

Economics of Wetlands and their Restoration Through Nature Based Solutions

Centre for Science and Environment Webinar on Lakes and Water Bodies
8th October 2025

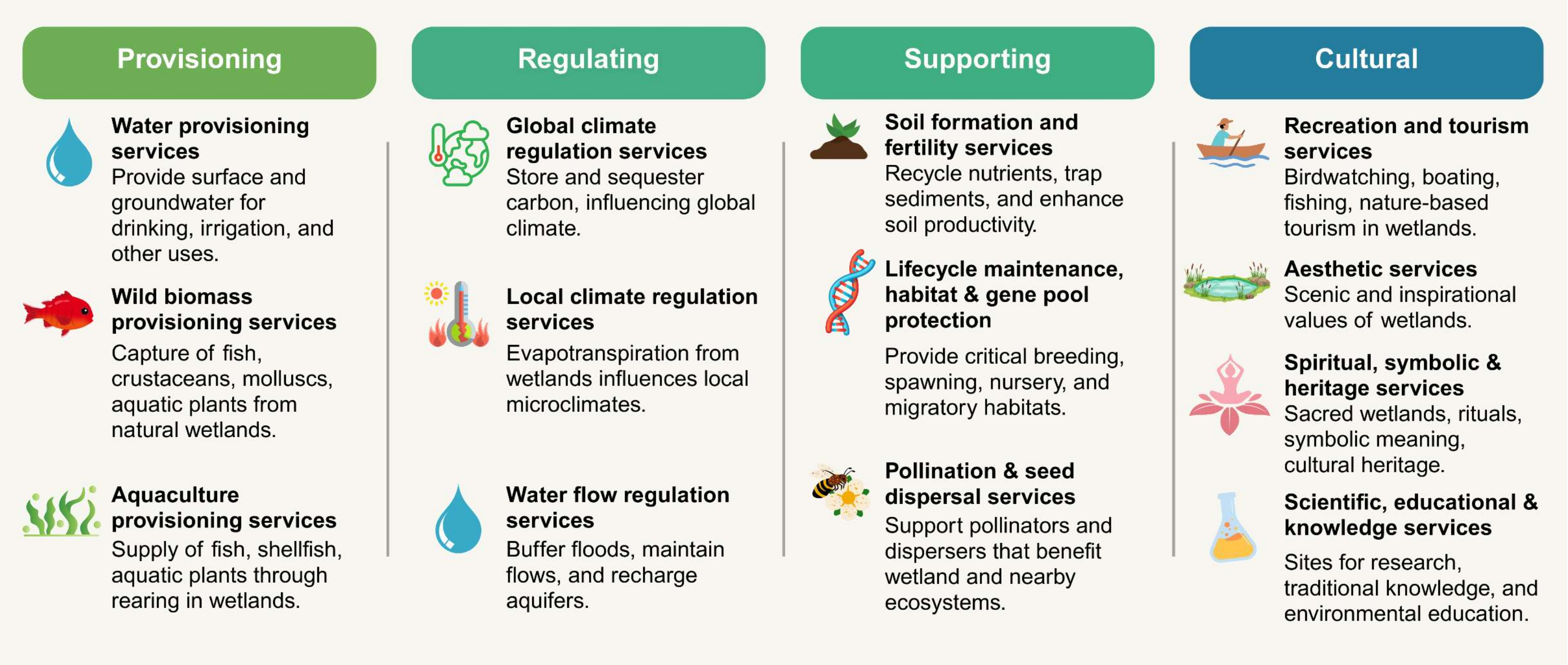
MADHU VERMA

Senior Economic Adviser and Chief Environmental
Economist

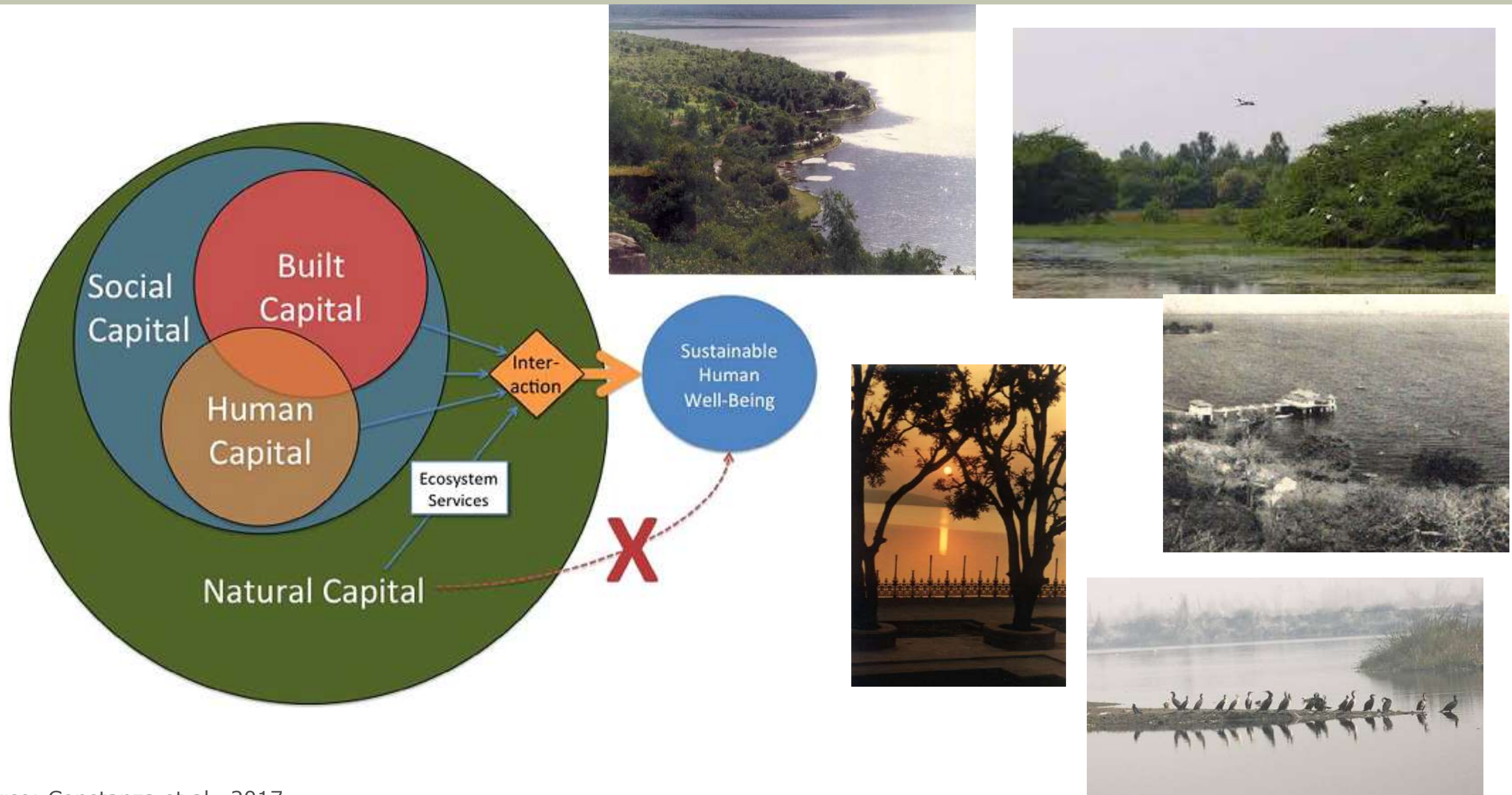


Natural Capital of Wetlands

The natural capital of wetlands refers to their inherent **Natural Assets**—such as soil, water, plants, and animals—that provide essential **Ecosystem Services** (benefits to the human population) and **Biodiversity** - variety of life within wetlands and the rich habitats they provide

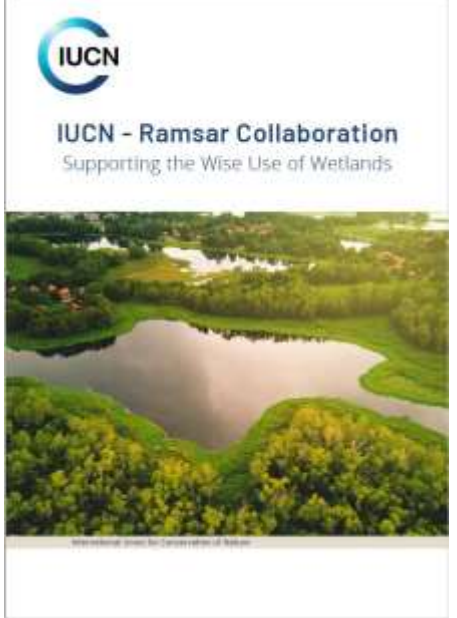


The interaction between built, social, human and natural capital

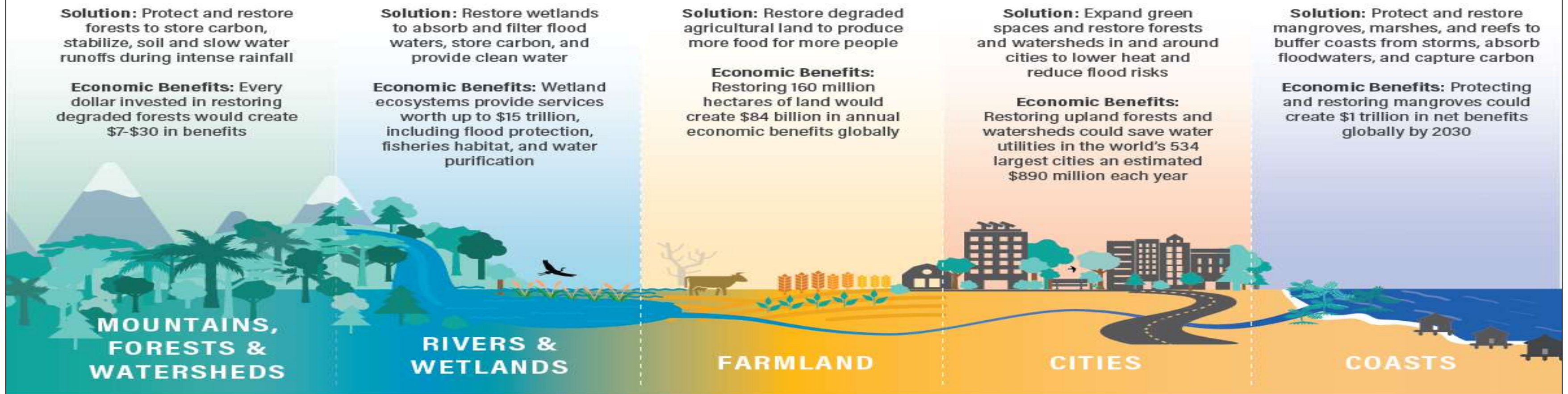


Ecosystem Restoration and Nature Based Solutions

- 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)
- Help Building back Better



Nature-Based Solutions Can Deliver Big Economic Benefits



Source: Verdone and Seidl, *Roots of Prosperity* (Forests); Millennium Ecosystem Assessment (Rivers & Wetlands); A. Wu, *How Can Restoring Degraded Landscapes Deliver Financial Returns?* (Farmland); The Nature Conservancy, *Beyond the Source* (Cities); Global Commission on Adaptation, *Adapt Now* (Coasts).



Nature Based Solutions (NbS)



- Nature-centric and cost effective
- Rooted in local tradition; culturally appropriate
- Localized solutions to global problems
- Strengthening ecosystems (natural), livelihoods (economic) and social capital
- Economics of NbS-Paradigm shift to a new inclusive system
 - Moving beyond GDP figures
 - Recognition and capture of hidden values and co-benefits
 - Inclusion of a wider set of ecosystem services (eg. cultural),
 - Qualitative aspects to understand the context and traditional narrative



Nature-based solutions (NBS) utilizing wetlands

- a critical strategy for addressing climate change, water security, and biodiversity loss.
- Provide a wide array of benefits, such as water purification, flood control, carbon sequestration, and supporting biodiversity.

How Wetlands Function as NbS:

Water Management:

- Wetlands act as multifunctional systems that store excess runoff, slowly release it during dry periods, and recharge groundwater.

Flood and Drought Mitigation:

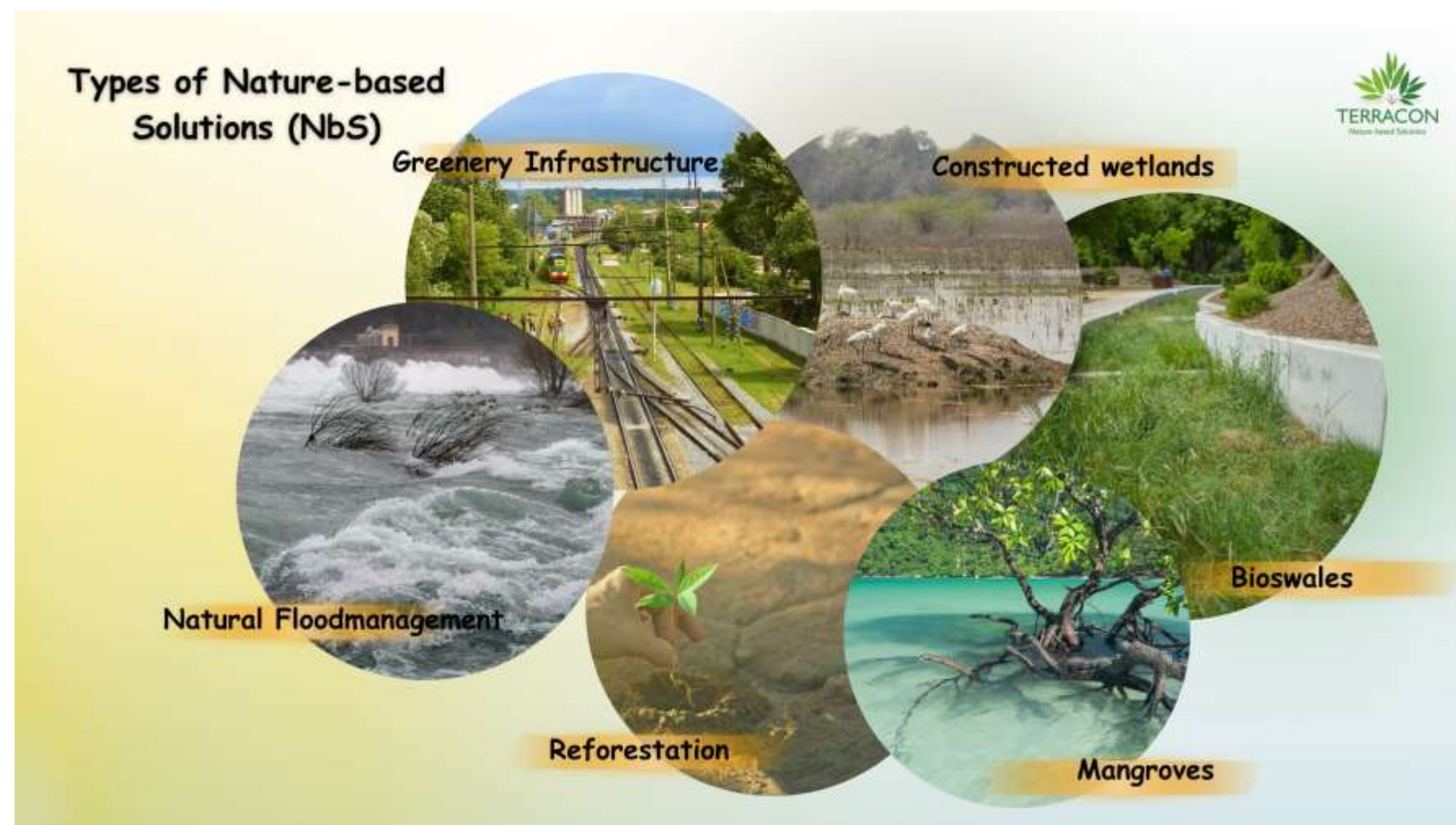
- They serve as natural buffers, absorbing floodwaters and reducing the duration and severity of droughts.

Water Quality Improvement:

- Wetlands help remove or reduce organic and inorganic pollutants from various sources.

Ecosystem Health:

- They maintain ecological integrity, support biodiversity, and provide essential services for both human well-being and the environment.



Key Initiatives in India

•MISHTI (Mangrove Initiative for Shoreline Habitats and Tangible Income):

- This program focuses on restoring degraded mangrove ecosystems, which are vital wetlands that provide coastal protection and support local incomes.

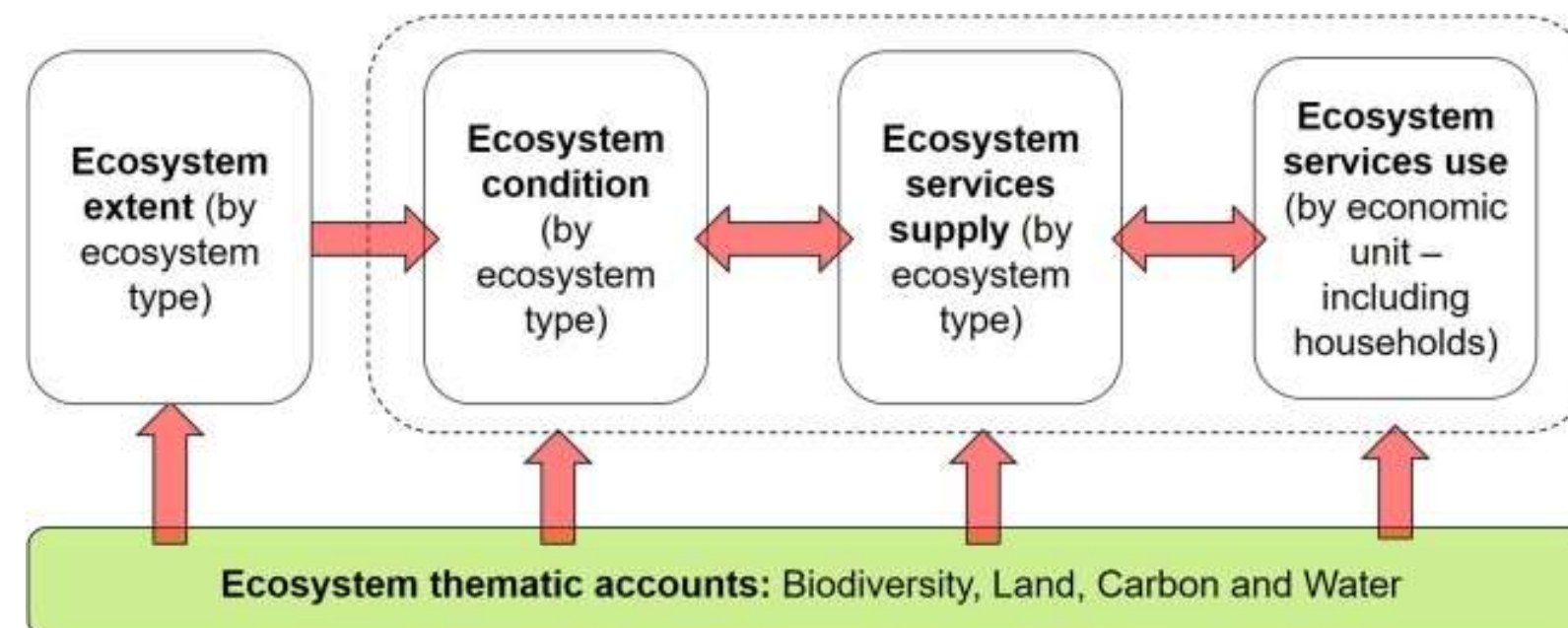
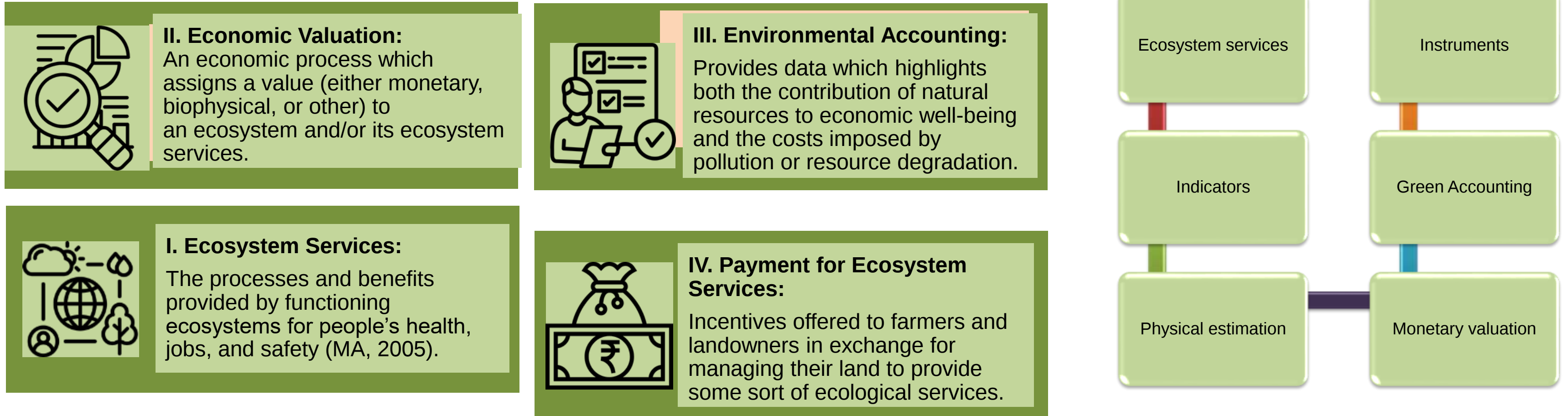
•Amrit Darohar Scheme:

- This initiative promotes the optimal use of wetlands, focusing on livelihood development for local communities and the preservation of wetland ecosystems.

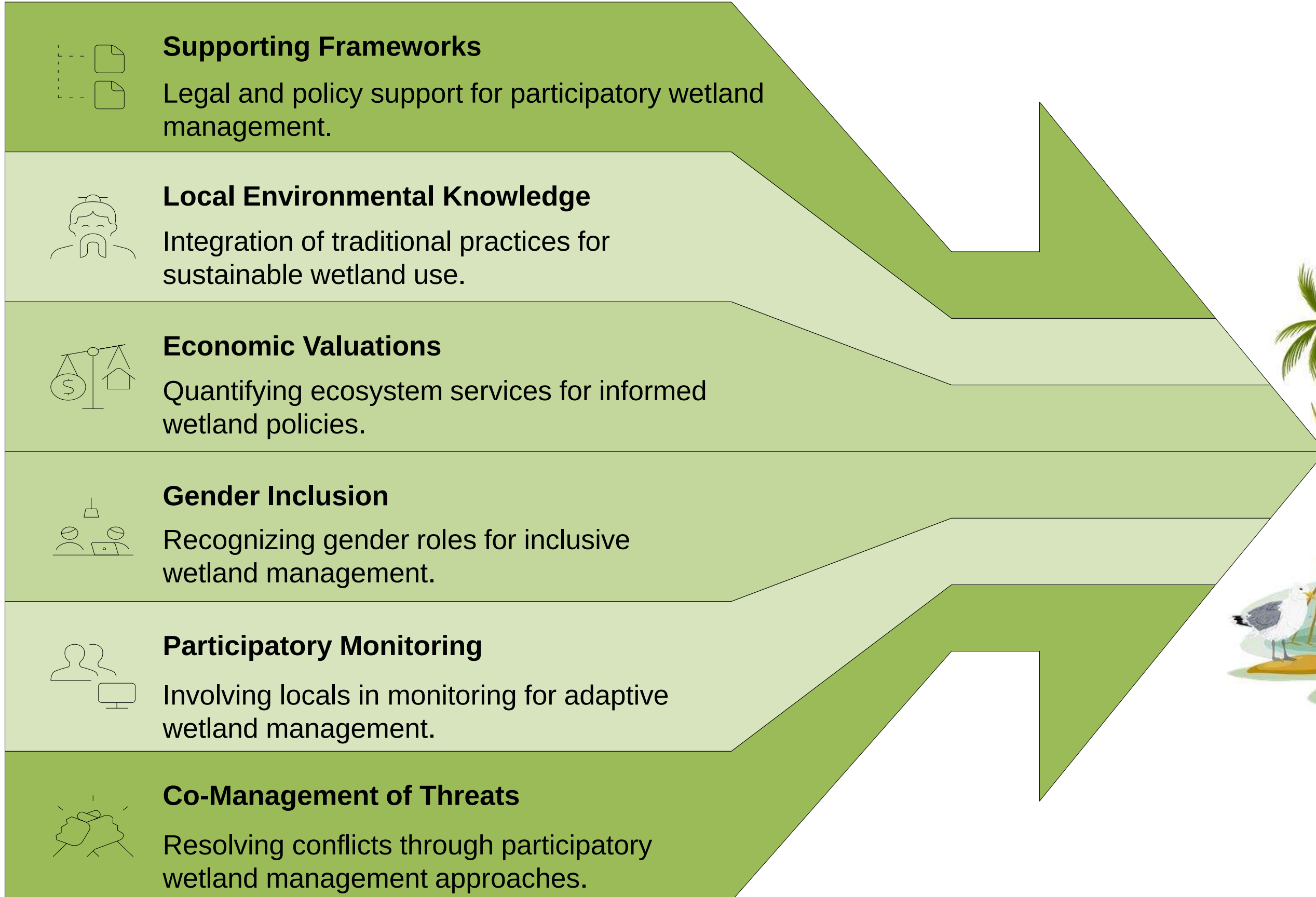
•Wetland Management Plans:

- India is developing management plans, including health cards for specific wetlands, to integrate scientific

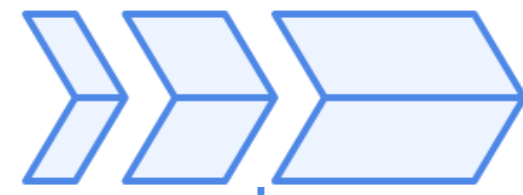
Process Flow of Putting Economic Valuation & Accounting to Practice



Tools for Wise Use of Wetland



Wetlands for Livelihood & Climate Resilience: 5M Framework



Map

Stakeholder mapping (fishers, farmers, washerfolk, vendors, urban residents)

Wetland catchment & land use mapping

Identify inflows: sewage, silt, nutrients



Measure

Water quality (DO, BOD, nutrients, bacteria, turbidity)

Weed/biomass extent & soil fertility

Ecosystem service valuation (water, recreation, habitat)

Socio-economic baselines (livelihoods, disease costs, income levels)



Model

Wetland dynamics model (population → sewage → water quality → livelihoods)

Scenario testing for interventions (sewage diversion, de-weeding, organic farming)

Climate resilience pathways (flood control, carbon storage, heat buffering)

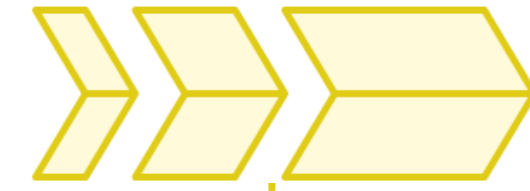


Monitor

KPIs: water quality, fish yields, farm income, recreation revenue, health outcomes

Quarterly dashboards + citizen/public reporting

Governance: Wetland Management Committee with multi-stakeholder oversight



Monetize

Voluntary contributions & recreation/tourism fees

Lakefront value capture (property levies)

PES/IBMs for upstream farmers (inputs, certification, price premiums)

Carbon credits & co-benefits financing

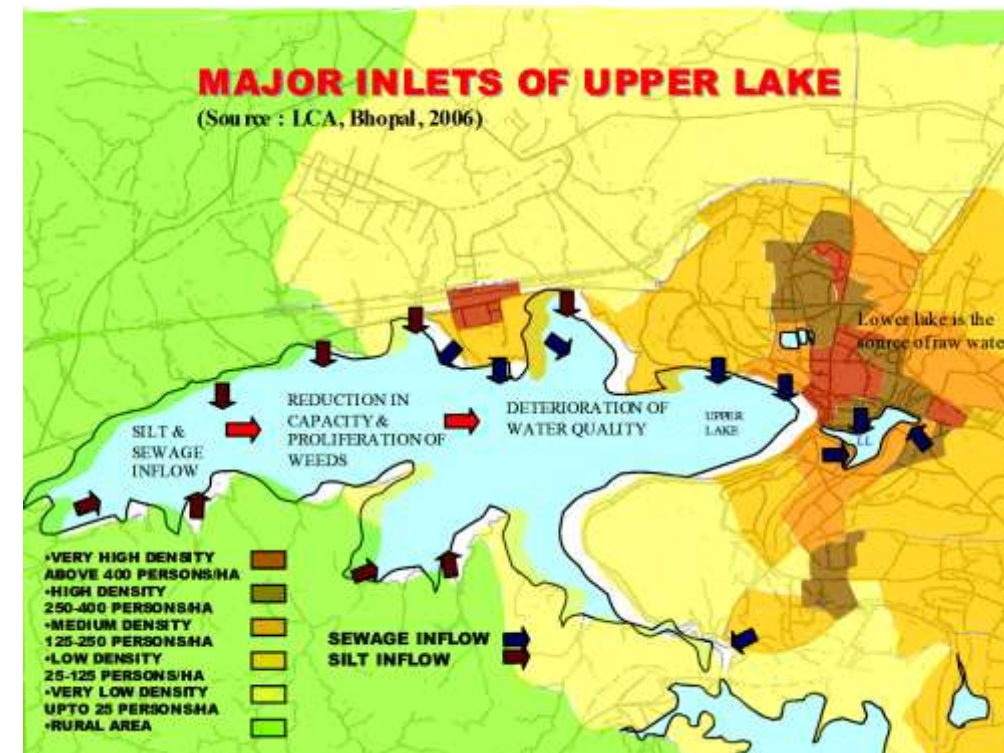
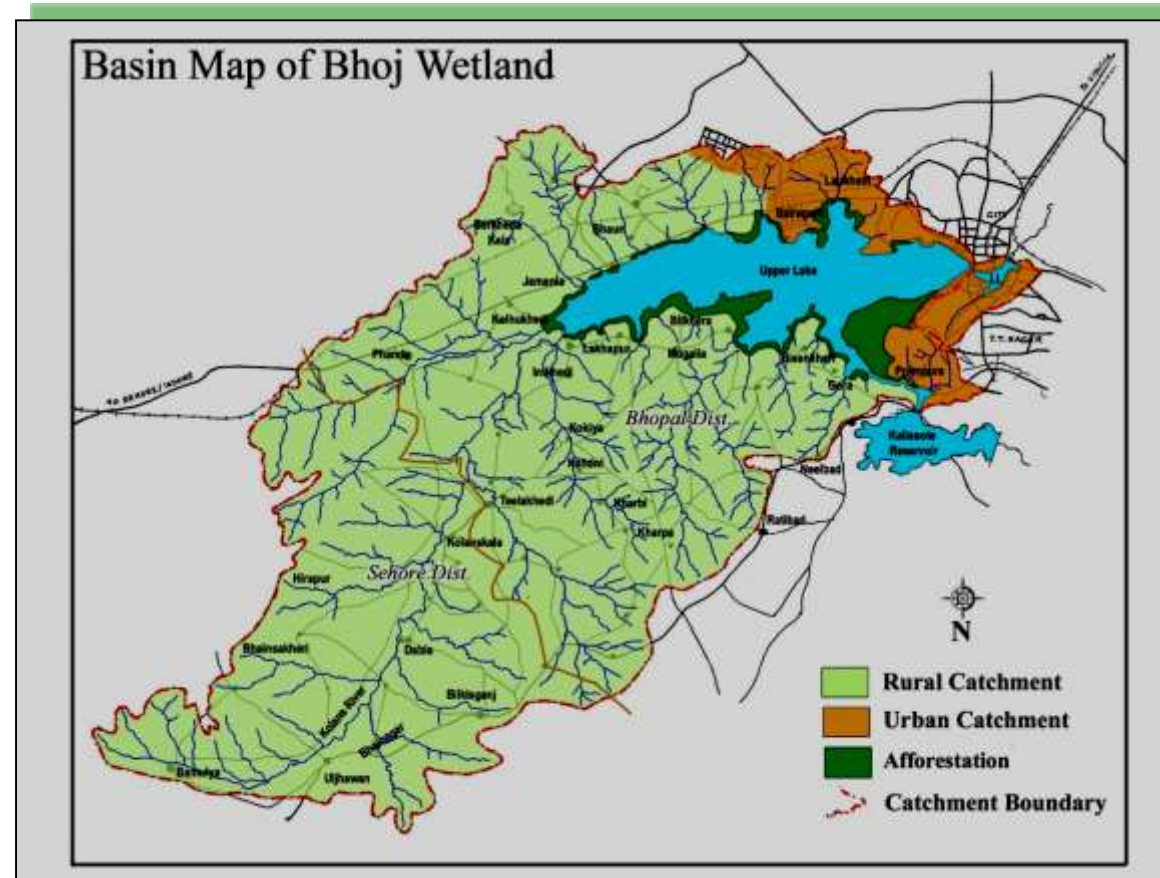
Background:

- Consists of **Upper & Lower lakes**, declared **Ramsar Site (2002)**
- Provides **40% of Bhopal's drinking water** (~28 MGD)
- Supports livelihoods (fishermen, washermen, boatmen, trapa cultivators, vendors)
- Delivers ecosystem services: microclimate regulation, recreation, biodiversity support



Threats

- Siltation (1–2.58 cm/year) & sediment inflow
- Sewage inflow (7,500 m³/day) + industrial & detergent waste
- Encroachment & eutrophication (33+ km² affected by weeds)
- Religious immersions, hospital waste, motor boating impacts



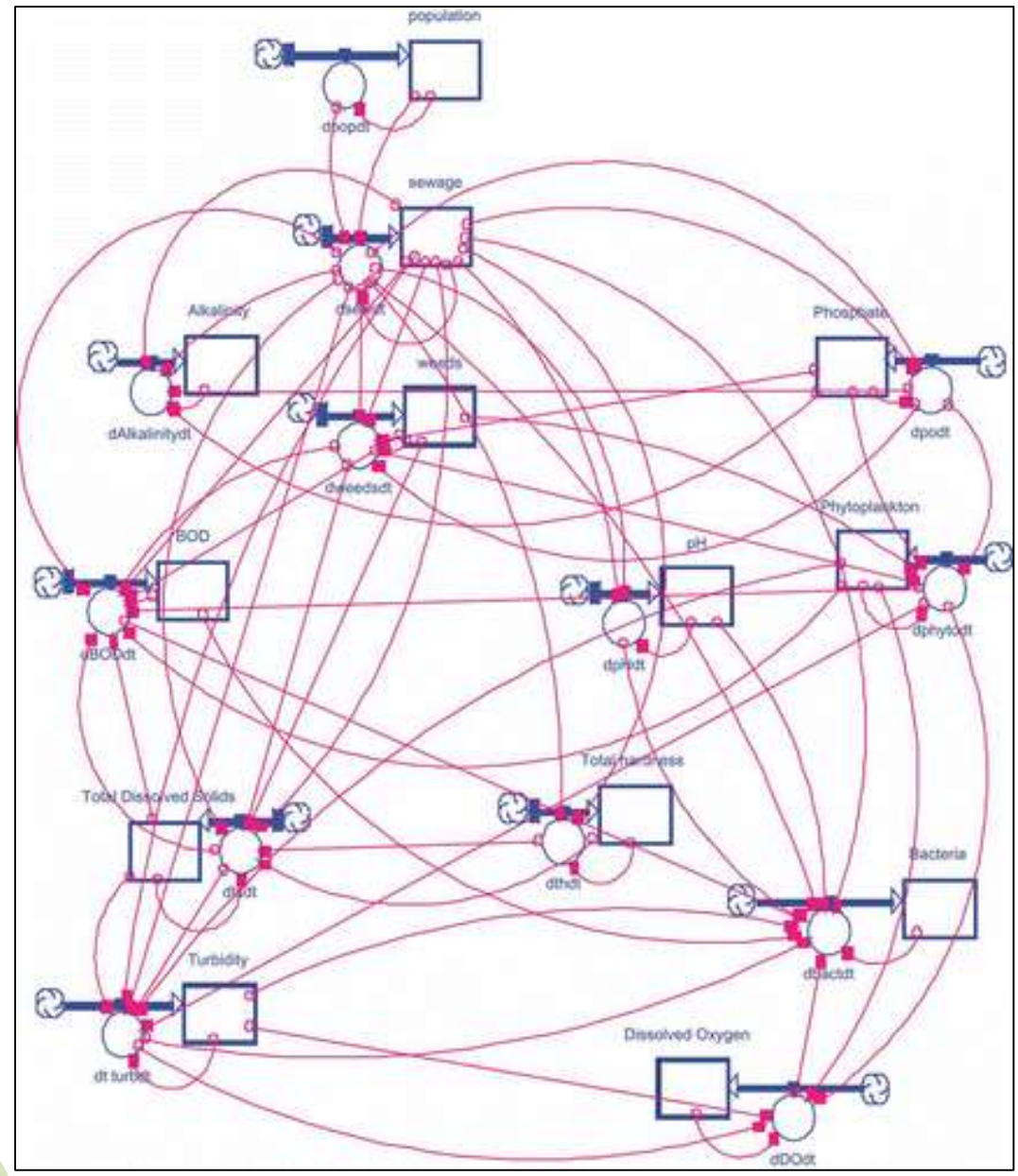
Source: Verma et. al., 2001; Verma, 2008, Verma & Negandhi, 2011

ECOSYSTEM SERVICES PROVIDED BY THE BHOJ WETLAND

- * DRINKING WATER
- * RECREATION
- MICROCLIMATIC STABILISATION
- AESTHETIC
- SEWAGE TREATMENT
- NUTRIENT CYCLING
- CARBON SEQUESTRATION
- SOIL FORMATION
- WATER REGULATION
- WATER PURIFICATION
- SHELTER FOR ANIMALS AND BIRDS
- EMPLOYMENT



Water Resource Modelling Using STELLA



RESTORATION ACTIVITIES

- DESILTING AND DREDGING WORKS
 - DESILTING AND DREDGING OF LAKES
 - DEEPENING AND WIDENING OF THE SPILL CHANNEL
 - RESTORATION OF THE TAKIA ISLAND
- CATCHMENT AREA TREATMENT
 - AFFORESTATION, CREATION OF BUFFER ZONES
 - CONSTRUCTION OF CHECK DAMS, SILT TRAPS, TOE WALLS
 - CONSTRUCTION OF GARLAND DRAINS AROUND LOWER LAKE
- SHORELINE AND FRINGE AREA MANAGEMENT
 - RETGHAT LALGHATI ROAD
 - SOLID WASTE MANAGEMENT
 - PREVENTION OF POLLUTION FROM DHOBI GHATS
- WATER QUALITY MANAGEMENT
 - DEWEEDING
 - MONITORING OF WATER QUALITY
 - INSTALLATION OF FLOATING FOUNTAINS, OZONISERS
 - AQUACULTURE



Economic Valuation Findings (IIFM Study, 2000)-at 2025 prices

- Drinking Water Supply: **₹40.04 crore/year**
- Fisheries: **₹3.36 crore/year**
- Trapa Cultivation: **₹2.10 crore/year**
- Recreation (WTP – Voluntary): **₹20.15 crore/year**
- Lakefront Property Premium: **50% higher values**
- Total: Multiple direct & indirect values **not captured in official accounting**

Median FINVOL per household per annum = Rs 241.00/- (US\$ 5.35)	Total Number of households in City = 2,01,116	Total Voluntary WTP per annum = Rs 4,84,68,956/- (US\$ 1,077,087)
Median FINTAX per household per annum = Rs 29.50/- (US\$ 0.65)		Total WTP as tax per annum = Rs 59,32,922/- (US\$ 181,842)

Implications for Natural Capital & Policy

- Wetland services are **undervalued or unpriced** in decision-making
- Economic valuation showed that **WTP for conservation > maintenance costs**
- Highlights need for **environmental accounting** to be integrated into city planning, GDP, and water management
- Supports **participatory governance** and **beneficiary-pays model**
- Demonstrates how **natural capital accounting** strengthens wise use strategies

Study findings used for seeking Ramsar status for BWLs & in the creation of Bhoj Wetland Management Agency



Iora Ecological Solutions Pvt. Ltd.
635 – 636, GF, Lane Number 3, Westend Marg, Garden of
Five Senses Road, Saidulajab Village, New Delhi- 110030

Email: madhu@ioraecological.com

Website: www.ioraecological.com

Tel: +91-9300803479