-green infrastructure (BGI)** (urban grids), referring to the patchworks of natural areas that provide habitat, flood protection, and cleaner water and air especially in the urban areas
  → Adopted in the USA in 1999 and EU in 2009

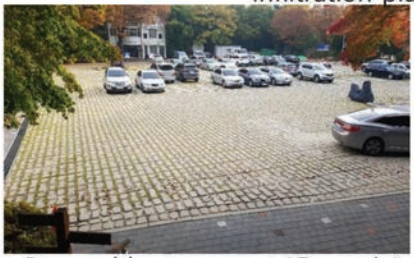
Examples of GI's (in Korea)

Retention ponds (Yanggu)

Vegetated swale (Cheonan)

Infiltration planter (Jeonju)

Infiltration by rainwater down spout (Incheon)



Permeable pavement (Gwangju)

Green roof (Asan)

(Sources: Kim, L. H., Gongju Univ, Korea)

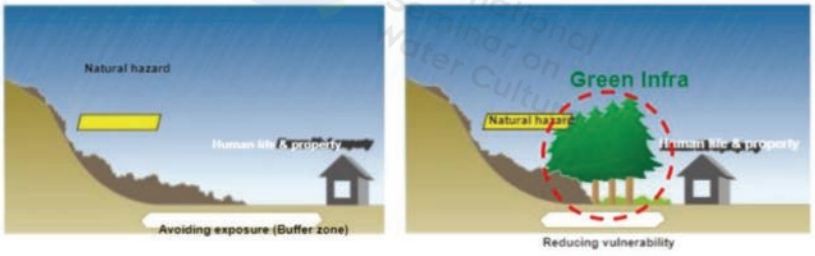
Examples of Blue-Green Infra

GI's and sustainable living (health) (adopted from EU)

(Source: https://biodiversity.europa.eu/topics/green-

Similar concept Ⅲ: Eco-DRR

- Eco-DRR: sustainable management, conservation and restoration of ecosystems to reduce disaster risk, with the aim to achieve sustainable and resilient development

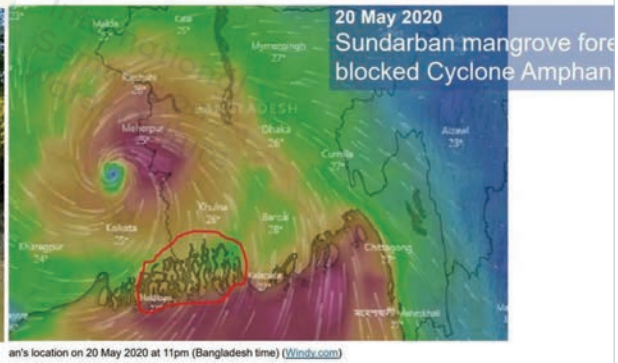


(Adopted from MOE, Japan, 2016)

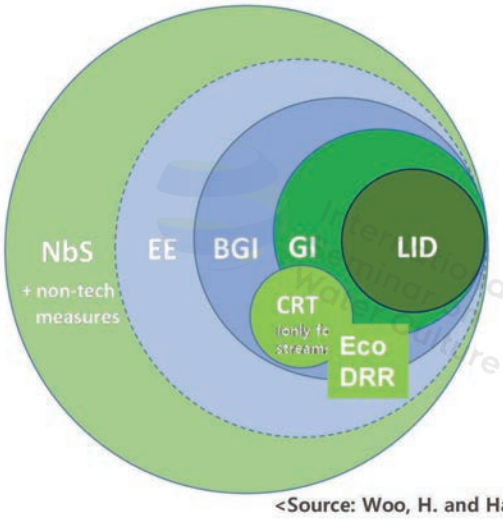
Examples of Eco-DRR

- ✓ A disaster-risk reduction measures against storm surge using the natural coastal forest belt, **such as mangrove trees**
- ✓ Additional benefits: carbon sequestration, biodiversity, livelihoods, culture and recreation

<Photo: World Bank>



Hierarchy/Subsets of relevant concepts



<Source: Woo, H. and Han, S.W., March 2020, E&IE, Korea>

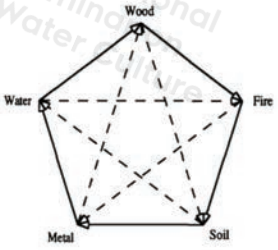
→ The spatial extent and number of beneficiaries vary with different approaches within NbS's.

The Yin-Yang and Five Elements Theory – The old Chinese philosophy

➢The Yin-Yang and Five Elements Theory (YYFET):

- ✓ All things and all beings in the universe are manifestations of the interplay of two opposite forces → yin and yang
- ✓ The interplay of yin and yang is in ceaseless motion and the motion is cyclic with inter-transformation of yin.
- ✓ The five elements in the universe are water, metal, soil, fire, and wood, which interacts by pulling and pushing each other.

Dynamics of yin and yang



By Yan et al (1993)

Mutual promotion and restraint among the five elements (solid line = promotion, dotted line = restraint)

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➢The traditional agricultural practices (in China) ← YYFET

- ✓ Principles: holism, harmony, regeneration, and cycling (Yan and Ma, 1991)
- ✓ Practices: inter-planting, mixed activities of agriculture/husbandry/ silkworm farming, not catching young lives of animals and plants

(Examples)

- ✓ Mixed activities: Beitang in China
- ✓ Harmony with nature: Satoyama in Japan
- ✓ An old-day eco-DRR: Tree belts in Korea

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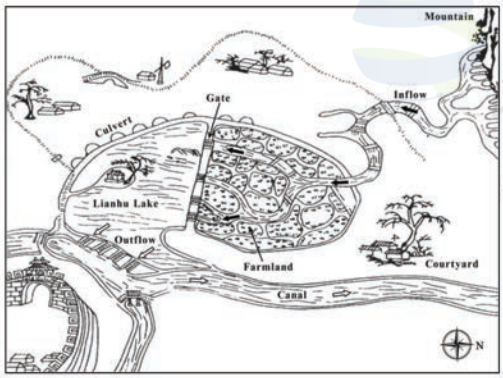
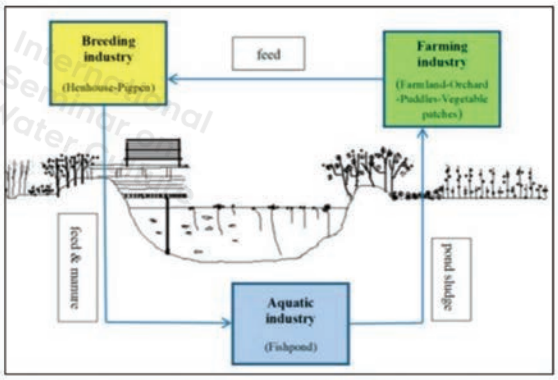
Beitang (陂塘) in China

- ✓ A Chinese traditional eco-friendly farming community
- ✓ Composed of a pond–ditch–courtyard–farmland
- ✓ Mixed activities of agriculture, aquaculture, and husbandry
- ✓ Another example of such: Agricultural heritage systems on aquatic-ecological conservation (AHSAEC) based on Taihu region, China



A sketch of Beitang (Gao et al, 2015)



A conceptual diagram of Taihu Lake multi-industry compound ecoagriculture model (Li et al, 2020)

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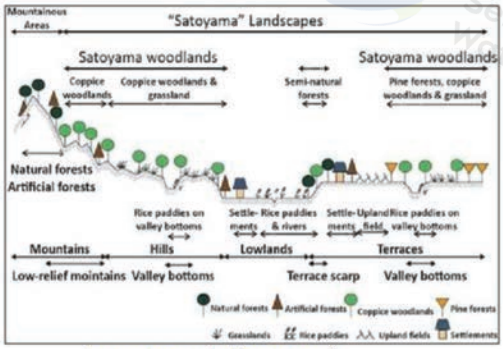
Satoyama (里山) in Japan

- ✓ A traditional Japanese rural landscape between the cities and the deep mountains (Yamamoto 2001)
- ✓ Sato: "village," and yama: "mountain"
- ✓ Composed mainly of village mountain, farm land, village, and pond
- ✓ A cultural and natural landscape consisting of farming and forestry villages and the semi-natural environments that surround them
- ✓ A good example of harmonizing with nature and benefits for human



A conceptual diagram of Satoyama (Yamamoto 2001)

A farming village landscape in Japan (https://tunza.eco-generation.org/file/satoyama%201.jpg)

Tree belts and clusters for DRR in Korea

- **Traditional practice of planting trees as a DRR**
  - ✓ **Anti-storm coastal tree belt (防砂林)**: Planting trees along the coastal beaches to protect against windstorms incurred from the sea
  - ✓ **Anti-wind tree belt (windbreak, 防風林) :** Planting trees on the northwestern side of villages to protect against the chilly northwestern winds in winter season
  - ✓ **Anti-flood tree belt (cluster, 防水林)** : Planting trees on the earthen levees along the rivers or the ground to protect villages and farmlands against river floods
  - → All were made for supplementing the weak point of the natural topography surrounding the village and farm land (**Maeulsoop = village forest**)
- Most of them had disappeared due to the modern-time river improvements, village and city expansion, road works, etc.
  - → At present, a two dozen, old, village forest belts are being protected as the National Cultural Heritage in Korea.

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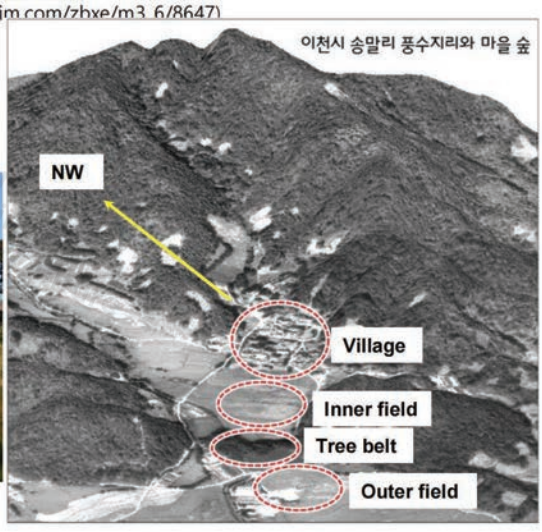
Anti-storm/wind tree belts (shelter belt)

Anti-storm coastal forest belt:
Moolgeonbangjo-eoboolim
Namhae-gun, Korea
(1.5 km long, 30 m wide and 10-15m high)
Source: Giri-limdotcom,
http://www.jirilim.com/zbxe/m3_6/8647)



(above) Windbreak tree belt: Maulsoop (village forest), Eoiam Folk Village, Chungnam, Korea; source: https://m.khan.co.kr/view.html?art_id=201510182202305#c2b)

(right) Village forest and "mountain in the back and stream in the front (背山臨水) source: https://www.hani.co.kr/arti/PRINT/173971.html)

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Anti-flood tree belt (cluster) – riparian forest belt

- They were common until at least early 20th century in South Korea (Lee et al. 2008).
  - ✓ In 1938, they were 102 including ruined ones.
  - ✓ In 2000, only 37? existed (63% disappeared)
- Many of them are being protected as Natural Cultural Heritage.
- Two typical examples of such are Gwanbangjelim in Damyang (left) and Sanglim in Hamyang (right).

Gwanbangjelim (Damyang) (370 years old) (Photographed by H. Woo)

Sanglim (Hamyang) (1,100 years old) (KBS)

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Gwanbangjelim - Practice of planting trees on the levee

- ✓ Historically in 1648, levee were first built to prevent flood and then trees were planted on the levee to prevent the levee erosion during high flow.
- ✓ In 1854, the levee was reinforced and additional trees were planted.
- ✓ Nowadays, only trees on the levee top left, while the others on the slopes disappeared.
- ✓ The 2.4 km long forest stretches with the total area about 123,000 m^2
- ✓ Large trees with muku trees, zelkova trees, nettle trees, and cherry trees that are about 200 to 300 years old (a girth of 1 m to 5.3 m)
- ✓ They are now protected as a National Cultural Heritage.

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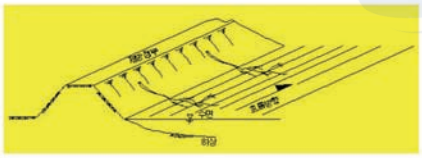
- ✓ One of the countermeasures against surface erosion in those days was the willow cuttings on the levee slopes.
- ✓ Nowadays, it is revived as one of the soil-bioengineering techniques used for stream restoration.



Before modern era

Modern-day willow fascine technique

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Sanglim - Tree-planting for a forest cluster

- ✓ Sanglim, a riparian forest cluster located in the west of Hamyang-gun along the bank of Wi-cheon Stream
- ✓ The total area of 119,008 m^2 (11.9 ha) with a round rectangular type
- ✓ Various broadleaf trees with zelkova trees, fringe trees, oak trees, snowbell trees, loose-flower hornbeam, dogwood trees, etc
- ✓ Choi, Chiwon, who was a governor-general of Hamyang province, 887-897, of the United Silla was known to first make it to prevent floods from the stream.
- ✓ An irrigation channel located in the forest (left figure)

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Engineering effects of levee planting on flood risk

- Potential positive effects of levee trees on river floods
  - Healthy root systems in levees can strengthen the levee planes and effectively increase the slope stability of the system.
  - Riparian trees stabilize banks along watercourses, preventing them from erosion during flood flows.

- Potential negative effects of levee trees on river floods (Woo and Kim, 2017; USACE, 2011)
  - Local scours around the stump during floods
  - Root growth and decay can create macro-pores and subsequent piping
  - Large trees are more susceptible to mass failure

- Another merits of levee planting: wind break, landscape, amenity.
- They are now cultural and recreational spots.

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Summary

- The modern-day NbS
  - ✓ A sustainable, carbon-neutral way of tackling the socio-environmental challenges
  - ✓ Principle of equally-beneficial harmonization with nature and sustainable utilization of ecosystem services
- The old-day water-related practices in the East Asia (examples)
  - ✓ China's mixed activities of farming, husbandry, and aquaculture
  - ✓ Japan's Satoyama
  - ✓ Korea's tree belts
- NbS is basically the same with the old wisdom of following the natural process, based on the philosophy of the Yin-Yang and Five Elements Theory.

  → We may it has been revived and clothed in modern dress to find out what is new (溫故而知新) !!!

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Thank you!

The 2nd Great Rivers Forum in Wuhan, 2018:
a milestone in interdiscipinary river management

1

The 2nd Great Rivers Forum in Wuhan, October 28-30, 2018:
a milestone in interdiscipinary river management

- organized by UNESCO Beijing Office and Changjiang Civilization Museum in Wuhan
- generous support by the Wuhan Municipal Government
- scientists, managers, and practitioners from all over the world
- Expert sessions included:
  - *(i) River Culture: Preserve and Let Evolve Natural and Cultural Heritages of Great Rivers*
  - *(ii) Visualizing Water Worlds along Great Rivers – Water Museums, Heritage, Memory and Sense of Place*
  - *(iii) Urban Development along Great Rivers – Reconnecting the City with Its River*
  - *(iv) Water-related UNESCO Designated Sites (WH sites, Biosphere Reserves, Creative Cities)*
  - *(v) High-level Roundtable on The Integration of River Culture and Environment in the Management of Great River Basins warranted science-policy transfer*
- This open-minded exchange was permanently online and received 16.797 million reads and 7989 discussion contributions in China alone, and uncounted participants worldwide

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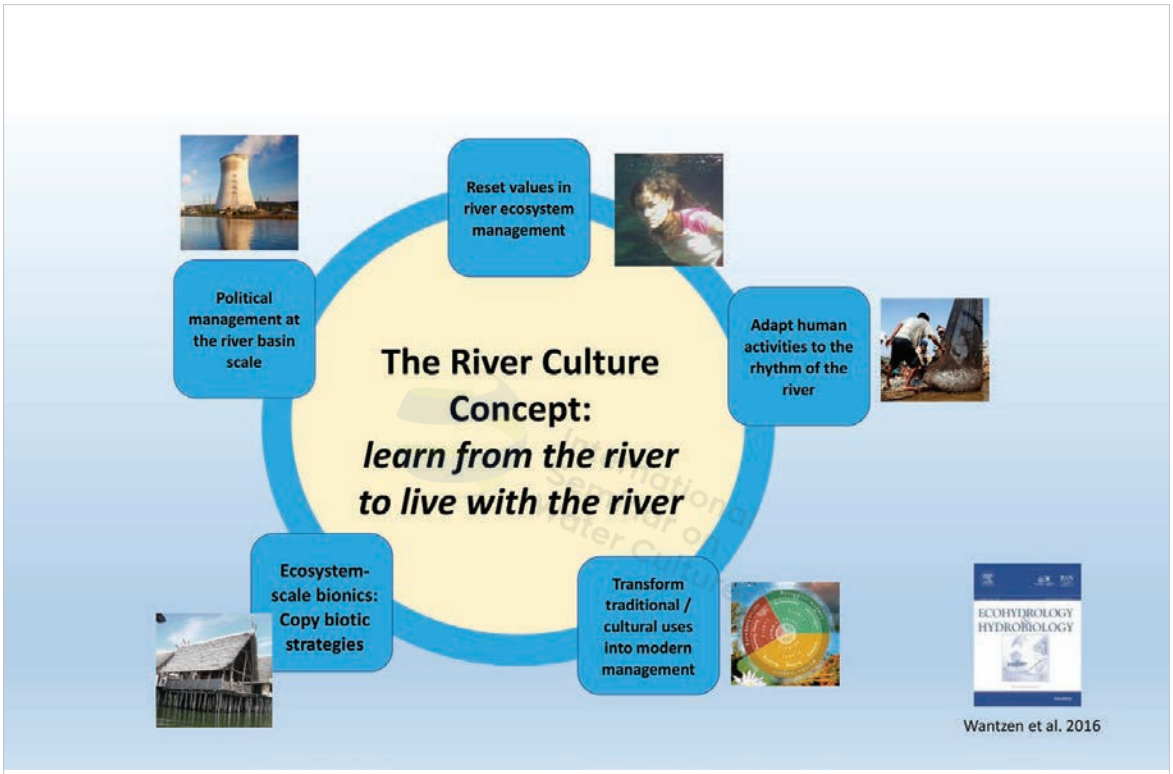
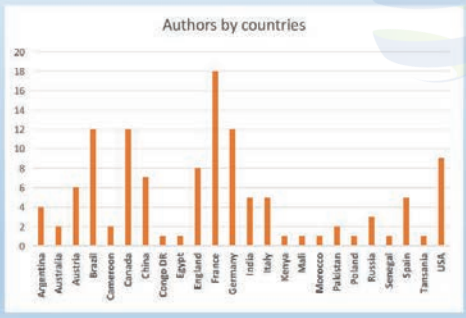


A book on River Culture at global scale:

unesco

→Transfer of biotic adaptive strategies, traditional ecological knowledge and innovative solutions into a sustainable riverscape management



- **125 authors from 24 countries, 42% female authors**
- **36 chapters, > 900 pages**
- **28 rivers from 4 continents (Africa 6, Asia 7, Americas 6, Europe 9)**
- **2 chapters on artist's perspectives, 1 chapter on gender equality**
- **5 reviews on socioecological concepts and on riverscape management in the anthropocene**
- **Foreword by Shabaz Khan**

River Culture

Life as a dance to the rhythm of the waters

SHORT SUMMARY

Back to life in the rhythm of the waters

The global crises of biodiversity and cultural diversity are interdependent, especially so in rivers. While we know that 84% of the freshwater fauna has disappeared between 1970 and 2014, the loss in cultural diversity connected to the river and its floodplain (e.g., spiritual linkages, traditional use forms, adapted architecture, etc.) is as yet unknown.

This book makes a first attempt to deal with biological and cultural diversities altogether, depicting the bio-cultural diversities, historical human-river relationships, threats, and practical examples of how to mitigate the crisis in riverscapes. More than 120 authors present interdisciplinary studies from river systems all over the world, and explore overarching issues on river management in the Anthropocene.

Modern societies increasingly re-integrate the river into their lifestyle, driven by citizens' movements and/or by governments

Practitioners and scientists in landscape and urban planning, ecologists, sociologists, NGOs and governments are invited to disseminate the positive examples presented here, to document their own work, and to contribute to a more harmonious and peaceful life in riverscapes.

84% loss
of biodiversity in freshwater, the cultural consequences are unknown

unesco

'Since wars begin in the minds of men and women it is in the minds of men and women that the defences of peace must be constructed'

Localization of the river case studies (chapter numbers 4-31)

map: https://en.wikipedia.org/wiki/File:World_location_map_(equirectangular_180).svg#file

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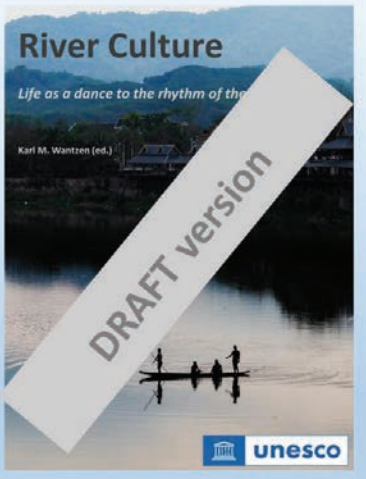
Global River Culture - Lessons from the book



- **Similar drivers, but different dynamics of deterioration of River Culture**
- **Tipping points are approaching fast**
- **Intergenerational and cultural disruptions**
- **NO return to "*good old times*", but cultural use forms may receive new functions (→ translational research)**
- **Nature-based solutions + sustainable innovations**
- **River awareness helps bending the curve (local actions)**
- **Climate change *can* be an efficient driver for action**
- **Good governance is needed for the *entire* river basin**

Water Culture: The Dynamic Mechanism and Current Innovation in Water Management

XIAO YUN. ZHENG

DISTINGUISHED PROFESSOR
DIRECTOR, CHINA INSTITUTE OF YANGTZE RIVER STUDIES
HUBEI UNIVERSITY, CHINA

The Dynamic Mechanism of Water Culture

- It is important to model the cultural dynamics on water management to explain how the cultural generation is driven by water and to better understand the cultural initiative in water management.

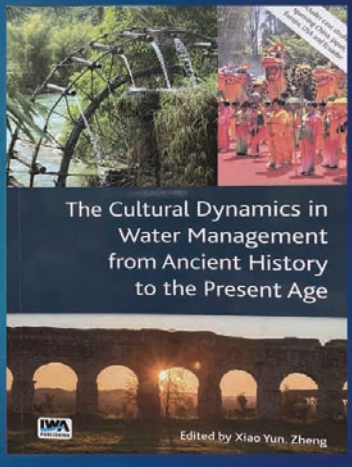
The Model of Dynamic Mechanism of Water Culture in Water Management

The Double Dynamics and Bidirectional Dynamics

1, The Double Dynamics: Demand dynamic and Cultural dynamic

Demand dynamic

Human beings depend on their demands of life, substance, residence and economic development to manage water. This includes the management of water for urban water supply, agricultural irrigation, water transportation, water use for daily life, etc.



Cultural dynamic

Human beings depend on their demands to manage water for cultural purposes such as the idea, value, aesthetic, religion, politic intention, custom, social norm, hobby of life, etc. This process also driven the creation of water culture.

- Summarily, people depend on their demands as well as culture to manage water. This has formed the double dynamics for water management.
- The demands of dynamics have driven the generation of water culture, while culture has also driven the generation of new demands for water management.

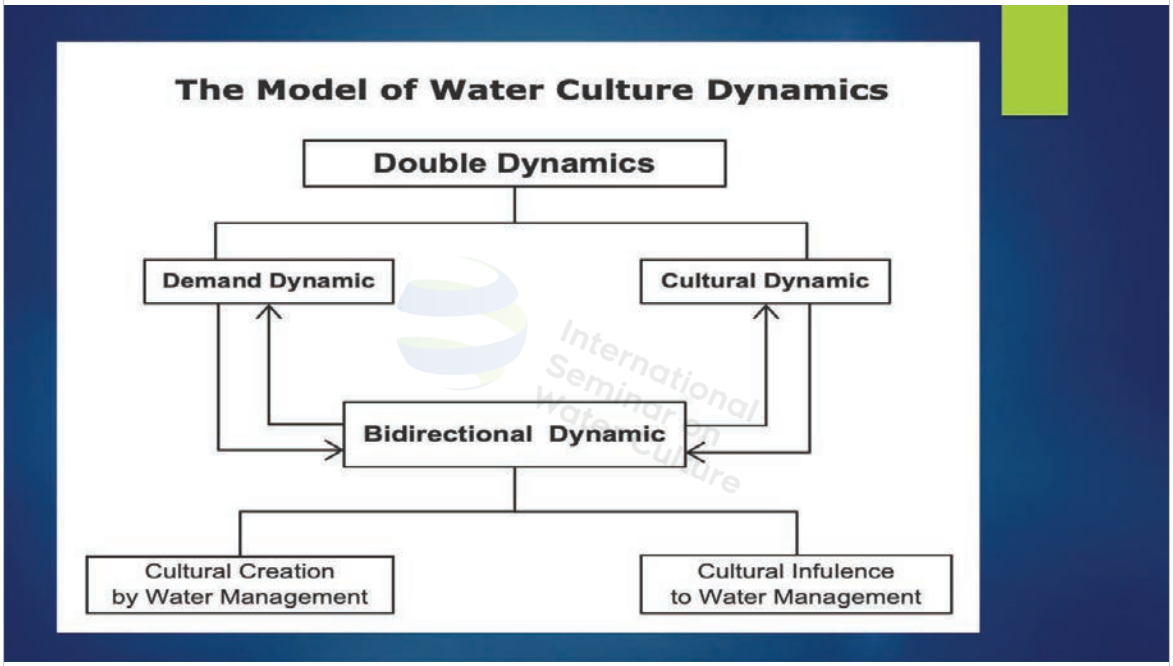
2, The Bidirectional Dynamics

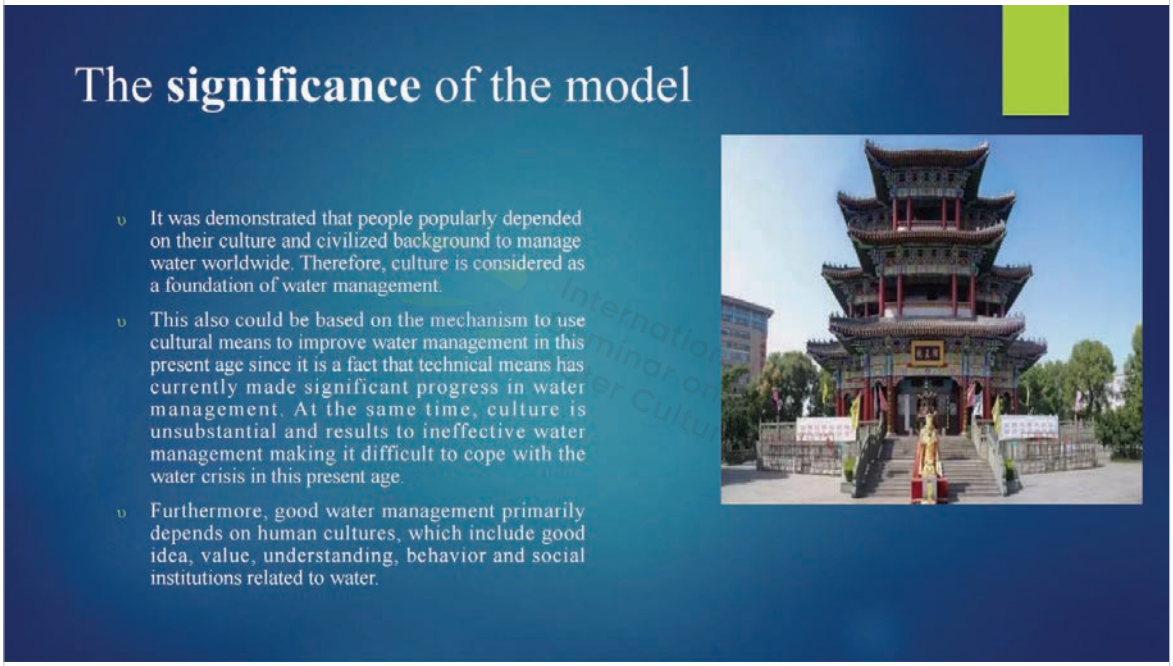
One directional dynamic

- The demands are driven by water management leading to creation of the culture. It is the dynamics of the cultural generation driven by water management, namely part of water related culture which was generated from water management.

Other directional dynamic

- Culture influences water management and becomes a dynamic of water management. People also depended on culture to manage water, and this brings the cultural factors to water management. In addition, water management generated culture, while culture has a significant influence on water management.


The Model of Water Culture Dynamics
Double Dynamics
Demand Dynamic
Cultural Dynamic
Bidirectional Dynamic
Cultural Creation by Water Management
Cultural Infulence to Water Management


The significance of the model
It was demonstrated that people popularly depended on their culture and civilized background to manage water worldwide. Therefore, culture is considered as a foundation of water management.
This also could be based on the mechanism to use cultural means to improve water management in this present age since it is a fact that technical means has currently made significant progress in water management. At the same time, culture is unsubstantial and results to ineffective water management making it difficult to cope with the water crisis in this present age.
Furthermore, good water management primarily depends on human cultures, which include good idea, value, understanding, behavior and social institutions related to water.

Innovation of water culture in Current Water Management

- **The Dynamic Role in Policy Making**

Good policy making should consider the water related value, ethics, tradition, custom, local participation, etc. Consequently, this makes the water policy making more effective and sustainable. For example, equal value determines how the water policy is made in a community to avoid possible water impacts and to make water management in a sustainable way.

Innovation of water culture in Current Water Management

- **The Cultural Dynamic Role in Hydro-project**

An effective and sustainable hydro-project planning and construction should be more culturally inclined by making culture a part of the planning and construction. The cultured hydro-project should include the purpose of construction as well as the local value, lifestyle, and traditional interests to make the project sustainable.

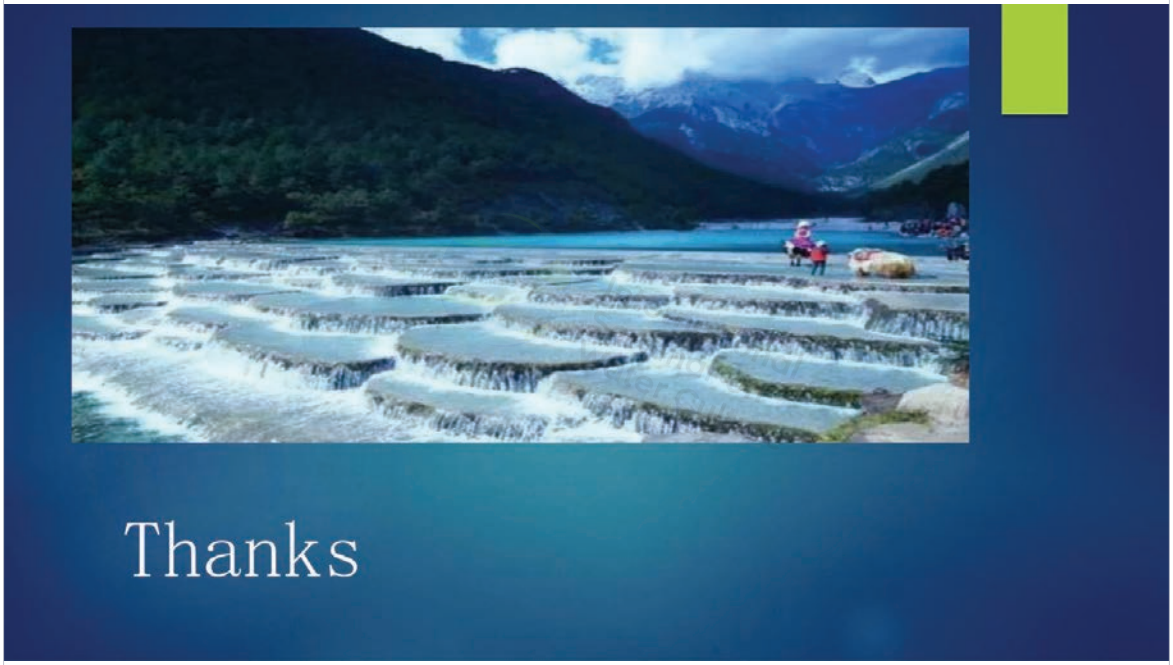
Innovation of water culture in Current Water Management

Water Culture as the Social Foundation of Water Management

Cultural-based water management will make water management more effective and sustainable. The value, awareness, water friendly behaviors and norm, and institution are the foundation of good water management which is broadly demonstrated. For example, culturally based water saving strategy should be more effectively.

Innovation of water culture in Current Water Management

- **The Role of Water Education**
- To achieve the goal and purpose of water management, inheritance of water traditions, rising of the knowledge and awareness, fostering of the value, building the capacity, and friendly behavior is important. As a part of water culture, water education could play an important role.


Thanks


Historical evolution of Yong Ding River
and urban development of Beijing
永定河历史演变与北京城市发展
Lv Juan
Director/Professor
中国水利水电科学研究院减灾中心
水利部防洪抗旱减灾工程技术研究中心
Research Center on Flood & Drought Disaster Reduction of the Ministry of Water Resources


永定河历史演变
与北京城市发展
Outline
1 The origin and network of Yongding River
永定河发源及水系
2 Historical evolution of Yongding River
永定河的历史演变
3 Yongding River treatment and urban construction in historical period 历史时期永定河治理与城市建设
4 The contemporary Yongding River and its urban development 当代永定河与城市发展

1. Origin and network of Yongding River 发源及水系

水利部防洪抗旱减灾工程技术研究中心
中国水利水电科学研究院减灾中心

永定河流域示意图

- Total Length: 747 km
- Drainage area: 47,000 km2 (mountainous area above Guanting is 43,000 km2)

The Beijing section of Yongding River is 187 km in total length, with a drainage area of 3168 square km, accounting for 18.9% of whole city area.
永定河北京段全长187公里，流域面积3168平方公里，占全市面积的18.9%。

1. Origin and network of Yongding River 发源及水系

Yongding River has two headstreams:

- one is originated in Sanggan River of Shanxi Province
- The other is originated in Yanghe River of Inner Mongolia

Converge in Zhuguantun of Hebei Province, called Yongding River

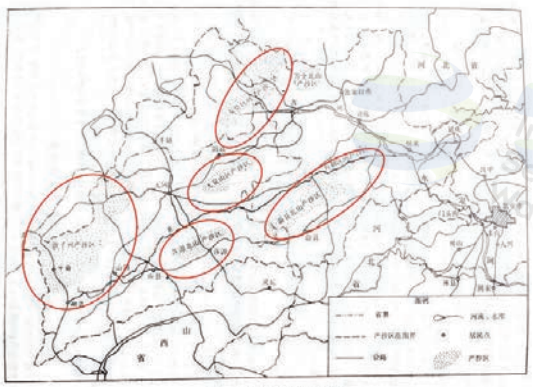
在河北省怀来县朱官屯汇合后称永定河

Yongding River Flow Path:

- flow south to Guanting,
- through the guanting gorges to Sanjiadian,
- cross the south of Youzhou Village to Beijing and Hebei,
- enter Yongding New River into Bohai Sea.

永定河南流至官厅，经官厅山峡至三家店出山，经幽州村以南入北京市、河北省部分区县，进永定新河入渤海。

1. Origin and network of Yongding River 发源及水系

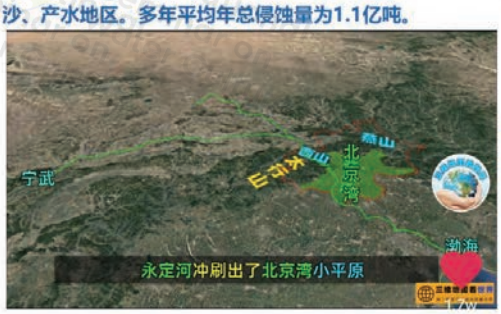


来源：北京水利志

上游产沙区

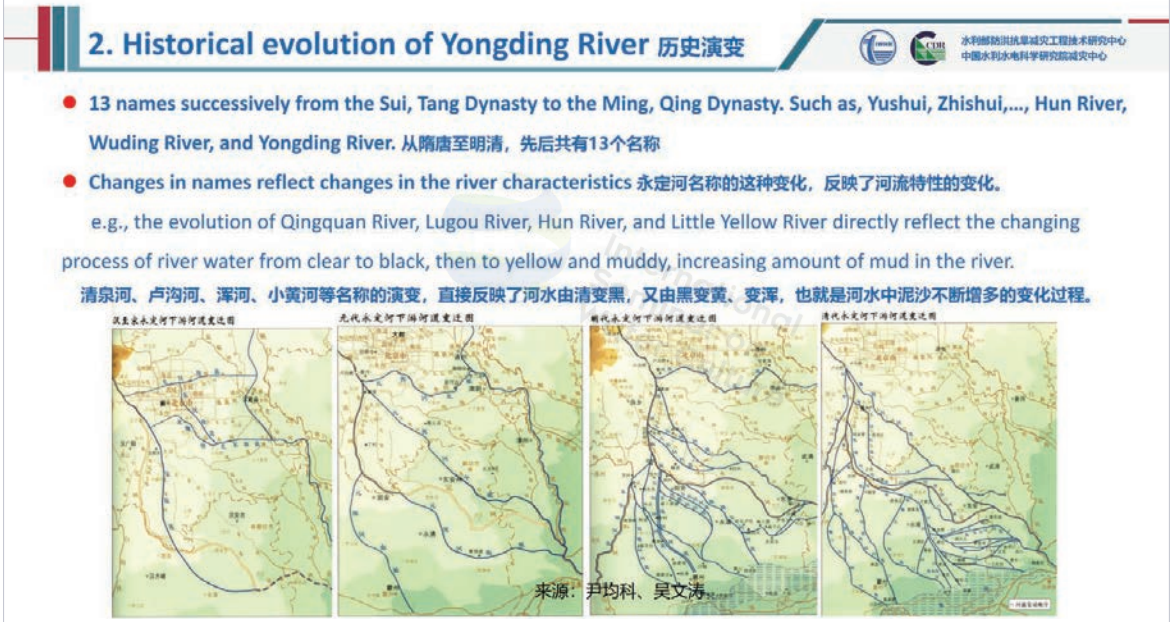
- Yanghe and Sanggan Rivers in the upper reaches of Yongding River, account for 90% of the basin area, are the main sand and water producing areas.
- The average annual erosion is 110 million tons.

永定河上游洋河、桑干河占流域面积的90%，是永定河主要产沙、产水地区。多年平均年总侵蚀量为1.1亿吨。



北京湾


永定河历史演变
与北京城市发展
02
Historical evolution of Yongding River
永定河的历史演变
IWHR
CDR


2. Historical evolution of Yongding River 历史演变
水利部防洪抗旱减灾工程技术研究中心
中国水利水电科学研究院减灾中心
13 names successively from the Sui, Tang Dynasty to the Ming, Qing Dynasty. Such as, Yushui, Zhishui,..., Hun River, Wuding River, and Yongding River. 从隋唐至明清，先后共有13个名称
Changes in names reflect changes in the river characteristics 永定河名称的这种变化，反映了河流特性的变化。
e.g., the evolution of Qingquan River, Lugou River, Hun River, and Little Yellow River directly reflect the changing process of river water from clear to black, then to yellow and muddy, increasing amount of mud in the river.
清泉河、卢沟河、浑河、小黄河等名称的演变，直接反映了河水由清变黑，又由黑变黄、变浑，也就是河水中泥沙不断增多的变化过程。
来源：尹均科、吴文涛

2. Historical evolution of Yongding River 历史演变

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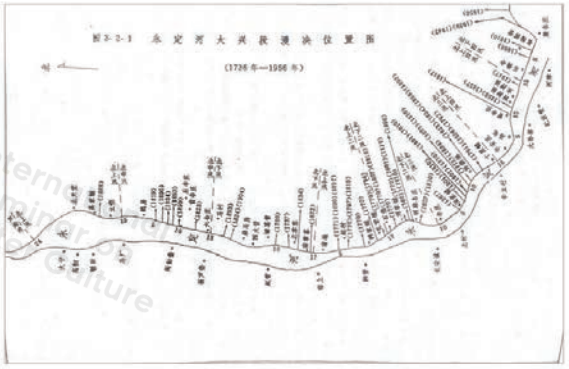
中国水利水电科学研究院减灾中心

Flood disasters(洪水灾害):

- **Most severely flood damaged river in Haihe watershed.**
- **Historically, it had 81 breaches and 9 changes of river way, and flood occurred in less than 4 years on average. 历史上有81次决口，9次改道**
- **In 1956, thousands of houses were destroyed and millions of land were flooded in Daxing district of Beijing.**



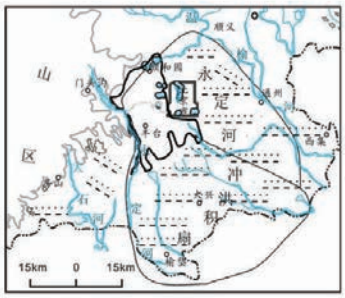
2. Historical evolution of Yongding River 历史演变

水利部防洪抗旱减灾工程技术研究中心
中国水利水电科学研究院减灾中心

Historical flood disasters in Beijing
北京的历史洪水灾害

来源：侯秀丽

2. Historical evolution of Yongding River 历史演变



- Beijing City Lakes formed by the ancient River way of Yongding River永定河古河道形成的北京城湖泊
- Jishuitan, Shichahai, Beihai, and Zhongnanhai come from the ancient river depressions.
  现今的积水潭、什刹海、北海、中南海都由古河道洼地积水而来。

2. Historical evolution of Yongding River 历史演变

Natural factors(自然因素):

Evolution

- Steep slopes, high flood peaks, high flow rates
  e.g. It takes only two and a half hours for more than 70 km.
- The river wandered to the south, north, left, and right after flowing out of the gorge, called "Wuding River".
  河身南、北、左、右游荡不定而得名"无定河"
- In the 37th year of Emperor Kangxi of the Qing Dynasty (1698 AD), it was firstly named Yongding River.
  清康熙三十七年(公元1698年)始定名为永定河

Characteristics

- Huge differences between flood and low flow
  洪枯水量相差悬殊
- The large amount of sand and the serious siltation of the river. 含沙量大，河道淤积严重
- The dikes are mostly silt and fine sand, easily be collapsed.卢沟桥以下河床，堤防多系粉细沙,易发生险情

2. Historical evolution of Yongding River 历史演变

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中国水利水电科学研究院减灾中心

Social factors(社会因素):

- With the rise of Beijing's status, the demand for nearby forests and land from urban construction and city life has grown, the upper reaches of the Yongding River are constantly being developed, resulting in the deforestation and exacerbating soil erosion.北京地位提升，城市建设和城市生活对附近森林和土地的需求不断增长，对永定河上游地区不断开发，导致森林被不断砍伐，加剧了水土流失。
- The mining of coal resources and the development of agricultural land occupied forest areas after the Yuan, Ming and Qing Dynasties, thus the environment is degraded. 元明清以后越来越规模化的煤炭资源的挖掘和农耕用地向山林区域的开拓,生态环境退化.

- Yuan Dynasty: the mountain picking and lifting station, the wood picking and lifting department etc.
元代设有采山提领所、采木提举司等机构专门掌管采伐木材

- Ming and Qing dynasties: similar institutions were set up to specialize in cutting firewood and burning charcoal.
明清时期，也有类似专管伐薪烧炭的机构设置

3. River treatment and urban construction in history 治理与城市建设

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中国水利水电科学研究院减灾中心

Historical flood control measures历史上的防洪措施

- Build dikes for water retaining 筑堤挡水

Jin Dynasty Earth embankment → Ming Dynasty Stone embankment → Qing Dynasty Extend the embankment

- The treatment of dangerous sections is mainly based on bank protection. 险工的治理主要是以护岸防护

Bank protection type:

- Forage revetment 埽工(埽料用秫秸或苇子，麻绳捆镶，层土层料，签椿镶于堤坡迎水面起到护岸作用)
- Water carrying stone dam 挑水石坝
- Permeable dam 透水坝
- Water reduction dams 减水坝

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Historical flood control measures

历史上的防洪措施

The famous "Eighteen Weirs" embankment near the Pang Village of Yongding River

永定河庞村附近著名的"十八蹬"大堤

The Jinmen Gate on the lower reaches of Yongding River (Guobao, Xuantong)

永定河下游的金门闸（国保，宣统）

The best-preserved ancient water conservancy project on Yongding River

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The earliest large-scale water conservancy project in Beijing

北京最早的大型水利工程

Liling Weir and Chexiang Canal
庚陵堰和车厢渠

As the first large-scale water diversion and irrigation project in the history of Beijing, it laid the foundation for the development and growth of Beijing. Yuyuantan where we are today is the core part of the irrigation district back then.作为北京地区历史上第一个大规模引水灌溉工程，为北京城市的发展壮大奠定了水利基础。今天我们所在的玉渊潭就是当年灌区的核心部位。

3. River treatment and urban construction in history 治理与城市建设

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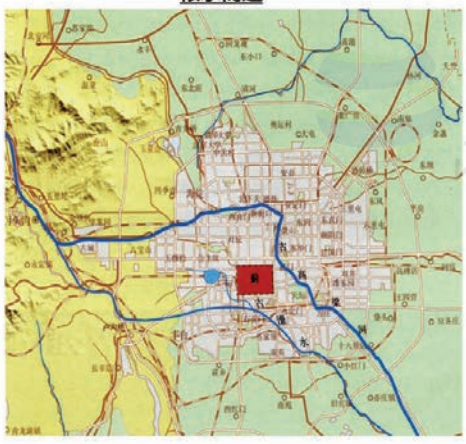
Built on the water

依水而建



The predecessor of Beijing was Jicheng, near the present-day Guang'anmen. The site was selected on the high land between Yongding River and the ancient Gaoliang River. The water source of Jicheng is today's lotus pond, whose area is more than ten times larger than it is now.

北京城的前身为蓟城，在今广安门附近。其选址在永定河与古高梁河之间的高地上。蓟城的水源地为今天的莲花池，其面积比现在大十倍有余。

3. River treatment and urban construction in history 治理与城市建设

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Developed by the river
依河发展

- Since Yongding River was the river with the largest amount of water flowing through Beijing at that time, it was rightly the first choice for water diversion and irrigation.由于永定河是当时流经北京地区水量最大的一条河，因此成为引水济漕的首选。
- According to the "Jin History · River Canal Records", due to the huge project, it takes three years for preparation, however, it was failed to reopen Jinkou River in Yuan Dynasty. 据《金史 · 河渠志》记载，因工程浩大，直到第三年才完成前期准备正式动工,但元重开金口河以失败告终。

Yuan failed to reopen Jinkou River.(元重开金口河以失败告终)

3. River treatment and urban construction in history 治理与城市建设

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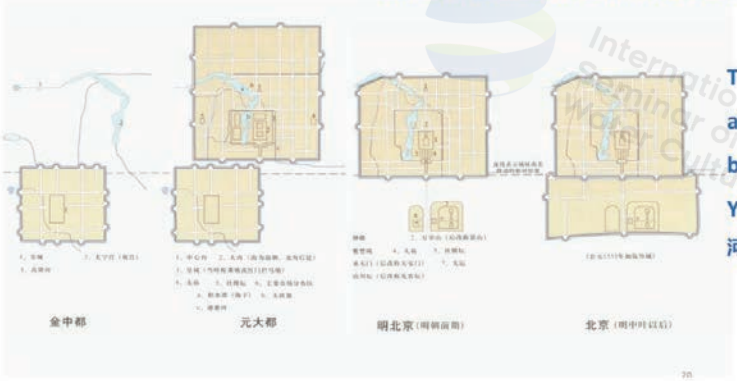
Set the city by water
以水定城

The central point and size of Beijing are identified by the scale of the river network, and the city water pattern is continued until present.
北京城的中心点及大小都是依据水系尺度而定的，城水格局一直延续到今天。



The river network in the city is an artificial water system formed on the basis of the ancient river channel of Yongding River. 城内水系是永定河(古漯水)古河道（三海）为基础形成的人工水系统。


永定河历史演变
与北京城市发展
04
The contemporary Yongding River and its urban development 当代永定河与城市发展
IWHR
CDR


4. The contemporary and urban development 当代与城市发展
水利部防洪抗旱减灾工程技术研究中心
中国水利水电科学研究院减灾中心
Upstream treatment（上游治理）
Building a series of reservoirs in the upstream, such as the Guanting Reservoir 在上游兴建一系列水库，如官厅水库
Carrying out water and soil conservation, such as close hillsides to facilitate afforestation, etc. 开展水土保持工作，如封山育林等
River channel improvement（整治河道）
Reinforcing the left embankment 左堤加固
Extending the stone embankment on the right bank 右岸石堤延长
Flood diversion projects（分洪工程）
Xiaoqing River flood diversion gate 小清河分洪闸
overflow weir on the right bank 右岸溢流堰
Liuzhuangzi flood diversion gate, etc. 刘庄子分洪口门等
Guanting reservoir
官厅水库
图 1 北京市中心城防洪防涝规划总体格局

4. The contemporary and urban development 当代与城市发展

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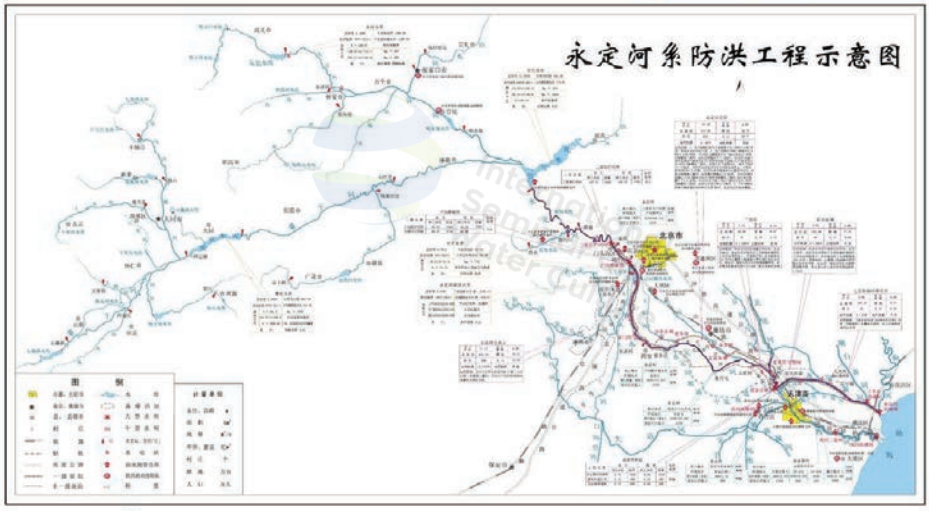
中国水利水电科学研究院减灾中心



4. The contemporary and urban development 当代与城市发展

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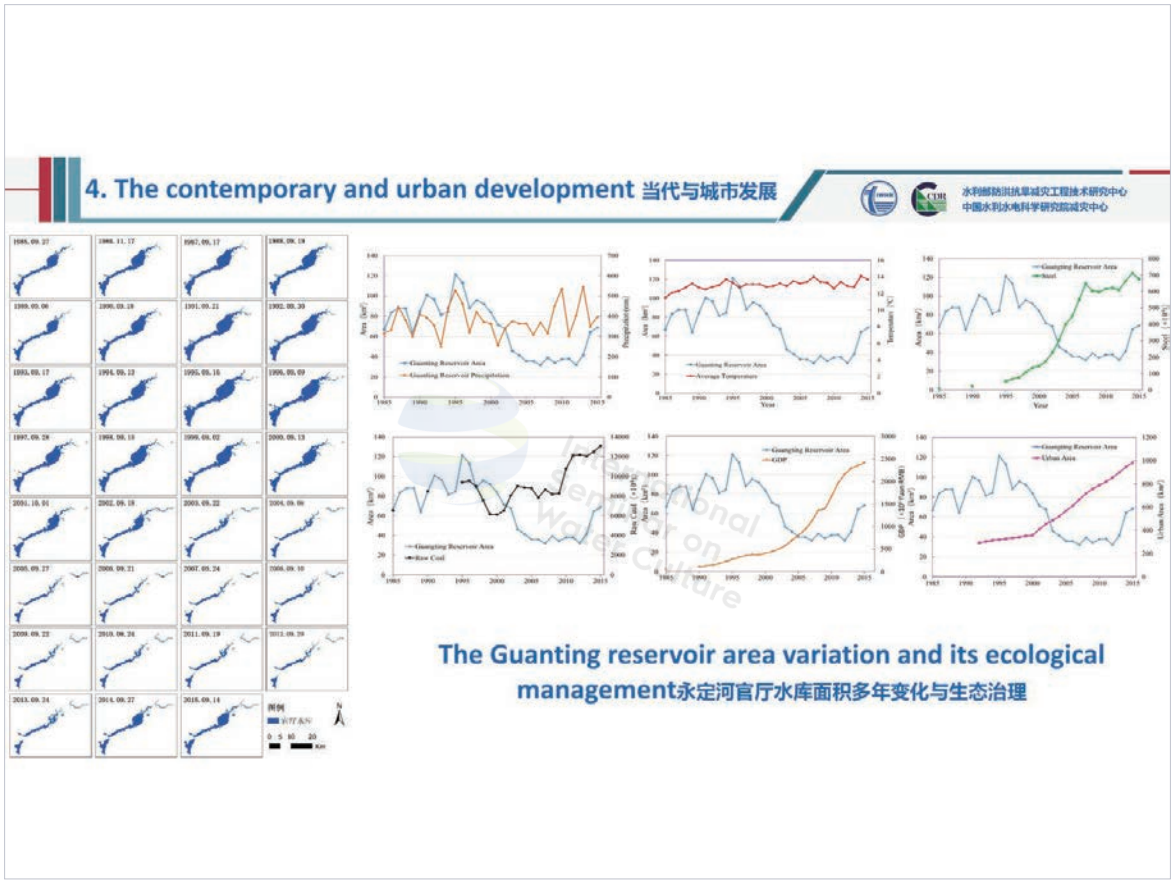
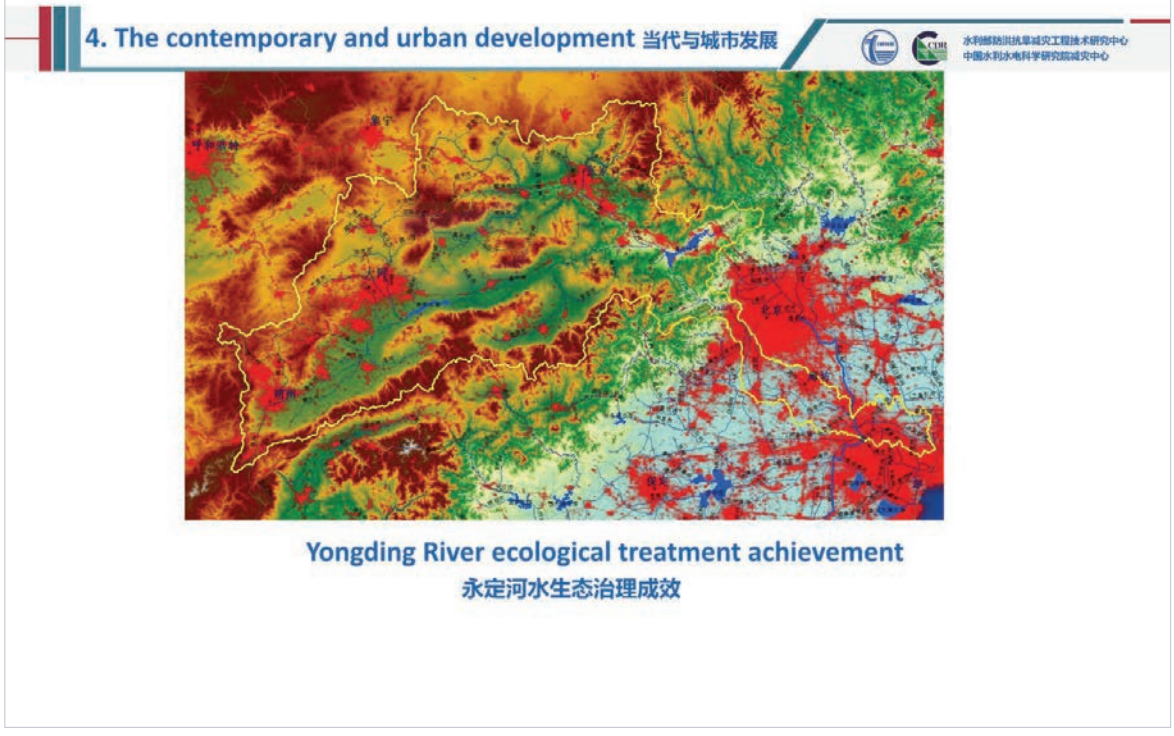
中国水利水电科学研究院减灾中心

- Yongding River began to dry up around 1980 and then cut off in 1996. The cut-off length is more than 500 km. 1980年前后永定河开始断流，1996年完全断流，长度有500多公里。
- The Yellow River was diverted into Guanting Reservoir through Wanjiazhai Reservoir from March to June in 2019. 2019年3月至6月通过万家寨水库引黄入官厅水库。
- The whole line of Yongding River was passed through the water from the South-to-North Water Diversion in this September.今年9月通过引南水北调的水，永定河全线通水。

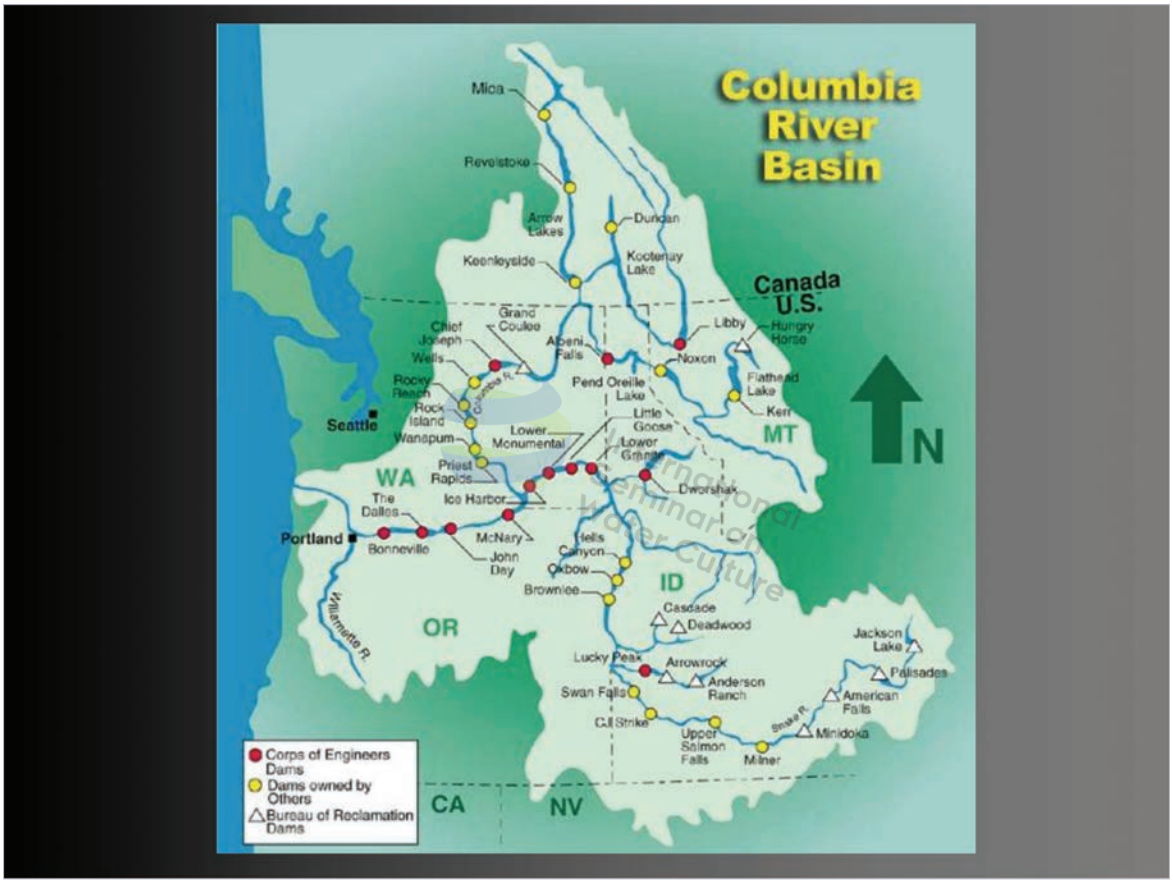

4. The contemporary and urban development 当代与城市发展
水利部防洪抗旱减灾工程技术研究中心
中国水利水电科学研究院减灾中心
The Guanting reservoir area variation and its ecological management永定河官厅水库面积多年变化与生态治理

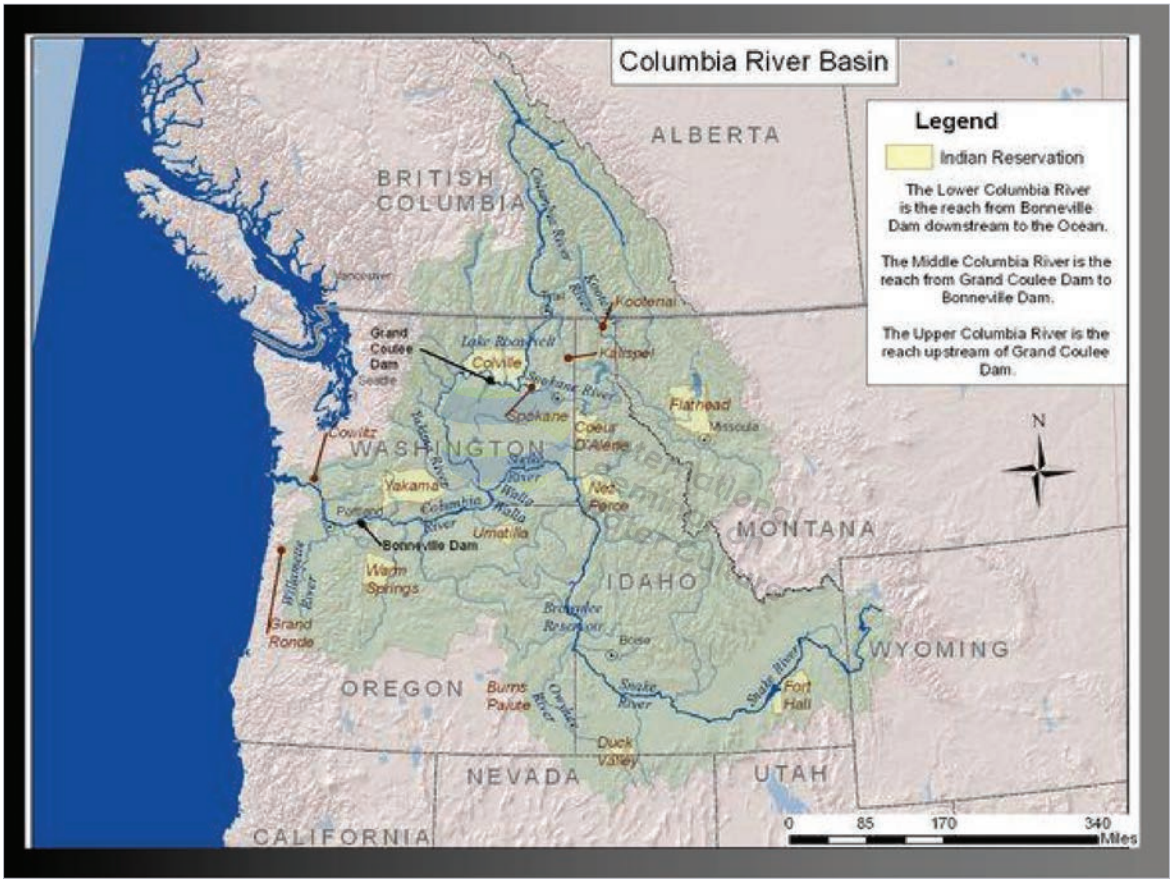

4. The contemporary and urban development 当代与城市发展
水利部防洪抗旱减灾工程技术研究中心
中国水利水电科学研究院减灾中心
Yongding River ecological treatment achievement
永定河水生态治理成效


敬请批评指正！
Thank you!

Teaching Water and Culture: The Grand Coulee Dam

David Pietz
University of Arizona


Columbia River Basin
Mica
Revelstoke
Arrow Lakes
Duncan
Keenleyside
Kootenay Lake
Canada
U.S.
Grand Coulee
Chief Joseph
Wells
Albeni Falls
Libby
Hungry Horse
Noxon
Rocky Reach
Pend Oreille Lake
Flathead Lake
Rock Island
Kerr
Seattle
Lower Monumental
Little Goose
Lower Granite
MT
Wanapum
Priest Rapids
WA
Dworshak
The Dalles
Ice Harbor
Portland
Bonneville
McNary
John Day
Hells Canyon
Oxbow
Brownlee
ID
Cascade
Deadwood
OR
Willamette R.
Jackson Lake
Lucky Peak
Arrowrock
Palisades
Anderson Ranch
Swan Falls
American Falls
C.J. Strike
Minidoka
Upper Salmon Falls
Milner
Snake R.
Corps of Engineers Dams
Dams owned by Others
Bureau of Reclamation Dams
CA
NV
N


Columbia River Basin
Legend
Indian Reservation
The Lower Columbia River is the reach from Bonneville Dam downstream to the Ocean.
The Middle Columbia River is the reach from Grand Coulee Dam to Bonneville Dam.
The Upper Columbia River is the reach upstream of Grand Coulee Dam.
ALBERTA
BRITISH COLUMBIA
Columbia River
Kootenai River
Kootenai
Grand Coulee Dam
Lake Roosevelt
Colville
Kalispel
Spokane River
Spokane
Coeur D'Alene
Flathead
Missoula
Cowlitz
WASHINGTON
Yakima
Nez Perce
Columbia River
Walla Walla
Portland
Umatilla
MONTANA
Bonneville Dam
Willamette River
Warm Springs
IDAHO
Grand Ronde
Boise
WYOMING
OREGON
Burns Paiute
Owyhee River
Snake River
Fort Hall
Duck Valley
NEVADA
UTAH
CALIFORNIA
0 85 170 340 Miles
N

If FDR never done another thing, he was a great man for authorizing Grand Coulee Dam. He saved the West…We didn't have water or electricity in the house until 1936. The dam can still irrigate another half-million acres. This country wasn't worth a tinker's damn until the dam went in. starvation country, that's what it was.

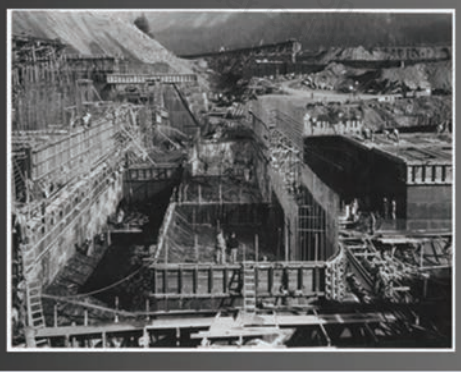
-Skip Lael, *We Built this Dam*, Oral History (Grand Coulee Visitor Center)

TWO DIFFERENT MEMORIES

It [Grand Coulee Dam] destroyed a lot of people. Our chief died and a lot of people died mostly from heartbreak, I think, because they lost Kettle Falls. To me it destroyed a lot of things, destroyed a lot of families. A lot of families broke up from…moving away from their homeland.

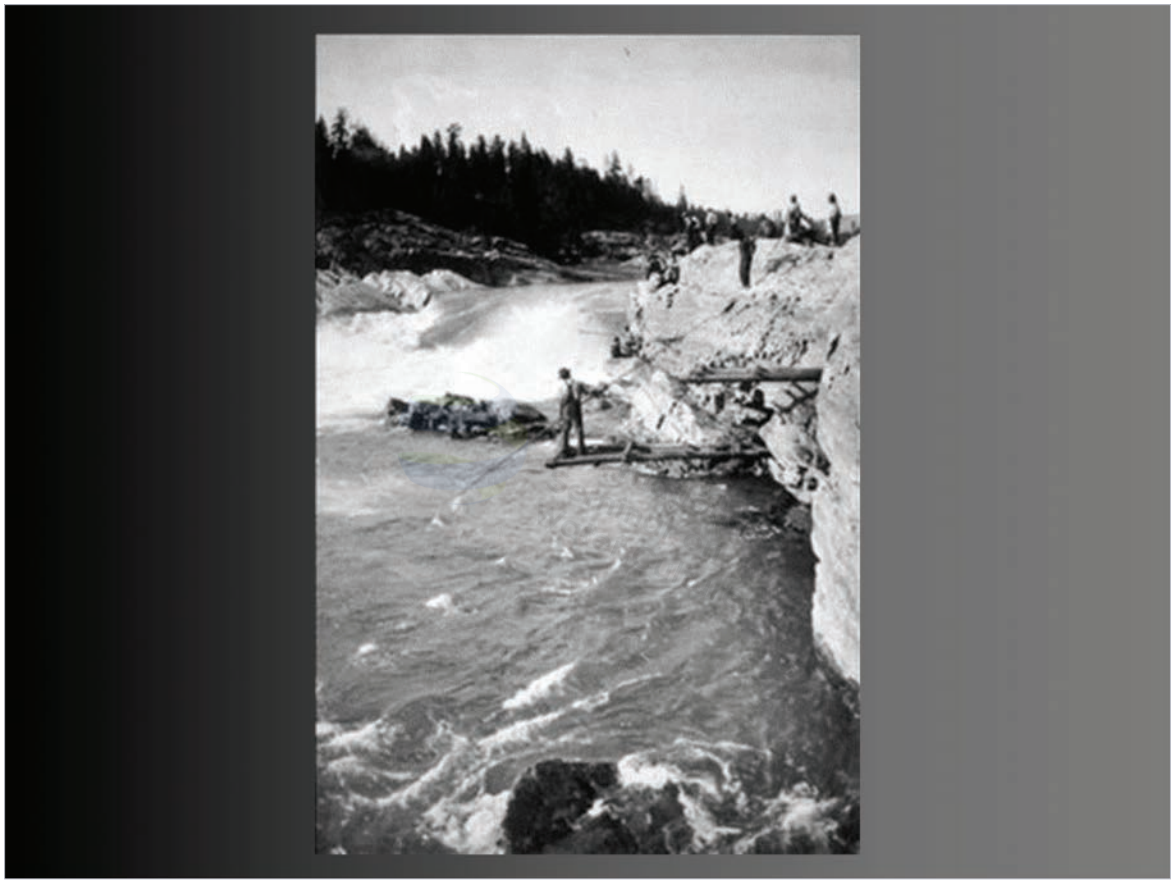
-Janette Timantwa, *Our Stories*, Oral History (Grand Coulee Visitor Center)

Inspired by these very different reflections on Grand Coulee Dam, this presentation explores how different social groups experience history – actual historical events, and the memory of those events. More specifically, I focus on the history of Grand Coulee Dam as a landmark of contested narratives. One narrative celebrated the social, economic, and cultural power of modernity. The other focused on the loss of indigenous cultural identities and practices. A central question is how social groups experience and interpret transformative changes of the landscape.



The idea of modernization was accepted by most Americans during the mid-20th Century as engineers, scientists, and political leaders joined forces to build a progressively better world. Industrial technologies enabled a grandiosity unknown in earlier generations as rivers were dammed, reservoirs built, and hydropower stations electrified the nation. The dam lit and heated homes, ignited dreams of an agricultural Eden through massive irrigation, powered the aluminum and airplane factories of the Pacific Northwest during World War II, and generated power to produce plutonium for the atomic bomb that devastated Nagasaki. The dam helped catapult the nation into the "American Century," and was immortalized as the "Eighth Wonder of the World." As Harry Truman asserted, "With this dam, man's ingenuity and perseverance have dramatically transformed the energy of a mighty river into a great new source of national strength."

The indigenous peoples living in the Columbia River watershed did not share this optimism. In contrast to the sentiments expressed at the dedication of the Grand Coulee Dam by President Truman (in 1950), some 10,000 members of the Colville, Yakama, Spokane, Nez Perce, Flathead, Blackfeet, Coeur d'Alene, Tulalip, and Pend d'Oreille tribes gathered at Kettle Falls a decade earlier for a "Festival of Tears" to lament the inundation of this important fishing site. To them, the construction of Grand Coulee Dam was, and remains, a story of destruction. Their narratives are often framed by themes of displacement and loss of cultural, social, and economic traditions. Salmon runs on the middle and upper Columbia River were disrupted. Before the dam, Native Americans from multiple tribes gathered at Kettle Falls from mid-June to early fall to fish salmon. Methods of catching fish derived from generations of acquired expertise. In perhaps the most dramatic and memorable form of fishing, fishers perched precariously over "kettles" (or potholes) on platforms equipped with long-handled dip nets to catch salmon during their annual passage up the falls. As recalled by a Spokane Tribal Elder, "Everybody ate fish. You could go down to the river in the morning and catch 8-10 fish . . . You used to be able to catch all you wanted." (Joe Brisboys, 1999) Kettle Falls was also a major center for trade on the Columbia Plateau. In order to insure a sustainable salmon population, catches were regulated by a "salmon chief" from the Colville Tribe. All of this changed when Grand Coulee Dam was built. Once Kettle Falls was inundated in 1940 the lifeways of river and peoples were indelibly transformed.




KETTLE FALLS, COLUMBIA RIVER
THIS IS OUR STRENGTH
ELECTRIC POWER
Canada's developed Hydro resources have increased over one-quarter since 1939, and the output of electricity from our generating stations has gone up by one-half. This water power is the bulwark of our manufacturing strength in war. It also gives promise of wealth for tomorrow, when more electricity can be made available for new factories, for homes, and farms.

This project confronts the Grand Coulee Dam as a landmark of alternative perspectives that suggest the complexity of the American experience. Content is organized around three central questions:

1) How did Grand Coulee represent the material and moral aspirations of the United States during the mid-20th Century

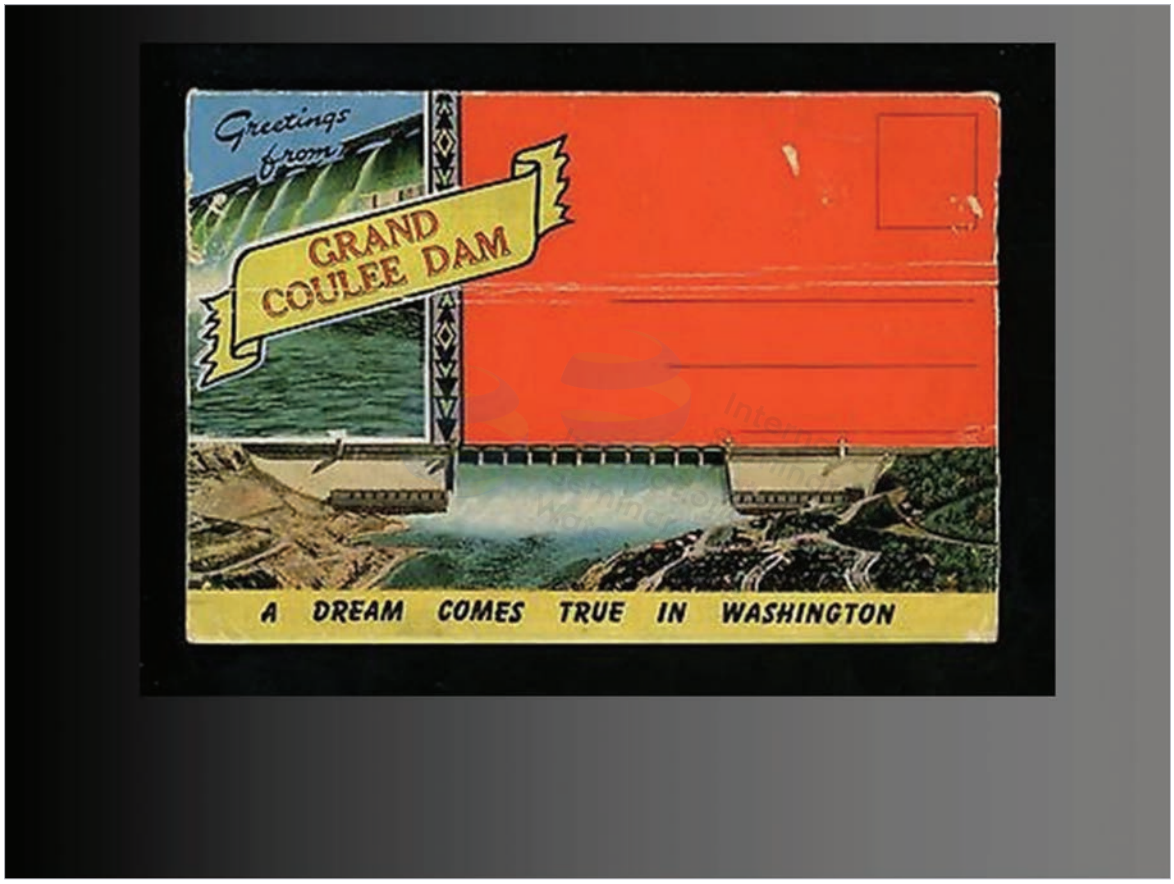
2) How did indigenous peoples experience the re-plumbing of the Columbia River valley?

3) How do we guarantee the rights of the minority?

4) How do we maintain pluralistic values and practices?

5) How do we define the collective good? And ultimately, do the means justify the ends in pursuit of that "collective good?"

6) How would we write our own narrative of Grand Coulee?


Greetings from
GRAND COULEE DAM
A DREAM COMES TRUE IN WASHINGTON

Hydro-technologies during the Minoan times in Greece

Webinar on the International Water Culture Discussion Series,
Beijing, China, 18th November, 2021

Prolegomena

(Paschou *et al.*, 2014)

In our country there is a long history, tradition and a heavy heritage on sciences and technology, extending to Minoan civilization (ca 3200-1100 BC).

Characteristics of Minoan Culture

1. *This period of ascendancy was called* ***the Pax Minoica*** *or "****Minoan peace****"; in place when cities needed no walls by Arthur Evans (1921-1935).*

2. The multicolored wall-paintings in Minoan "palaces" depict a **life full of creativity, good taste and in complete harmony with the natural environment** (Evans, 1921-35).

Cont'ed

3. The Minoans **did not participate in hostilities, like other did.** For example:
   (a) Sumerians against Uruk, Larsa, Aksak, ...
   (b) Babylonians against Sumerians and Elamites
   (c) Assyrians and Hittites against Babylonians ... ..
   (d) Egyptians against Libya, Persian, Phoenician ...
   On the other hand in several cases **they acted as reconciliators** (Brockley, 2020).

Cont'ed

4. This civilization is an **astonishing paradox**:
A great power without a military aristocracy; a "palace" that was not a royal residence and neither the king was glorified; a religion with no greatness, while women were equal to men and free (Hirschfeld, 2013).

5. John Younger (2008), who has studied the Minoan culture for decades, reported that women figured prominently in art and religious artifacts and therefore probably in the administration of the Minoan civilization as well (Budin and Turfa, 2016).

Cont'ed

6. According to S. Marinatos and others, the Minoans existed in the Eastern Mediterranean and mainly in the Aegean, until Miletus, which they founded. Their presence in Thera, which they also ruled, was also special. Among the many Minoan finds of Thera, the most notable were the specimens of the Minoan Linear Writing A', as well as the lead weights that weighed exactly according to the Minoan system (Marinatos, 1964).

7. Also on the toichographies many facets, clothing, headdresses and jewelries were Minoan. It was a triumph of the Paminoists and personally of Marinatos, who exploited the Junta many times, both as the director of the Archaeological Service and in its excavation. No one dared to contradict him,

Minoan Thalassocracy

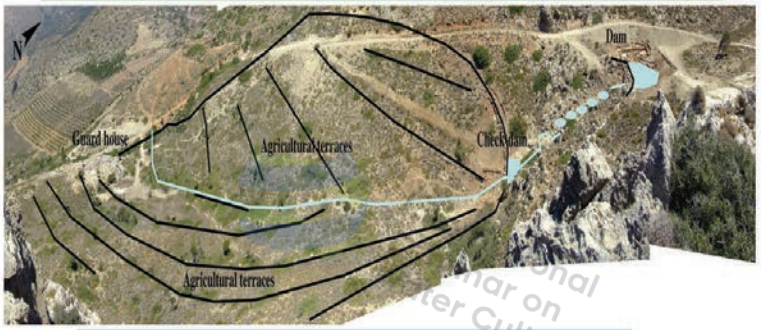
S. Marinatos, was the first to discover a color toichography in a house, which presents a whole fleet of ships consisting of seven large and three boats in the shape of a "crescent". This treasure is considered to be of capital importance, not only artistically, but also historically (Saroglou-Tsakou, 2014).

Marinatos also collected 30 seal stones with illustrated ships from Minoan Crete. It thus proves that the Minoans developed and used various types of ships probably before ca 1500 BC (Basch, 1987).

Modern reconstruction of a Minoan ship.

Irrigation practices of Minoans: The project of Choiromandres

Irrigation System at Choiromandres (Angelakis et al., 2020)



No defensive walls in Minoan Settlements

View of the "palace" of Phaistos

Part of the defensive wall and the Lions Gate at Mycenae in central Creece

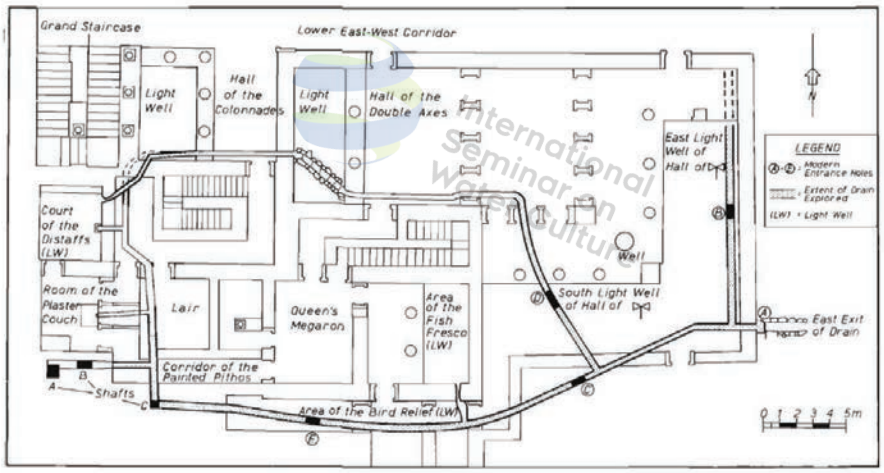
Minoan Era (ca 3200-1100 BC)

Throughout the history of human kind, one of the most remarkable and advanced achievements is the water supply and sewerage and drainage systems of the Minoan period (Evans, 1921-1935).

In each "palace", town and other settlements, these and other waterworks were perfectly constructed and protected, very functional, decentralized, cost-effective and friendly to the environment (Angelakis, 2017a).

Part of the central drainage sewerage network in the small "palace" of Knossos (left) & Mycenae (right) (Angelakis, 2017b)

The drainage and sewerage network of the "palace" of Knossos
(Mac Donald and Driessen, 1988)



During the Minoan Era nothing was more remarkable and elaborate than the drainage and sewerage systems

At the beginning of the 20th century, the writer and health scientist Angelo Mosso visited the Villa of the Agia Triada during an intense downpour and noted that the entire drainage system was working perfectly. Mosso recorded it by indicating that:

"I doubt if there is another case of storm water drainage system, which works 4000 years after its construction".

Cont'ed

Each quarter of the "palace" had its own subsidiary drainage system connected to the central drain. These systems had vertical shafts of ample size which acted both as roof drains and as ventilation ducts, the latter in much the same manner as do the soil stacks in our the modern house.

Perhaps we also may be permitted to doubt whether or not our modern sewerage systems will still be functioning after even one thousand years.../

Gray H. (1940). Sewerage in Ancient and Mediaeval Times. Sewage Works J. 12.5: 939-46.

Conclusions

- The "Water Resources Engineers" in the ancient Hellenic civilizations, from the Bronze Age, had basic knowledge of hydraulics, sustainability, environmental protection and hygiene.
- The water resources projects impress by their excellent design and adaptability to the environment, their technological differentiations, depending on the local conditions and the time of their operation, which in many cases reaches a few millennia.
- The basic principles and rules for designing and constructing hydraulic works, such as water, drainage and sewerage that first developed in the Minoan era, were improved in Historic times and especially in the Classical and Hellenistic period.
- During the Roman period they grew even more, especially in terms of their scale.

Take Home Message

Given that today:

2.6 billion people do not have adequate hygiene conditions,
2 billion people drink polluted water,
1.8 million people/yr die from related diseases.
$ 260 billion/yr are lost due to lack of adequate water supply and drainage. And
On average, every $ 1 invested in such projects yields $ 4:

Probably the study and exploitation of the Minoan water related practices and combined with the current available knowledge and technologies, could improve the current situation, especially in the developing world, with environmentally friendly, low cost and high-performance technologies.

WHO (2018)
https://www.who.int/en/news-room/fact-sheets/detail/drinking-water

Joint IWA/IWHA-SG on WAC

Thank you for listening