A compendium of
RIVER MANAGEMENT PLANS

From Managing River Basins to River Specific Projects

NAMAMI GANGE

National Institute of Urban Affairs

WATER & ENVIRONMENT VERTICAL

A COMPENDIUM OF

RIVER MANAGEMENT PLANS

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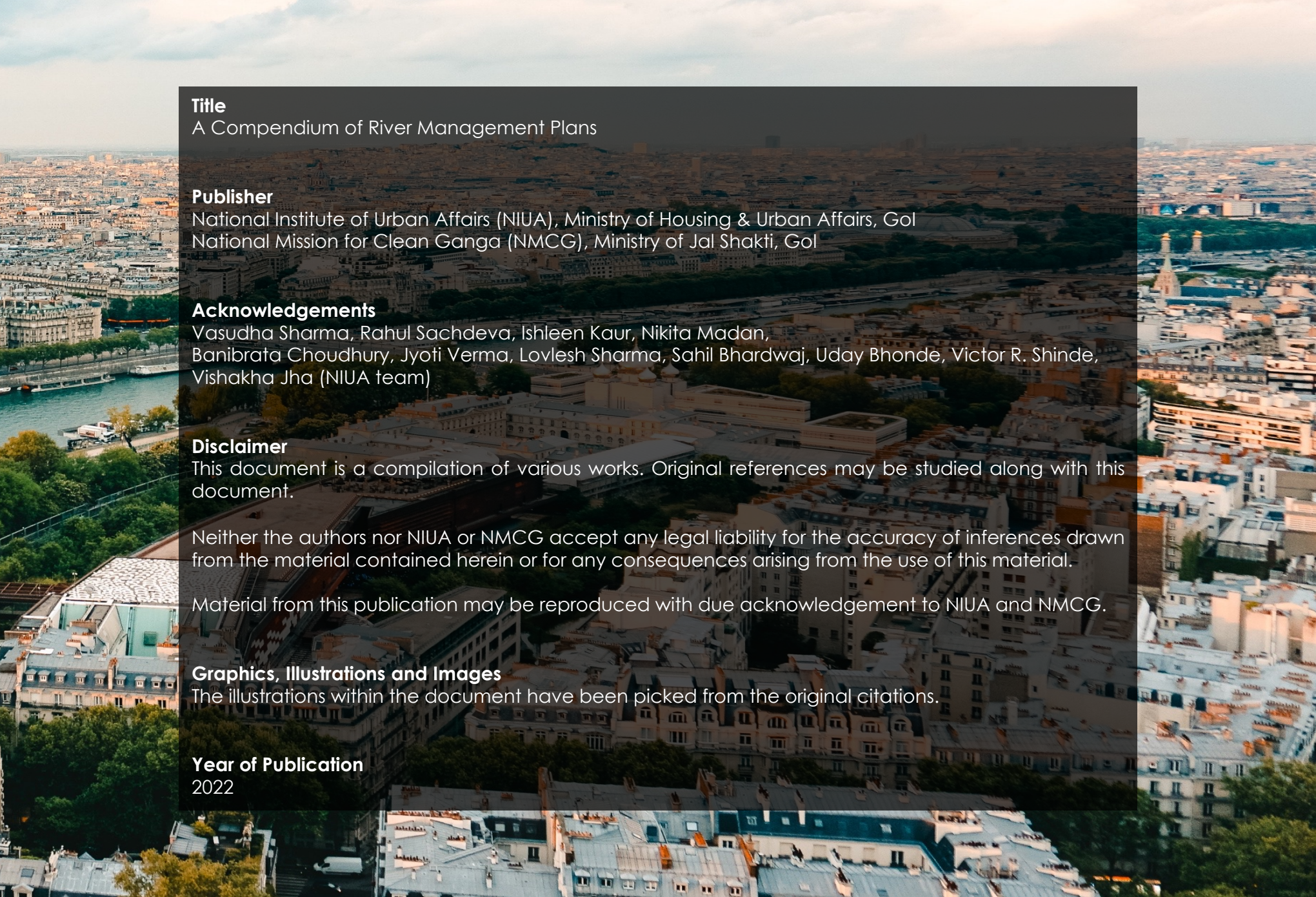

Title
A Compendium of River Management Plans

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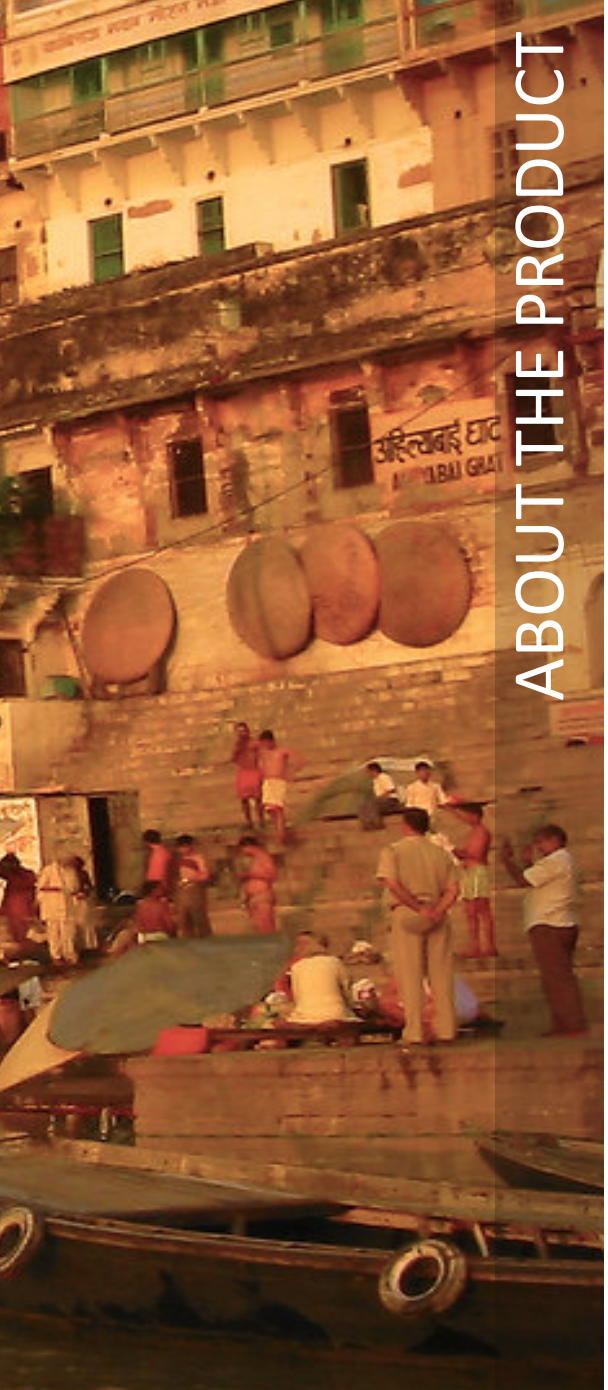
PREFACE

Water resources act as the lifeline for human habitation. People have been living close to rivers, lakes, wetlands and deltas for many centuries. Most of the early civilizations emerged on the banks of some of the world's most iconic rivers, which offer a multitude of services such as water supply for farms and cities, fisheries to provide food for communities, energy to power economies, flood attenuation for downstream development, cultural and leisure amusement for people, spiritual upliftment for believers and a habitat for a diversity of plants and animals. Unfortunately, the expectations from rivers have exceeded their natural capabilities, thus resulting in over-abstraction, pollution, alien infestation, floodplain alteration and habitat destruction. These failures are usually the consequences of poor decision-making, insufficient management and inappropriate planning.

The first step towards river rejuvenation is creating a value for the rivers among various stakeholders. One way to do so would be to adopt both, top-down (basin to site level) and bottom-up (site to basin level) approaches for planning the river basins as a whole, so as to ensure that adequate provisions to protect and manage the rivers are taken consistently over time. This knowledge product reviews various river management plans, with a view to understand the treatment meted out to rivers in the entire planning process. There are several implications of this knowledge product. First, it apprises the readers of different tools and instruments that various management plans have used to create a value for the river in the planning process itself. Second, it highlights the gaps and key areas of concern that plans need to address, in order to holistically manage a river within their limits. Third, it provides a glimpse into some innovative planning practices and initiatives to enhance river management.

This Knowledge Product will provide readers with enough insights to support and promulgate sustainable and environmentally safe river management.

Ganga River, Varanasi @ Flickr



ABOUT THE PRODUCT

Throughout the history of humankind, rivers have been the lifeline of all civilizations. The trend continues even today. However, because of contemporary socio-economic development, rivers have been facing growing threats on several fronts - unsustainable withdrawals, pollution, and habitat deterioration, to name a few. One of the important drivers of deterioration of river health is the rapid pace of unplanned urbanization.

Given its significance for sustaining human civilizations, improving river health is gaining increasing international prominence, and becoming a prime mandate of governments all over the world, including India. The issues pertaining to rivers are so prominent that the 2030 Developmental Agenda also emphasizes on *'river conservation and restoration'* under the *Sustainable Development Goal 6 (SDG-6)*. The thrust is on inculcating a sense of responsible urban development, that extends respect to the rivers.

Across the globe, there have been several noteworthy attempts to revive polluted rivers. An assessment of such attempts can provide an opportunity to adopt and replicate them. This knowledge product tries to capture some of the best practices adopted for effective river management across the globe, while emphasising the need of comprehensive river management for addressing the issues faced by river cities in India.

The case examples incorporated in this Knowledge Product highlight the globally prevalent river management practices, with a focus on key strategies for - ecological restoration of the river (Environment); enabling the re-connect of people with the river (Social) and; boosting the livelihoods of people associated with river activities (Economy).

Ganga River @ Pixabay

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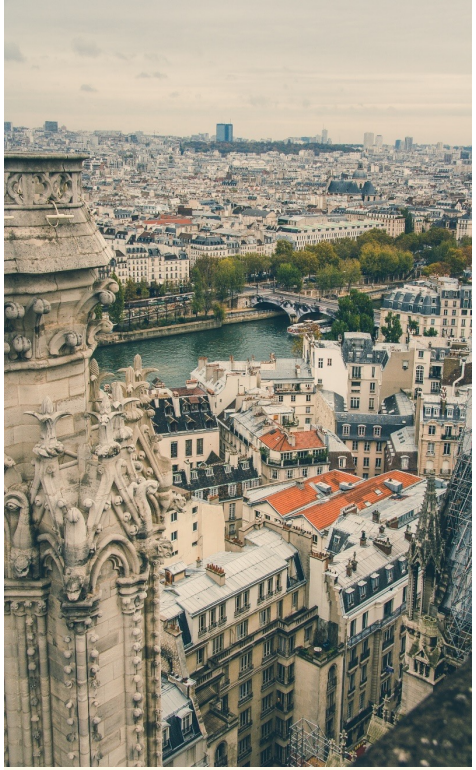


RIVER MANAGEMENT PLANS

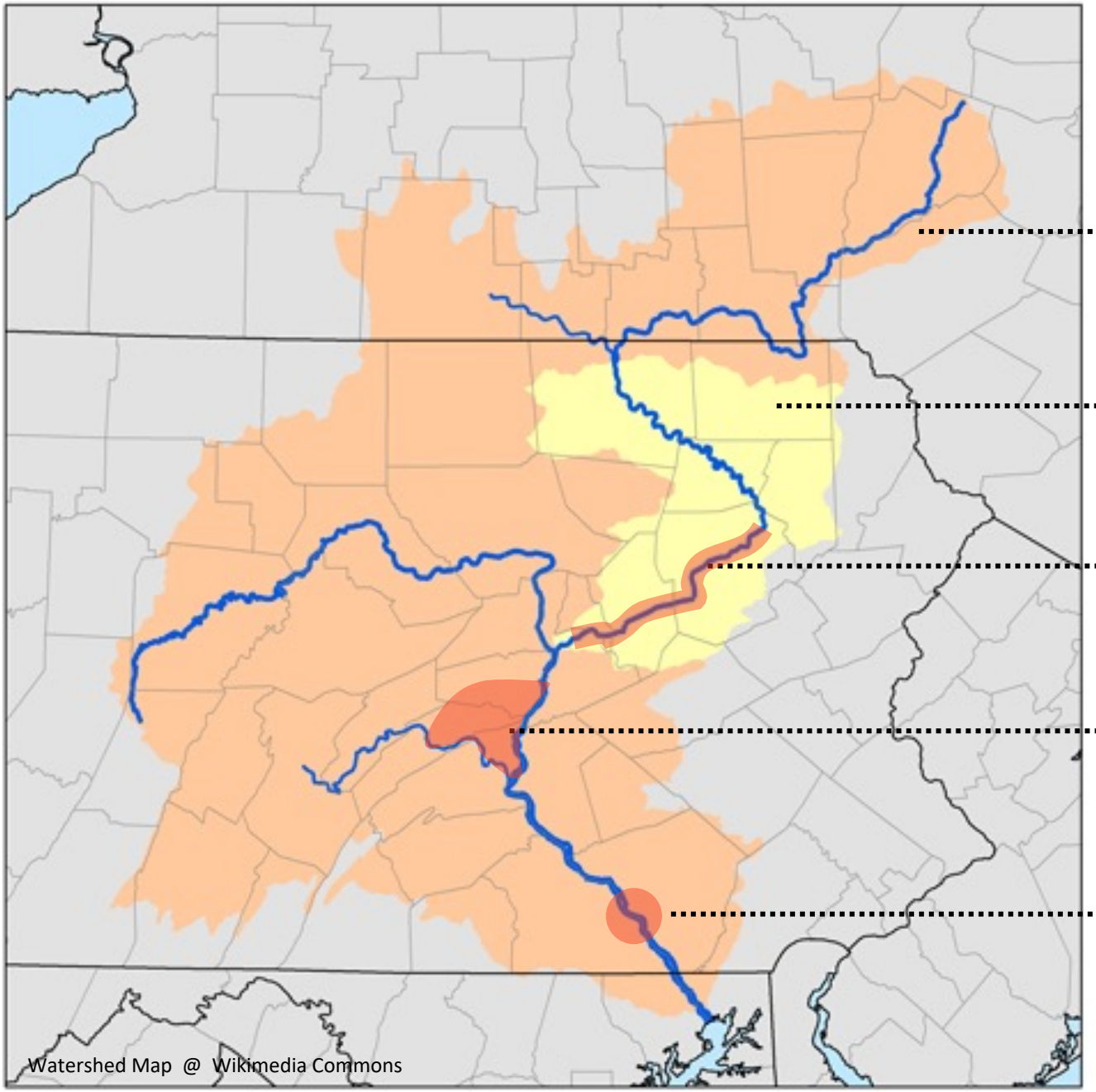
Managing river basins and their watersheds is one of the key focus areas of planning for Integrated Water Resource Management (IWRM). River management is a process that primarily involves conservation and development of water, adjoining land and related resources, within a river basin/ catchment/ or precinct area. The main goal of such management is to maximize the economic and social benefits derived from water resources in a sustainable manner, while preserving or restoring these freshwater ecosystems.

The key elements of a successful river management plan include:

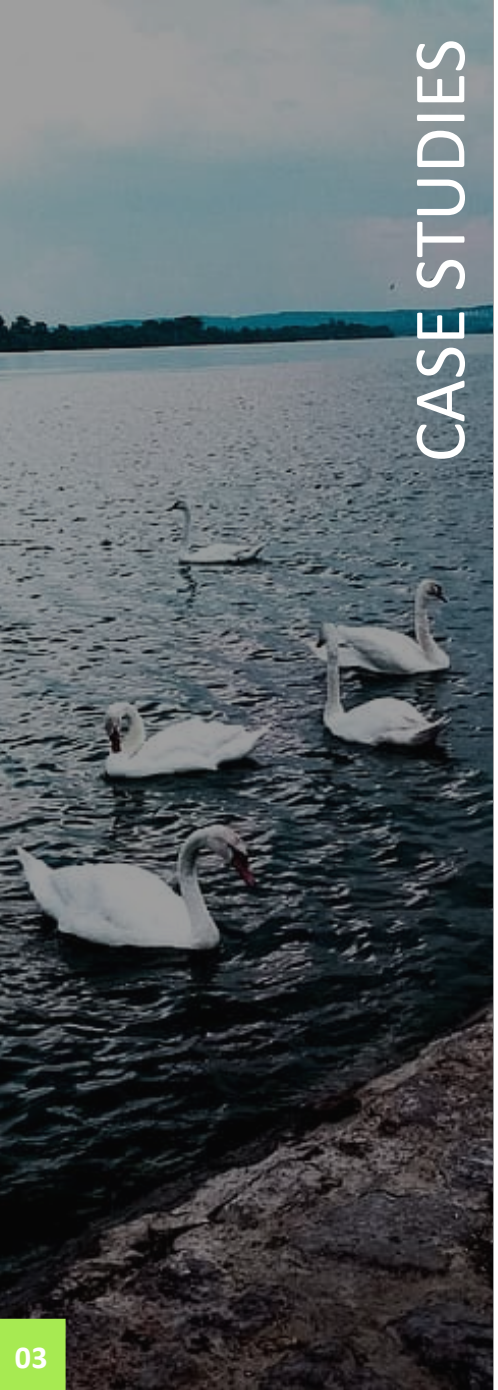
1. A long-term vision for the river, agreeable in-principle by all major stakeholders.
2. Convergence of existing inter-sectoral policies, strategies, programs and projects (such as agriculture, industry, urban development, navigation, fisheries), towards river-sensitive development.
3. Scientific approach that blends hard and soft measures for sustainable river management.
4. Strategic decision-making at the river basin scale, which guides actions at sub-basin or local levels.
5. Participatory approach including all relevant stakeholders (government, academia, private sector, and civil society groups, eco-groups, NGOs) pursuing well-informed and transparent planning and decision-making.
6. A living and dynamic document with provisions to incorporate new requirements and learnings, as per the changes occurring in the natural ecosystem.

With the growing concerns of urbanization affecting rivers, River Management Plans are being prepared across the globe at various levels viz. river catchment, basin, or precinct level. However, currently in India, there exists a significant gap in river-sensitive planning. This essentially means preparing cities for treating the river as an asset and ensure that developmental activities in the urban setup are not detrimental to the river. Thus, River management plans become even more essential for promoting such development in future.

Varying Scales of *River Management Plans*



Watershed Map @ Wikimedia Commons

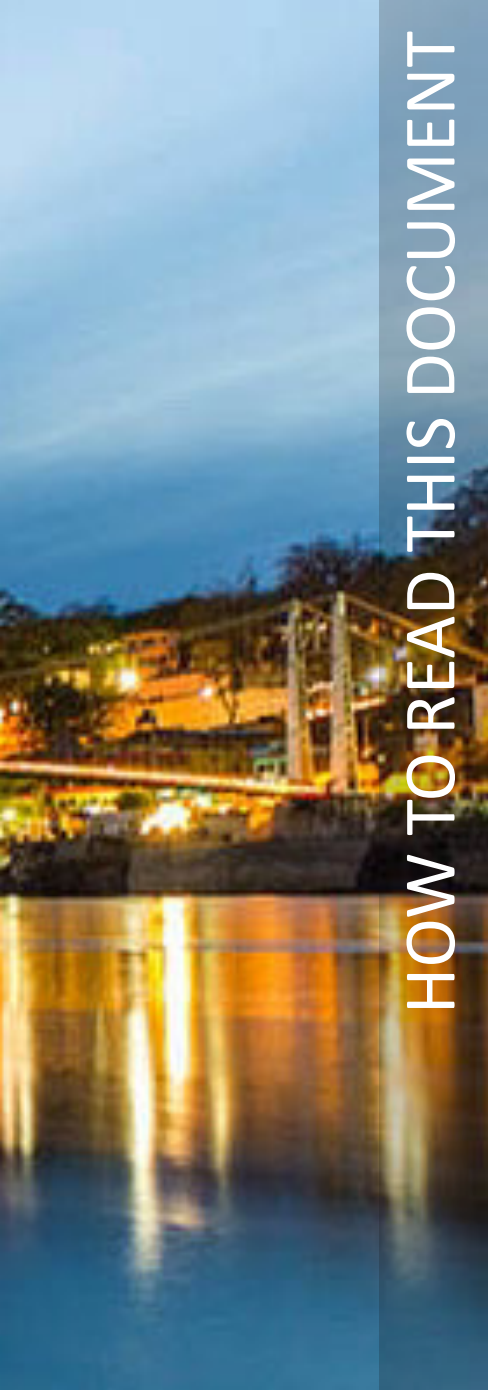


CASE STUDIES

Hierarchy of Plans

- RIVER BASIN MANAGAMENT PLAN
- RIVER CATCHMENT MANAGAMENT PLAN
- RIVER CORRIDOR MANAGAMENT PLAN
- RIVER PRECINCT MANAGAMENT PLAN
- PROJECT SPECIFIC RIVER PLAN

Ram Jhula, Rishikesh @ Mouthshut



HOW TO READ THIS DOCUMENT

The next sections in he Knowledge Product are a collation of different case examples of varying scales that have been assessed on three broad parameters and are further divided into sub-indicators. The three parameters of assessment are:

- **Key strategies** incorporated/ applied in the Plan, whether it's a Project Plan or a Basin level Plan
- **Implementation framework** that has been adopted by the Plan towards identifying the core issues, including pertinent aspects of finance, governance and monitoring.
- **Impact Assessment** either post Plan implementation or the impacts proposed and projected by the Plan

The sub-indicators further assess these cases based on their adoption of systems approach, the robustness of the proposed implementation framework and the holistic ecological, economic and social impacts of these Plans.

A collection of 10 case studies have been chosen from among 17 case examples spread across various global regions based on a Rapid Assessment of their effectiveness in terms of the key strategies, implementation framework and Impact Assessment. An effort has been made towards collating diverse cases of different scales, from Basin to Project level to understand the nuanced ways in which these Plans can intervene.

The following section elaborates on the structure adopted for the case studies providing different heads under which the information has been collected and organized.

CASE EXAMPLE: River name/ Country

VISION

Basin Picture

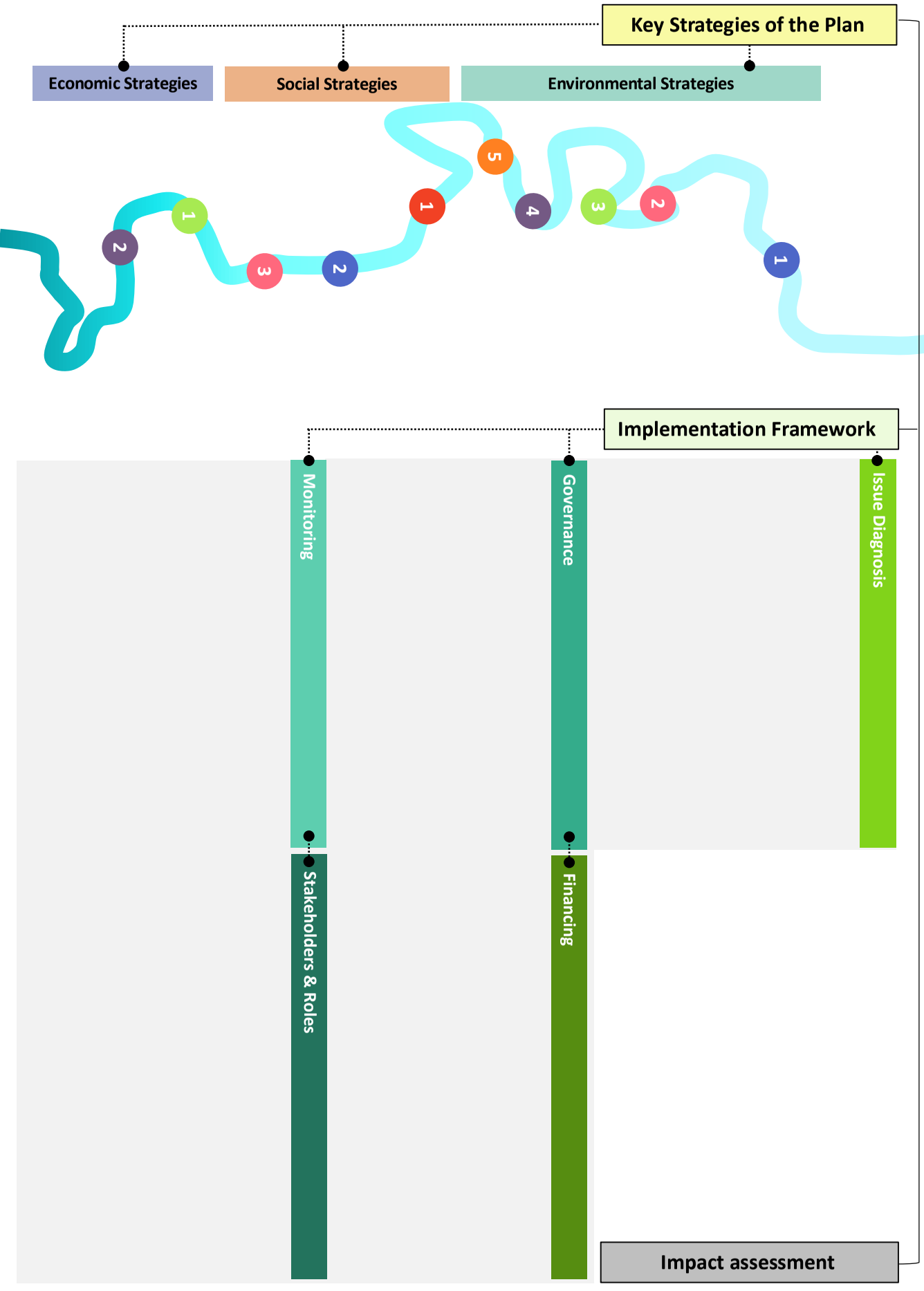
HIERARCHY OF PLAN

DOCUMENT NAME

RIVER BASIN PROFILE

CORE ISSUES

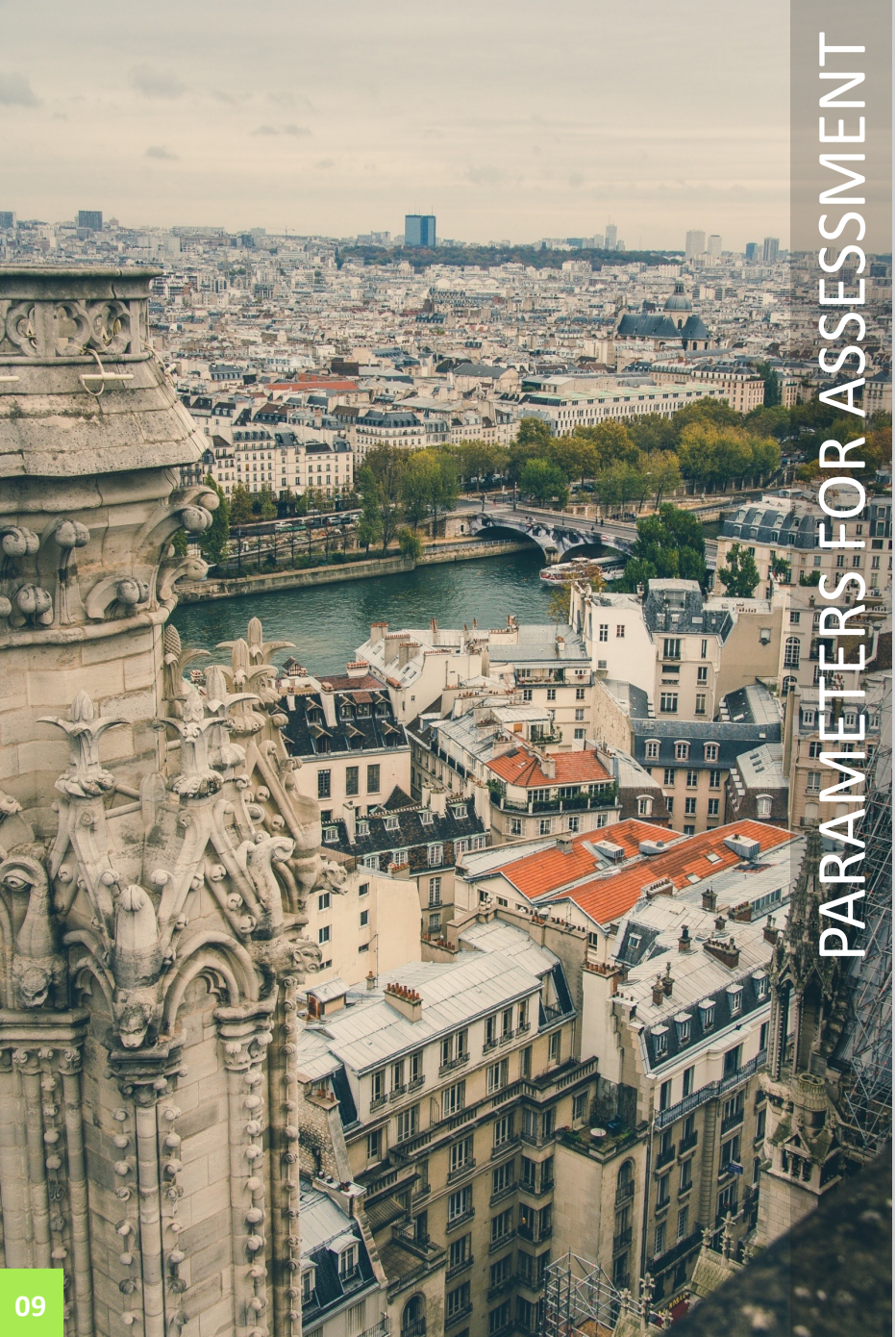
PHOTOS (PAST and PRESENT)



Plan Assessment

Due consideration given | Mentioned but not in detail | Absent

STRATEGIES			IMPLEMENTATION FRAMEWORK				IMPACT ASSESSMENT		
ENVIRONMENTAL	SOCIAL	ECONOMIC	ISSUE DIAGNOSIS	GOVERNANCE	FINANCING	MONITORING	ENVIRONMENTAL	SOCIAL	ECONOMIC



PARAMETERS FOR ASSESSMENT

KEY STRATEGIES OF THE PLAN

ENVIRONMENTAL
Strategies pertaining to ecological restoration of the river and its surroundings

SOCIAL
Strategies pertaining to fostering community engagement and re-establishing connect with the river

ECONOMIC
Strategies pertaining to boost the economy generated from riverine activities, like livelihood opportunities, real estate growth, etc.

IMPLEMENTATION FRAMEWORK

ISSUE DIAGNOSIS
Methodology for conducting problem identification and impact studies

FINANCING
Methods used for raising finances for plan implementation

GOVERNANCE
Plan formulation and implementation framework

MONITORING
Techniques and parameters adopted for monitoring of the Plan

IMPACT ASSESSMENT

ENVIRONMENTAL
Environmental benefits observed as a result of the plan

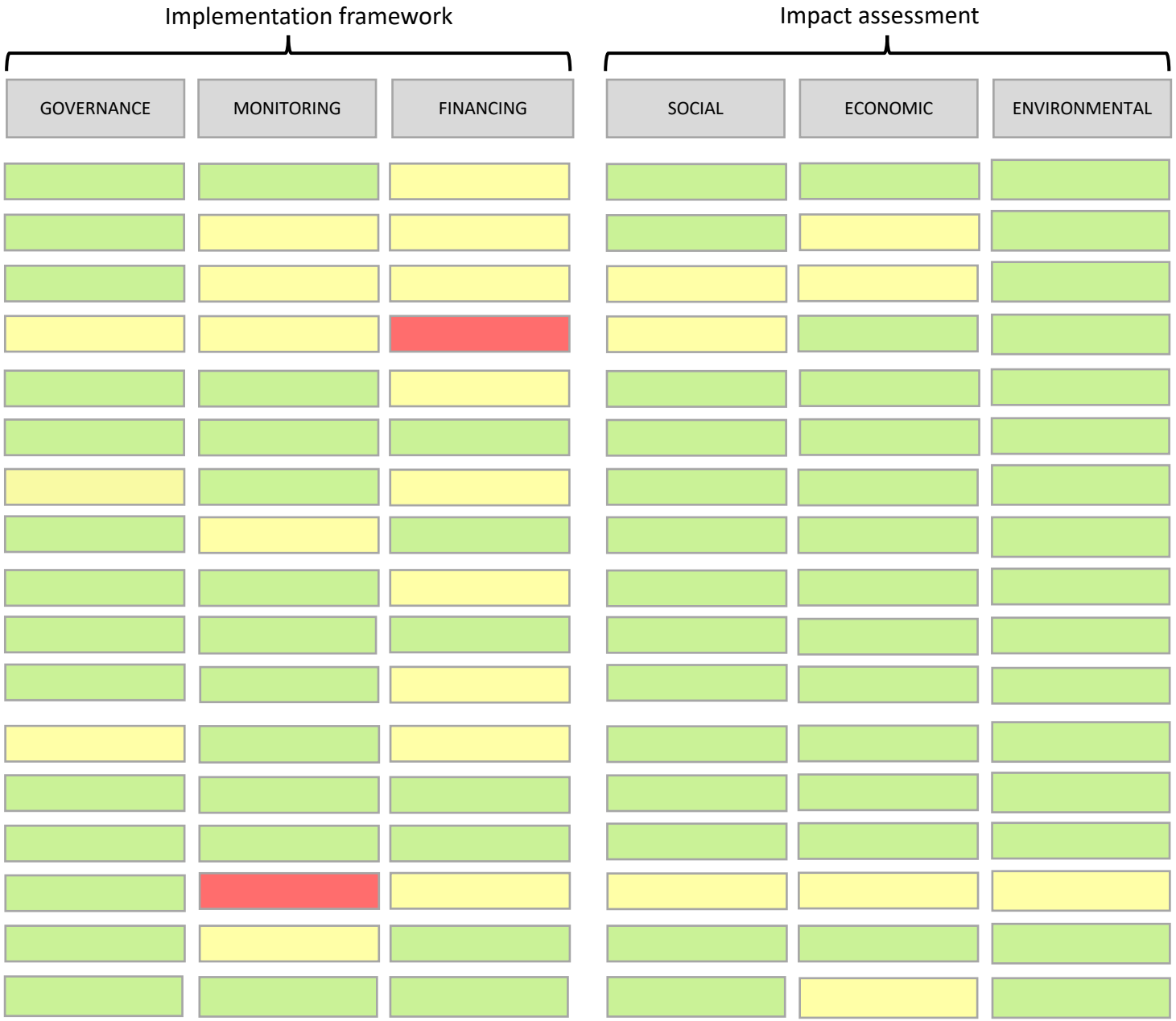
SOCIAL
Social impact of the plan, esp. over the quality of life

ECONOMIC
Economic returns achieved as a result of the plan

CASE STUDIES ASSESSMENT

Key strategies of plan

	CASE STUDY	PLAN NAME	ENVIRONMENTAL	SOCIAL	ECONOMIC
Australia	Parramatta, Sydney	Parramatta River Master Plan, 2020			
	Fitzroy River	Fitzroy River Catchment Management Plan, 2017			
	Georges River	George's River Precinct Plan, 2017			
	Brisbane River	Brisbane River Master Plan, 2019			
America	Los Angeles, US	LA River Revitalization Plan, 2007			
	Trinity River, Texas	Confluence : The Trinity River Strategic Master Plan, 2030			
	White River, Indianapolis	White River Master Plan, 2019			
	Chicago River	Chicago River Corridor Development Plan, 2012			
Europe	Thames River, London	Thames River Basin District Plan, 2021			
	Anglian River, UK	Anglian River Basin District Plan, 2021			
	Rhine River, Germany	Internationally Coordinated Management Plan 2015 for Rhine River Basin District			
Asia	Brantas River, Indonesia	Brantas River Basin Development Plan,2020			
	South Korea	The 4 River Restoration Master Plan, 2012			
	Singapore River	*Singapore River Development Plan, 2012*			
	Brahmaputra River, India	*Brahmaputra River Master Plan*			
	Sabarmati River, India	*Sabarmati Riverfront Development Master Plan, 2019*			
	Ganga River, India	*Ganga River Basin Management Plan, 2015*			


Implementation framework
Impact assessment
GOVERNANCE
MONITORING
FINANCING
SOCIAL
ECONOMIC
ENVIRONMENTAL
LEGEND
Due consideration given
Mentioned, but not in detail
Absent

Varanasi, UP @ Wallpaper Flare


Varanasi, UP @ PixaHive

Ganga River, India

VISION

To restore the ecological balance of the national river Ganga and provide an enabling environment for endemic flora, fauna and microorganisms to thrive in the Ganga river network.

Ganga River Basin

HIERARCHY OF PLAN

Basin Level

DOCUMENT NAME

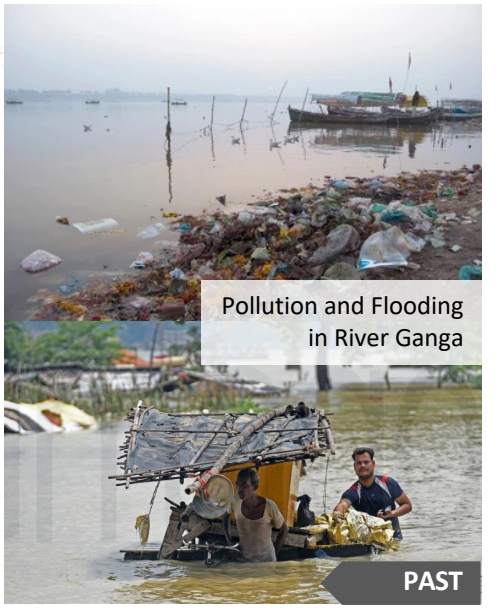
Ganga River Basin Management Plan, 2015

RIVER BASIN PROFILE

Location: **India**
Length: **2525 km**
Basin Area: **8,61,404 km^2**
Population: **48.5 Crores**
Density: **563 persons/km^2**
Urbanization Rate: **30%**

CORE ISSUES

- Water pollution
- Flooding
- Drought
- Fragmented management
- Deteriorating groundwater levels



Pollution and Flooding in River Ganga

PAST

PRESENT

Cleaner river, protected with embankments

Key Strategies of the Plan

Environmental Strategies

1. Management of environmental flow; agricultural runoff
2. Augmentation of capacity of STPs
3. GIS based spatial planning and monitoring
4. Afforestation (medicinal, native species) and Biodiversity Conservation
5. Abatement of industrial pollution

Social Strategies

1. Development of Ganga Grams
2. Communication & Public Outreach Activities with Ganga Vahini, Praharis, etc.
3. Development of modern dhobi ghats

Economic Strategies

1. Sustainable Riverfront Development
2. Public amenities in Char Dham and Ganga Yatra

Implementation Framework

Issue Diagnosis

Carried out by Deltares and its partners AECOM India and Future Water in cooperation with GoI, for:

- **Scenario and strategy assessment**
- **Environmental flow assessment**
- **Groundwater surface water interaction assessment**

Governance

Improved inter-ministerial and Centre-State coordination for a holistic basin approach

1. GAP-I (1985): Focus on main stem of Ganga, 25 towns, 260 schemes completed
2. GAP-II (1996): 4 tributaries covered- Yamuna, Gomti, Damodar, Mahananda
3. NRCP (1996): 41 rivers; 8 Ganga Basin rivers- Betwa, Chambal, Ganga, Mahananda, Mandakini, Ramganga, Yamuna
4. NGRBA (2009): Chaired by PM implementing bodies - NMCG at Centre and SPMGs at State
5. NAMAMI GANGE (2014): Project under Jal Shakti Ministry, 11 Basin states covered, All tributaries included

*GAP: Ganga Action Plan

Monitoring

- National Ganga River Basin Authority (NGRBA) is responsible for planning, financing, monitoring & coordination.
- Environmental Monitoring & Impact Assessment Wing is responsible to -
  - **Conduct regular/ random field measurement of environment related data within the basin**
  - **Monitor/ coordinate developmental and infrastructure projects**
  - **Conduct impact assessment of existing practices and infrastructure within the basin**

Impact assessment

Expected Impacts

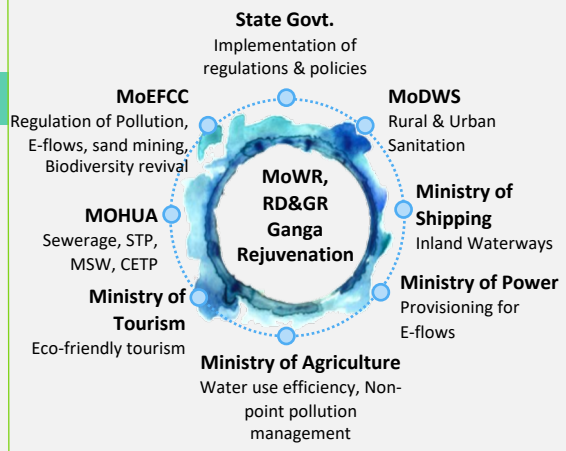
Environmental
- Improved water quality
- Sustained environmental flow
- Restored aquatic species
- Increased forest cover

Social
- Improved livelihood opportunities

Financing

International banks and Central Government, including
- Government of India (GoI)
- World Bank
- Japanese International Cooperation Agency (JICA)

Stakeholders & Roles



Plan Assessment: Absent; Mentioned but not in detail; Due consideration given

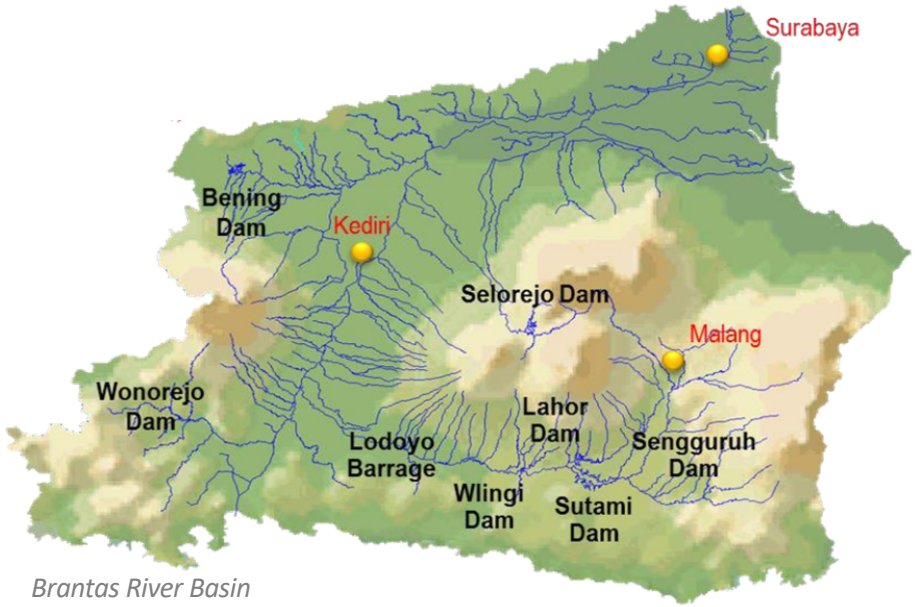
IMPACT ASSESSMENT: ECONOMIC, SOCIAL, ENVIRONMENTAL

IMPLEMENTATION FRAMEWORK: MONITORING, FINANCING, GOVERNANCE, ISSUE DIAGNOSIS

STRATEGIES: ECONOMIC, SOCIAL, ENVIRONMENTAL

Brantas River, Indonesia

VISION
To raise up social life and prosperity in economy, social and culture of the society within the basin.



Brantas River Basin

HIERARCHY OF PLAN
Basin Level

DOCUMENT NAME
Brantas River Basin Development Plan, 2020

RIVER BASIN PROFILE
Location: Java Island, Indonesia
Length: 320 km
Catchment Area: 11,800 sq. km.
Population: 16 million (2005)
Density: 1356 persons/km^2

CORE ISSUES
- Water pollution
- Flooding
- Drought
- Erosion and sedimentation
- Destruction of aquatic biota

Waste disposal in the river and frequent flooding

Massive Infrastructure development along with investment in early flood warning and monitoring systems

Key Strategies of the Plan

Environmental Strategies

1. Re-forestation in the River Zone
2. Flood Plain Zoning w.r.t carrying capacity of river infrastructure and regulations for land use conservation
3. Water Quality Monitoring & Restoration
4. Preparation of disaster legislation/ operating procedure and Hazard Risk Mapping
5. Water Supply & Demand Management, by Canal Rehabilitation and other means
6. River flow capacity improvement, by dredging, riverbank, aligning, etc.

Social Strategies

1. Capacity Building & Community Awareness
2. Implementation of Flood Forecasting and Warning System (FFWS)

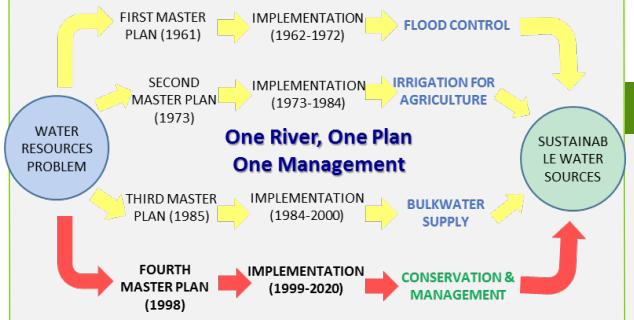
Implementation Framework

Issue Diagnosis

- Social and Environmental Impact Assessment conducted in detail
- Brantas River Forum formed - 50% community participation required in all water management planning, as per the Water Law

Governance

Decentralised approach



Monitoring

- Established community driven monitoring system
- Stakeholder reporting, water quality monitoring and routine inspection are carried out
- A clean monitoring programme with government, NGOs, local communities and media, applying social pressure on industries for pollution control

Impact assessment

Expected Impacts

Environmental
- Improved water quality
- Flood protection for 50 years

Social
- Community interests addressed
- Improved quality of living
- Improved livelihood options

Economic
- 1 billion kwh energy produced/year
- Reduction in flood induced loss

Financing

International banks and Central Government, including

- Japanese Reparation (JR)
- Overseas Economics Cooperation Fund of Japan (OECF)
- Government of Indonesia (GOI)
- Asian Development Bank (ADB)
- International Bank for Reconstruction and Development (IBRD)

Stakeholders & Roles

Regulator
PERUM Jasa Tirth (PJT)
EAST JAVA Provincial Govt. (O&M)
Provincial Environmental Agency

Operator
EAST JAVA Provincial Govt. (O&M)
Basin Water Resources Management Committee (PPTPA)

Influencer
Basin Water Resources Management Committee (PPTPA)
NGOs

Implementor
Basin Water Resources Management Committee
Provincial Water Resources Management Implementation Committee (PTPA)
Provincial Public Works Agency
NGO

Plan Assessment
Absent
Mentioned but not in detail
Due consideration given

IMPACT ASSESSMENT: ECONOMIC, SOCIAL, ENVIRONMENTAL
IMPLEMENTATION FRAMEWORK: MONITORING, FINANCING, GOVERNANCE, ISSUE DIAGNOSIS
STRATEGIES: ECONOMIC, SOCIAL, ENVIRONMENTAL

Thames River, UK

VISION

Protecting and enhancing the benefits provided by the water environment.

Thames River Basin

HIERARCHY OF PLAN

Basin Level

DOCUMENT NAME

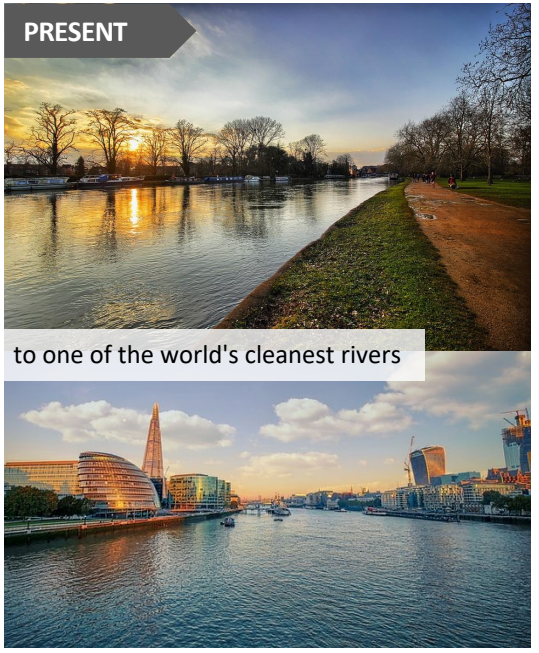
Thames River Basin District Management Plan, 2012

RIVER BASIN PROFILE

Location: **London, UK**
Length: **200 miles**
Catchment Area: **16,200sq.km.**
Population: **1.5 Crore**
Density: **926 persons/sq.km**
Urbanisation Rate: **20% (approx.)**

CORE ISSUES

- Storm water pollution
- Plastic waste
- Flooding
- Sewage influences
- Direct industrial discharge
- Physical modification
- Invasive non-native species



Key Strategies of the Plan

Environmental Strategies

1. Delineation of protected areas in the district
2. Wetland creation and coastal re-alignment
3. Addressing pollution via Urban Waste Water Treatment Directive
4. Incorporation of green-blue infrastructure into regeneration
5. Strategy to tackle non-native species
6. Flood Risk Management
7. Mitigate point-source pollution/ impacts on receptors

Social Strategies

1. Government funded improvement by local partnerships
2. Major governance reforms- public participation

Economic Strategies

1. Riverfront Development

Implementation Framework

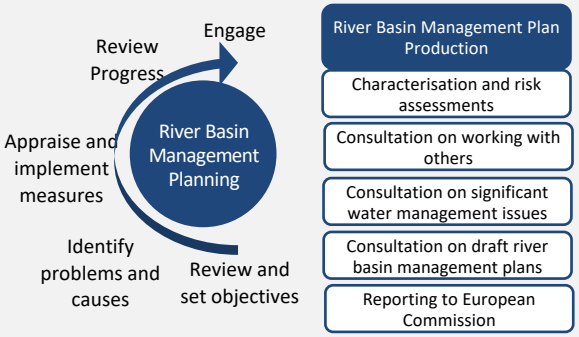
Issue Diagnosis

Social, Environment & Economic Impact Assessment conducted with features like:

- Social and cultural cohesion (events)
- Digital platform
- Community Engagement Programmes
- Thames 21 River Keeper Network
- Full cost-benefit analysis, with business cases

Governance

District Liaison Panel with Catchment Group partnerships.



Monitoring

Periodical reporting of progress as per UK Common Standards Monitoring Guidance (CSMG).
Extensive monitoring programmes that assess on the basis of-

- Status or risks facing protected areas
- Ecological status + individual status of quality elements
- Chemical status + individual status of quality elements
- Annual change in status of each ecological element

Impact assessment

Expected Impacts

Environmental

- Improved water quality
- Healthy ecosystem- 125 species of fish, up from almost none in 1950s

Social

- Community Interests addressed
- Improved quality of living
- Improved livelihood

Economic

- Increased navigation by River

(4.7 million tourists visit Thames annually)

- Returns from infrastructure development

Financing

- Countryside Stewardship Scheme
- Catchment Partnership Action Fund (CPAF)
- Environment Agency's Environment Programme
- Water Metering, Polluter Pays Principle
- Funding through Local Partnerships (Community driven)

Stakeholders & Roles

- Central government departments – R, I
- Environment Agency – R, O , I, Imp
- Natural England - R, O , I, Imp
- Marine Management Organisation - R
- Internal drainage boards - R , O , I, Imp
- Local government – R, O , I, Imp
- Navigation - R, O , I, Imp
- Forestry Commission - O , I, Imp
- Highways England & Network Rail - O , I
- NGOs - O , I, Imp
- Marine Management Organisation - I

Plan Assessment

Absent

Mentioned but not in detail

Due consideration given

IMPACT ASSESSMENT: ECONOMIC, SOCIAL, ENVIRONMENTAL

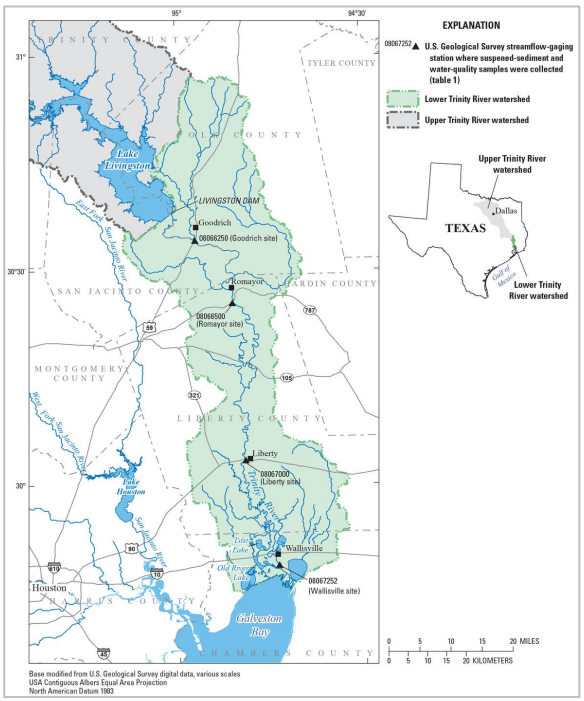
IMPLEMENTATION FRAMEWORK: MONITORING, FINANCING, GOVERNANCE, ISSUE DIAGNOSIS

STRATEGIES: ECONOMIC, SOCIAL, ENVIRONMENTAL

Trinity River, US

VISION

The Trinity River is integral to a robust economy for Fort Worth and the Tarrant County region. The lifeblood of our environment that seamlessly interweaves our natural spaces and urban places. The centrepiece of our community where people come together to socialize, recreate, and play.

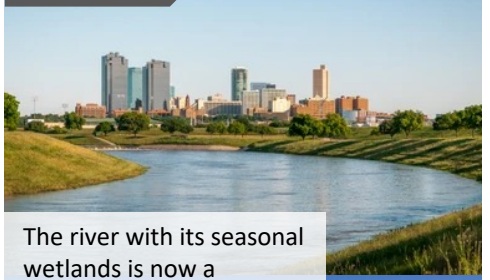


Trinity River Basin, USGS

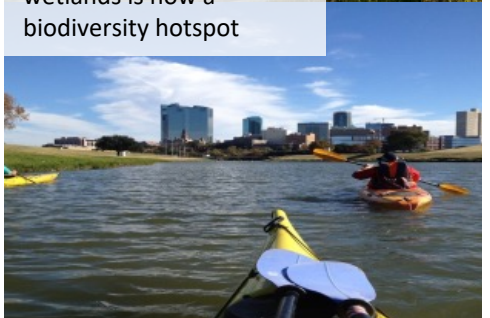
Ranked the 3rd most polluted river in Texas, was also known as The River of Death

PAST

PRESENT



The river with its seasonal wetlands is now a biodiversity hotspot



HIERARCHY OF PLAN

Basin Level

DOCUMENT NAME

Confluence- The Trinity River Strategic Master Plan, 2030

RIVER BASIN PROFILE

Location: **Dallas, Texas**
Length: **710 miles**
Basin Area: **40,380 km2**
Population: **80 lakhs (2011)**

CORE ISSUES

- Storm water pollution
- Flooding
- Sewerage influences
- Physical modification of river corridor

Key Strategies of the Plan

Environmental Strategies

1. Integrated watershed-wide stormwater treatment policy
2. Nodes & corridor of habitat created and open spaces for conservation
3. Utilize river corridor's features for infiltration & evapotranspiration
4. Developing treatment terraces within channel to treat stormwater
5. Enhancing the ecological integrity of the river and streams

Social Strategies

1. Provide safety & comfort for all users on trails
2. Foster sense of ownership, community stewardship along river
3. Promote the distinct identities of each river segment

Economic Strategies

1. Create infrastructure to provide amenities in non-flood events.
2. Creating development nodes for engaging urban conditions.

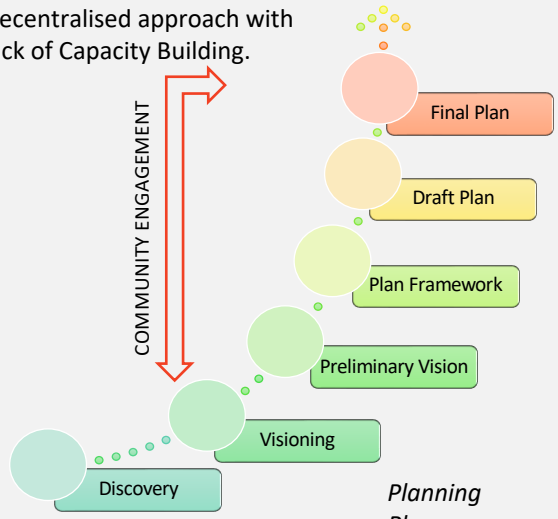
Implementation Framework

Issue Diagnosis

Social Impact Assessment conducted in detail via:
- Focus Group Discussions
- Pop-up Workshops, Annual Confluence events

Governance

Decentralised approach with lack of Capacity Building.



Monitoring

Periodical reporting by Streams & Valleys Organisation, by managing/ monitoring plan progress, leading interagency communication, facilitating project prioritization & tracking, and building community leadership & involvement (rigorous science-based monitoring & analysis programme).

Impact assessment

Expected Impacts

Environmental
- Improved water quality
- Healthy ecosystem: Habitat restoration of salmon, steelhead, other wildlife by restoring to a healthy, functioning river

Social
- Community interests and leadership
- Improved quality of living

Economic
- Reduction in flood mitigation costs
- Local employment creation
- Infrastructure creation

Financing

Land + development-based funding
- Public/ Municipal Improvement Districts
- Tax Increment Financing
- Connections with New Development

Stakeholders & Roles

Main Actors
- Streams & Valleys, Inc. (S&V)
- Tarrant Regional Water District (TRWD)
- City of Fort Worth Park & Recreation Department (PARD)

Other partners
- North Central Texas Council of Governments (NCTCOG)
- Trinity River Vision Authority (TRVA)
- United States Army Corps of Engineers (USACE or Army Corps)

Planning Committees

Trinity River Task Force
Provided high level feedback and insight into the broad vision for the river

Trinity River Working Committee
Provided detailed input about specific planning concepts. Reviewed and informed the plan at every stage.

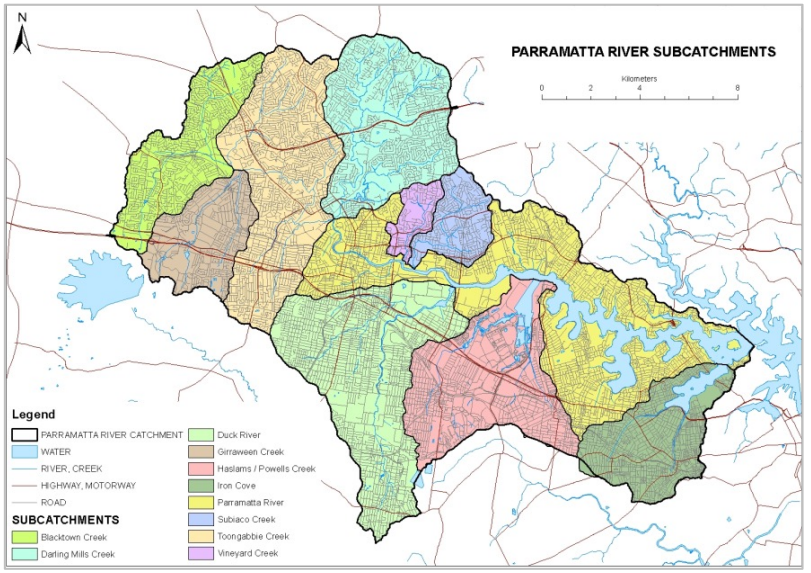
Trinity River Technical Committee
Provided technical expertise and detailed feedback about specific policies and projects in the proposed plan

Plan Assessment
- Absent
- Mentioned but not in detail
- Due consideration given

IMPACT ASSESSMENT: ENVIRONMENTAL | SOCIAL | ECONOMIC
IMPLEMENTATION FRAMEWORK: GOVERNANCE | FINANCING | MONITORING | ISSUE DIAGNOSIS
STRATEGIES: ENVIRONMENTAL | SOCIAL | ECONOMIC

Parramatta River, Australia

VISION
Make the Parramatta river a living river and swimmable again by 2025.



Parramatta River catchment

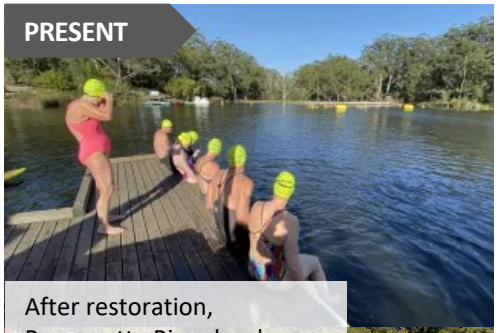
HIERARCHY OF PLAN
Catchment Level

DOCUMENT NAME
Parramatta River Master Plan, 2020

CATCHMENT PROFILE
Location: **Sydney**
Length: **14km**
Catchment Area: **266 sq. km.**
Population: **7.85 Lakhs (2011)**
Density: **2954 persons/sq.km**
Urbanization Rate: **Highly urbanised**

CORE ISSUES
- Storm water pollution
- Weeds
- Erosion and sedimentation

Sewage inflow and weeds degraded the river leading to loss of fish biodiversity



After restoration, Parramatta River has been made swimmable again

Key Strategies of the Plan

Environmental Strategies

1. Maximization of pervious area and vegetation coverage
2. Rainwater harvesting
3. Maximization of infiltration and evapo-transpiration
4. Treatment of runoff (adopted regional approach)
5. Vegetated stormwater treatment systems
6. Designed overland flow paths to include dense vegetation
7. Riparian vegetation protection and enhancement

Social Strategies

1. Community engagement through web portals and forums

Economic Strategies

1. Tourist spot creation

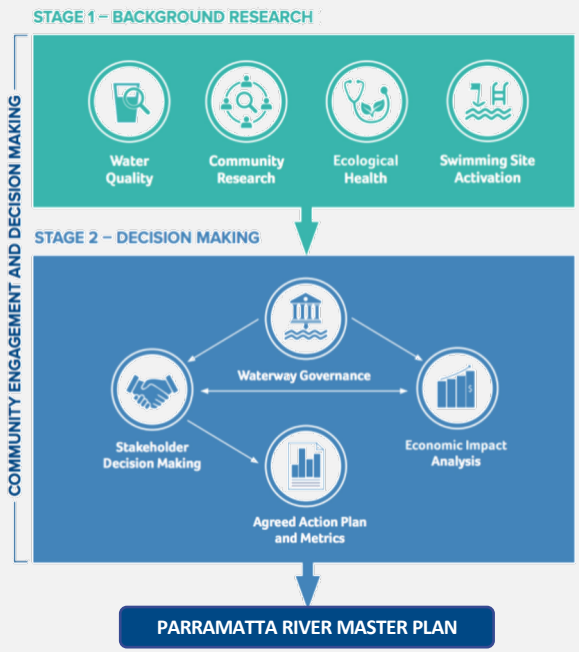
Implementation Framework

Issue Diagnosis

- Cost-Benefit Analysis conducted, with scenario development
- Networking
  - River awareness campaigns- River Aware
  - Community events- River fests
  - River Keeper Network

Governance

Aboriginal Leadership with lead state agency, having sufficient powers and funding



Financing

Economic returns from recreational site development and community engagement

Impact assessment

Expected Impacts

Environmental

- Improved water quality
- Healthier ecosystem
- Five iconic species living in catchment and valued by community (their habitat requirements addressed)

Social

- Community interests addressed
- Improved quality of living
- Improved livelihood opportunities

Economic

- 80,000 visitors/ year
- 1.4 Million $ economic return/year
- Local employment creation
- Physical health benefits

Monitoring

- Annual reporting of progress
- Quarterly updating Master Plan Dashboard

Plan Assessment

Absent

Mentioned but not in detail

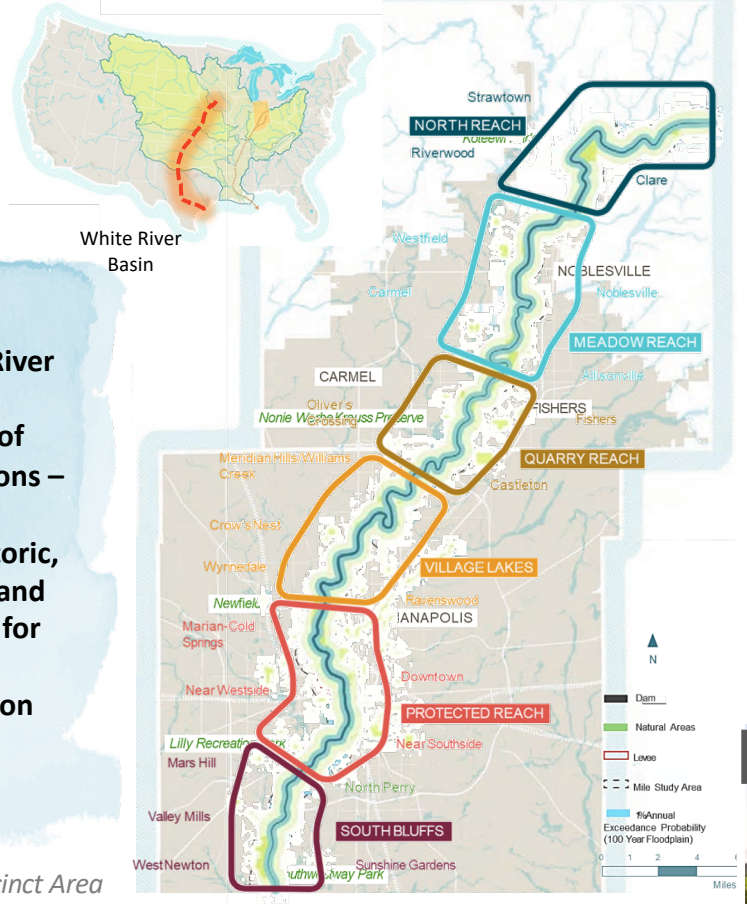
Due consideration given

IMPACT ASSESSMENT: ECONOMIC, SOCIAL, ENVIRONMENTAL

IMPLEMENTATION FRAMEWORK: MONITORING, FINANCING, GOVERNANCE, ISSUE DIAGNOSIS

STRATEGIES: ECONOMIC, SOCIAL, ENVIRONMENTAL

White River, Indianapolis



White River Precinct Area

VISION
The White River will soon embody all of our aspirations – as a clean, natural, historic, connected, and active asset for the Central Indiana region to enjoy.

HIERARCHY OF PLAN
Precinct Level

DOCUMENT NAME
White River Plan, 2019

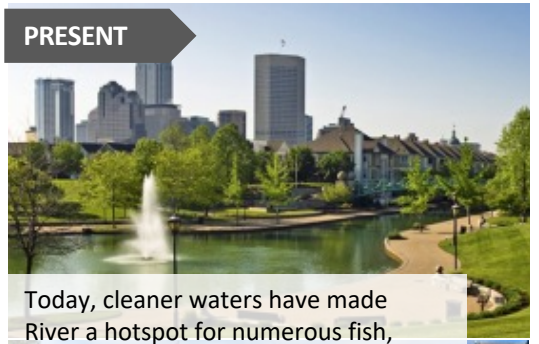
RIVER BASIN PROFILE
Location: **Indianapolis**
Length of River: **583 kms**
Catchment Area: **14,880 sq.km.**
Population: **2 million**
Precinct River Length: **78kms**
Precinct Area: **249 Sq. km.**

CORE ISSUES
- Water pollution
- Flooding
- Sewage influences
- Loss of biodiversity
- Invasion by non-native plants
- Sedimentation

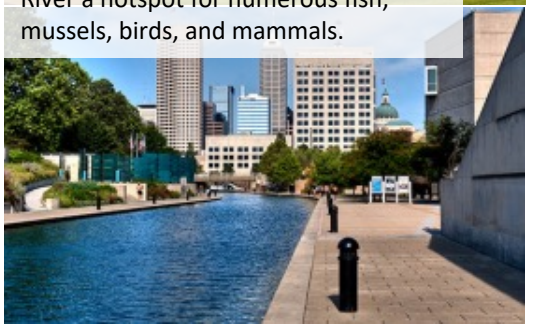
Because of the diverse landuse, threatened by a number of pollution risks across its watershed

PAST

PRESENT



Today, cleaner waters have made River a hotspot for numerous fish, mussels, birds, and mammals.



Key Strategies of the Plan

Environmental Strategies

1. Restore productive landscapes for water capture
2. Strengthen river infrastructure
3. Protect/ restore floodplains, and build resilience to climate change

Social Strategies

1. Enhance community stewardship of river health

Economic Strategies

1. Stabilize local businesses and expand commercial districts
2. Connect retail areas and neighborhoods to river amenities
3. Maximize multimodal connections along river - locally and regionally
4. Recapture economically productive landscape for recreation

Implementation Framework

Issue Diagnosis

Feasibility studies conducted, incorporating social, economic and environmental aspects

- In-person interviews, project website, community surveys
- Stakeholder consultations via appointment of Steering Committees, Stakeholder Committee and multi-topical task force

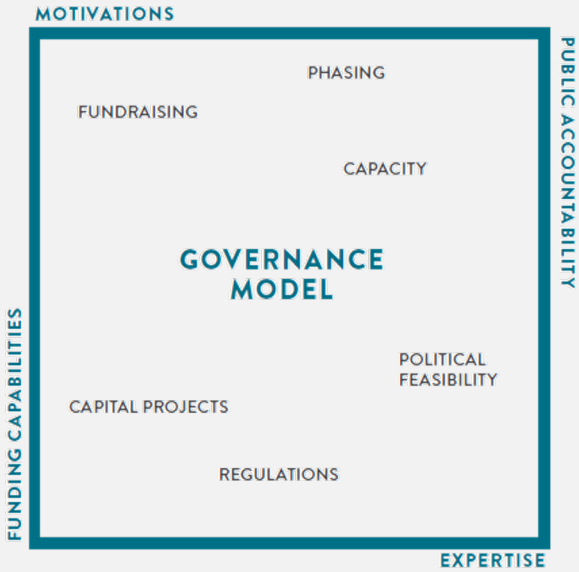
Governance

Community Driven Model for economic, social and political feasibility

Planning Phases

Discover → Envision → Action

With effective Community Engagement



Impact assessment

Expected Impacts

Environmental

- Improved water quality
- Habitat restoration

Social

- Improved quality of living
- Community leadership

Economic

- Increase in tourist footfall
- Additional livelihood opportunities

Financing

Multiple ways of generating funds:

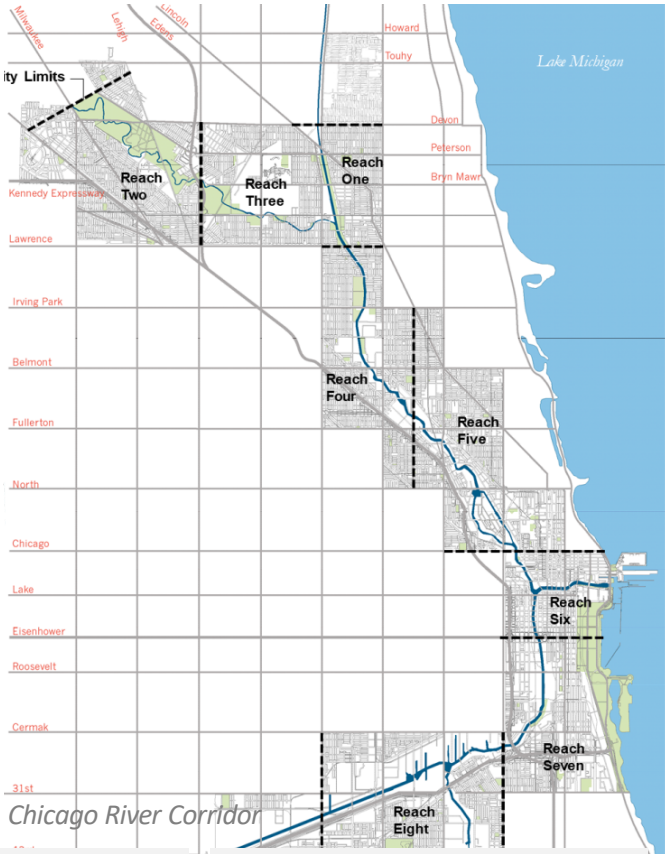
- General operating funds, grants, loans, donations
- Tax increment financing districts
- User fees, special levy
- Real estate proceeds
- Events and promotion, parking fees
- Philanthropy/ corporate sponsorship

Monitoring

White River Alliance - sole body appointed to coordinate monitoring and publicise River Monitoring Data with other stakeholders, such as:

- Hoosier Environmental Council
- Friends of the White River
- Marion County Soil and Water Conservation District (SWCD)
- Hamilton County SWCD
- Marion County Public Health Department
- Hamilton County Health Department, Reconnecting to Our Waterways

Chicago River, US



Chicago River Corridor

VISION

To Increase public access and create new recreational opportunities along the river for all the city's residents.

HIERARCHY OF PLAN

Precinct Level

DOCUMENT NAME

Chicago River Development Plan, 2020

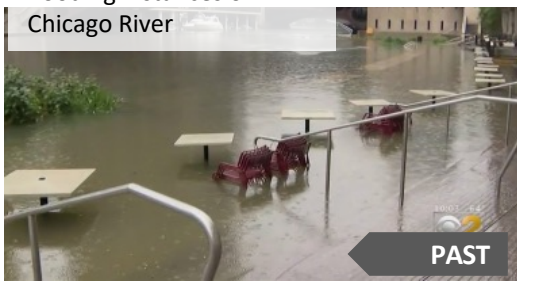
CORRIDOR PROFILE

Location: **Chicago**
Length: **45 kms (approx.)**
River stretch: **28 miles long within the city limits**

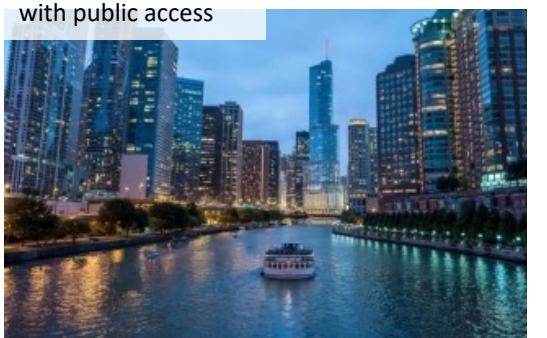
CORE ISSUES

- Impaired water quality
- Threatened habitat & wildlife
- Flooding
- Lack of public access
- Irresponsible development along river

Sewage influences and flooding instances of Chicago River



Improved riverfront with public access



Key Strategies of the Plan

River development zoning
- **River Bank Zone,**
- **Urban Greenway Zone**
- **Development Zone**

Environmental Strategies

1. Restore & manage river edge buffers
2. Restore & enhance river banks
3. Create, restore & protect wetlands & riparian aquatic habitats
4. Establish river corridor education & management programs
5. Improve & protect water quality

Social Strategies

1. Improve river access with Connected greenways

Economic Strategies

1. Develop river as a recreational amenity
2. Provide Commercial opportunities at the riverfront

Implementation Framework

Issue Diagnosis

Feasibility studies conducted incorporating social, economic and environmental aspects
- Capital Improvement Program - Project prioritization, final cost estimation, funding coordination
- Public participation

Governance

Decentralised approach, following 3 linked spheres of activities, by City of Chicago - Department of Planning and Development

STEERING COMMITTEE

Provide overall policy direction

Setback & Environmental Sub-committee

Guidance on Specific implementation strategies

Planning, Forest, Transport, Water, Park, Environment Department

KEY PARTNERS

Six-week period to provide opportunities for public comments and feedback

PUBLIC PARTICIPATION

Public/Private River Development Corporation

IMPLEMENTATION

Planning Process

Impact assessment

Expected Impacts

Environmental
- Improved water quality
- Habitat restoration, particularly of fishes

Social
- Improved quality of living, owing to access to river

Economic
- Increased (58 million) tourist footfall
- Livelihood opportunities creation

Financing

10 year capital budget

Tax Increment Financing

Federal Empowerment Zone Funds

01

02

Municipal Bonds

03

Foundation, Government & Federal Community Block Development Grants

04

Monitoring

Monitoring Stations by Chicago Department of Environment for
- Floodplain Development Compliance
- Water quality

Plan Assessment

Absent

Mentioned but not in detail

Due consideration given

IMPACT ASSESSMENT: ECONOMIC, SOCIAL, ENVIRONMENTAL

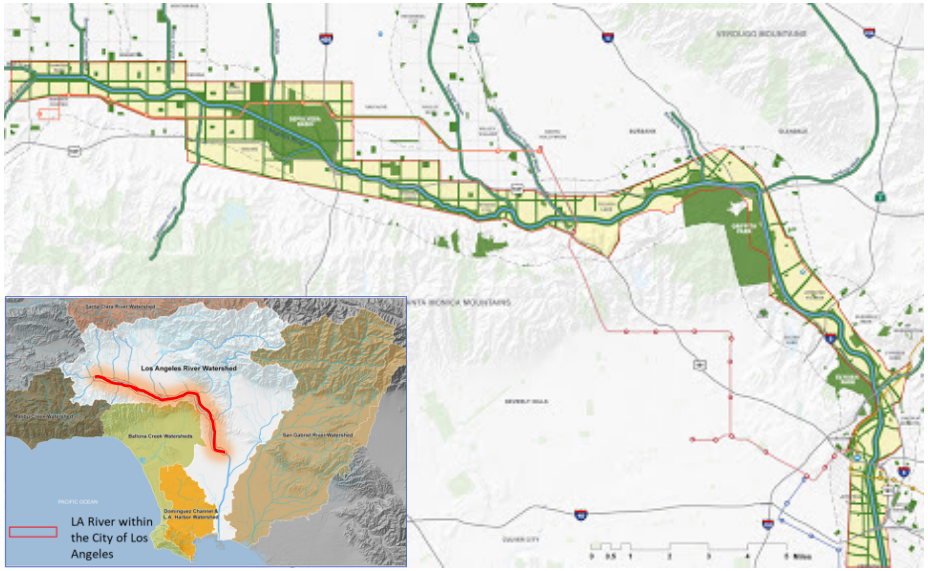
IMPLEMENTATION FRAMEWORK: MONITORING, FINANCING, GOVERNANCE, ISSUE DIAGNOSIS

STRATEGIES: ECONOMIC, SOCIAL, ENVIRONMENTAL

Los Angeles River, US

VISION

Revitalize the river, green the neighbourhoods, capture community opportunities and create value.



LA River Corridor

HIERARCHY OF PLAN

Corridor Plan

DOCUMENT NAME

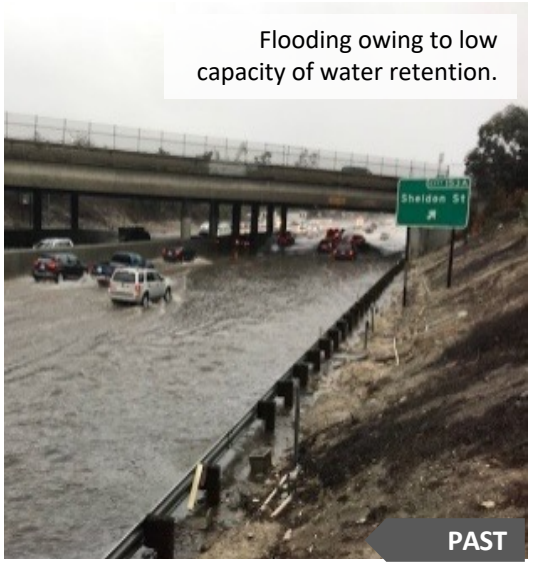
Los Angeles Revitalization Plan, 2007

RIVER BASIN PROFILE

Location: **Los Angeles**
Name of River: **LA River**
Length: **32 miles**
Catchment Area: **2,142 sq. km.**
Population: **4 million (2017)**
Density: **1868 persons/km^2**

CORE ISSUES

- Water pollution
- Flooding
- High flow velocity of river
- Variations in channel geometry
- Destruction of aquatic biota



Flooding owing to low capacity of water retention.

PAST

PRESENT

Now, offers a variety of uninterrupted trails for pedestrians, bicyclists, and equestrians.

Key Strategies of the Plan

Environmental Strategies

1. Expansion of river's floodplain & reduction in storm water runoff
2. Multi-benefit landscape treatment & green infrastructure
3. Landscape based water quality treatment
4. Treatment terraces within channel to treat storm water
5. Continuous functional riparian corridor
6. Bio-engineering at the river's edges

Social Strategies

1. Community Engagement Framework
2. Implementation of Flood Forecasting and Warning System (FFWS)

Economic Strategies

1. Parks, plazas, civic amenities on reclaimed areas
2. Safe access to river and wildlife sites

Implementation Framework

Issue Diagnosis

Detailed cost-benefit analysis of alternatives with economic returns along with community engagement and likely environmental benefits

- Alternative scenario development
- Community engagement platforms
- To complement the Community Plan process, a River Improvement Overlay (RIO) district would be created

Governance

Three-tiered structure proposed for managing a revitalized Los Angeles River

3 Elements

Governmental	Entrepreneurial	Philanthropic
• Los Angeles River Authority • Joint Powers Authority- City, Council of Los Angeles and US Army Corps of Engineers through MoU	• Los Angeles River Revitalization Corporation (Not-for-profit entity)	• Los Angeles River Foundation (Not-for-profit body established by private individuals)
Principal entity with power and responsibility for River Reconstruction, ROW Management, maintenance, public liability, permitting, and land development	*Directing public and private financing for river elated and neighbourhood revitalization projects*	*Supporting the plan's revitalization goals*

Financing

Through Central and State sources along with Local Departments (ULB and water boards) and private entities

- Trust for Public Land
- The Conservation Fund
- National Fish and Wildlife Foundation

Monitoring

- Done by city Joint Power Authority at community level
- Conducted by Los Angeles River Authority, and Los Angeles River Corporation, based on phased project development & water quality improvement monitoring

Impact assessment

Expected Impacts

Environmental

- Improved water quality
- Flood protection
- Restoration of habitat

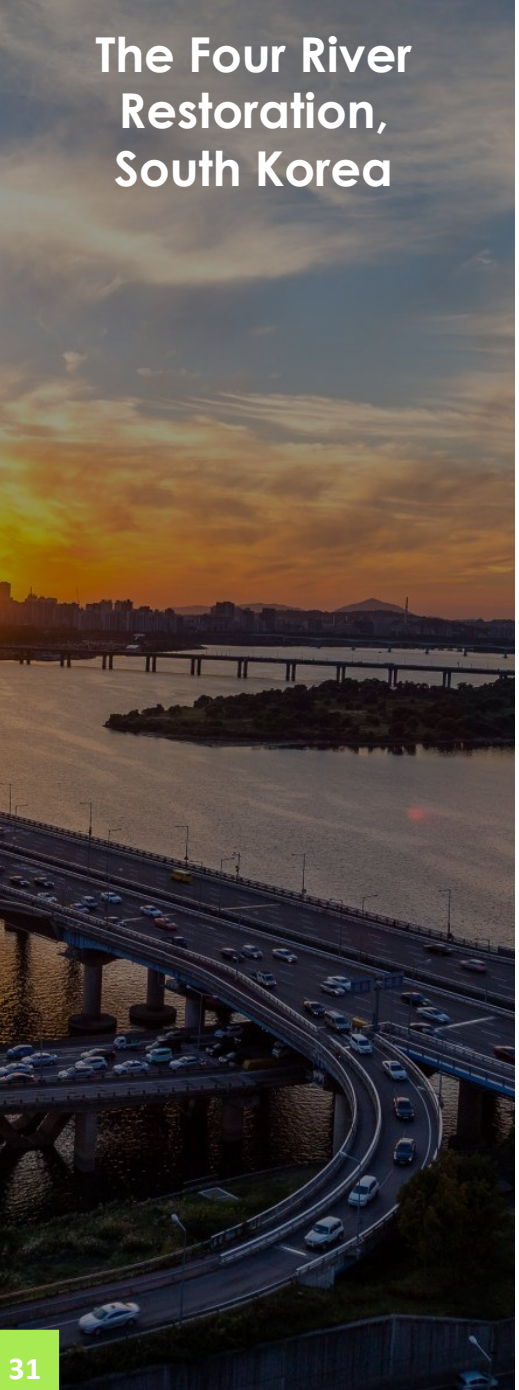
Social

- Community interests addressed
- Improved QOL, owing to accessible & green environment

Economic

- 4.68-billion labor income
- Reduction in flood induced damage
- Increase in real estate values

The Four River Restoration, South Korea

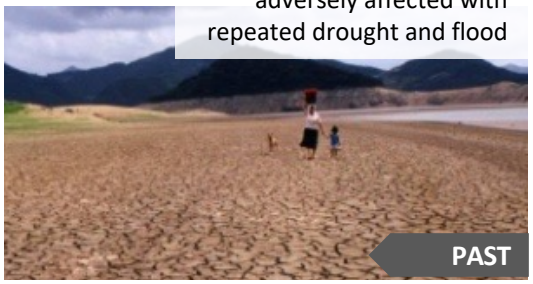


VISION

Reviving rivers, for a new Korea, clean rivers for recreational and cultural activities, a vibrant haven for wildlife and tourists

The Four Rivers Watershed

Rivers and Wetlands were adversely affected with repeated drought and flood



PAST

PRESENT

Components of infrastructure development, eco reserves etc.

HIERARCHY OF PLAN

Project Specific

DOCUMENT NAME

The 4 River Restoration Master Plan, South Korea, 2012

RIVER BASIN PROFILE

Location: **South Korea**
Name of River: **Han, Nakdong, Geum and Yeongsan rivers**
Length: **690 km**
Catchment Area: **69,534 sq. km.**
Population: **3.5 crores**
Density: **515 persons/km2**
Urbanization Rate: **81.5%**

CORE ISSUES

- Drought
- Flooding
- Water pollution
- Injured aquatic ecosystem

Key Strategies of the Plan

Environmental Strategies

1. Dredging of sedimented riverbed & agricultural land remodelling
2. Non-point pollution treatment facility
3. Ecological Restoration
4. Air Diffusing System
5. Installing nature-friendly fish-ways and ecological wetlands
6. Creation of riparian eco-belts

Social Strategies

1. Development of Water Cultural Centre, for community engagement

Economic Strategies

1. Small & medium sized multipurpose dam, weirs for water security
2. Waterfront Eco-parks, promenades, water leisure, sports area
3. Interconnection between rivers & cities, via green mobility

Implementation Framework

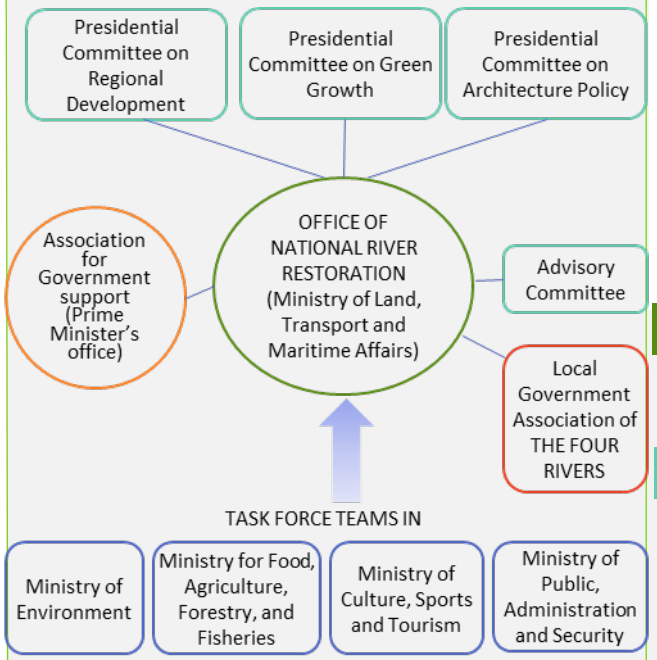
Issue Diagnosis

Environmental Impact Assessment & cost-benefit analysis conducted in detail

- EIA Panel consisting of River Basin Environmental office staffs, Regional Construction Management Administration, Korea Environment Institute (KEI) researchers, local professionals, etc. with significant community participation
- Conducted via water modelling and River Water Forum

Governance

Decentralised approach with Expert Committees



Impact assessment

Expected Impacts

Environmental

- Improved water quality (Grade 1)
- 86% clean water supply up from 76% (in 2006)
- Multiplication of the 8 endangered fish species

Social

- Community interests addressed
- Improved quality of living
- Improved livelihood opportunities
- Socio-cultural cohesion

Economic

- Reduction in flood induced damage
- Increased agricultural production
- Real estate value tripled
- 271 million kWh/yr hydropower plants
- 1,757 km of bicycle roads
- Water levels increase by 4.55m
- No damaged areas due to low flood water level (2~4m ▼) by dredging

Financing

Fully funded by the Korean Government and K-Water Co.

Monitoring

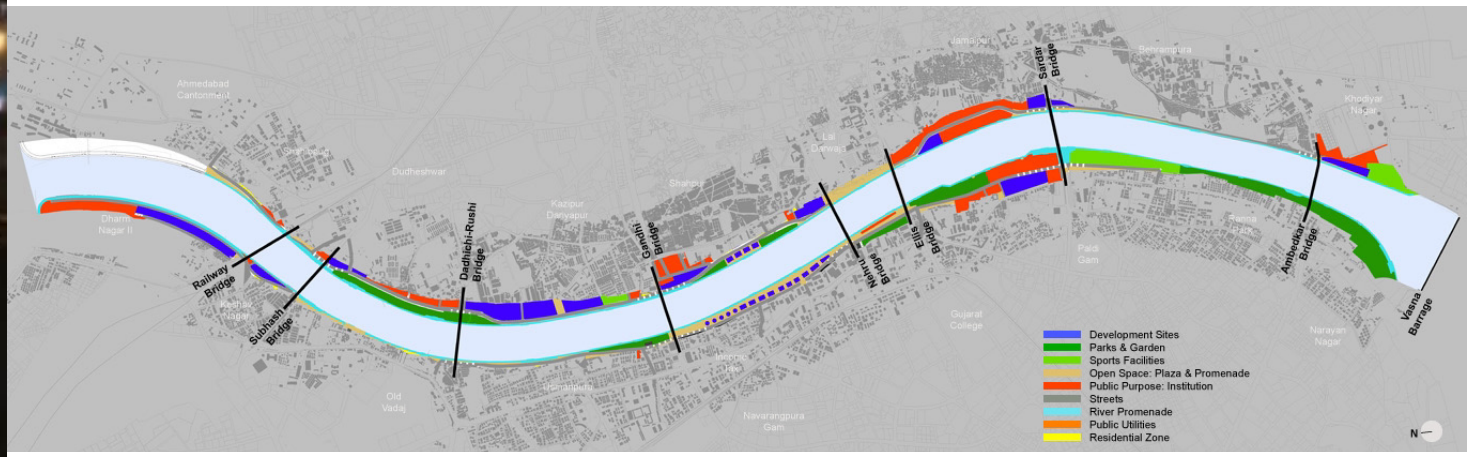
Establishing the IWRM System

- Increasing efficiency of the management through continuous monitoring (Water channel, sediment discharge, water quality, ecological environment, underground water, facilities, flood, water supply, etc)

Sabarmati River, Ahmedabad, India

VISION
A Multidimensional Environmental Improvement, Social Upliftment and Urban Rejuvenation.

The river was plagued with stretches of polluted stagnant water and in stretches it had dried



Sabarmati River Project Area

HIERARCHY OF PLAN
Project Specific

DOCUMENT NAME
Sabarmati Riverfront Master Plan, 2019

PROJECT PROFILE
Location: **Ahmedabad, India**
Name of River: **Sabarmati**
Length: **371 kms**
Catchment Area: **21,674sq.km.**
Project Length: **11.5km**

CORE ISSUES
- Water pollution
- Encroachment
- Sewage influences
- Direct industrial discharge
- Flooding

The river is seen as an example of revived river and an aesthetically designed riverfront

Key Strategies of the Plan

Established land use policy for ecological restoration and the upliftment of economic value of the area.

Environmental Strategies

1. Water retention & groundwater recharge
2. Land reclamation & creation of embankments
3. Consideration to River hydraulics
4. Reduced risk of erosion & flooding in flood prone neighbourhoods
5. River cleaning through STPs

Social Strategies

1. Improved river access through connected greenways
2. Resettlement & rehabilitation

Economic Strategies

1. Enhanced connectivity between river & city
2. Infrastructure and riverfront development - parks, promenades

Implementation Framework

Issue Diagnosis

- Feasibility Studies incorporating social, economic and environmental aspects, conducted in 1998 by SRFDC
- Alternatives developed and most feasible option chosen, depending upon the project risks it posed

Governance

Special Purpose Vehicle driven governance framework

Ahmedabad Municipal Corporation (AMC) → Sabarmati River Front Development Corporation Ltd.1997

The AMC created a "wholly owned" company to develop the Sabarmati riverfront

Politically driven project

Monitoring

No specific monitoring mechanism, however, significant measures have been taken under SMART Cities Mission

- Command & Control Centres executed, which plan to use sensors for monitoring mechanisms to device data evidence-based urban planning
- Supervisory Control & Data Acquisition System (SCADA)

Financing

- Loans from the Housing and Urban Development Corporation (HUDCO) (a large national level infrastructure funding agency), and the AMC.
- Land Based Financing - Property Development, 15% reclaimed land to be sold for revenue generation

Impact assessment

Expected Impacts

Environmental

- Improved water quality
- 12.5 million cubic meter storage of river water for groundwater recharge
- Healthy ecosystem
- Extensive tree plantation

Social

- 50,000 people rehabilitated
- Informal markets for 25000 vendors and their families
- Direct benefits to 1,000s of Dhobis (washer men)

Economic

- 400 cr+ revenue generated with property development
- Tourist footfall increased (10 lakh/year)
- 202 Ha. land made available for further development

Plan Assessment: Absent | Mentioned but not in detail | Due consideration given

IMPACT ASSESSMENT: ENVIRONMENTAL | SOCIAL | ECONOMIC

IMPLEMENTATION FRAMEWORK: ISSUE DIAGNOSIS | GOVERNANCE | FINANCING | MONITORING

STRATEGIES: ENVIRONMENTAL | SOCIAL | ECONOMIC

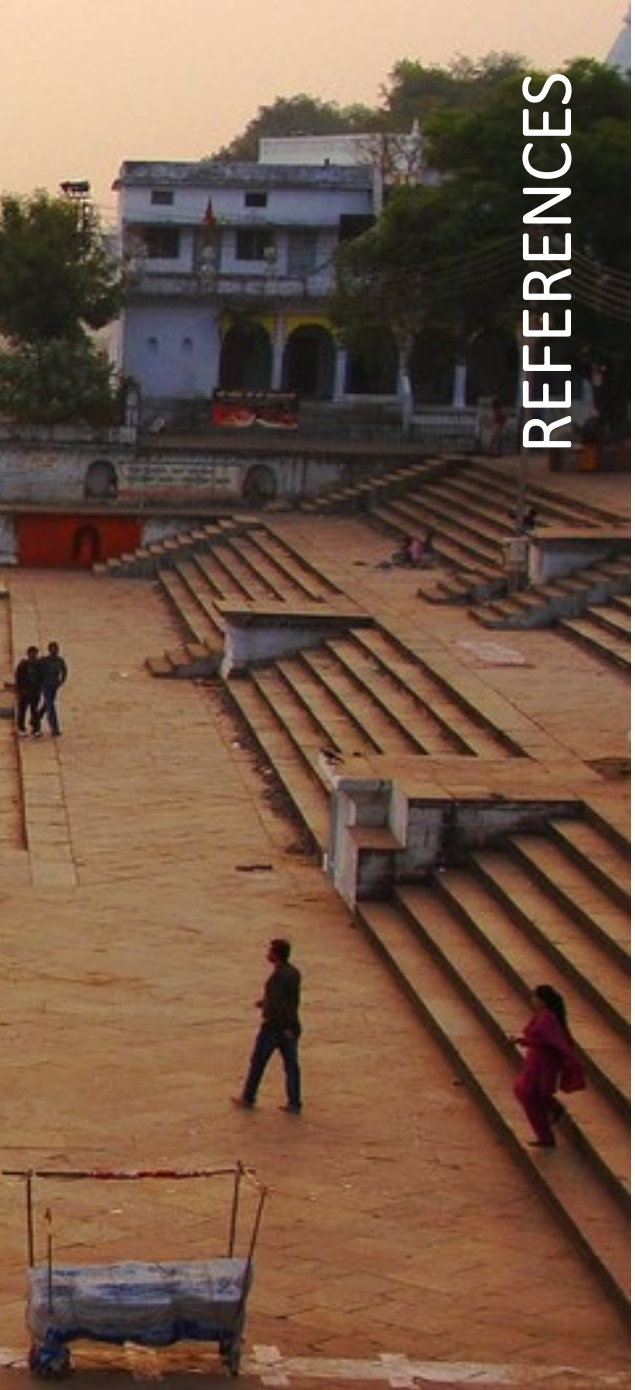
Kolkata Ghat @ Wikimedia Commons

WAY FORWARD

From the practices observed across the globe, it can be pointed out that the River Management Plans are being prepared individually at multiple levels; starting from basin level and going down till the project scale; each differing in its time frame, capacity and level of participation from the stakeholders (particularly, the community). What goes amiss in this process is the integration of all these plans, which is very essential for effectively addressing the issues concerned here.

Better overall coordination at the river basin level is a pre-requisite for implementing the plans effectively. This, in turn, needs more integration at the operational level. Effectively, both top-down and bottom-up approaches have to be followed, to holistically address the concerns. This means to ensure that many physically separate actions at local scale must be planned and coordinated with optimum outreach, in combination with the larger holistic vision of river management the the basin scale.

M.P. Ghat @ Flickr



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