

SESSION – 2

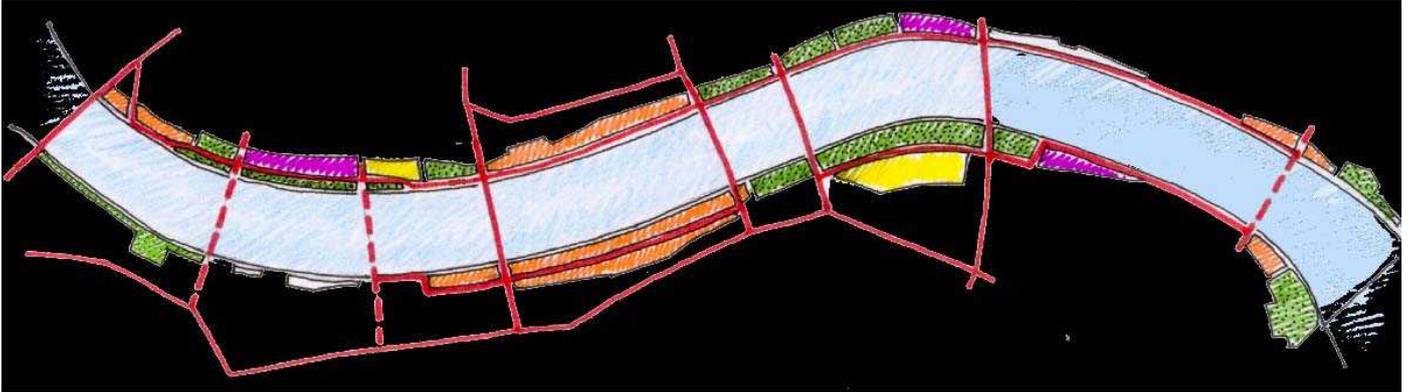
**IMPROVEMENTS TO WATERWAYS –
EXPERIENCES OF OTHER CITIES**

Session – II

Sabarmati Riverfront Development

*Thiru. Jagdish Patel,
General Manager (Tech), Sabarmati River Waterfront Development Corporation Limited,
Ahmedabad.*

Sabarmati Riverfront Development
Integrated Environmental Improvement and Urban Revitalization

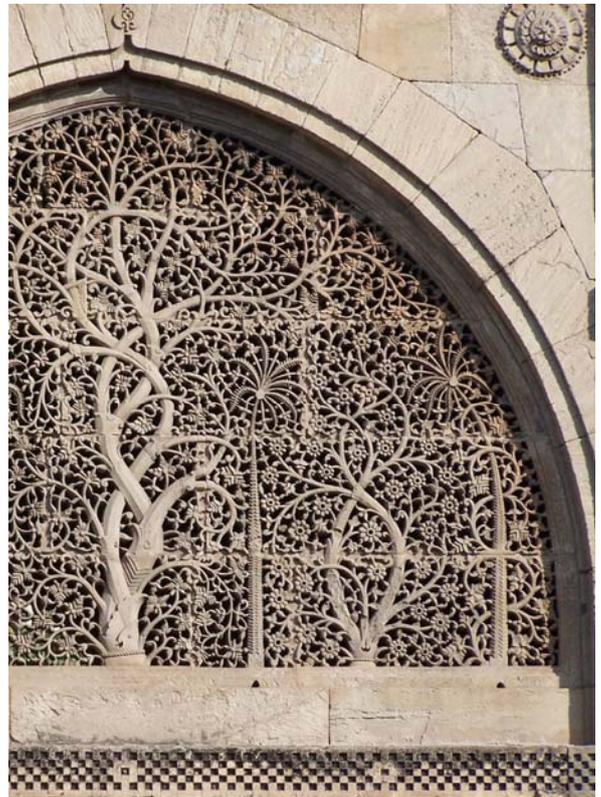
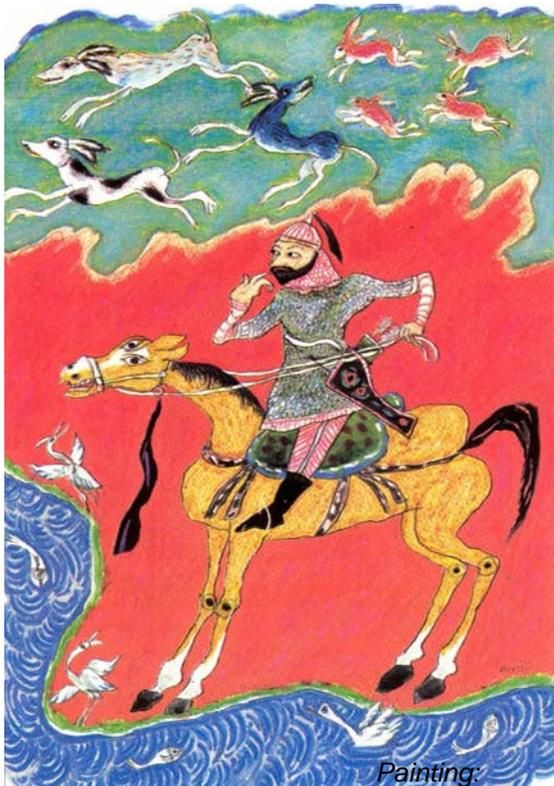


Sabarmati River Front Development Corporation Limited

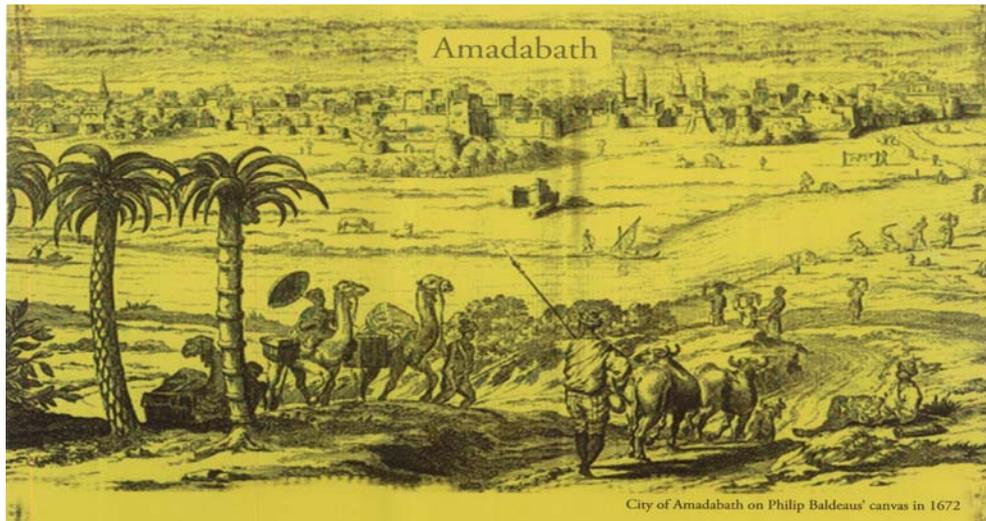
Ahmedabad and the Sabarmati

Sabarmati and the growth of Ahmedabad

Ahmedabad was established on Sabarmati in 1411



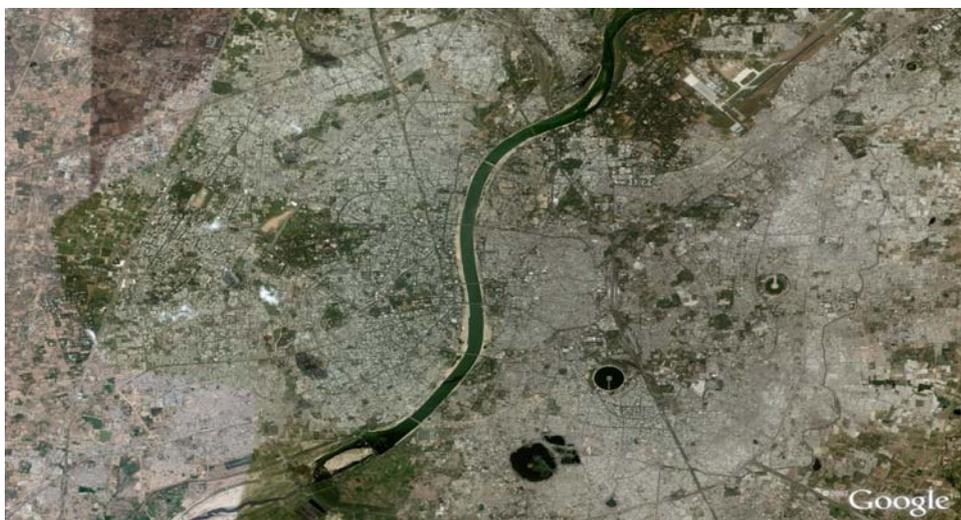
Ahmedabad and the Sabarmati - 1672



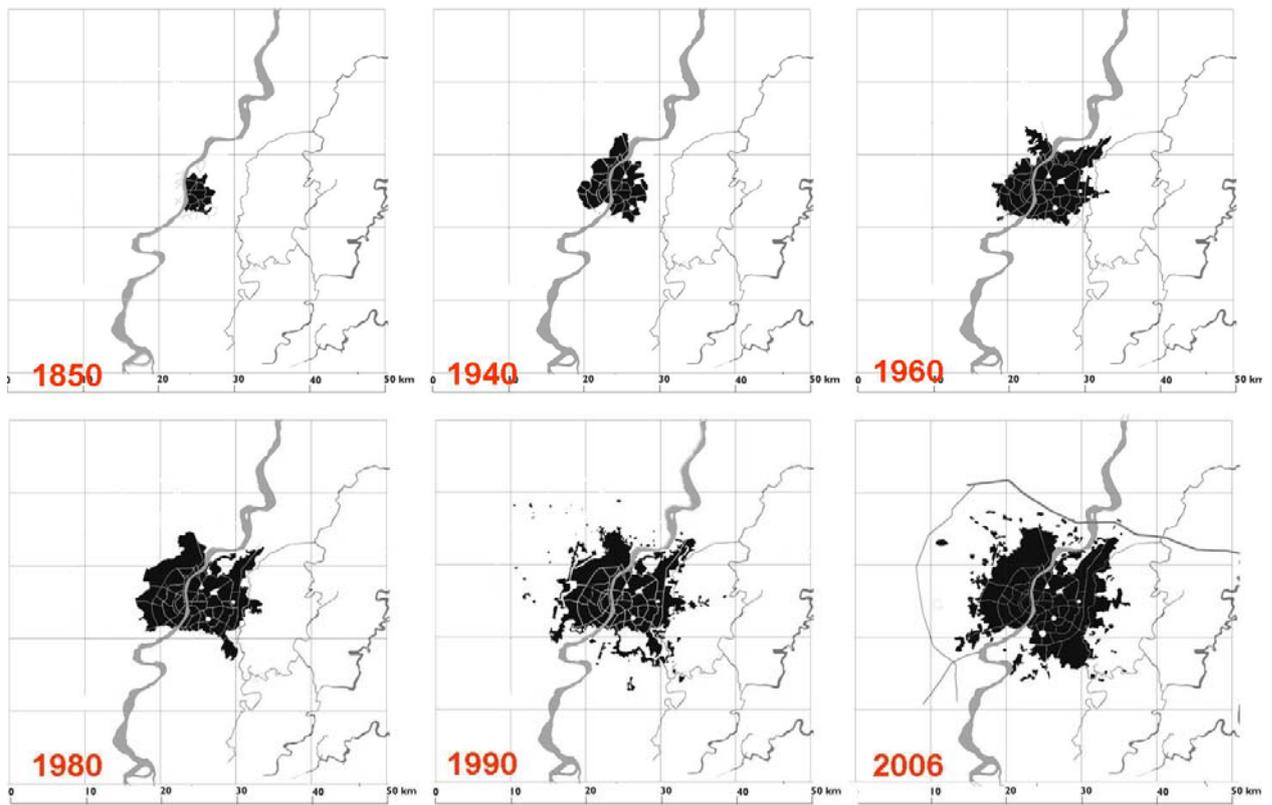
Ahmedabad and the Sabarmati - 1949



Ahmedabad and the Sabarmati - 2007



Sabarmati and the Growth of Ahmedabad

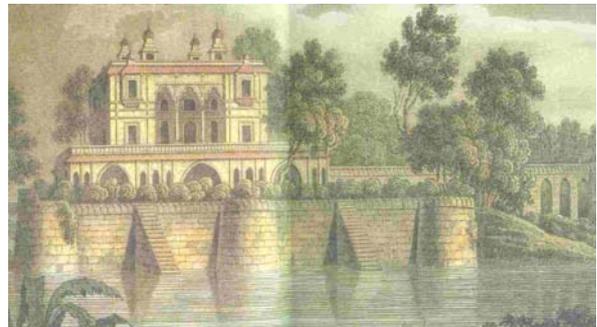


Sabarmati has always been important to Ahmedabad

As a source for drinking water



As a place for recreation



Gandhiji built his ashram on the bank of Sabarmati in Ahmedabad



As a place to gather



As a place for the poor to build their hutments



As a place for washing and drying clothes



As a place for holding the traditional 'Sunday Market'



As a place for farming



And yet, Sabarmati was abused and neglected

It became a place to dump garbage



Stormwater drains spewed untreated sewage into the river



A few nalas brought sewage into the river



Sewage from the slums flowed directly into the river



Encroachments reduced the river's flood carrying capacity



The river became inaccessible to the public

Haphazard and dull development came up along the riverfront



The bridges were the only places from which the river could be enjoyed



The river became insignificant in the life of the city



The city turned its back to the river

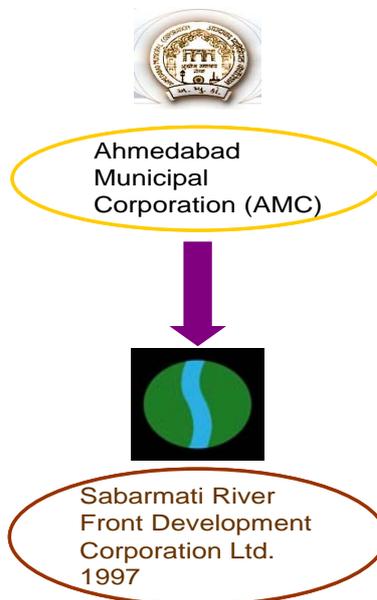


Ahmedabad had abused and neglected the Sabarmati



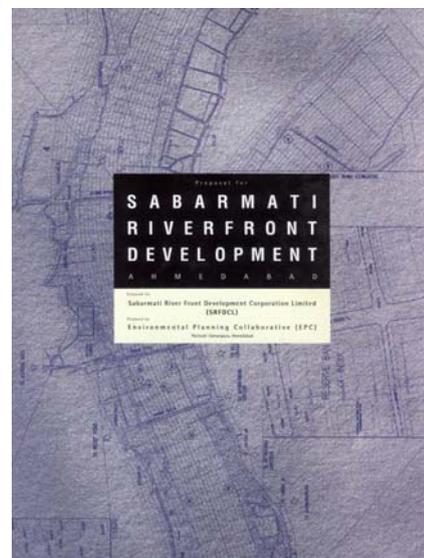


The AMC created a “wholly owned” company to develop the Sabarmati riverfront



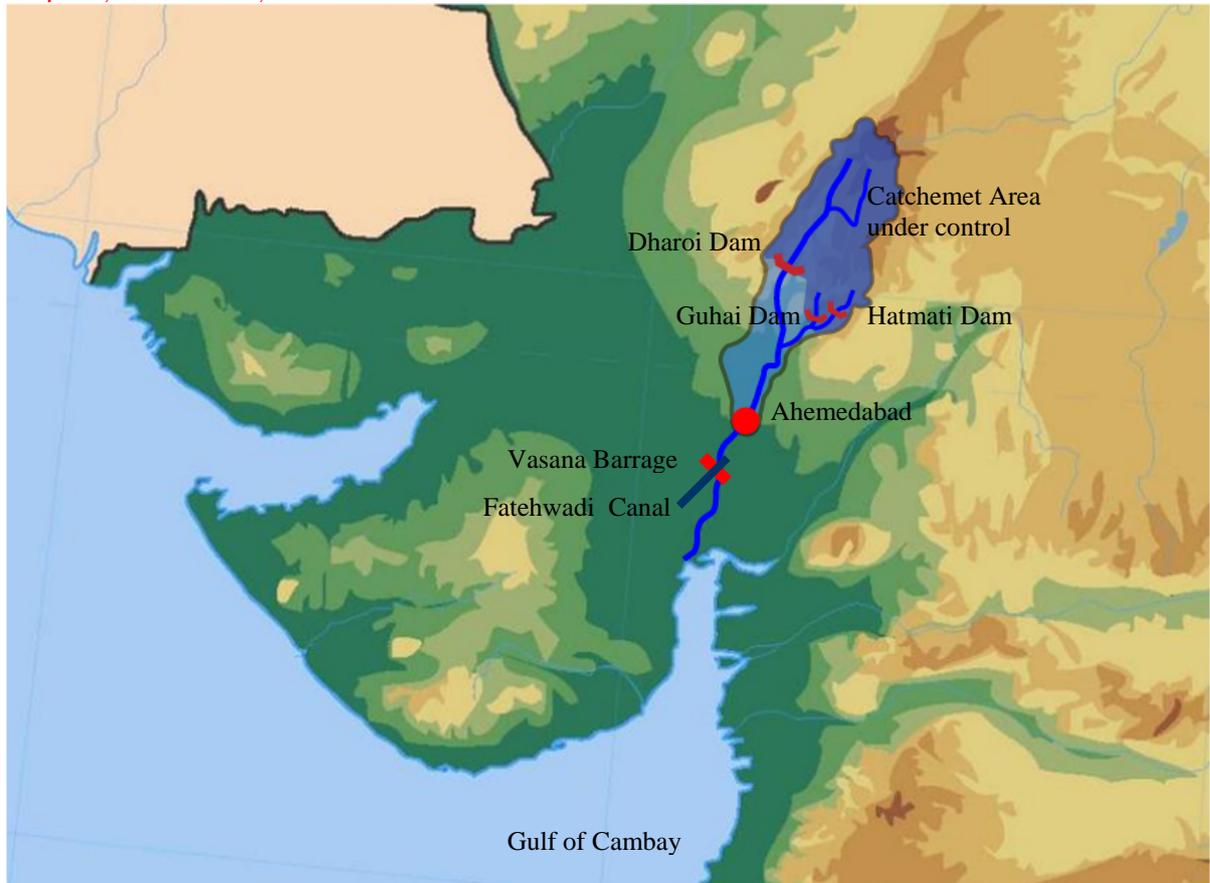
Proposal for Sabarmati Riverfront Development 1998

- Physical Features of the River
- River Hydraulics
- Land Reclamation and Embankments
- Land Ownerships
- Water Retention
- Ground Water Recharge
- Land Use and Road Network
- Infrastructure Services
- Resettlement and Rehabilitation
- Implementation Strategy
- Project Costs and Revenue Potential
- Structure of the SRFDCL
- Development Management



A Multidimensional Environmental Improvement, Social Upliftment and Urban Rejuvenation Project

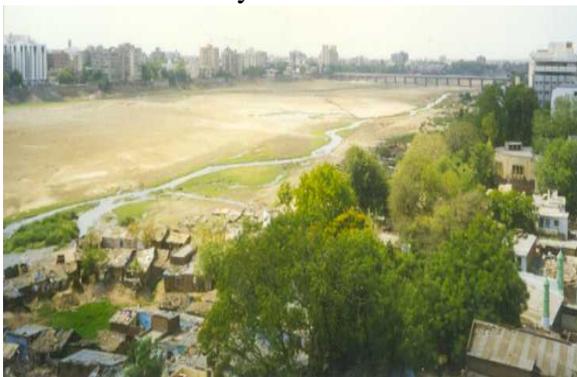
Gujarat, Sabarmati, Ahmedabad and the Narmada



Dharoi Dam

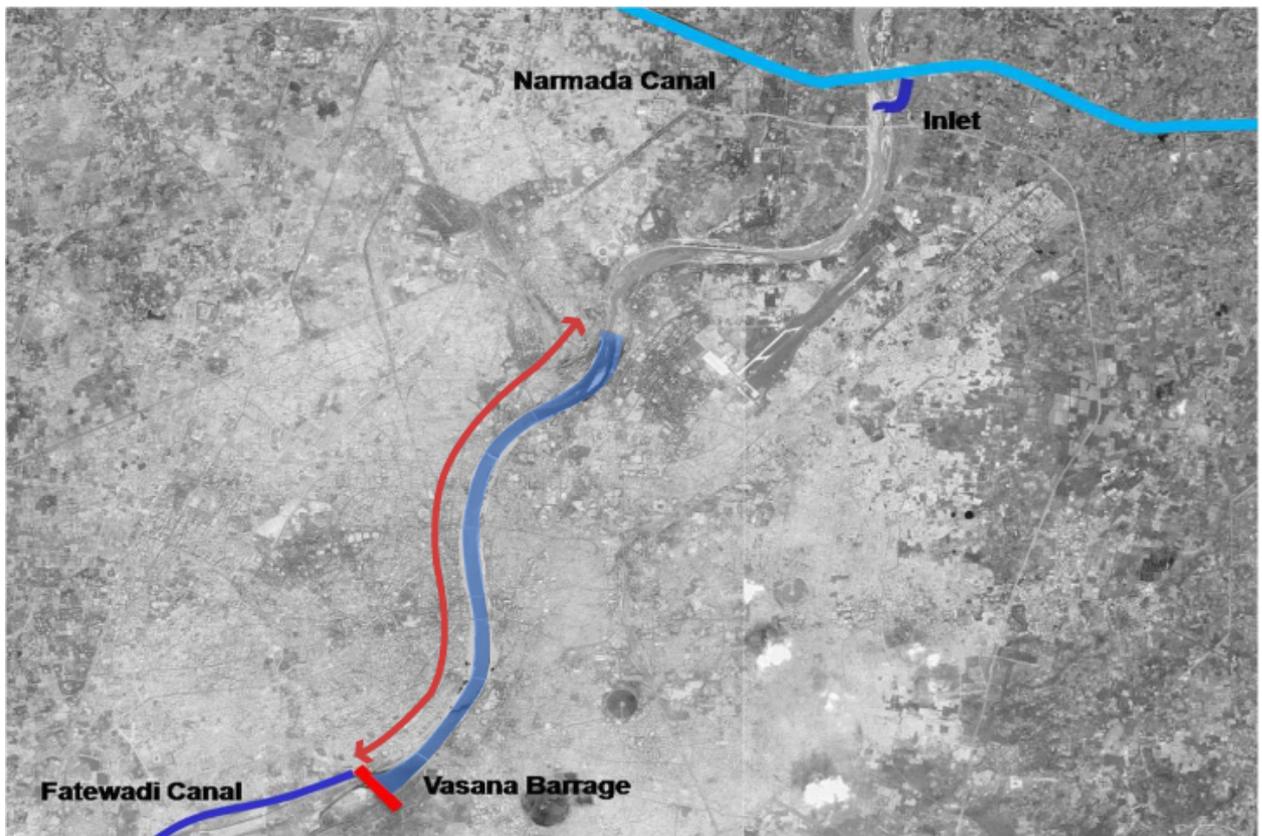


Dry River Bed



Vasana Bridge





Ambitions of the Sabarmati Riverfront Development Project

- Make the riverfront accessible to the public
- Stop the flow of sewage, keep the river clean and pollution-free
- Provide permanent housing for riverbed slum dwellers
- Reduce risk of flooding and erosion in flood prone neighborhoods
- Create riverfront parks, promenades and ghats to enjoy the water
- Provide Ahmedabad with new cultural, trade and social amenities
- Revitalize riverfront neighborhoods, rejuvenate Ahmedabad
- Generate resources to pay for all of the foregoing
- Stitch together East and West Ahmedabad
- Create a memorable identity for Ahmedabad

Make the riverfront accessible to the public

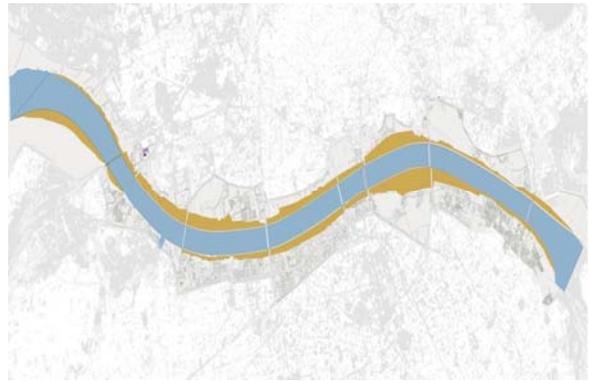


River Training and Land Reclamation – The Existing Riverbed



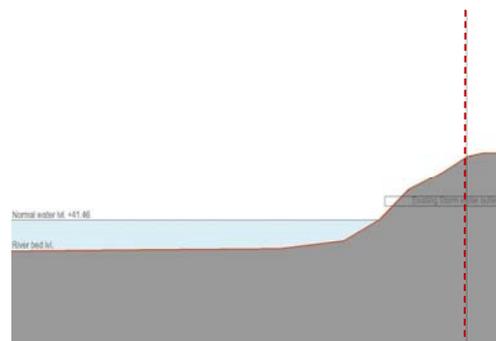
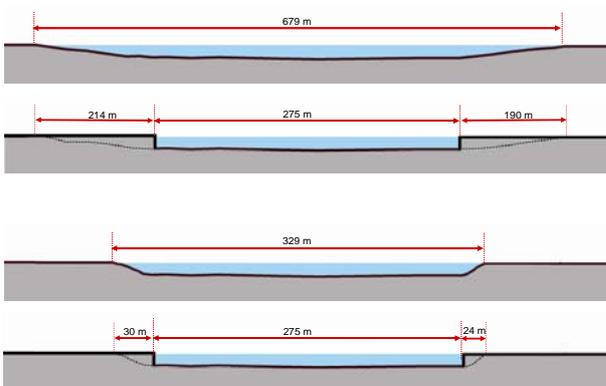
River Training and Land Reclamation

- Defined Waterway – 275 m wide
- Total Reclamation area - 185 Hectares



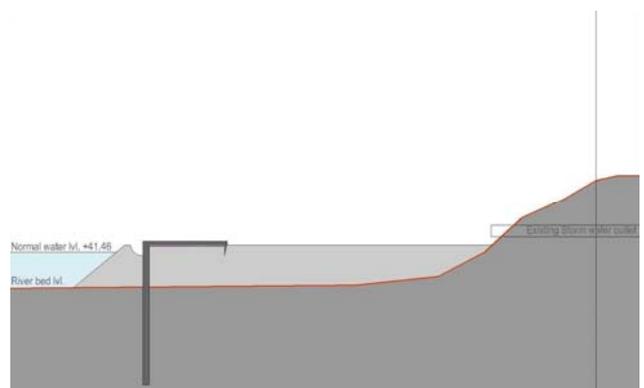
River Training and Land Reclamation – The Extent

The Construction Process – Original Condition



The Construction Process – Diaphragm Wall and Anchor Slab

Diaphragm Wall and Anchor Slab



Diaphragm Wall and Anchor Slab



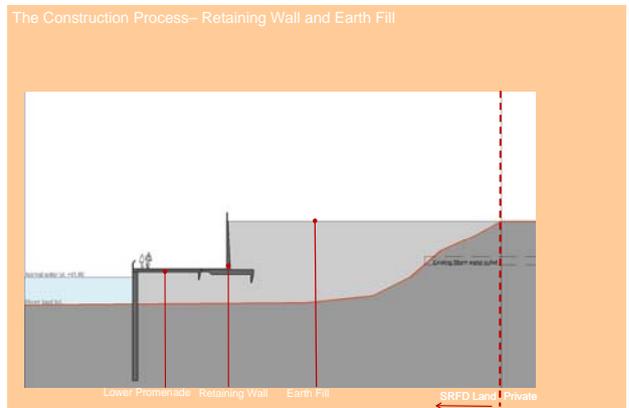
Diaphragm Wall and Anchor Slab



The Construction Process– Retaining Wall and Earth Fill



Retaining Wall and General Earth Fill



Retaining Wall





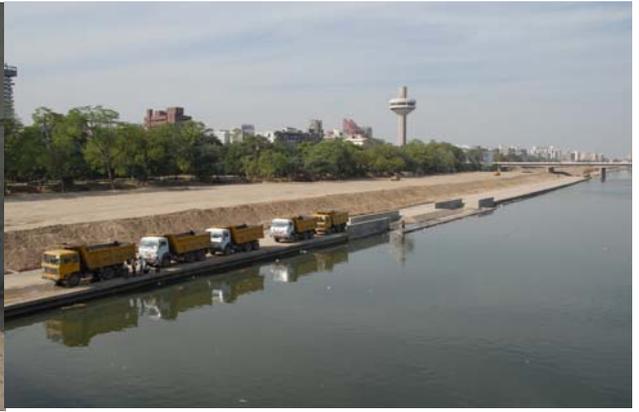
Retaining Wall and



General Earth Fill



General Earth Fill



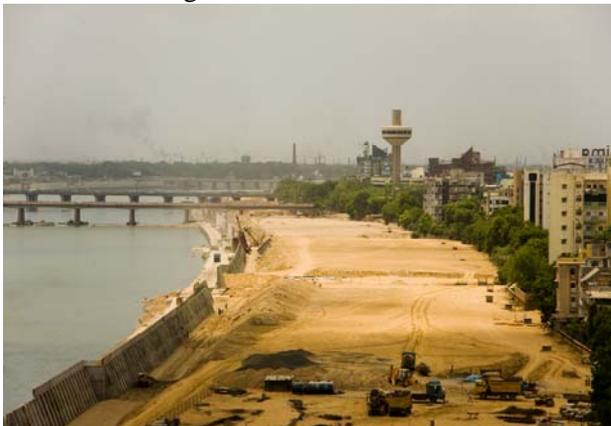
General Earth Fill



Retaining Wall and General Earth Fill



3,88,00,000 kilograms of steel used!



36,20,000 bags of cement used!

1,11,00,000 cubic meters of soil to be used
12,00,000 trucks of soil to be used



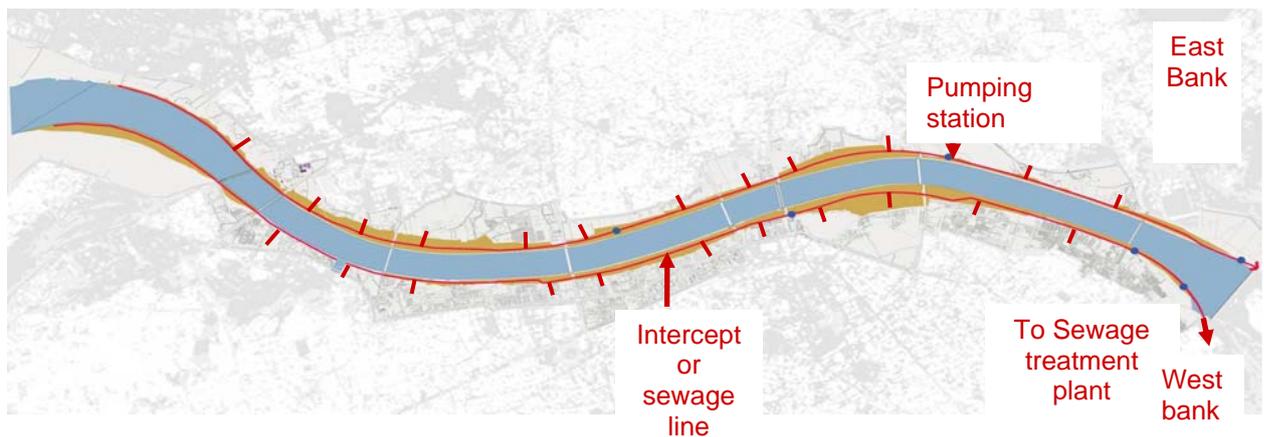
The entire length of Sabarmati is now public!



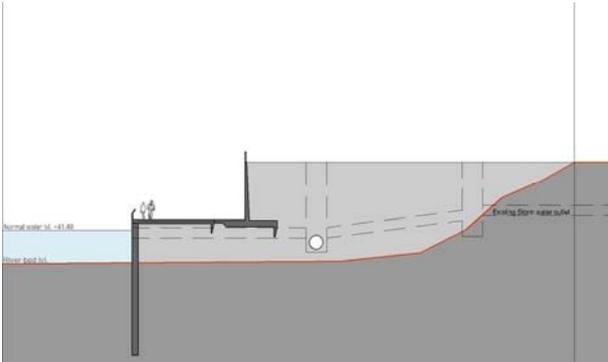
Stop the flow of sewage, keep the river clean and pollution-free



Ensuring Clean Water



The Construction Process – Interceptor sewage line and Outfalls Extensions



Interceptor sewage line being built



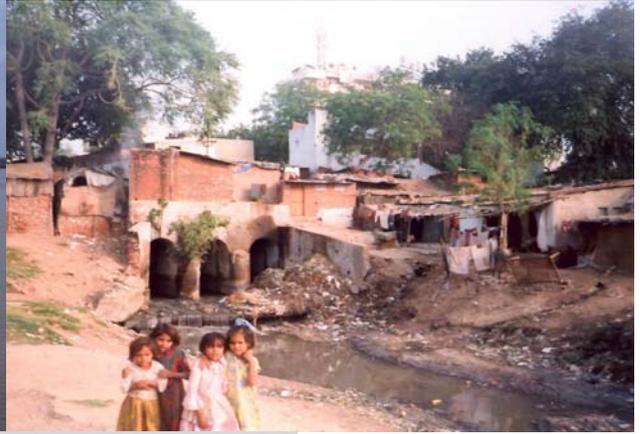
Interceptor sewage line being built



The sewage will soon stop flowing into the Sabarmati!



Provide permanent housing for River bed slum dwellers



Relocation of Riverbed Slum Dwellers - Socio Economic Survey of Riverbed Slums

MSB 8/9/2000

Interview Schedule for Socio-Economic Survey of the River Side Slums

Schedule No.: 10167/01 Structure ID: barbar-SES Group: _____ Investigator: _____

Survey date: _____ Phase: _____ Pocket: _____ Demarcation Line (DL) date: 2.12.2000

Name of the Slum & details: _____

Ownership of land on which the slum is located: Private-1 Corporation-2 Government-3

Within Demarcation lines: above SES Ward No.: 10167/01 To be covered?

Postal Address of the Structure: _____ Tel. No. _____

I Identification and Social Background

1.1 Full Name of the Occupant: Mishra, Rajesh Kumar

1.2 Family Composition

Sr. No.	Name of the Family Members	Relationship with Occupant	Sex	Age	Marital Status	Education Status/ Skill	Occupation/ Vulnerability (Specify, if any)
						Teaching	
Total							

1.3 Religion: Hindu - 1, Christian - 2, Muslim - 3, Other - 4

1.4 Name of caste: _____ SC-1, ST-2, OBC-3 Other: _____ If not known, do not fill in this column.

1.5 Mother Tongue: Gujarati - 1, Hindi - 2, Marathi - 3, Any other - 4

1.6 Ownership details of the structure: If Owner, no. of Years If Tenant, no. of Years

Have legal documents?: Yes - 1, No - 2 None & document to be submitted.

1.7 If Tenant, full name and address of owner/joint owners: _____

Rent Paid & to whom: _____ Deposit Paid & to whom: _____

1.8 Occupancy Details (see the document, where available)

Document	Y/N	Name in Document	Document	Y/N	Name in Document
Ration Card (include living person name)			AMC slip	<input checked="" type="checkbox"/>	for this for single slip.
Voter Identity Card		Main member only	Driving License		
Electricity Bill			Bank Account		
AMC House Tax receipt			Other ID		

1.9 If owner, number of years of living in the present structure: 1 years



Relocation Sites



Improved Housing



Riverfront slum dwellers will soon all have permanent housing!



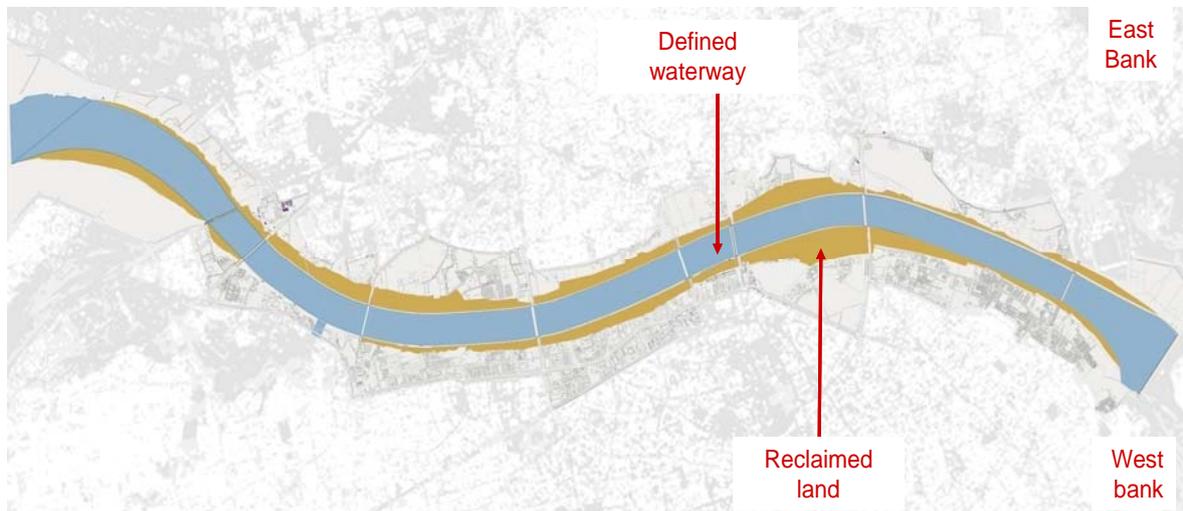
Reduce the risk of flooding in flood prone neighborhoods



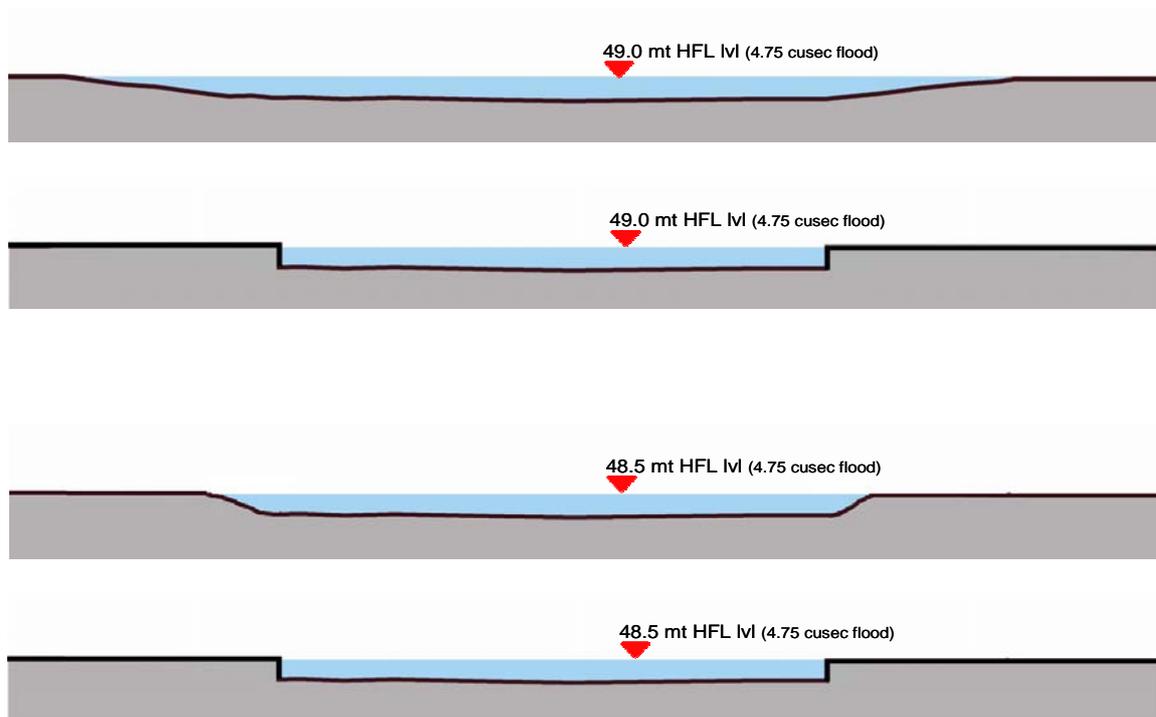
Contour Map of Ahmedabad



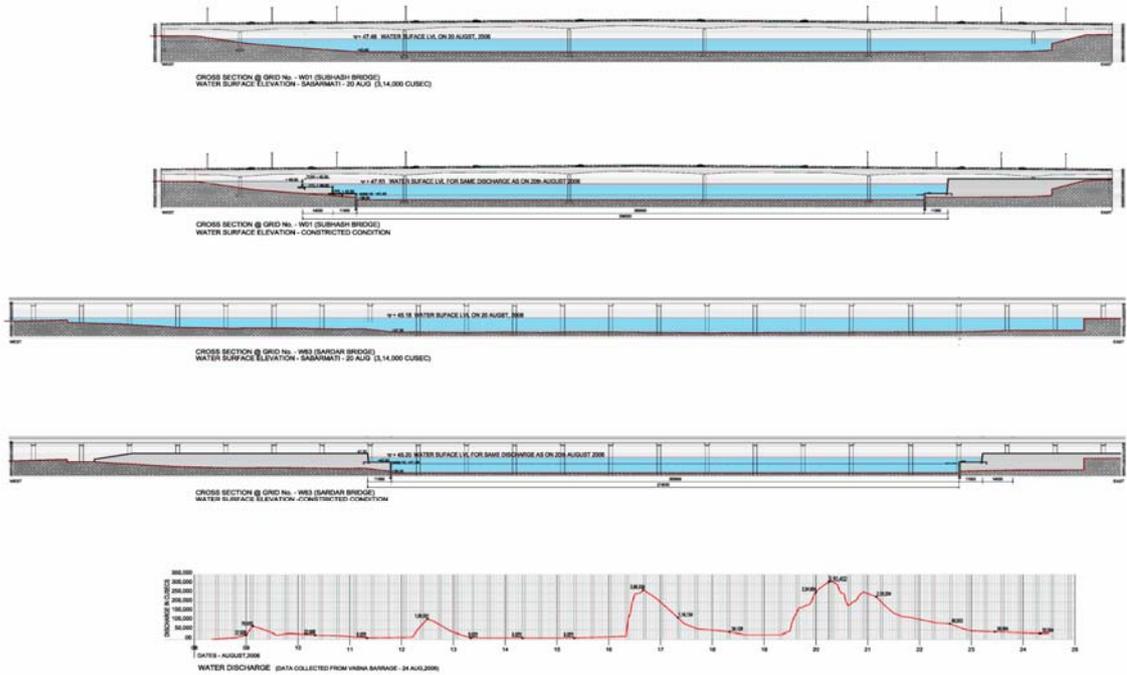
The Defined Waterway and Reclaimed Land



Embankments and HFL for a 4.75 Lakh Cusec Flood



High flood levels verified during 2006 flood

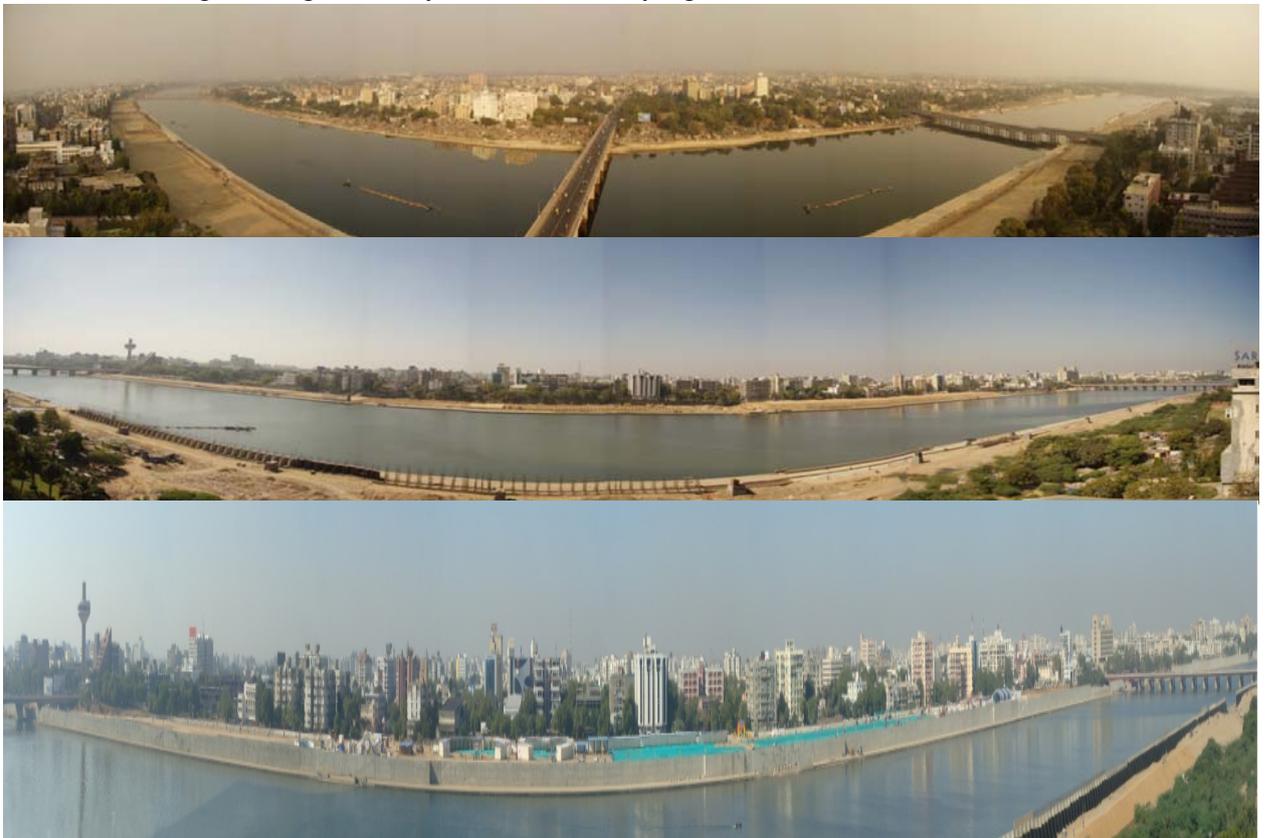


WATER SURFACE ELEVATION - SABARMATI - 20 AUGUST, 2006 AND FOLLOWING RIVER CONSTRUCTION : (FOR SAME DISCHARGE)
Sabarmati River Front Development Project - Sabarmati River Front Development Corporation Ltd., AMC - Ahmedabad.

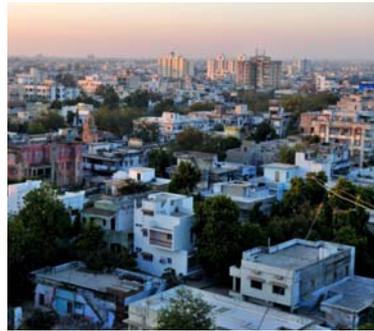
SCALE 1:750

HCP DESIGN AND PROJECT MANAGEMENT PVT LTD 'Partosh', Usmanpura, Ahmedabad-380 013, Gujarat, INDIA (079) 27550875, 27552563. Fax: (079) 27552924 www.hcp.co.in

Risk of flooding will significantly reduce in low lying



Create riverfront parks, promenades and ghats to enjoy the water



Urban Forest – Paldi



Park – Cultural Mile



Park – Khanpur



Park – Shahibagh



The Heritage Park – Lal Darwaza



Upper Promenade – Ashram Road



Arcades - Ashram Road



Lower Promenade – Ashram Road



Lower Promenade – Cultural Mile



Lower Promenade - Shahibaug



The Sabarmati Riverfront Project will add almost 10,00,000 sq. mts. of parks, promenades and plazas to Ahmedabad!



Provide Ahmedabad with many new cultural, trade and social amenities

A Mile of Cultural Institutions and Museums



Trade Fair Facilities



Open Air Markets



Hospital Facilities



Educational Institution - Shahibaug



Market Street - Ashram Road



Riverfront Retail Street - Ashram Road

Organized Vending along Khanpur Park

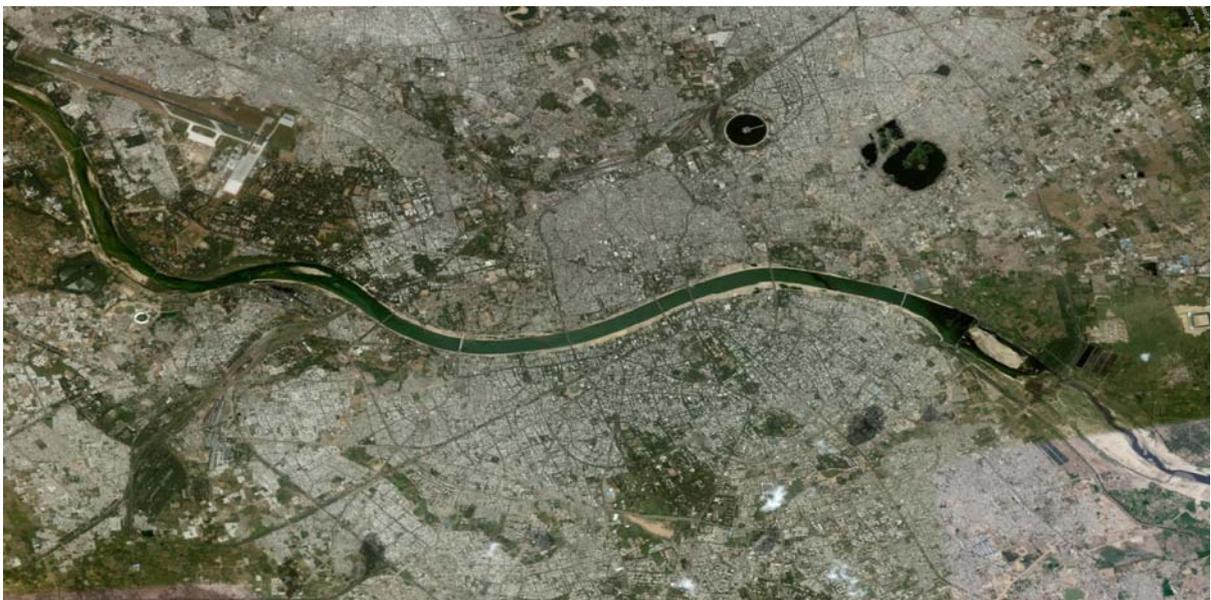


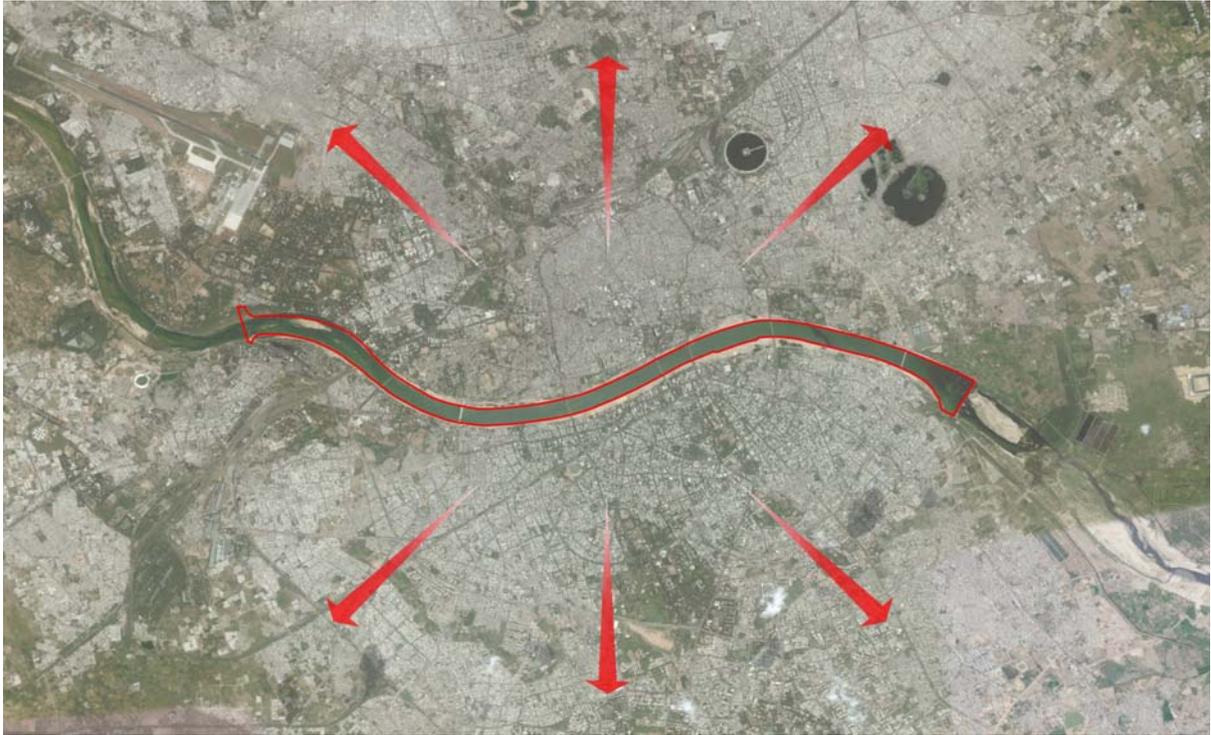
The Sabarmati Riverfront Project will help provide Ahmedabad with many new cultural trade and social institutions!



Revitalize riverfront neighborhoods Rejuvenate Ahmedabad

The Riverfront Project can transform all of Ahmedabad . . .



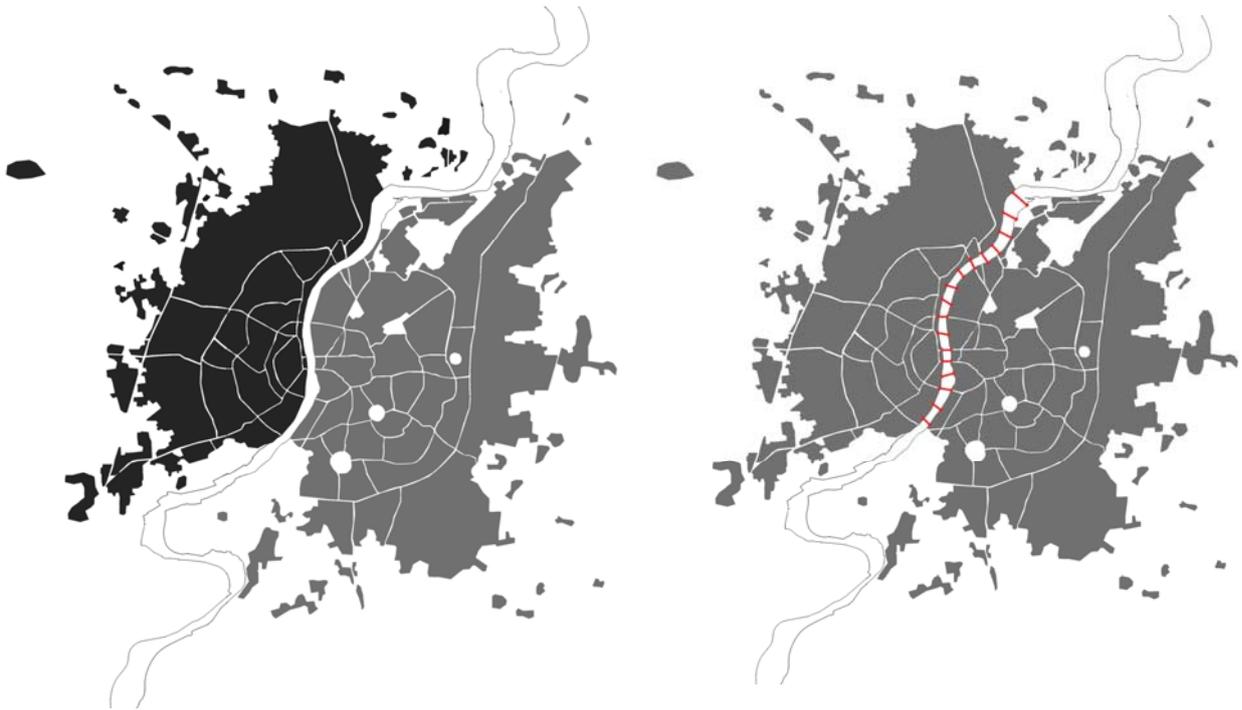


Planning Precincts

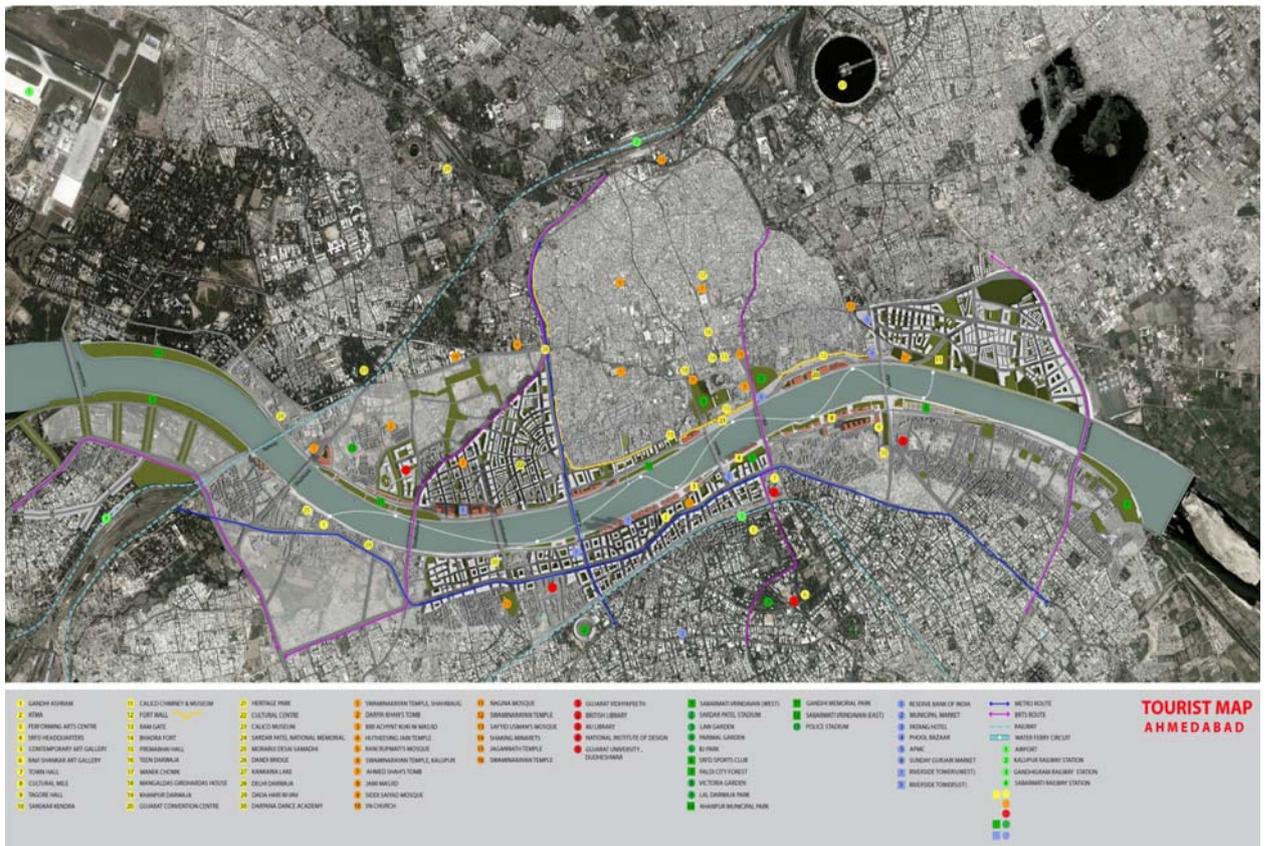


- | | |
|---------------------------------------|----------------------------------------|
| 1. Paldi Residential Neighborhood | 10. Shahibagh Residential Neighborhood |
| 2. Cultural Mile | 11. Shahibagh Institutional Precinct |
| 3. Health-care Hub | 12. Dudeshwar Mixed Use Precinct |
| 4. B J Park Institutional Precinct | 13. Khanpur Mile |
| 5. Ashram road Business District | 14. Lal Darwaza Heritage Precinct |
| 6. Ashram road Mixed Use Precinct | 15. Fair and Market Precinct |
| 7. Gandhi Ashram Heritage Precinct | 16. Calico Redevelopment Precinct |
| 8. Sabarmati Residential Neighborhood | 17. Pirana Precinct |
| 9. Sabarmati Redevelopment Precinct | 18. Lower Promenade |

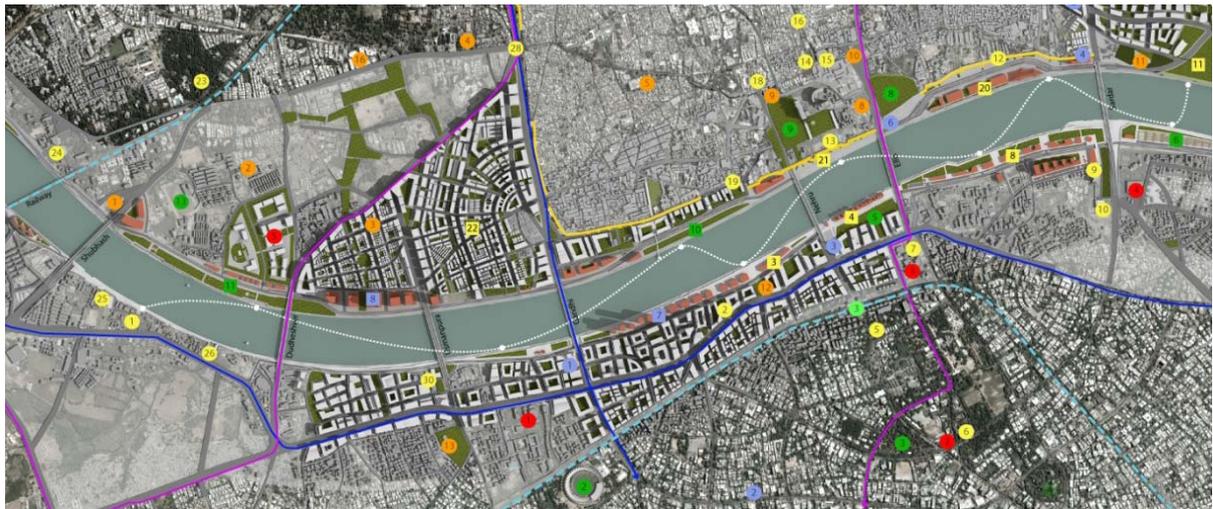
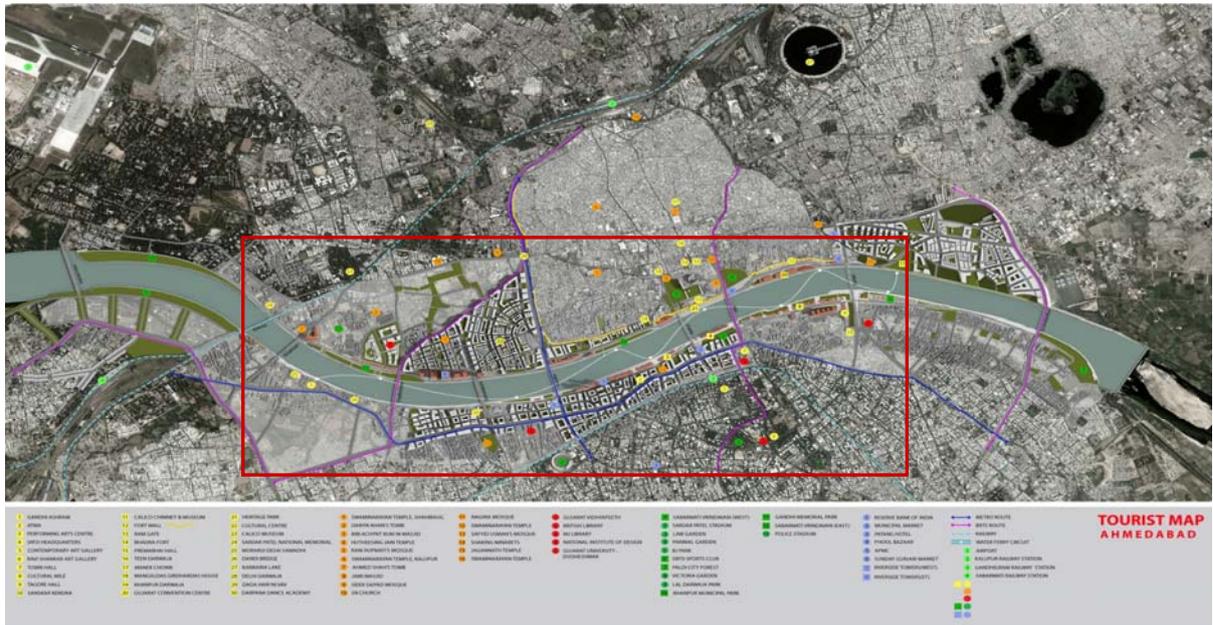
Stitch together East and West Ahmedabad



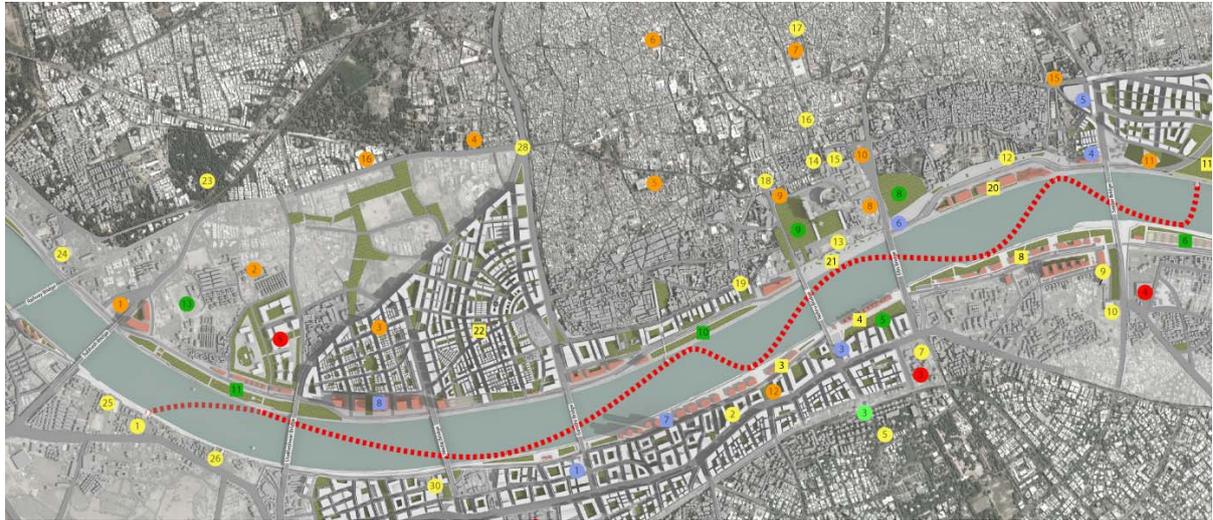
Tourist Map of the Future . . .



Tourist Map of the Future . . .



Boats and activities along the water will help tie East and West Ahmedabad . . .



Boats and activities along the water will help tie East and West Ahmedabad . .



Generate resources to pay for all of the foregoing

Commercial Development – Sardar Bridge



Commercial Development – Khanpur



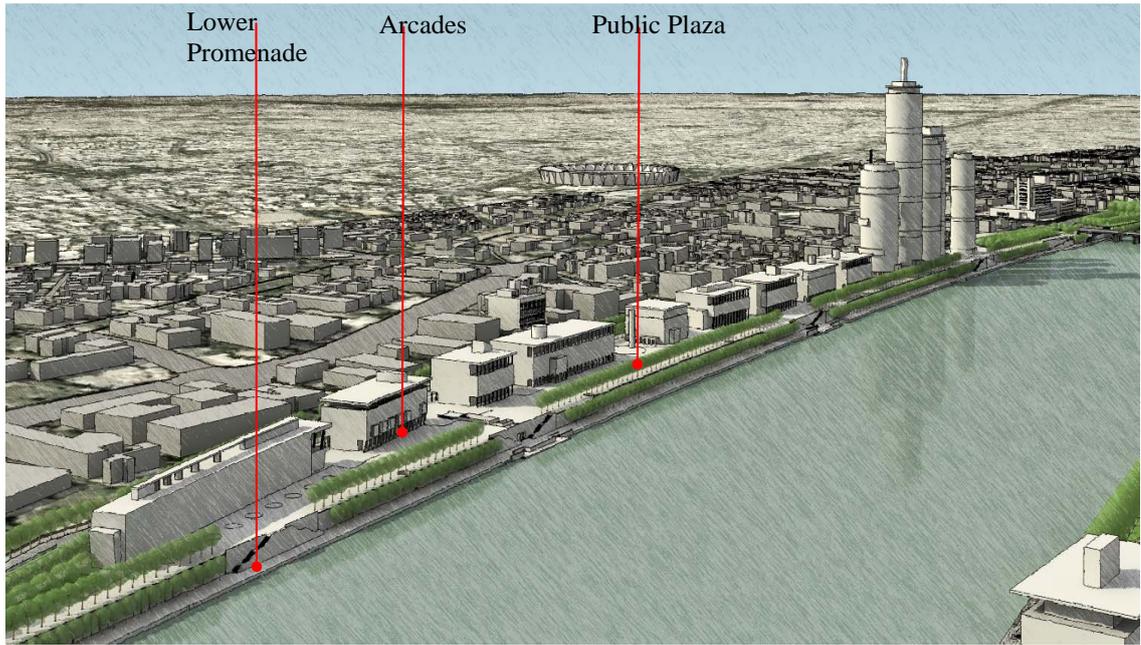
Commercial Development – Khanpur



Commercial Development – Subhash Bridge



Commercial Development – Ashram Road



Create a memorable identity for Ahmedabad



CEE
Discover
Ahmedabad

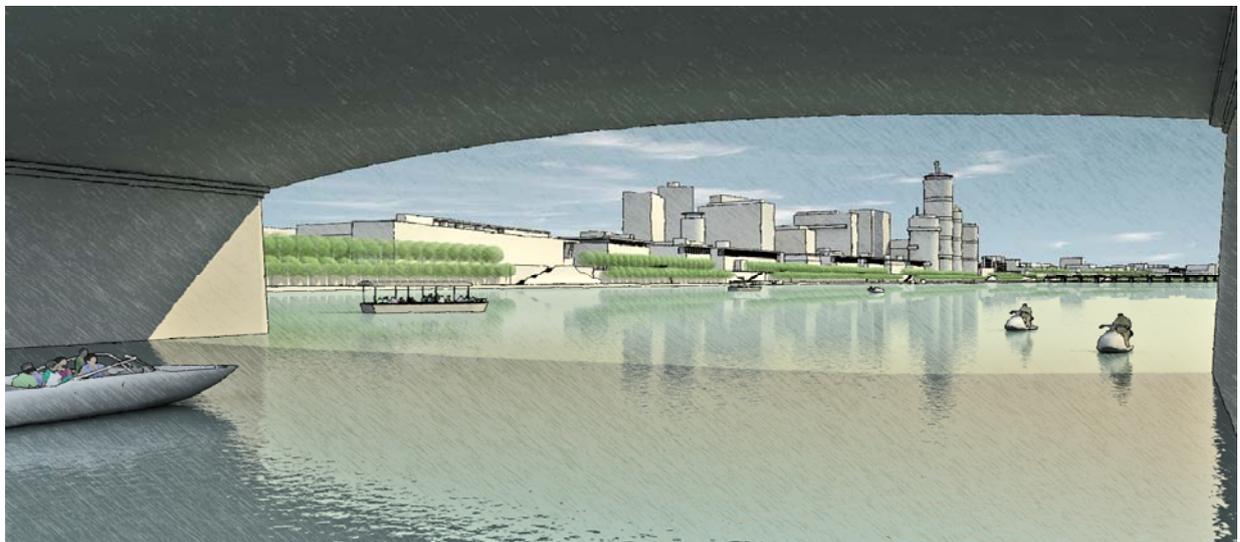
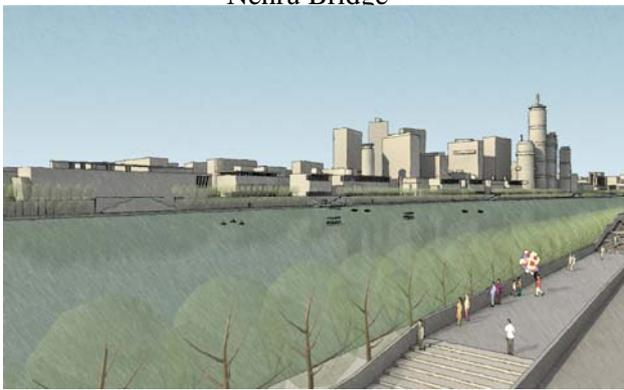


A New Skyline for Ahmedabad



A New Skyline for Ahmedabad – View from
Nehru Bridge

View from the Observation Deck



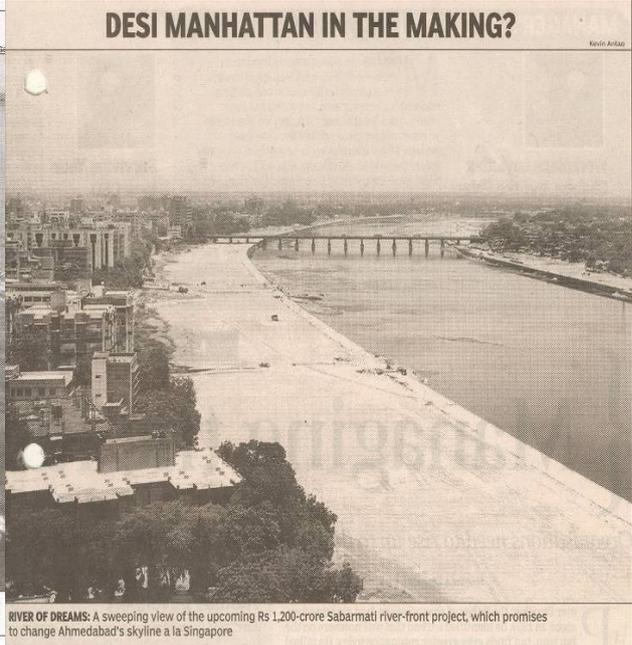
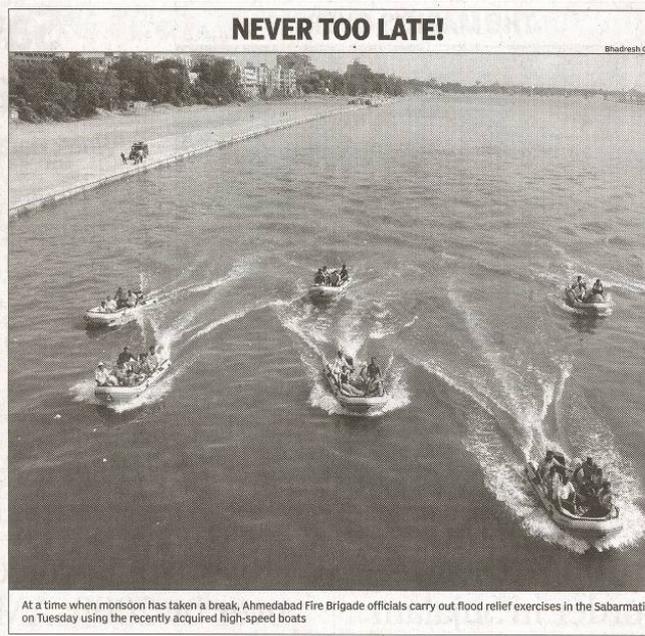
**The Project will bring
The Sabarmati back to Ahmedabad and Amdavadis back to The Sabarmati!**

International kite Festival 2006



International kite Festival 2010





Session – II

Improvement of Waterways – Lake Bhopal Development

Thiru Aniruddhe Mukerjee

*Secretary, Transport, Government of Madhya Pradesh &
Managing Director, M.P. Road Transport Corporation, Bhopal, M.P.*

Problems Associated with Urban Wetlands

Problems	Causes
Reduction of water storage capacity	<ul style="list-style-type: none"> • Inflow of silt and organic materials from urban and rural catchments, along with monsoon runoff and dry weather flows • Addition of clay and non-biodegradable materials through immersion of idols
Deterioration of water quality	<ul style="list-style-type: none"> • Inflow of untreated sewage from habitations; • Dumping of municipal wastes • Dissolving of paints in water during immersion of idols; • Chemical fertilizer runoff from the catchment; • Activity of washing of clothes by washermen • Leakage of oil during motor boating
Flourishing growth of invasive aquatic plants	<ul style="list-style-type: none"> • High nutrient load to lakes from inflow of sewage and agricultural wastes
Reduction of water spread area	<ul style="list-style-type: none"> • Encroachment on the lake fringe area, which becomes exposed when the lake water level drops after rains end

Bathing and washing activities



Idol Immersion



Trapa Cultivation



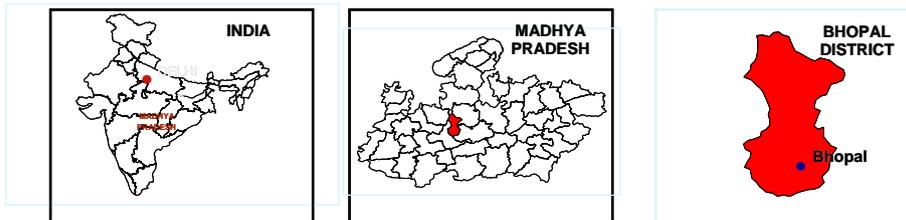
Boating



Upper & Lower Lake (Bhoj Wetland)

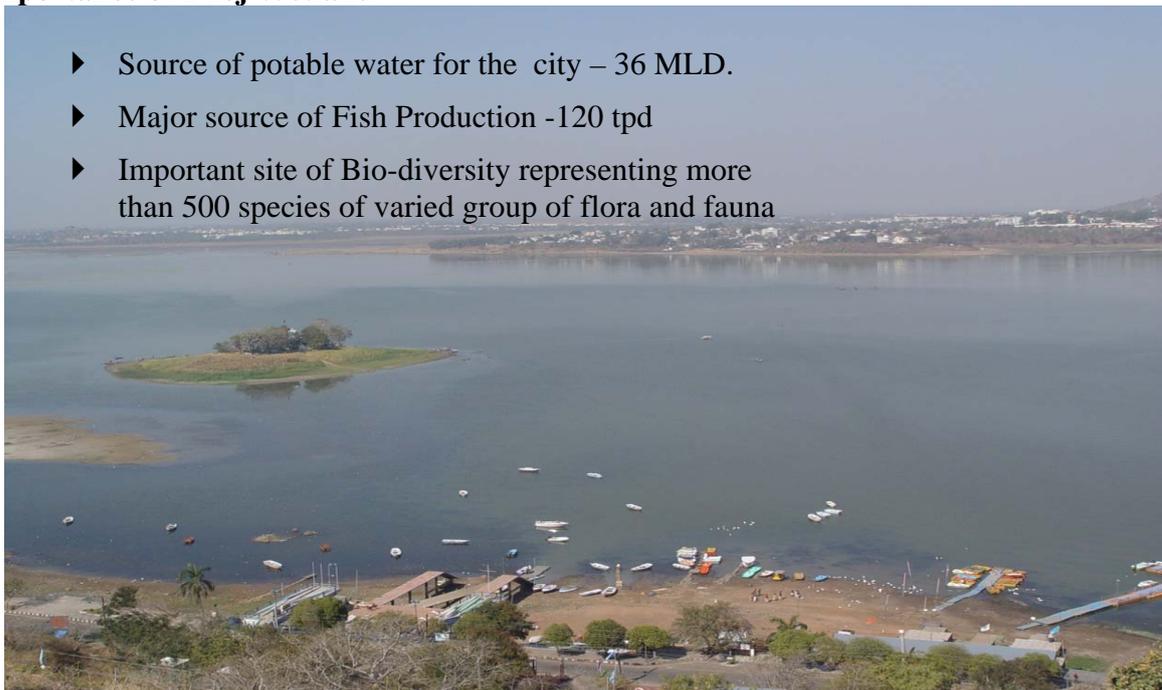
- The Upper Lake of Bhopal, arguably the oldest among the largest man-made lakes in India was constructed by King Bhoj in the early-11th century
- Lower lake was constructed by Nawab Chhote Khan In the late-18th century
- Both the lakes together known as Bhoj Wetland and have been intimately linked with the socio-economic and cultural aspects of people of Bhopal since their construction.
- These lakes have been included as Ramsar site and also recognized by Bombay History of Natural Society as Important Bird Area (IBA site)

Location of Bhoj Wetland



Importance of Bhoj Wetland

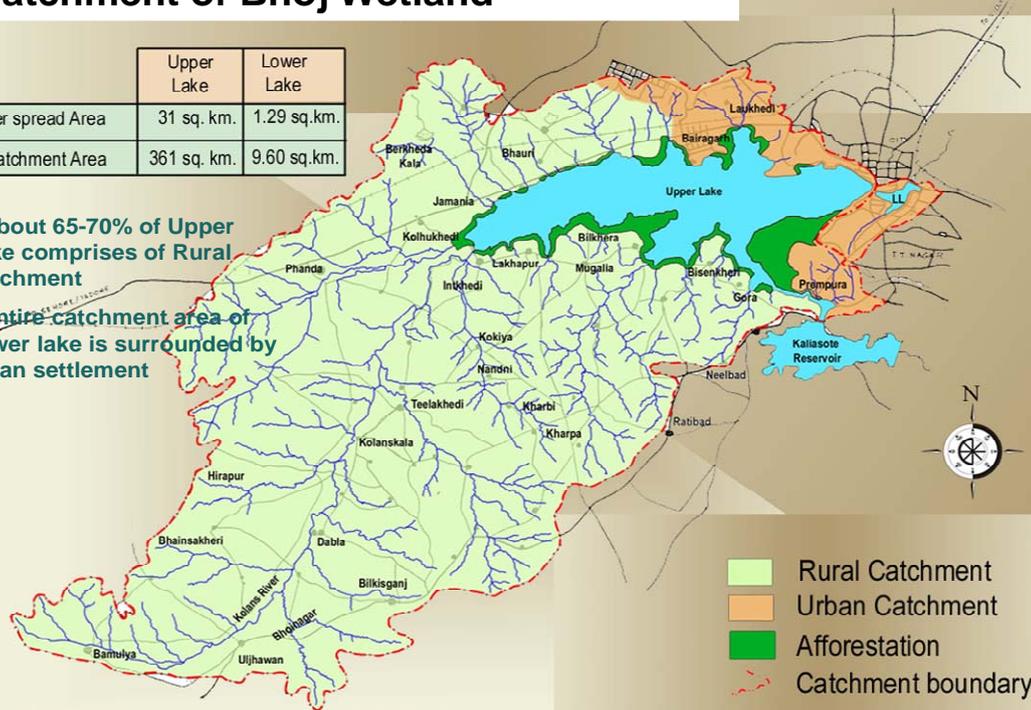
- ▶ Source of potable water for the city – 36 MLD.
- ▶ Major source of Fish Production -120 tpd
- ▶ Important site of Bio-diversity representing more than 500 species of varied group of flora and fauna



Catchment of Bhoj Wetland

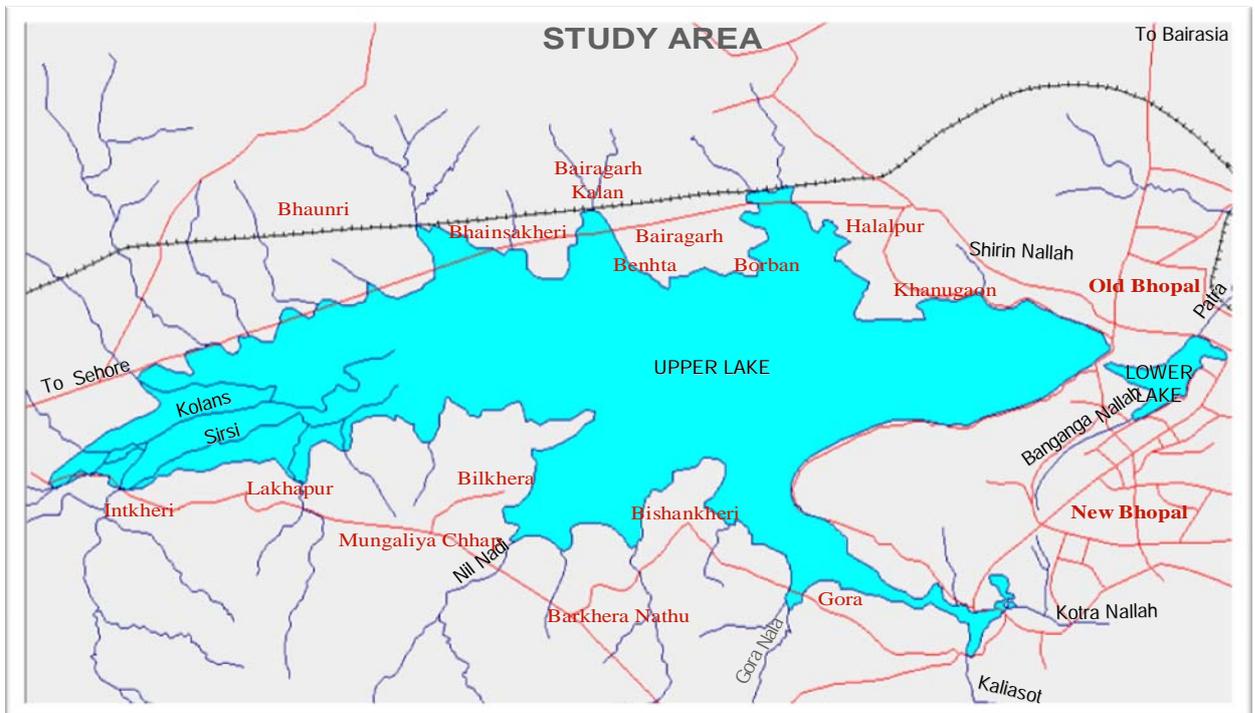
	Upper Lake	Lower Lake
Water spread Area	31 sq. km.	1.29 sq. km.
Catchment Area	361 sq. km.	9.60 sq. km.

- About 65-70% of Upper Lake comprises of Rural Catchment
- Entire catchment area of Lower lake is surrounded by urban settlement



Inflow channels of Bhoj Wetland

- o Upper Lake – 31 inflow channels
- o Lower Lake - 11 inflow channels



The Bhoj Wetland Project

Funded by : JAPAN BANK FOR INTERNATIONAL COOPERATION
 Implementing Agency : Environmental Planning & Coordination Organisation
 Project cost : 7.055 Billion Yen

Objectives:

- ▶ Conservation and management of Bhoj Wetlands which were being subjected to severe environmental degradation due to pollution.
- ▶ Ensuring potable water from the Upper lake in increased quantity and satisfactory quality.

Integrated Conservation and Management Plan

Desilting & Dredging Works

- Desilting & Dredging
- Deep. & Widening of Spill Channel
- Restoration of Takia Island

Prevention of pollution

- Prevention of Pollution (Sewerage Schemes)

Catchment Area Treatment

- Afforestation, Creation of Buffer zone.
- Construction of check dams, garland drains, Silt traps

Water Quality Management

- De-weeding
- Installation of Floating fountain
- Aquaculture
- Water Quality Monitoring

Shoreline & Fringe Area Management

- Construction of Link Road
- Lake View Promenade
- Protection of lake fringes
 - Demarcation of No Construction Zone
- Solid Waste Management
- Prevention of Pollution from Dhobighat

Public Awareness

- Public Participation & Environmental Awareness
- Interpretation Center

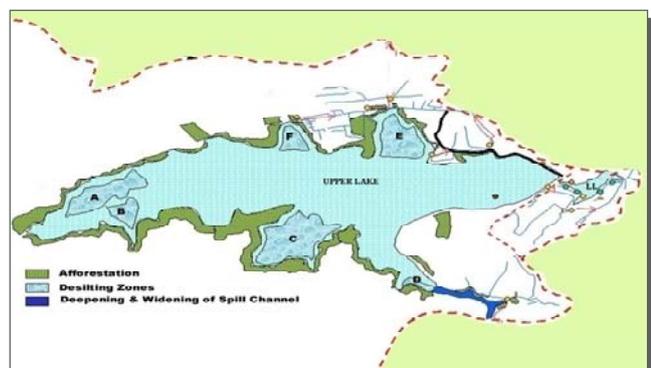
Sub-project Activities - Desilting & Dredging

Objective:-

- ▶ To increase the storage capacity of the lake by removing accumulated silt.

Achievement:-

- ▶ 2.7 M Cum silt from Upper was removed from different zones.
- ▶ Water storage capacity of the lake was increased by 3%



De-silting Zones

A zone	9.51 lac cum
B Zone	3.39 lac cum
C Zone	11.63 lac cum
D Zone	0.29 lac cum
E Zone	2.83 lac cum
F Zone	1.10 lac cum

Sub-project Activities - Deepening And Widening of Bhadbhada Spill Channel

Objective:-

- ▶ To increase discharge capacity of spill channel through removal of accumulated silt

Achievement:-

- ▶ Deepening & Widening works in 2.6 Km of spill channel was carried out to accommodate a discharge of 566 cum/sec. 1 M cum silt was removed.
- ▶ Increased storage capacity by 1%.



Restoration of Takia Island in Upper lake

Objective:-

- ▶ Prevention of erosion and deformation of the island of religious importance

Achievement:-

- ▶ The restoration and beautification of the island was an added attraction to the **people**.

Before restoration



After restoration



Creation of Buffer Zones (Afforestation)

Objective:-

- ▶ Control of soil erosion.

Achievement:-

- ▶ 1.7 M plants in 1000 Ha. area comprising of 22 plantations and 9 nurseries.



Catchment Area Treatment

Objective:-

- ▶ To control inflow of silt from the catchment area.

Achievement:-

- ▶ 75 check dams & 2 silt traps were constructed across 31 inlets of the Upper lake.

Before Rains



After Rains



Creation of Buffer Zone (Link Road)

Objective:-

- ▶ As a physical buffer to prevent encroachments within the Lake.

Achievement:-

- ▶ A 5.4 Km road including a bridge having 7.5 m wide carriage way and 2.5 m wide footpath on each side was constructed on the north-east shore of Upper lake.



High Level bridge across Bhadbhada spill channel

Objective:-

- ▶ To relieve the Bhadbhada weir from future traffic load and let it function exclusively as a weir by diverting traffic to the new bridge.
- ▶ To interlink the city network with areas across spill channel.

Achievement:-

- ▶ A 4 lane bridge across Bhadbhada spill channel is being constructed, which is likely to be completed at a record time.



Intervention - Creation of buffer zone (Lake View Promenade)

Objective:-

- ▶ To create a physical barrier.
- ▶ To restrict encroachment and pollution along the lake.
- ▶ Fringe area protection.

Achievement:-

- ▶ A 2.5 Km long Promenade on the south-east fringe of Upper lake was constructed having walkway, resting place, baradari & play area.



Fringe area protection

Objective:-

- ▶ Documentation of Full Tank Level and 50 meter no construction zone around the Upper Lake as per the Bhopal Master Plan 2005.

Achievement:-

- ▶ No Construction Zone (NCZ) documented.



Improved Solid Waste Management

Objective:-

- ▶ Control of solid waste ingress into the lake.

Achievement:-

- ▶ Bhopal Municipal Corporation was provided vehicles/ machines/bins/ weigh bridges to enable them to handle solid waste amounting to 70 MTD from 18 wards of the catchment.



Prevention of Pollution from Dhobighat

Objective:-

- ▶ To prevent pollution due to washing activities.

Achievement:-

- ▶ Rehabilitation sites for 250 washermen families with washing facilities was developed downstream of the lake.



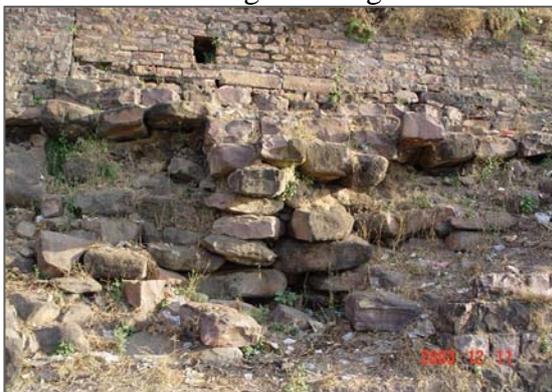
Control of seepage through earthen dam of Upper lake

Objective

- ▶ Strengthening the historical upstream retaining wall of the dam
- ▶ Control of seepage

Achievement:-

- ▶ The existing retaining wall has been repaired to enhance its life.



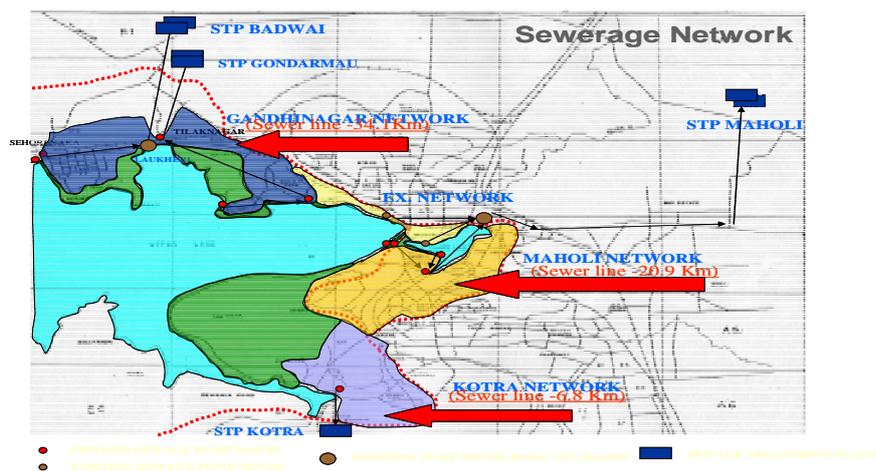
Diversion and treatment of Sewage

Objective:-

- ▶ To prevent inflow of sewage into the lake
- ▶ Interception and treatment of the sewage

Achievement:-

- ▶ Infrastructure (laying of 86.7 km sewer line, construction of 8 sewage pump houses and 4 treatment plants) for diversion and treatment of 56 MLD domestic sewage was developed.



Sub-project Activities - Installation of Floating Fountains

Objective:-

- ▶ To oxygenate the lake water for improving the water quality.
- ▶ To add aesthetic beauty.

Achievement:-

- ▶ 9 aeration units were installed in Upper lake.



De-weeding

Objective:-

- ▶ Removal of weeds to improve water quality .
- ▶ To prevent accelerated evapotranspiration of lake water.

Achievement:-

- ▶ Controlled removal of shoreline, floating, emergent and submerged weeds carried out.



Biological Control of Weeds through Aquaculture

Objective:-

- ▶ To control the growth of aquatic weeds.
- ▶ To increase fish production & provide livelihood opportunities for fishermen.

Achievement:-

- ▶ Herbivore grass carps along with Indian Major carps were introduced into the lake.



Sub-project Activities - Monitoring of Water Quality

Objective:-

- ▶ Regular monitoring of water quality of the lake.
- ▶ To assess impact of Bhoj Wetland Project Activities.

Achievement:-

- ▶ A dedicated laboratory has been established.
- ▶ 120 parameters of water and soil are being analyzed at monthly and quarterly intervals since 1998 to monitor the lake water quality .



Interpretation Centre

Objective:-

- ▶ To create environmental awareness for the conservation of lakes

Achievement:-

- ▶ An Interpretation Centre was established for educating the people about the various aspects.



Public Awareness

Objective:-

- ▶ To create awareness among the people regarding the need for conservation of Bhopal lakes.

Achievement:-

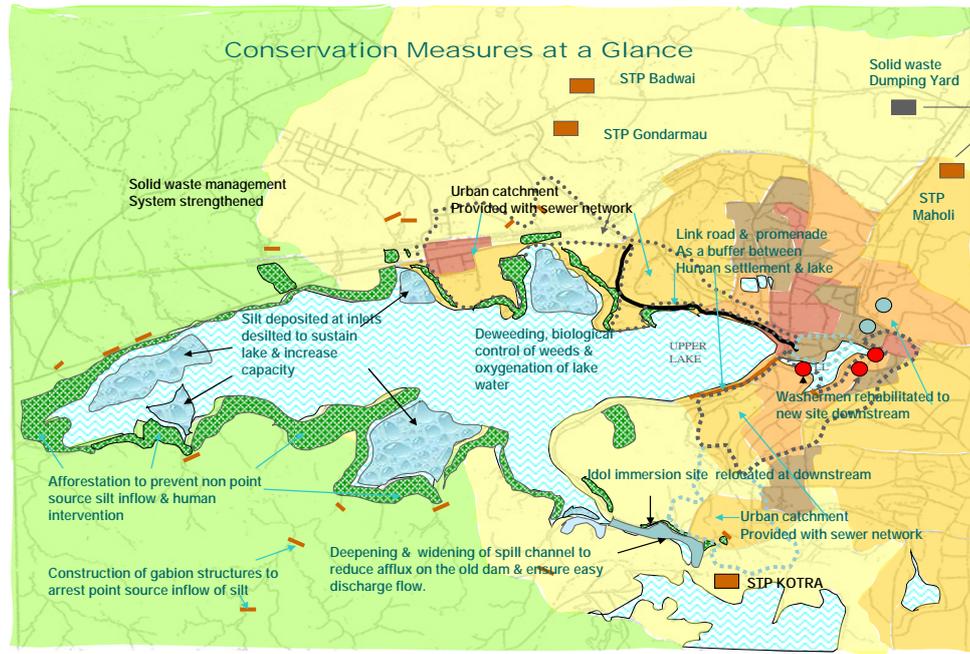
- ▶ 50 NGOs, 10 colleges, 25 local schools and the general public were associated in creating awareness among the people of Bhopal to save the lakes from deterioration.



Participation of students in rally to create public awareness for the conservation of lakes

Largest ever human chain formed in Bhopal to express solidarity for better health of the lakes.





Project Innovations:- Control of Idol Immersion

Objective:-

- ▶ To stop immersion of Idol in Upper Lake
- ▶ To create awareness in common man about the toxicological effects and health hazards on account of idol immersion activity.

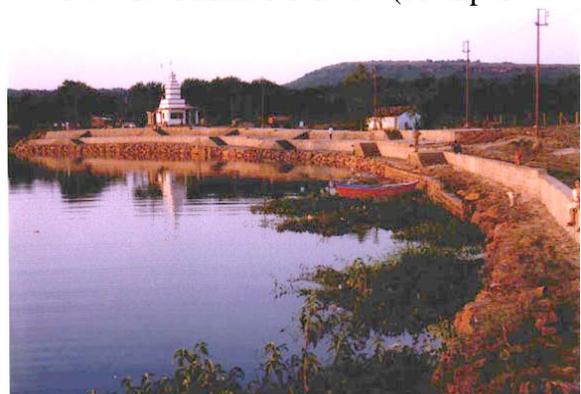
Yr.	Ganesh	Qt. (Kg)	Durga	Qt. (Kg)
09	13394	148270	1016	79110

Achievement:-

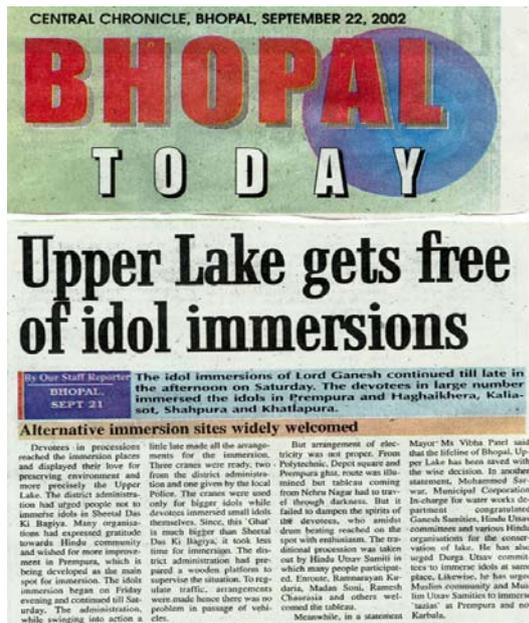
- ▶ An alternate idol immersion site on the spillway/ downstream of the Upper lake was developed.
- ▶ Through an intensive awareness campaign, idol immersion ceased at the traditional sites which was located on the Upper lake.



New Idol Immersion site (Prempura)



Control of Idol Immersion



Prempura ghat for Ganesh immersions preferred

By Our Staff Reporter
BHOPAL, SEPT 20

the students Rajgopal, Sevak Kumar, Sajed Mohammad, Shabbam and others were present.

A symposium was organised by Surabhi School for deaf and dumb students to make them aware about the threat of pollution of Upper lake because of immersion of Ganesh idols. The students who were present at the symposium were made to understand the level of pollution which might take place at the lake if the Ganesh idols are immersed there.

When the students grasped the gravity of the problem, their opinion was sought on where the idols should be immersed which was at Prempura Ghat or at Shital Das Bagh situated at the Upper lake.

Then, the students supported the move of immersing idols at Prempura ghat so as to avoid pollution of the main water source of the city.

The students expressed their views through signs and special teacher Rajesh Kumar conducted the whole proceeding.

It is noteworthy that when the whole city was reeling under water problem because of insufficient rainfall at that time also these students joined in a series of prayers which were taking place at the banks of the dried up Upper lake for appease the Almighty for sufficient rain in the city. Now they desire that this major water source shouldn't get polluted.

Now immersions will carry prizes

BHOPAL, SEPT 20 : Bhoj Wetland Project to promote immersion of Ganesh idols at Prempura Ghat will award prizes to the idols on the basis of gratitude of the idol and the co-operation with environment. Bhoj Wetland Project with an aim to conserve Upper and Lower lakes has made alternative arrangements like construction of Prempura Ghat near Bhadrabha Sri Channel so that the main water source of the Lake is not affected.

A crane being used to immerse a huge Ganesh idol at Prempura Ghat in the city on Friday.

Promotion of organic farming

Objective:-

- ▶ To promote the use of organic manure instead of chemical fertilizer

Achievement:-

- ▶ A drive to promote the use of organic manure was launched in 13 villages of the catchment of the Upper lake
- ▶ Relevant activities included hands-on training to farmers for making high-quality compost using bacteria culture



Project Innovations:- Control of Motor Boating

Objective:-

- ▶ Being a large urban lake, tourism including motor boating, was popular.
- ▶ To discourage motor boating in the Upper lake.

Achievement:-

- ▶ The project authorities were able to convince the BMC to ban boating because of the oil spillage and resultant lake pollution.



Decisions for Speedy Implementation

- The State Cabinet delegated its financial powers to an Empowered Committee under the Chairmanship of the Chief Secretary of the State Government, which was constituted in February 1996.
- The State Government decided to bring most of the sub-projects (except for the ones being executed by the Bhopal Municipal Corporation and the CPA) under a single umbrella called the Bhoj Wetland Project Directorate, by upgrading the project cell within EPCO.
- A Technical Evaluation and Tender Approval Committee was constituted under the chairmanship of the Secretary of the Environment Department, including Chief Engineers of the PHED/WRD/PWD as well as a representative of the Finance department. It was the competent authority for according approval to the Detailed Project Reports of the various works under the project, evaluating tenders and technical matters, and sanctioning works up to Rs. 15 million for all Implementing Agencies.

Lesson learned & Replicability

- A) A Lake and Its Catchment Must be Managed as a Composite Whole:** Appropriate measures like protection of green cover, trapping of nutrients from runoff, changes in fertilizer consumption pattern from chemical to organic should be adopted.
- B) Awareness Raising, Education and Stakeholder Participation are Essential:** Stakeholder involvement including lake dependant communities and common people should be an integral part of any management programme. Their interest in the lake needs to be sustained through awareness campaigns and other eco-friendly activities.
- C) Lakefront Protection is a Must:** The lake front should be protected from encroachment and pollution by declaring a buffer zone from the full tank level of the lake as “No-construction zone” by developing and demarcating the area as bio-physical zone.

- D) Administrative and Financial Mechanisms for Expeditious Decision-Making are needed:** There is a need for administrative and financial innovations in project implementation to avoid delay.
- E) Continuity of Project Staff is Essential:** It is important to retain the technical staff involved in the project preparation and implementation for time bound execution of the project activities as frequent change of project head and other staff often delays time bound execution
- F) Need to Sustain Measures:** The sustainability of the measures must be ensured for a long period to achieve fruitful results.

Measures for Sustainability

Establishment of an independent Lake Conservation Authority for maintenance of the Bhoj Wetland.

JBIC provided a core fund for formation of the Authority

Session – II

Siruthuli's Efforts in Cleaning up of Water Bodies in Coimbatore

Thiru K Mylswami

Project Coordinator – Siruthuli



Coimbatore Scenario

- During 1970s Coimbatore district was declared as “Drought prone district”.
- During 1980s UNDP warned that Coimbatore District had the record of fastest depleting ground water level in the world.
- Still, we are one of the districts with highest number of borewells.

Ecological Degradation

- Felling of trees.
- Poor Rainfall.
- Ground water getting dried-up.
- Tanks with poor storage facility.
- Contamination due to Sewage and Garbage

Misuse of Rivers, Canals & Tanks

- Indiscriminate Sand Mining.
- Pilferage and unauthorized borewells.
- Encroachments over water bodies.
- Blocking or Diverting water ways.
- Dumping of Solid Wastes.
- Letting in effluents into fresh water.
- Sewage getting mixed with potable water.

Decrease in Rainfall

- Average rainfall data:
 - Whole of India is 1350 mm
 - Within Tamilnadu, it is between 950 and 1150 mm
 - Coimbatore is just 600 - 700 mm
- Due to monsoon failures in 2002 & 2003,
 - Both ground water and surface water had adverse effects which led to acute water shortage during 2003.
 - The Municipal Corporation of Coimbatore reduced the supply of drinking water to once in 4 days instead of daily supply.

- The wells and borewells went dry as a result of which farming community and industrial establishments were affected.

All these led to ...

Eco-conscious citizens of Coimbatore coming together to provide a solution.

Project Siruthuli : Siruthuli means “A small drop”



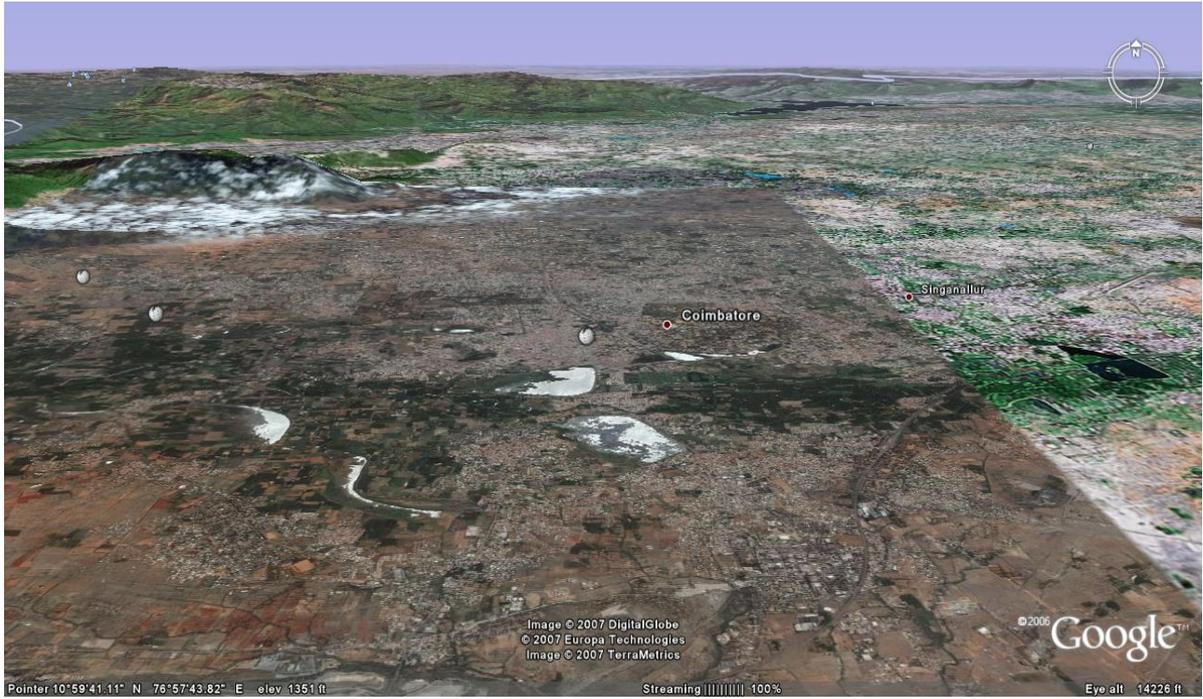
The Organization

- Founded by Corporates of Coimbatore.
 1. Sri Bannari Amman Group of Companies
 2. Pricol Limited
 3. Lakshmi Machine Works Limited
 4. Elgi Group of Companies and
- Governed by 6 trustees.
- Navigated by 50 apex members.
- Assisted by government/funding agencies.
- Supported by the eco-conscious citizens.

Four Pillars of Siruthuli

Four Pillars of Siruthuli





River Noyyal System



Noyyal River Basin

- Length of the River course : 160 kms
- Average width of the basin : 25 km.
- Noyyal River System consists of 21 Anicuts and 31 Tanks
- Spread into Coimbatore, Tirupur, Erode and Karur Districts – 3550 Sq.Kms

Water Resources Management

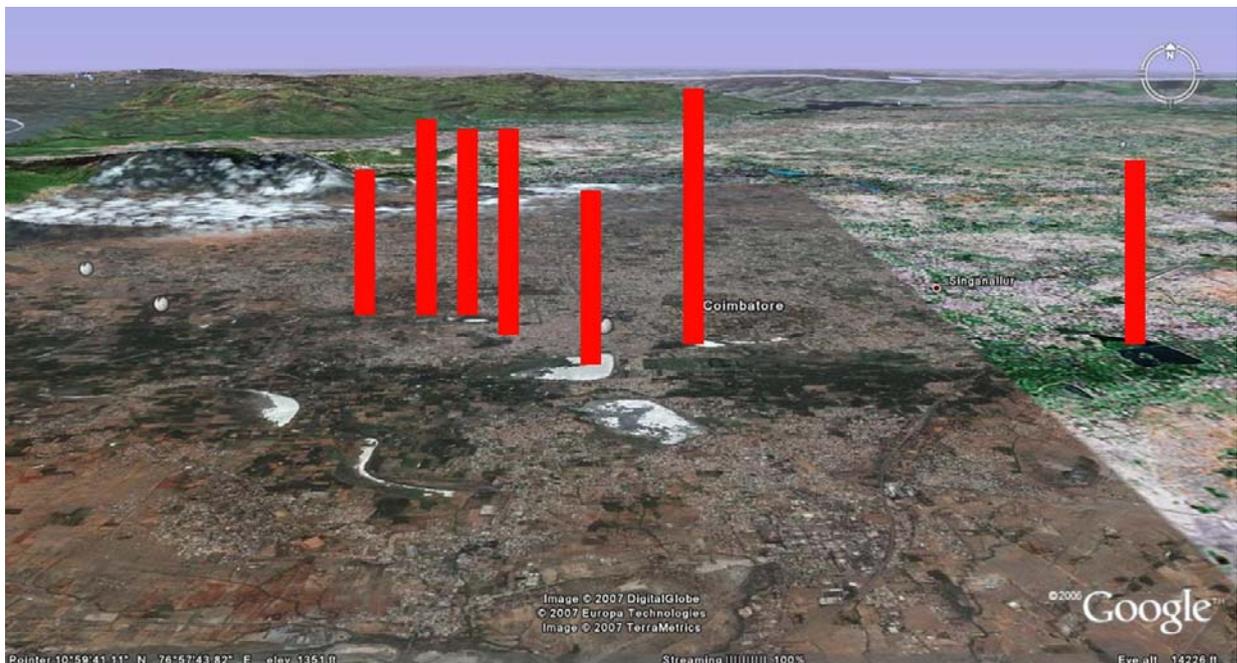
- i. Desilting of Water bodies
- ii. Noyyal Restoration
 - a) Formation of a Technical Advisory Committee
 - b) Encroachment Removal
 - c) Desilting of Chithiraichavadi Anaicut
 - d) Construction of Nandangarai Check Dam
 - e) River restoration through watershed concepts
- iii. Roadside Rainwater Harvesting

Desilting of Tanks

- 7 out of 9 tanks desilted.
- 808 acres of water spread area desilted.
- 20 kms of tank bund formed / strengthened.
- Capacity to store 230 M.Cft. Water.

Tanks desilted:

- | | |
|-----------------------|--------------------------|
| 1. Narasampathy Tank | 5. Selvachinthamani Tank |
| 2. Krishnampathy Tank | 6. Periyakulam Tank |
| 3. Selvampathy Tank | 7. Kuruchikulam Tank |
| 4. Kumarasamy Tank | |



NARASAMPATHY TANK

Tank Particulars

Latitude	: 10° 59.97' N
Longitude	: 76° 54.518' E
Length of the bund	: 3200 m
Total tank bed area	: 124.05 acres
Encroachment area	: 9.8 acres
Storage capacity	: 59.711 M.Cu.ft
Desilted/Deepened area	: 114.25 acres



Selvampathy Tank



Before...



... After



Filled with Water



KRISHNAMPATHY TANK

Tank Particulars:

Latitude: 11° 00.283' N
Longitude: 76° 55.237' E

Length of the bund	2600 m
Total tank bed area	175.93 acres
Encroachment area	52.99 acres
Storage capacity	7.658 M.Cu.ft
Desilted / Deepened area	55.71 acres



Krishnampathy Tank



Before...



... After



Filled with water



SELVAMPATHY TANK

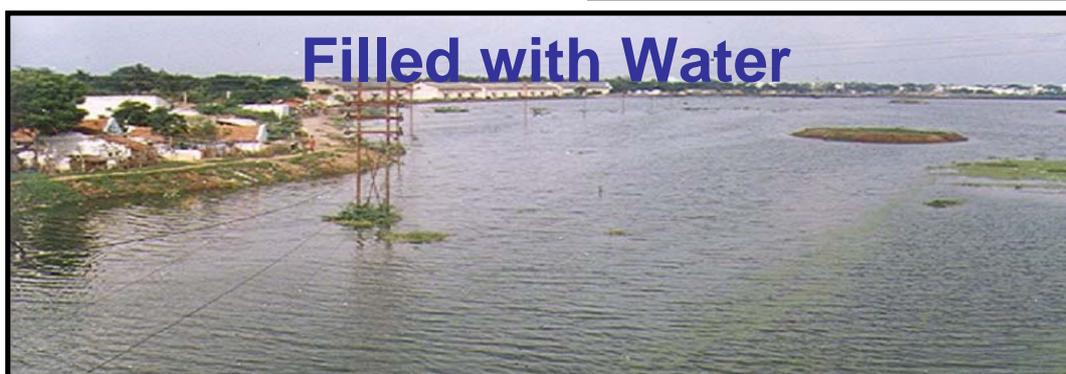
Tank Particulars:

Latitude: 10° 59.457' N
Longitude: 76° 56.701' E.

Length of the bund	2600 m
Total tank bed area	175.93 acres
Encroachment area	52.99 acres
Storage capacity	7.658 M.Cu.ft
Desilted / Deepened area	55.71 acres



Selvampathy Tank



KUMARASAMY TANK

Tank Particulars:

Latitude: 10° 59.457' N
Longitude: 76° 56.701' E.

Length of the bund	2400 m
Total tank bed area	93.90 acres
Encroachment area	11 acres
Storage capacity	19.868 M.Cu.ft
Desilted / Deepened area	75.05 acres



Kumarasamy Tank



SELVACHINTHAMANI TANK

Tank Particulars:

Length of the bund	1800 m
Total tank bed area	36.82 acres
Encroachment area	0 acres
Storage capacity	2.929 M.Cu.ft
Desilted / Deepened area	20.00 acres



Selvachinthamani Tank



Before...



... After



Filled with Water



COIMBATORE BIG TANK

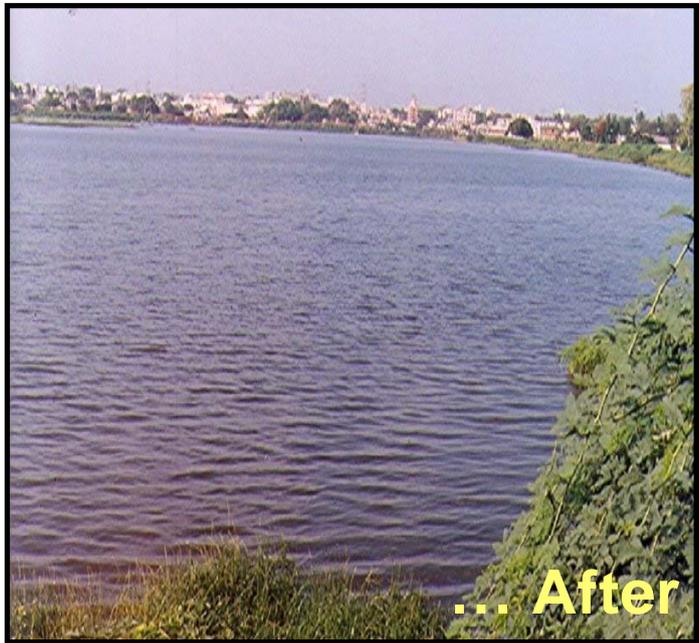
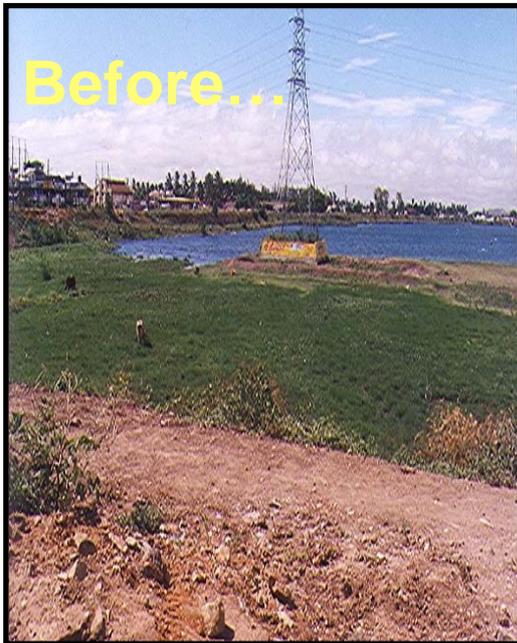
Tank Particulars:

Latitude: 10° 59.103' N
Longitude: 76° 56.959' E

Length of the bund	2000 m
Total tank bed area	320.00 acres
Encroachment area	3.25 acres
Storage capacity	69,501 M.Cu.ft
Desilted / Deepened area	300 acres



Coimbatore Big Tank



KURICHI TANK

Tank Particulars:

Latitude:
Longitude:

Length of the bund	3946 m
Total tank bed area	343.96 acres
Encroachment area	12.5 acres
Storage capacity	59.918 M.Cu.ft
Desilted / Deepened area	193 acres

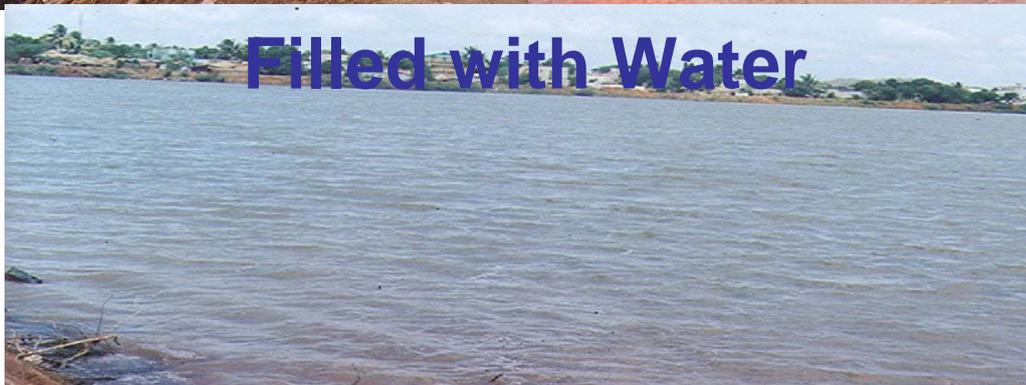


Kuruchi Tank

Before....



... After



Filled with Water

Kuruchi Tank - Road Laying Works

Before....



... After

After Completion of Work



Noyyal Restoration

1. Awareness to public -Noyyal Yatra 2005
2. Acknowledgement by the people - Noyyallukku Nooru
3. Encroachment Removal from origin to Singanallur (35 KM)
4. Desilting of Chithiraichavadi Anicut.
5. Construction of Nandangarai Check Dam.
6. Implementation of Madhvarayapuram Watershed project.
7. Restoration of River Noyyal Through Watershed Approach (Macro level)

Awareness to public – Noyyal Yatra – 2nd October 2005



**More than 1 lakh participants walked on
“Noyyal Yatra” and that is for one single cause
‘Restoration of River Noyyal’**

**Acknowledgement by the people
Noyyallukku Nooru - July 2006**



**About 1.23 million people followed our beloved Former
President of India Dr. APJ Abdul Kalam and contributed
Rs. 100/- each for “Noyyal Restoration”.**

Chithiraichavadi Anicut ...



Feeds water to 7 tanks located in the city through its 11.75 kms channel

Desilted Area - 2 Ha



... Chithiraichavadi Anicut



New bunds formed for 400 mts

Water overflows during monsoon



... Chithiraichavadi Anicut



New bunds formed for 400 mts

Water overflows during monsoon



...Nandangarai Check Dam...



**Total Project
Cost Rs. 12.8
million**

Contributions:

Siruthuli - Rs. 6.5 million
Government - Rs. 6.3 million



...Nandangarai Check Dam...



**Water
impounding
area - 4 Ha**

Dimensions of check dam

Height - 4 mts
Width - 30 mts



...Nandangarai Check Dam



**An initiative by
Siruthuli in
2008, under
"Namakku Naame
Thittam of
DRDA,
Coimbatore"**

Benefits:

- 600 open wells/bore wells getting recharged.
- Direct benefit to 1600 Hectares of agricultural land.
- Benefiting 500 farming families.
- Reduces man-animal conflicts as it serves as a waterhole for wild animals.

Madhvarayapuram Watershed



Exposure
visit

Siruthuli's
Chairman
addressing
farmers



... Madhvarayapuram Watershed



Group discussion
with farmers

1300 Ha of farm
land belonging to 10
villages reap the
benefits



Roadside / Open space Rainwater Harvesting to recharge groundwater

- During 2004 a Geo-hydrological Study was conducted by Siruthuli to assess the feasibility of constructing RWHS within Coimbatore city
- Recommended for 600 RWHS for 105.60 Sq.Km of Coimbatore city
- Constructed 150 RWHS in the first phase with the financial assistance of Coimbatore Corporation

Rain Water Harvesting Structures (On Road Side)



**RWHSs (On Roadside)
with borewells,
recharge pits and filter
media**

Rain Water Harvesting Structures (Open Space)



**One of the Model of
RWHS at General
Hospital, Coimbatore**

**RWHSs (Open Space)
with borewells, recharge
pits with filter material**



Impact of RWHS



**Water
Percolates at
a faster rate**

**Positive
change on
ground water
recharge**

Zone	SWL (in ft) during May 05	SWL (in ft) during May 08
West	150	33
South	125	14
East	140	25
North	130	15

Ministry of Water Resources, New Delhi – CGWB Chennai - Project on Construction of Artificial Recharge Structures

Total Project Cost : Rs. 1 Crore
 Time frame : 31st March 2010
 Monitoring by : CGWB Chennai and DLTCC
 Implemented by : SIRUTHULI
 No. of RWHS : 215
 - 130 RWHS (open space)
 - 85 RWHS (road side)

Inauguration of the project 2nd December 2009



District Collector, Mayor and Deputy Mayor on the inaugural function

Inspection by DLTCC Members



Dr. P.Umanath IAS , District Collector/ Chairman DLTCC
Dr. N.Varadaraj Regional Director CGWB,
Dr.S.V.Balasubramaniam Chairman Siruthuli

Siruthuli's Upcoming Projects

- Rejuvenation of Neman Tank in Tiruvallur District
- Construction of a culvert along the channel connecting Periyakulam to Valankulam
- Construction of an NGO Training Centre called “Siruthuli Mazhai Mayyam”
- Madhvarayapuram Water shed Development Project funded by NABARD for 1300 ha.

Siruthuli – “A Small drop”

Through

- small drops of effort
- small drops of dedication
- small drops of commitment

We hope to create an **Ocean** of well being

Together we strive towards a

**Clean & Green
Mother Earth**

Session – II

National River Conservation Project

Thiru Yokesh Sharma,

Chief General Manager, Construction and Design Services Uttar Pradesh Jal Nigham, Ghaziabad



Water is Precious and Scarce Resource

- Globally, only a small fraction (about 3%) is fresh water
- India is among the wettest countries in the world, but rainfall is highly uneven with time and space
 - extremely low in Rajasthan and high in North-East
 - On an average there are only 40 rainy days
- Out of 4000 BCM rainfall received, about 600 BCM is put to use
- To sustain growing demand for agriculture and other uses water abstraction from all possible source
- Water resources are over-exploited resulting in major WQ problems

Main Water Quality Threats

- Water Scarcity
 - Uneven distribution of rainfall
 - Over-exploitation of water resources
- Pathogenic Pollution
- Oxygen depletion
- Eutrophication (nutrient build-up leading to excessive plant growth)
- Salinity
- Toxicity
- Ecological health

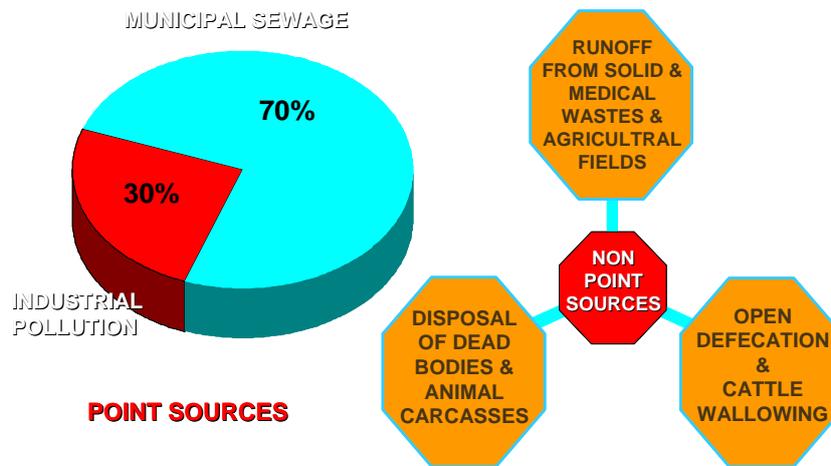
Major cause for water quality degradation

- **Point Sources of Pollution**
 - Domestic Wastewater
 - Industrial Wastewater

- **Non-Point Sources of Pollution**

- Rural and Slum Population, open defecation, garbage etc
- Agricultural Run-off
- Half-burnt bodies
- Storm water
- Cattle wallowing
- Deposition of Air pollutants

MAIN SOURCES OF POLLUTION



Water Quality Criteria

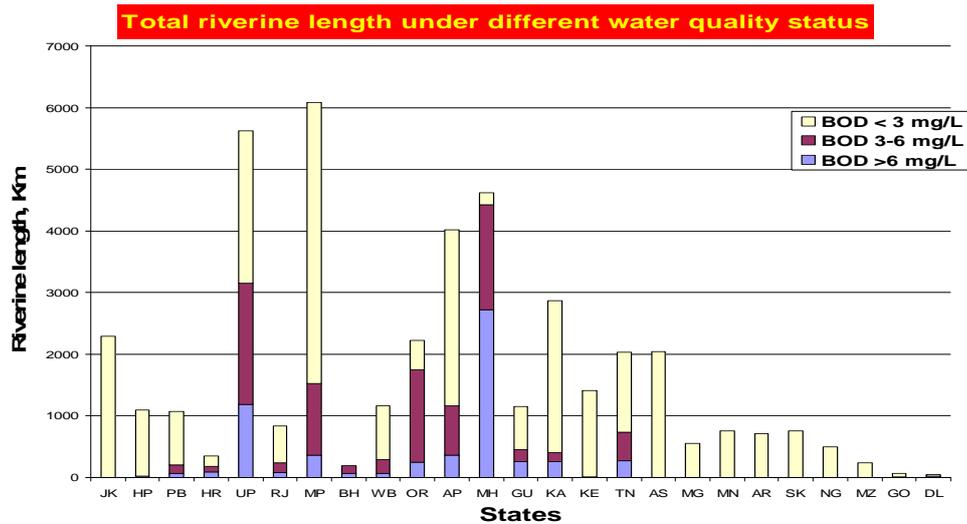
Designated-Best-Use	Class of water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	<ol style="list-style-type: none"> 1. Total Coliforms Organism MPN/100ml shall be 50 or less 2. pH between 6.5 and 8.5 3. Dissolved Oxygen 6mg/l or more 4. Biochemical Oxygen Demand 5 days 20°C 2mg/l or less
Outdoor bathing (Organised)	B	<ol style="list-style-type: none"> 1. Total Coliforms Organism MPN/100ml shall be 500 or less 2. pH between 6.5 and 8.5 3. Dissolved Oxygen 5mg/l or more 4. Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	Total Coliforms Organism MPN/100ml shall be 5000 or less <ol style="list-style-type: none"> 1. pH between 6 to 9 2. Dissolved Oxygen 4mg/l or more Biochemical Oxygen Demand 5 days 20°C 3mg/l or less

Propagation of Wild life and Fisheries	D	<ol style="list-style-type: none"> 1. pH between 6.5 to 8.5 2. Dissolved Oxygen 4mg/l or more 3. Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	<ol style="list-style-type: none"> 1. pH betwvn 6.0 to 8.5 2. Electrical Conductivity at 25°C micro mhos/cm Max.2250 3. Sodium absorption Ratio Max. 26 4. Boron Max. 2mg/l

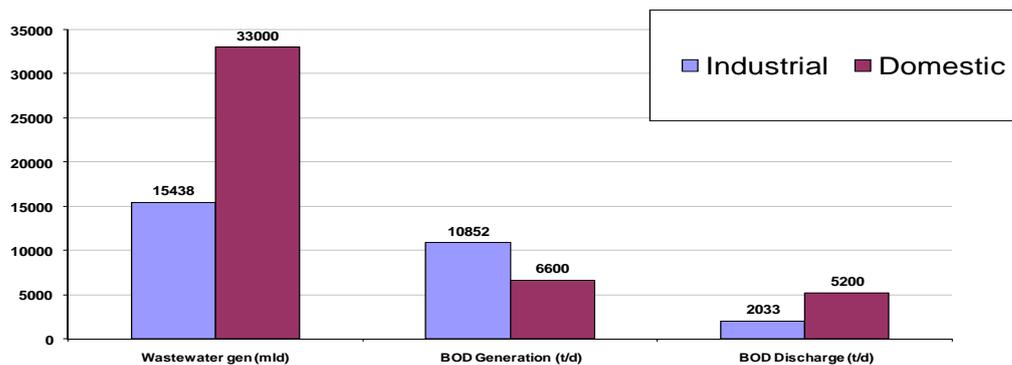
WATER QUALITY STATUS OF RIVERS

Analysis of 10 years data with respect to BOD values as indicator of organic pollution

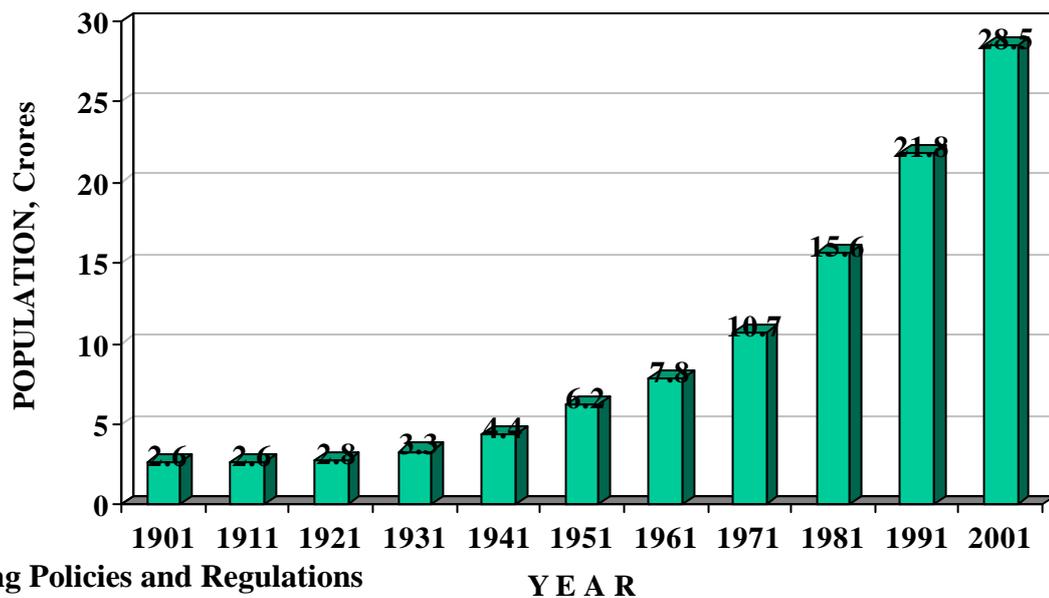
S. No	Level of Pollution	Pollution Criteria	Riverine length, Km.	Riverine length percentage
1.	Severely polluted	BOD more than 6 mg/l	6086	14
2.	Moderately polluted	BOD 3-6 mg/l	8691	19
3.	Relatively clean	BOD less than 3 mg/l	30242	67



Comparison of pollution load generation from domestic and industrial sources



Increase in Urban Population in India



Existing Policies and Regulations

- **Policies**

- Provisions in India's Constitution
- Policy Statement for Abatement of Pollution, 1992
- National Water Policy, 2002
- National Environment Policy, 2006

- **Acts / Notifications**

- Water (Prevention & Control of Pollution) Act, 1974
- Water (Cess) Act, 1977
- Environment (Protection) Act, 1986
- CGWA
- WQAA
- NGRBA

- **Initiatives**

- Development of standards and Water quality criteria
- National River Conservation Plan (NRCP)
- National Lake Conservation Plan (NLCP)
- Environment Impact Assessment
- Special Drive for 17 categories of polluting industries
- Pollution Control in Small-Scale Industries
- Charter on Corporate Responsibility for Environment Protection
- Special Drive for Industries Discharging into Rivers and Lakes

NATIONAL RIVER CONSERVATION DIRECTORATE MINISTRY OF ENVIRONMENT AND FORESTS

Coordinates implementation of water pollution abatement schemes under:

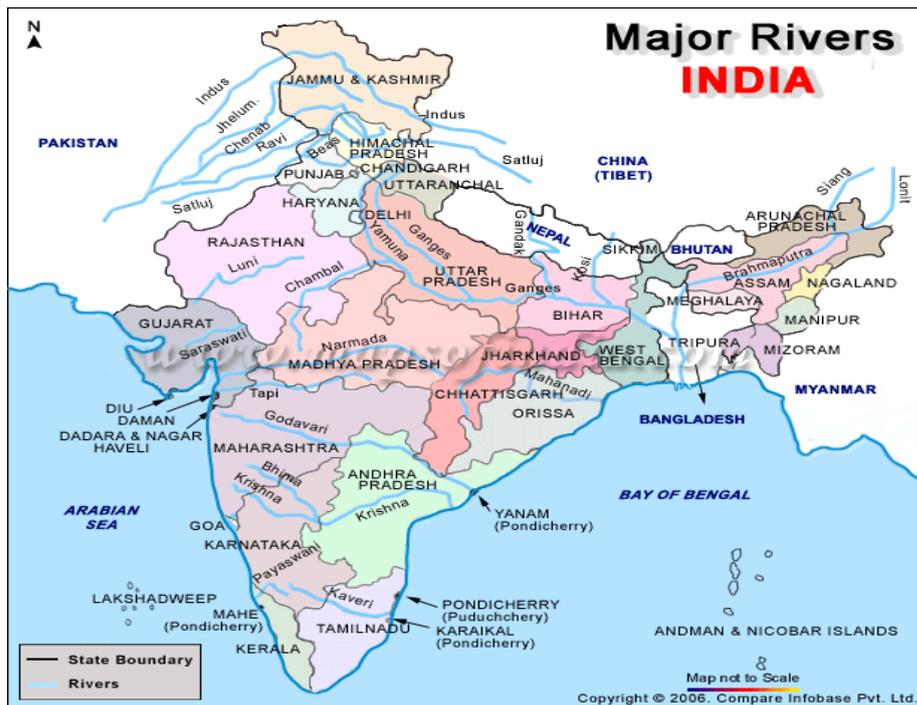
- ❖ National River Conservation Plan (NRCP)
- ❖ National Lake Conservation Plan (NLCP)

INTRODUCTION

Rivers in India are

- life lines of the people
- closely linked with our culture and tradition
- closely bound with the health and well being of large population

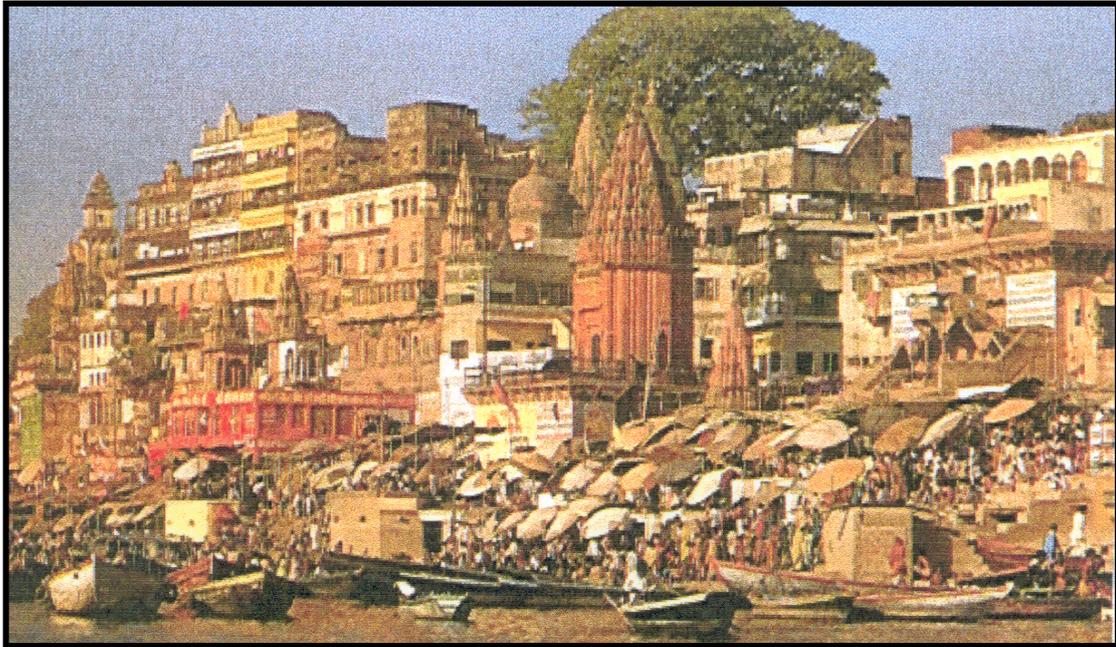
Restoring the health of rivers, which have become polluted, is very important



NATIONAL RIVER CONSERVATION PLAN

BACKGROUND

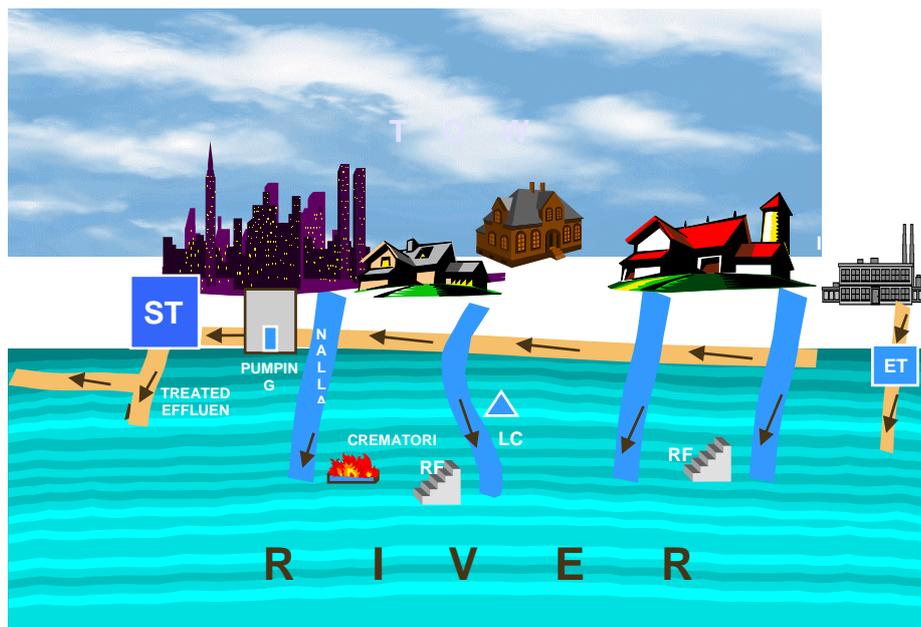
- ❖ Pollution abatement works in major rivers in the country commenced with the launching of Ganga Action Plan Phase-I in 1985
- ❖ GAP-I extended as GAP-II in 1993 to cover shortfall and Gomti, Yamuna, Mahananda and Damodar rivers
- ❖ Programme broad based in 1995 to include other major rivers and renamed NRCP



River Action Plans

Objectives: Reduction of pollution load into river through schemes of:-

- interception & diversion of sewage
- sewage treatment
- crematoria (electric & improved wood)
- low cost sanitation
- river front development
- afforestation
- public participation



RIVER ACTION PLAN

GANGA ACTION PLAN PHASE-I

- ❖ 260 schemes completed against the target of 261 schemes.
- ❖ 25 towns of U.P., Bihar, West Bengal covered.
- ❖ Amount spent- Rs. 452 crore.
- ❖ 869 million litres per day (mld) sewage treatment capacity created.
- ❖ 1 remaining scheme of STP at Munger under litigation.

GANGA ACTION PLAN-II

- ❖ Started in 1993 for river Ganga to cover shortfall and extended to its 5 major tributaries in phases
- ❖ Present cost - Rs. 2403.07 cr.
- ❖ Sanctioned cost - Rs. 2272.47 cr.
- ❖ Schemes sanctioned - 687
- ❖ Schemes completed - 503
- ❖ Amount spent - Rs.1356.10 cr.



Scorecard

S. No.	Item	Target	Achievement
Ganga Action Plan Phase – I Expenditure: - Rs. 452 crores			
1.	No of schemes	261	260
2.	Treatment capacity	882 mld (35 STPs)	869 mld (34 STPs)
3.	No. of Interception & Diversion schemes	88	88
4.	No. of Low Cost Sanitation schemes	43	43
5.	No. of Crematoria schemes	28	28
6.	No. of River Front Development schemes	35	35
Ganga Action Plan Phase – II Expenditure: - Rs. 370.40 crores			
1.	No of schemes	319	200
2.	Treatment capacity	277 mld (37 STPs)	129 mld (18 STPs)
3.	No. of Interception & Diversion schemes	120	67
4.	No. of Low Cost Sanitation schemes	26	24
5.	No. of Crematoria schemes	19	9
6.	No. of River Front Development schemes	49	35

NATIONAL RIVER CONSERVATION PLAN

Includes :

- ❖ Ganga Action Plan Phase-II
 - Ganga
 - Yamuna (YAP-I & II)
 - Gomti
 - Damodar
 - Mahananda
- ❖ 30 Other major rivers of country

PRESENT COVERAGE OF NRCP

- ❖ 166 towns along 37 stretches of polluted rivers in 20 States
- ❖ Approved cost - Rs. 486.4 million
- ❖ Sanctioned cost - Rs. 396.1million
- ❖ Funds released - Rs. 247.4 million
- ❖ Number of schemes - 1023
- ❖ Schemes completed - 732

FUNDING PATTERN

- ❖ Initially 100% funds were given by Centre. From 1993, equal sharing of funds between Centre and States was started
- ❖ The share between the Centre and States was changed from 50:50 to 100% by the Centre with effect from 1.4.1997
- ❖ New projects approved after March 2001 are being funded on 70:30 cost sharing basis between Centre and the State
- ❖ Operation and maintenance (O&M) of assets created is the full responsibility of the State Government/local body

Present Implementation Mechanism

- Concerned Agencies
 - National River Conservation Directorate
 - Central Pollution Control Board
 - State Nodal Departments (like urban development)
 - Public Health Engineering departments e.g. TWAD, Chennai Metro Water etc.
 - Urban Local Bodies e.g. CMDA Chennai etc.
 - State Pollution Control Boards

CUMULATIVE STATUS OF NRCP (PHYSICAL)

- ❖ Schemes sanctioned 1054 nos
- ❖ Schemes completed 753 nos
- ❖ STP capacity sanctioned 4169.75 mld
- ❖ STP capacity created 2970.29 mld
- ❖ Adding up 869 mld capacity created under GAP-I, an aggregate STP capacity of 3359 mld has been created.

WORKS UNDER NRCP

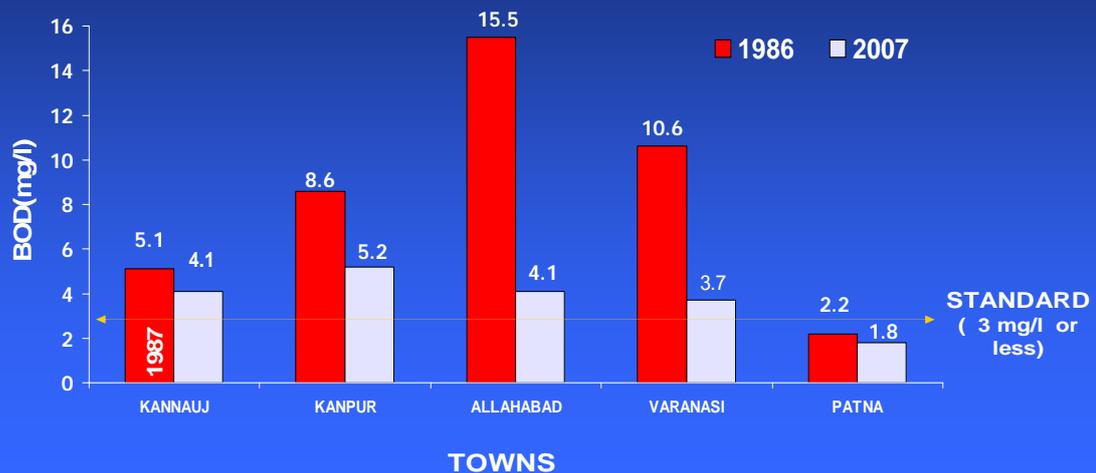
Major types of works and respective %age cost incurred are

- ❖ Interception & Diversion of sewage (I&D)-52.32%
- ❖ Sewage Treatment Plant (STP)-36.66%
- ❖ Low Cost Sanitation (LCS)-7.22%
- ❖ River Front Development (RFD)-1.13%
- ❖ Crematoria (CRE)-0.64%
- ❖ Public Participation & Awareness (PP&A) 0.32%



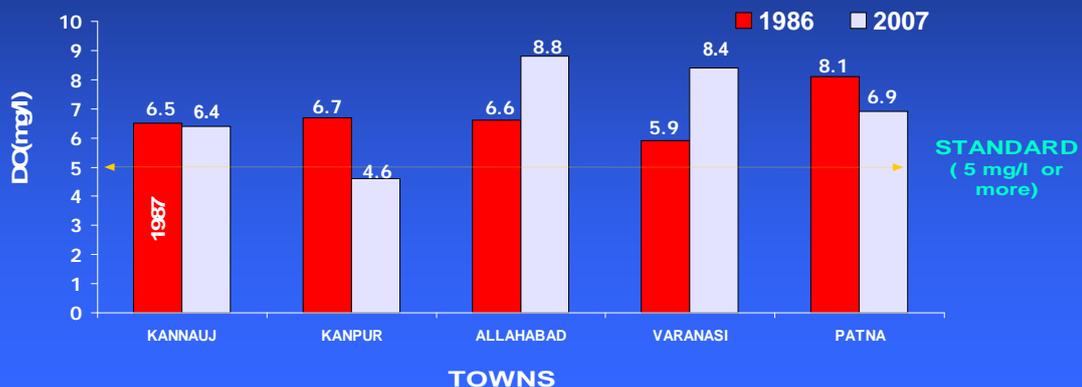
IMPROVEMENT IN WATER QUALITY OF GANGA

Bio-chemical Oxygen Demand (Summer Average)



IMPROVEMENT IN WATER QUALITY OF GANGA

Dissolved Oxygen (Summer Average)



Industrial Pollution

- 30% by volume, toxic and non-biodegradable
- Distilleries, Pulp & Paper, Tanneries and Sugar industries - major violators
- Major problem with small scale industries; lack of common effluent treatment facilities
- Industrial hotspots along the rivers
- Inadequate techno-economically feasible effluent treatment technologies

Experience from industries

- High organic load - distilleries
- High TDS - pharmaceuticals, pesticides, rayon, dye and dye intermediates
- Small scale industries - location (residential areas), inadequate resources, skill etc.
- Problem with CETPs

GROSSLY POLLUTING INDUSTRIES

- ❖ Program started in 1997
- ❖ 1357 grossly polluting industries identified
 - Industries installed ETPs - 898
 - Industries closed -269
 - Defaulters- 190



WATER QUALITY MONITORING OF NRCP SCHEMES

- ❖ Water Quality Monitoring is carried out at 158 locations in identified stretches of 10 rivers
- ❖ More emphasis on critical stretches of Ganga river - 27 WQM stations on these stretches
- ❖ Performance monitoring of STPs also undertaken
- ❖ Premier independent institutions/organisations engaged for third party evaluation/monitoring
- ❖ Water Quality Assessment Authority (WQAA) under the provisions of the Environment (Protection) Act, 1986, also oversees water quality issues
- ❖ Notification of Uniform Monitoring Protocol, 2005 to bring about uniformity in monitoring mechanism and to ensure quality of data generation

Experience with GAP

- Improvement in BOD/DO, but faecal coliform not complying
- Inadequate flows: competing water demand
- Weak ownership by Stakeholders
- Inadequate O&M and under-utilisation of STPs

- Lack of civil society involvement
- Expansion of program beyond Ganga Basin resulting in thin spread of resources

Evaluation of GAP-I

A Cost Benefit Analysis of GAP-I carried out by Harvard Institute of International Development, UK in 2000 observed that :

- River cleanup programmes involve a long time period and large resources for effective action
- In terms of both time taken and cost involved, GAP compares favourably with those of other major rivers like Thames, Rhine and Danube
- Financial Internal Rate of Return (IRR) for the project found to be around 20-24%

CONSTRAINTS IN IMPLEMENTATION & MAINTENANCE

- ❖ Inadequate availability of funds for *Operation & Maintenance (O&M) of assets*
- ❖ *Delays* in land acquisition
- ❖ *Inadequate capacity* of local bodies / implementing agencies
- ❖ Erratic/Non-availability of power supply for operation of assets
- ❖ Court cases

Financial Resources

- ❖ Due to fund constraint, treatment of full pollution load of even major rivers like Ganga and Yamuna could not be approved.
- ❖ Sharp increase in Pollution load as a result of rising urban population
- ❖ In addition, huge demand exists from States for taking up new projects

MAGNITUDE OF THE PROBLEM

- Around 33,000 mld of domestic wastewater generated from class I & II towns
- Generation of sewage increasing at a phenomenal rate commensurate with the growth in urban population .
- Sewage treatment capacity of 7400 mld only exists in the country out of which the capacity created under the schemes of NRCD is 4000 mld.
- Present sanctioned schemes of NRCP would add a further capacity of 2000 mld which leaves a large gap between the requirement of sewage treatment and the actual capacity available for treatment.
- The task of river cleaning is thus enormous requiring huge financial as well as human resources

Ecological Flow

- Large proportion of river water diverted for irrigation
- important to maintain minimum ecological flow
- Significant for sustenance of biodiversity and aquatic life
- Minimum flow also necessary for dilution for maintaining standards and enhancing carrying capacity of the river

ISSUES OF MINIMUM FLOW

Maintenance of Minimum Ecological Flow in Rivers

- ❖ Objectives of River Action Plans to achieve Water Quality upto 'Bathing Class' (BOD of 3 mg/l)
- ❖ Present Sewage **Discharge Standards** after treatment BOD 30 mg/l.
- ❖ To achieve the bathing class water quality in Rivers, at least **10 times dilution** required, besides flow requirements for maintaining river ecology
- ❖ Minimum ecological flow necessary in rivers especially during the lean season for achievement of the standards.

ISSUES FOR RESOURCE GENERATION

Requirement for generation of resources

- ❖ Dovetailing existing schemes like JNNURM, etc
- ❖ Additional enhanced allocation by Central Government
- ❖ State Governments and the Urban Local Bodies to generate resources through taxes, levies, cess, user charges
- ❖ External Aid/ Loan Assistance from Bi-lateral and multilateral institutions
- ❖ Private sector through SPVs

Resource Recovery - Requirement for generation of resources for O&M

- ❖ Urban local bodies/State Governments should consider *innovative ways for raising revenue for meeting O&M costs*, by adopting measures, such as,
 - Levying user charges
 - Sale of Sludge
 - Generation of power from biogas in STPs
 - Creation of facilities for tourism
- ❖ Training of O&M staff another aspect needing attention.

Lessons Learnt

- Absence of holistic approach
- Need for strengthening planning & coordination and bringing together all relevant agencies at Central & State levels to address issues of land acquisition, removal of encroachments, erratic electricity supply, etc
- Weak monitoring i) projects; ii) water quality
- Lack of involvement of CPCB and SPCBs
- Lack of resources at the State/local level to run the sewage treatment infrastructure

Future Challenges

- Increasing demand for irrigation, power, industry
- Demographic pressures
- Climate change impacts: Fluctuating flows
- Cleaner technology: Development & Dissemination
- Weak compliance & enforcement
- Mass awareness
- Social habits

New Direction

- River basin as a planning unit
- Integrates pollution abatement with water flow aspects
- Restoration of river as a living ecosystem
- New institutional mechanism

Need for River Basin Authorities

- Need to replace piecemeal/sporadic efforts by integrated and holistic approach
- River basin as unit for planning & management
- Apex policy level and regulatory body for entire basin
- To address inter-sectoral & inter-ministerial coordination requirements
- Central decision making body with greater involvement of States

National Ganga River Basin Authority

- Constituted on 20.02.2009 under the Environment (Protection) Act, 1986
- empowered planning, financing, monitoring and coordinating authority
- to ensure effective abatement of pollution and conservation of the river Ganga by adopting a river basin approach
- Chaired by the Prime Minister and has as its members, the Union Ministers concerned, the Chief Ministers of the States through which Ganga flows, viz., Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal

Functions of NGRBA

- Development of river basin management plan
- maintenance of minimum ecological flows
- planning, financing and execution of programme for abatement of pollution in the river Ganga
- collection, analysis and dissemination of information relating to environmental pollution
- investigations and research
- creation of special purpose vehicles, as appropriate
- promotion of water conservation practices
- monitoring and review of implementation

Regulatory issues

- Water abstraction rights subject to maintenance of ecological flows
- Town & country planning to be oriented towards river cleaning program
- Land use regulation
- Compliance by industries

Implementation: Environmental aspects

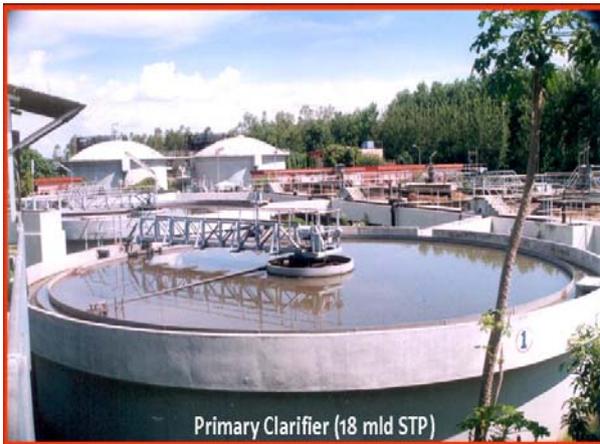
- Strengthening of Pollution Control Boards
- Online continuous water quality monitoring
- Independent Oversight
- Protocols with Industrial Associations for better compliance

Vision

- a clean river
- River as an living ecosystem



36 mld CETP, Kanpur



Primary Clarifier (18 mld STP)

Chrome Recovery in tannery, Kanpur



80 mld Dinapur STP, Varanasi





Session – II

San Antonio River Development

*Thiru K.Panindra Reddi IAS.,
Member Secretary, Chennai Rivers Restoration Trust*

Creation of SARA

- ▣ In 1917, the voters of Texas, recognizing the necessity of developing and conserving the State's water resources and inspired by devastating floods of 1913 and 1914, passed a constitutional amendment allowing the legislature to create special purpose political subdivisions of the State to serve regional areas, generally coincidental with river basins and to be generally known as river authorities.
- ▣ SARA, created in 1937 is one of many such active river authorities in the state of Texas. Its jurisdiction covers 3,658 square miles, in Bexar, Wilson, Karnes and Goliad Counties.

SARA's Responsibilities

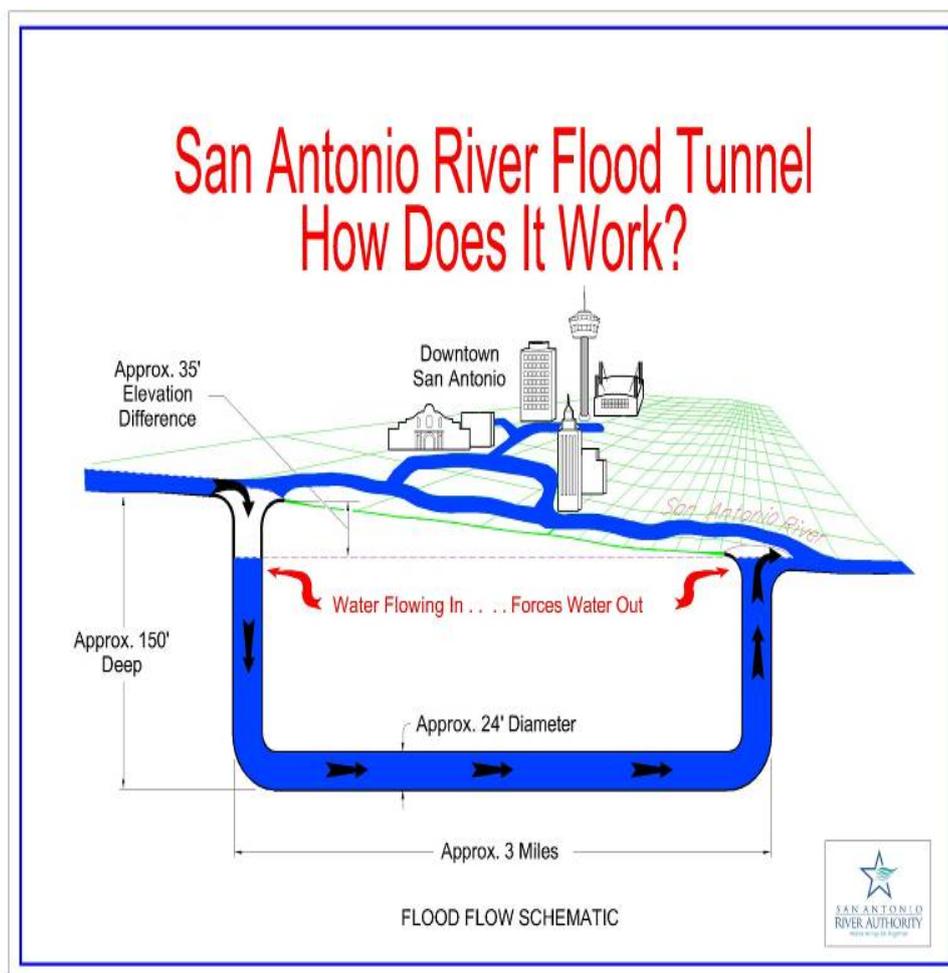
- ▣ Flood control
- ▣ Pollution prevention
- ▣ Soil conservation
- ▣ Sewage treatment
- ▣ Water conservation (including storage, procurement, distribution and supply)
- ▣ Irrigation
- ▣ Navigation
- ▣ Parks & recreational facilities
- ▣ Fish preservation
- ▣ Forestation measures

Funding

- ▣ Tax revenue 2c per \$100 value of property. Accrual about \$17mn annually which is used for O&M and planning. This is less compared to \$1.3 for the school district, \$0.57 for the city.
- ▣ Average collection is \$22 per home
- ▣ County collects the tax and passes on to SARA
- ▣ Annual budget \$101 Mn out of which 60% goes for flood control, 28% for utilities, 4% for water quality, 4% on water resources and 4% on park services
- ▣ The state of Texas funds the water quality studies
- ▣ Federal Emergency Management Agency funds the flood control related studies.
- ▣ The city of San Antonio and the Counties contribute to the programmes of SARA.

Flood Control

- ▣ San Antonio Channel improvement project in 1954, for 31 miles of the River and its tributaries
- ▣ The presently ongoing San Antonio River improvement project for 13 miles of the River in San Antonio city costing \$216.6 million
- ▣ 6000 foot-long San Pedro Creek Tunnel (1991) for the major portion of a 100 year storm flood
- ▣ 16200 foot-long San Antonio River tunnel in San Antonio City (1997) which is a 24feet 4 inch diameter inverted siphons located 140 feet below ground level for the major portion of a 100 year storm flood.
- ▣ Administer FEMA buy - out programs throughout the San Antonio River Basin
- ▣ Development of Geographical Information System (GIS) database for improved flood warning
- ▣ Perform debris removal to maintain flow capacity of waterways



Watershed Management

- ▣ Hydrology and hydraulics modeling and GIS mapping arm of SARA.
- ▣ Evolving Digital Flood Insurance Rate Map (DFIRM) to map area at risk of flooding during a 1% storm event (100 year)
- ▣ Formulating a system for the emergency operators in the lower San Antonio River Basins

Environmental Services and Water Quality

- ▣ Water quality laboratory: SARA conducts weekly tests of drinking water and / or wastewater for cities within the basin to improve water quality, habitats and the environment
- ▣ Clean Rivers Program: a water monitoring and assessment program that involves sampling at sites in the San Antonio River Basin from Bexar to Goliad counties and generates data being used for a historical database
- ▣ SARA Stream Monitoring Program: supports additional sampling at sites along the San Antonio River and its major tributaries
- ▣ Fish Community Composition Assessments: provide additional data on the biodiversity and health of the San Antonio River Basin's rivers, creeks, and streams

Water Resources

- ▣ Partner in water resource development activities that could lead to new water supplies
- ▣ Completed Water Needs Assessment of communities within the San Antonio River Basin
- ▣ Administrator of the Regional Water Alliance, a group of Region L water purveyor and regional water entities working together to seek and implement solutions to meet the region's water needs.

Utility Services

- ▣ SARA has three permitted active wastewater treatment plants (Salatrillllo, Upper Martinez and Martinez II) which combined have a capacity of over 10 MGD
- ▣ Own and operate three water systems in Wilson County
- ▣ Provide contracted operation and maintenance of the water systems in Goliad County communities of Berclair and Fannin

Park Services

- ▣ Operate two lake-based recreation areas (Braunig Lake and Calaveras Lake) in partnership with San Antonio's CPS Energy, serving 350,000 persons annually
- ▣ Promoting River walks along the river banks
- ▣ Promote regional approach to planning and conservation through development of the San Antonio River Basin Plan for Nature – based Park Resources

Lake Parks





San Antonio River Improvements Projects (SARIP)

- ▣ This project sanctioned recently aims at eco restoration, flood damage reduction and economic development. The project costing \$345 Mn is funded by the City (\$74.7Mn), County (\$184 Mn), Private funds (\$11.3 Mn), and USACE (\$74 Mn). The city's contribution is proposed to be raised through a Visitors tax (\$125 Mn).

Project Benefits

- ▣ Ecosystem Restoration – *The changes proposed will increase water quality and the quantity and diversity of plant and animal species.*
- ▣ Flood Damage Reduction – *Project will maintain or decrease the elevation of the 100 year floodplain.*
- ▣ Quality of Life – *Add to San Antonio's unique charm and make the city more attractive to residents, visitors, and businesses and provide enhanced recreational opportunities along an expanded linear park system.*
- ▣ Cultural connections – *Linking people, neighborhoods and cultural resources and celebrating the historical connection of the river to four of the five historic missions in the San Antonio Missions National Historical Park.*
- ▣ Economic Development – *Promote business development along and adjacent to the river. Improvements will also enhance tourism.*

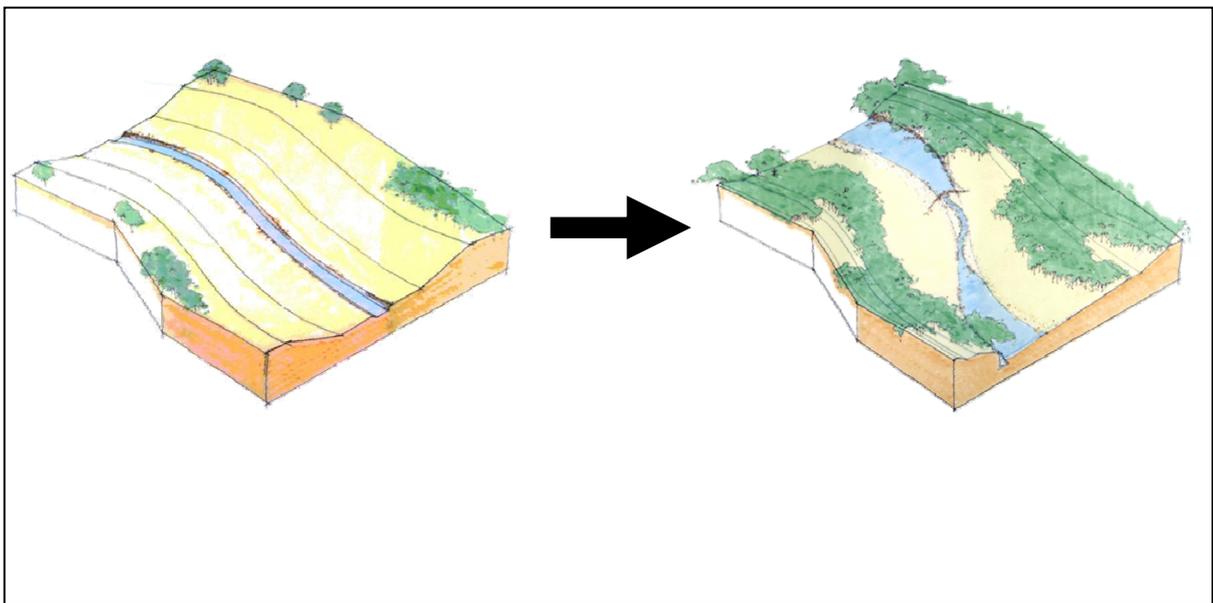
Community Support and Oversight

- ▣ San Antonio River Foundation
 - Provides private funding to support project
- ▣ San Antonio River Oversight Committee
 - A 22 person citizens committee established in 1998 with members appointed by the City, County and SARA representing the various neighborhood and business stakeholders along the river.

Existing Proposed

Riverine system rating 1.2
Rating 1 Extremely degraded

Proposed 8.2
Rating 10 ... Prestine



River Training + Art Enhancement



San Antonio Water Systems

- ▣ San Antonio water system, a subsidiary of the San Antonio City, owns and operates three major water recycling centres
- ▣ The combined permitted capacity of all SAWS' facilities is 225.5 million gallons per day.
- ▣ Recycled water is discharged to outfalls on the San Antonio river, Salado Creek, Leon Creek and Medio Creek.
- ▣ Transfers of recycled water are also made to SAWS' recycled water distribution system
- ▣ In Chennai the sewage treatment capacity is 486 million liters for a population of 5 million. The treatment capacity available is 97.2 liters per day per person. The SAWS sewage treatment capacity is about 125.5 million gallons (856.9 million liters) for a population of 1.2 million. The treatment capacity available is 397 liters per day per person.
- ▣ The design for expansion is started when 70% of the capacity is reached. When the capacity utilization reaches 90% they start construction for the next phase.

River Walk



Business of Cleaning



Key Learnings

- ▣ River basin approach
- ▣ Stake holder support
- ▣ Technology backstop by SARA
- ▣ Community Involvement and oversight
- ▣ Funding support from City, State and Federal Governments

Session - II

Presentation on Coom River Restoration

K.Phanindra Reddy IAS

Member Secretary, Chennai Rivers Restoration Trust

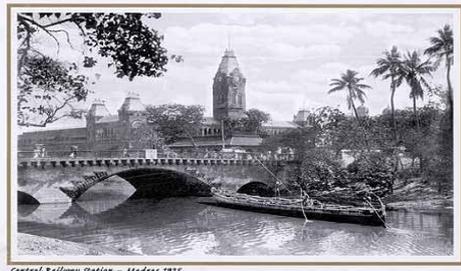
“Chennai can be said to have been beautified only when the Coom river is beautified. Coom should become the Thames of Tamilnadu and steps have to be taken to beautify it”

Hon’ble Chief Minister of Tamilnadu on 24rth December 2008 during the inauguration of the 35th Tourism and Trade Fair

The Glory of Coom



Napier Bridge – Madras 1885



Central Railway Station – Madras 1925



Thiru Pachayappa Mudaliar, famous philanthropist used to take bath in the river

Coom: Today



A dead river

-Today nobody can even touch the water without getting a disease

-No fish can live in it .The Fisheries department with the assistance of the World Bank team tried several experiments (data on record) All fish died within one hour



It breeds mosquitoes and causes disease

-Frequent and devastating floods in Chennai due to congestion in the Coom

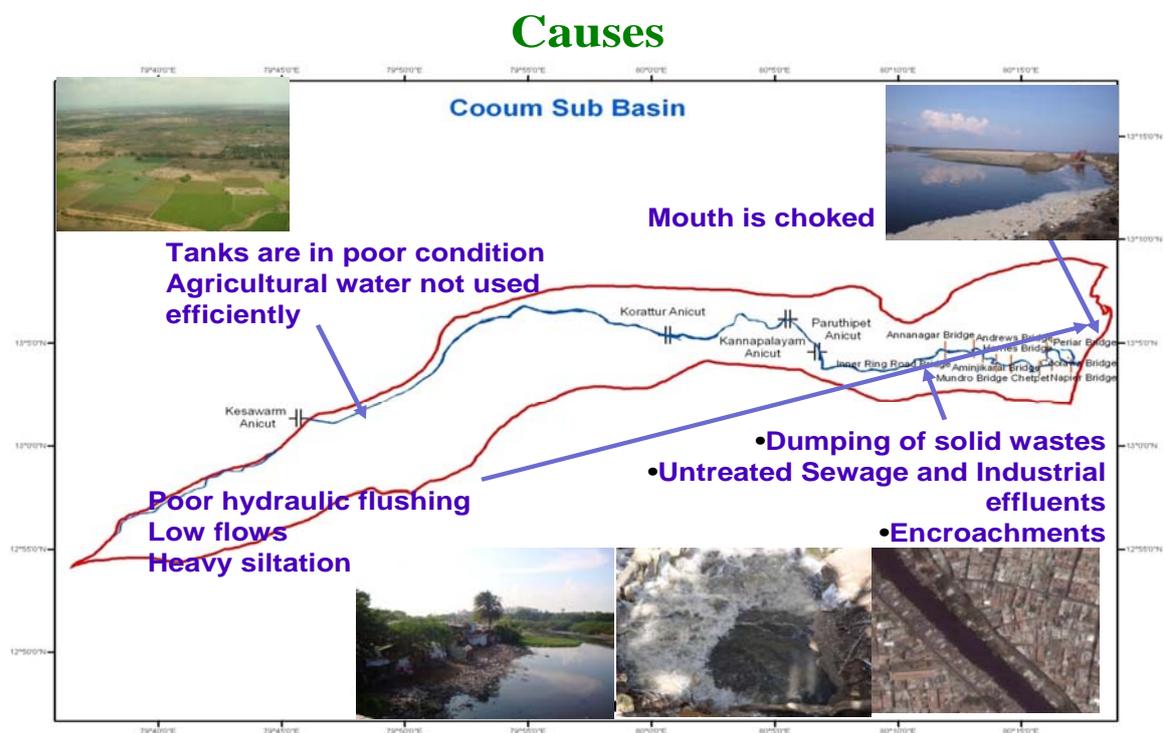
-Many live in terrible conditions on its banks

-Public apathy

-It is no one’s responsibility but everyone’s problem!

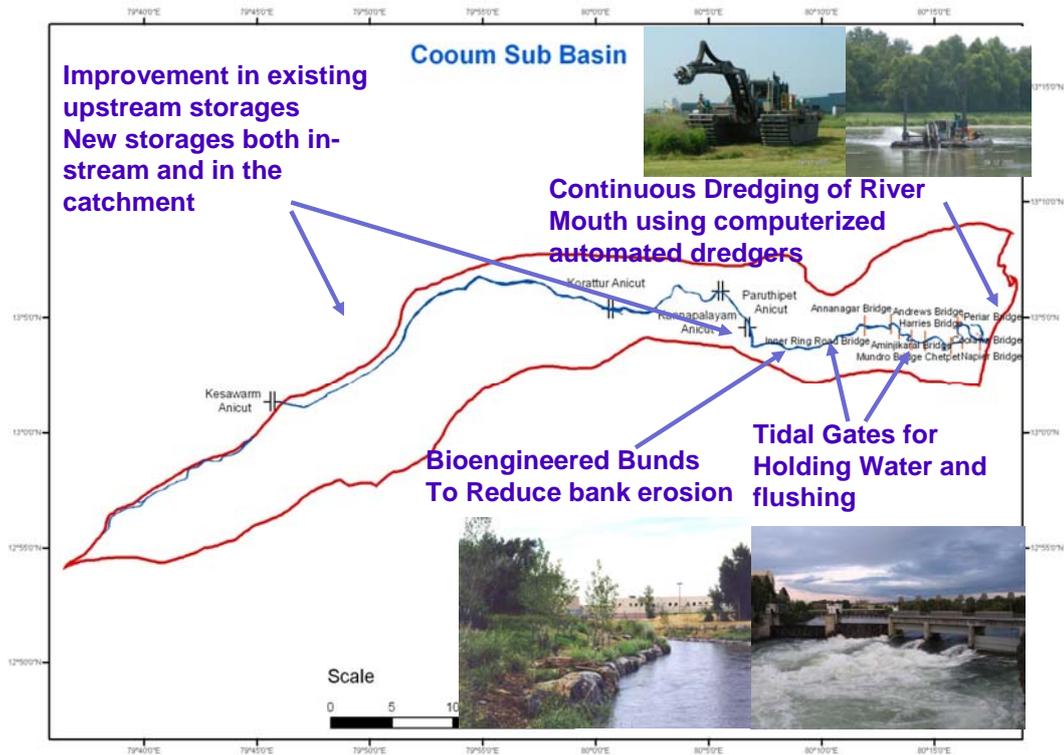
Causes

- Intensive/inefficient abstractions of surface water upstream for agriculture
- Excessive groundwater pumping resulting in groundwater depletion leading to reduced base flow in the river
- Flow reduction as well as Littoral Drift leading to Mouth closure problems
- Reduction in flood carrying capacities due to excessive siltation and encroachments leading to flood problems in the City each monsoon
- Discharge of untreated Sewage and Industrial Effluents
- Pollution from the Slums
- Dumping of Solid Waste both in the peri-urban and urban areas

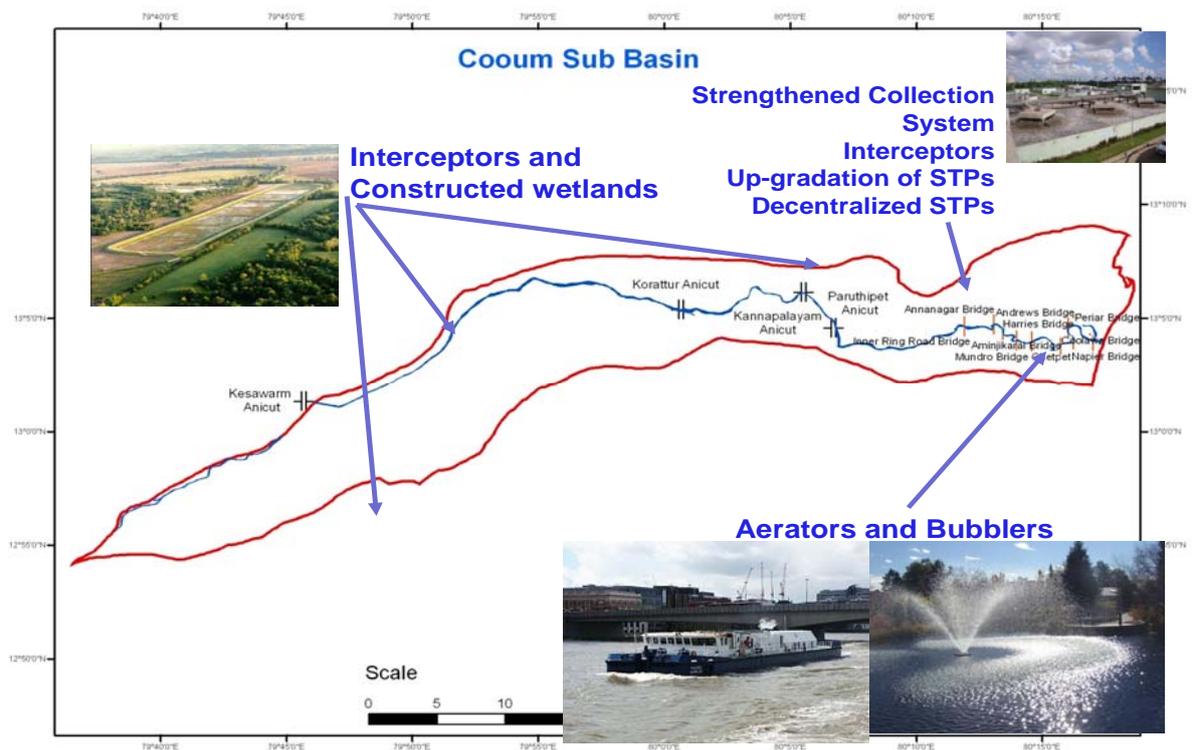
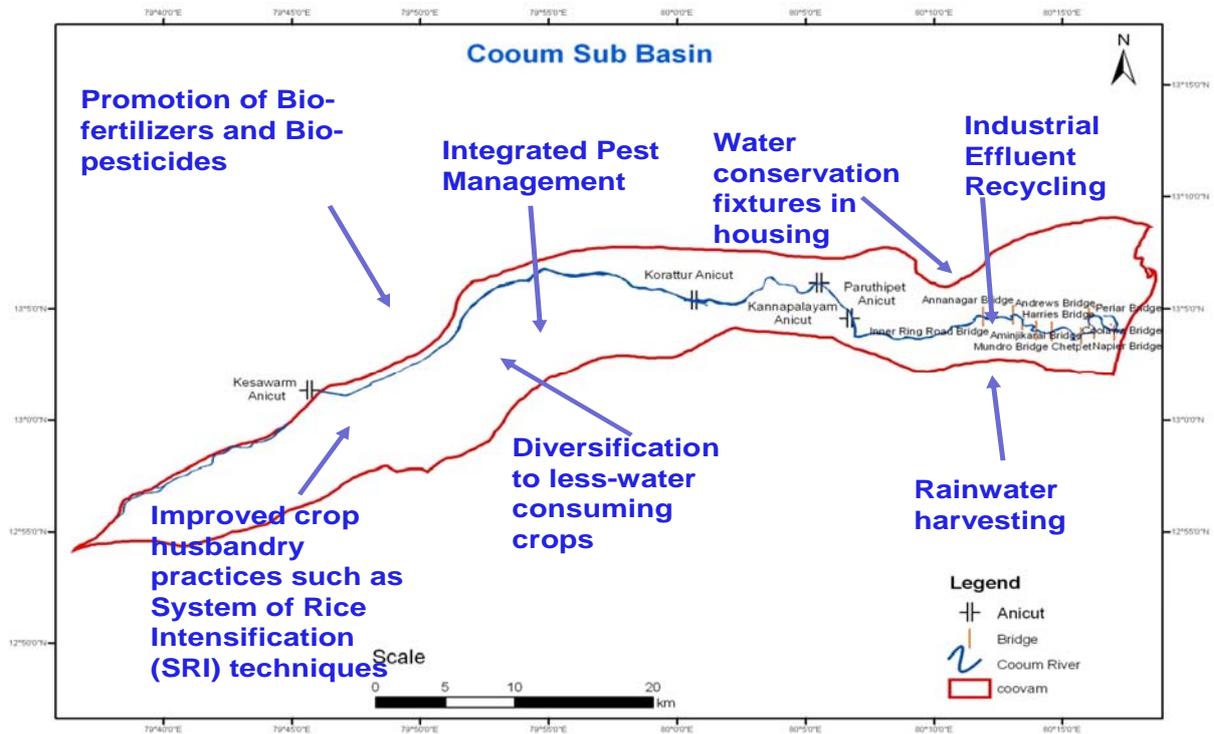


Solutions

- ✓ Upstream Storages
 - * Upstream of Thiruverkadu
 - * Improve Existing storages 127 tanks with possible storage capacity of 84 MCM Average annual virgin flow 172 MCM at Thiruverkadu
 - * New storages both in-stream and in the catchment
- ✓ Automatic River Management Systems with gate controls
- ✓ Continuous Dredging of River Mouth
- ✓ Tidal gates
- ✓ Bio-engineered bunds to reduce erosion



- ✓ Agricultural Demand side Management
 - Improved crop husbandry practices such as System of Rice Intensification (SRI) techniques
 - Diversification to less-water consuming crops
- ✓ Promotion of biofertilizers and biopesticides
- ✓ Integrated Pest management
 - Minimize (and eventually eliminate) use of chemical fertilizers and pesticides
- ✓ Industrial effluent recycling
- ✓ Water conservation measures in housing
- ✓ Rainwater harvesting
- ✓ Strengthening of Sewerage and Storm-water Collection Systems
- ✓ Augmentation of Existing Sewage Treatment Plants
- ✓ Implementation of Onsite and Decentralized Sewage and Solid Waste Treatment Systems
- ✓ Application of innovative technologies like Constructed Wetlands
- ✓ In-stream Aeration Fountains and Bubblers
- ✓ Improve Solid Waste collection system
- ✓ Scientific disposal of solid waste



Environmental Measures

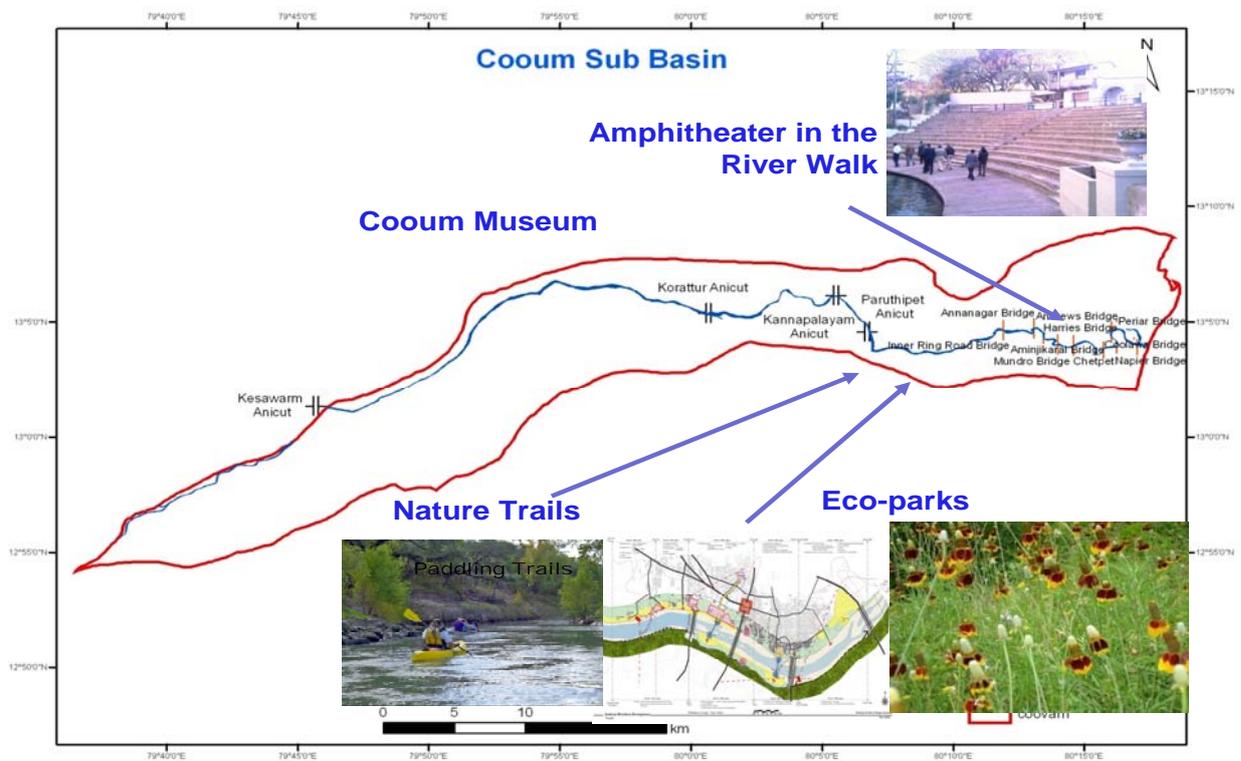
- ✓ Continuous water quality monitoring
- ✓ Maintain plant species diversity
- ✓ Environmental education for sustainability

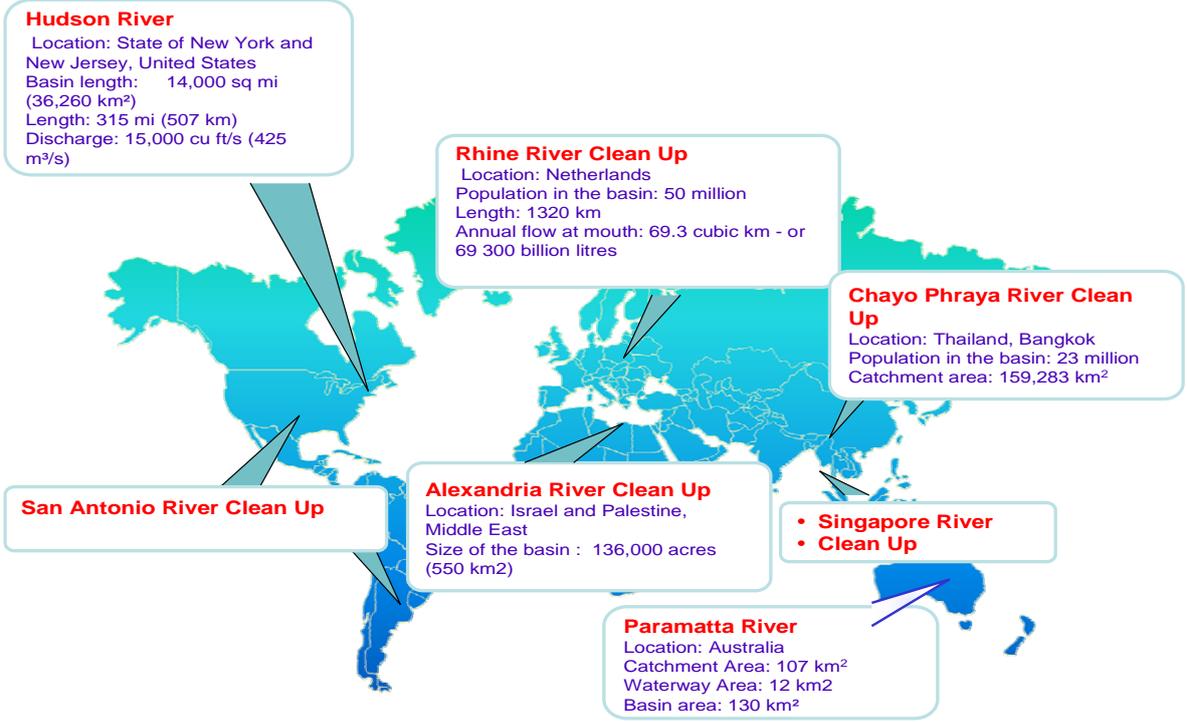
Social Measures

- ✓ Vertical tenements to resettle slum dwellers
- ✓ Community participation to enhance sustainability involving
 - Citizens at large
 - Slum Dwellers
 - Schools, Colleges
 - Hospitals
 - Hotels
 - Industries
 - Commercial Establishments

Recreational Measures

- ✓ River Walk - Improve conditions along the banks with a long-term vision for the benefit of the citizens of Chennai and India
- ✓ Boating (Recreational Tourist Commercial)
- ✓ Coom Park and Museum
- ✓ Events such as water sports to generate revenues and maintain interest in the river





Who will do this?

Chennai Rivers Restoration Trust

- Planning
- Coordination
- Arranging Technical Assistance
- Arranging Funds
- Monitoring

Public Works Department

- Water Resources Organization
- Rehabilitate Tanks and structures
- Build and operate River Administration Systems
- Dredging bottom of river
- Manage mouth (dredging, tidal gate)
- Protect the river in the future

Chennai Corporation

- Solid waste collection and management
- Storm water management

Chennai Metro Water

- Ensure segregation of Storm water and Sewerage systems
- Build interceptor and upgrade Sewage Treatment Facilities

CMDA

- Aligning the development plans with river restoration objectives and enforcing regulations

Peri-Urban Municipalities/Panchayats

- Solid waste collection and management
- Sewage collection and management

Hospitals

- Eliminate biomedical waste dumping into the Cooum as per current laws

TN Pollution Control Board

- Enforce pollution laws effectively

Agriculture Dept./TNAU

- Improve irrigation efficiency
- Conserve water in agriculture using modern crop husbandry techniques such as System of Rice Intensification (SRI)
- Diversify to less water consuming crops
- Promote Integrated Pest Management, bio-fertilizers and bio-pesticides

TN Slum Clearance Board

- Effectively manage encroachments

Universities, NGOs & General Public

- Research partnerships
- Awareness building & education
- Private Sector: Partnerships & Investments
- Community consultation and outreach

Where are we?

- ✓ Securing vacant spaces along the river banks
- ✓ Langs garden road, Swami Sivananda Salai
- ✓ CMWSSB charted action plan to plug sewage infalls in two years
- ✓ Resettlement action plan under preparation by TNSCB and CMDA
MM Nagar, Perumbakkam etc
- ✓ Timelines set by TNPCB for major polluting industries upstream
- ✓ Action initiated by Corporation to clean the banks and enforcement action against eateries

Cooum: Tomorrow, the Thames of Chennai...



It is a social, environmental, and economic asset:

-People will WANT to visit and live near the Cooum

-Businesses will want to invest on the Cooum

-Citizens of Chennai will be proud of the Cooum

-Fish as well as citizens will come back, the ecology will thrive

-Healthy river, healthy people!

...and it will smell like roses!

Session – II
Role of German Agency for Technical Cooperation (GTZ) in Waterways Development

*Thiru K.Dirk Walther,
 German Agency for Technical Cooperation, New Delhi*



Seminar on "Waterways in Chennai"
 Chennai Metropolitan Development Agency



GTZ support for 6 JNNURM cities



Dirk Walther (Dipl.Geol./MSc. WRM)

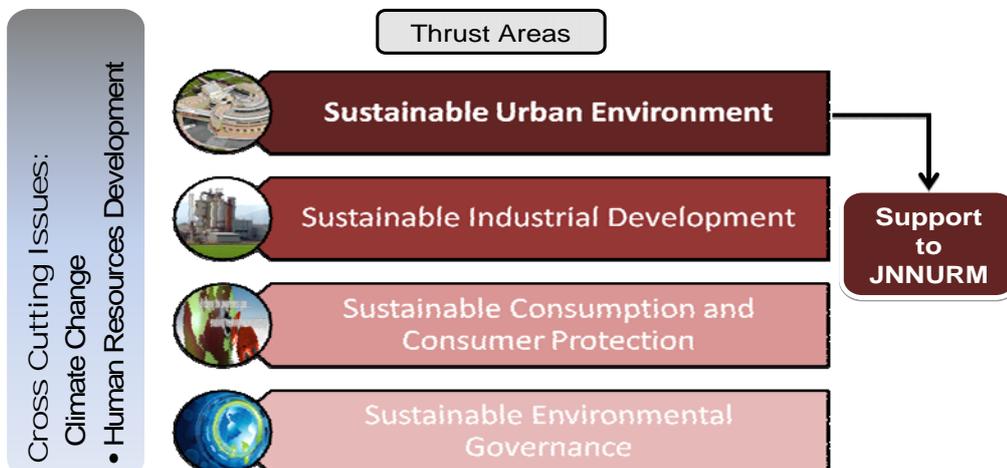
Chennai March 2010



IndoGerman Environment Programme

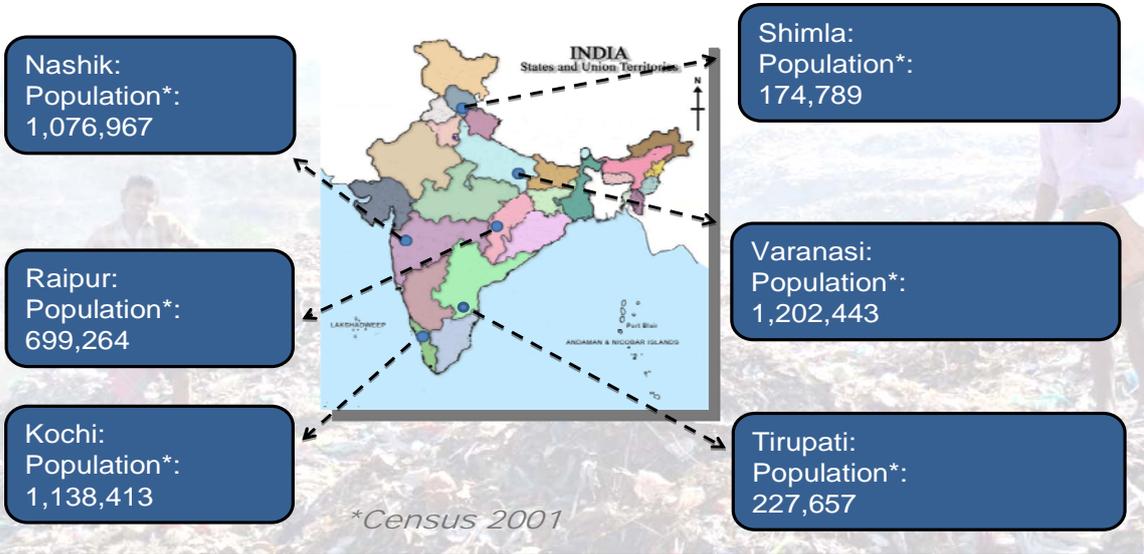


ASEM: Joint program of the German Technical Cooperation and the Indian Ministry for Environment and Forests



Dirk Walther (Dipl.Geol./MSc. WRM)

Chennai March 2010



Dirk Walther (Dipl.Geol./MSc. WRM)

Chennai March 2010





	Intervention	Urban Local Body
Pro-Poor Issues	Municipal solid waste Management	All Municipal Corporations
	Sustainable Urban Transportation/City Mobility Plan	Shimla, Raipur and Kochi
	Waste water management	Raipur, Nashik, Shimla
	Water supply	Shimla and Nashik
	Mandatory reforms including e-governance	All Municipal Corporations
	Clean Development Mechanism (CDM) support	All Municipal Corporations
	City Sanitation plans	All Municipal Corporations

Dirk Walther (Dipl.Geol./MSc. WRM)

Chennai March 2010

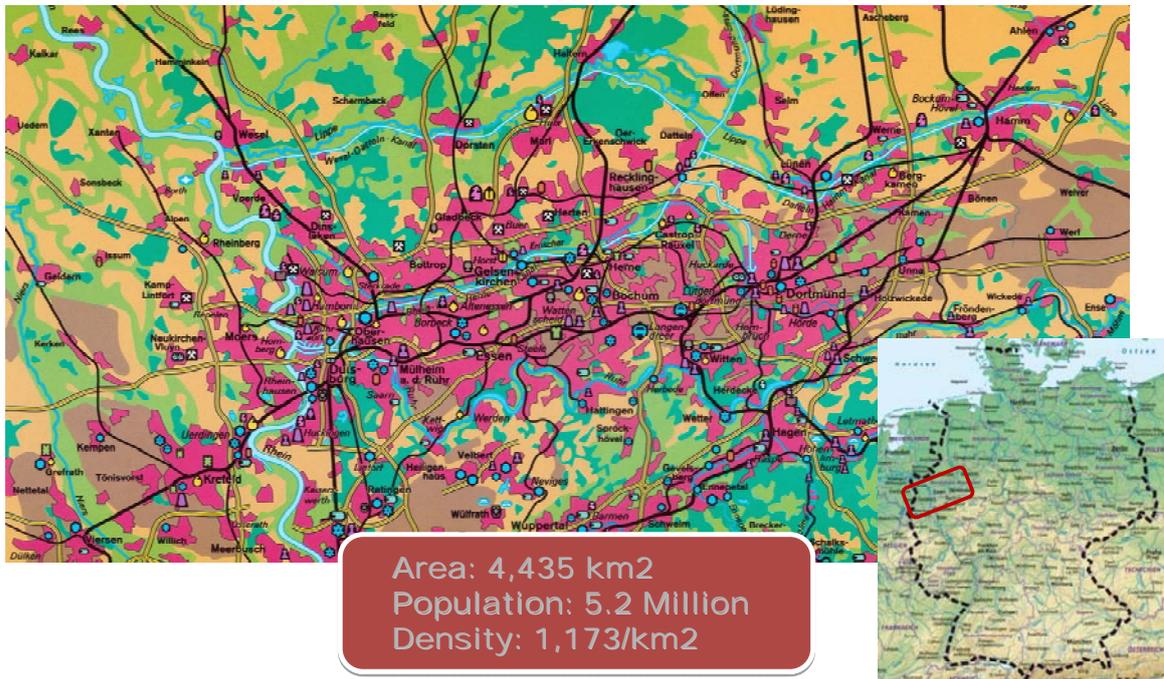
Riverfront development
-a multi-layer and multi-stakeholder task-



Dirk Walther (Dipl.Geol./MSc. WRM)

Chennai March 2010

The Ruhr – An example for regional development



Dirk Walther (Dipl.Geol./MSc. WRM)

Chennai March 2010

Case Study Emscher -Historical Background-

All sewage from coal and steel industry was drained into the Emscher

People died of plagues as malaria, epidemic typhus and cholera

The founding of a regional water management institution was also to ensure further industrial development

1899 – 1910: Cities, districts and big industrial enterprises cooperated to canalize the Emscher river.
 1909 the last big flooding happened.

Dirk Walther (Dipl.Geol./MSc. WRM)

Chennai March 2010

Riverfront development in Germany of the 30ies and beyond

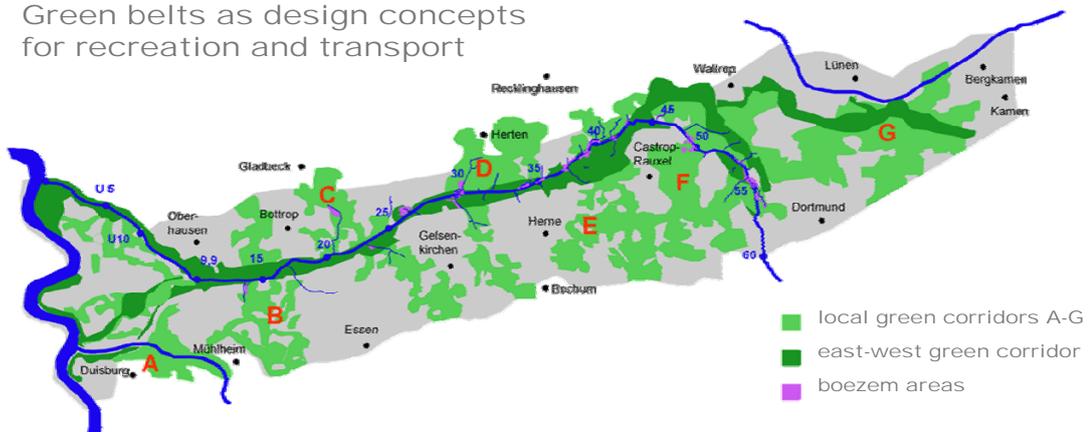


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Chennai March 2010

New concepts for riverfront development in Germany

Green belts as design concepts for recreation and transport



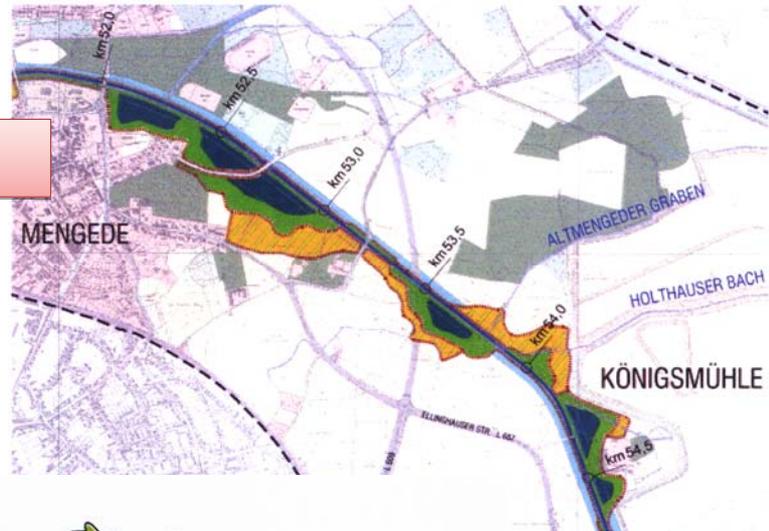
(with courtesy from Claudia Horch Regionalverband Ruhr)

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Hydraulic restructuring using ecologically friendly concepts

retention model:
floodplain valley



retention model: green
belts as retention zones

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From engineering to ecological engineering

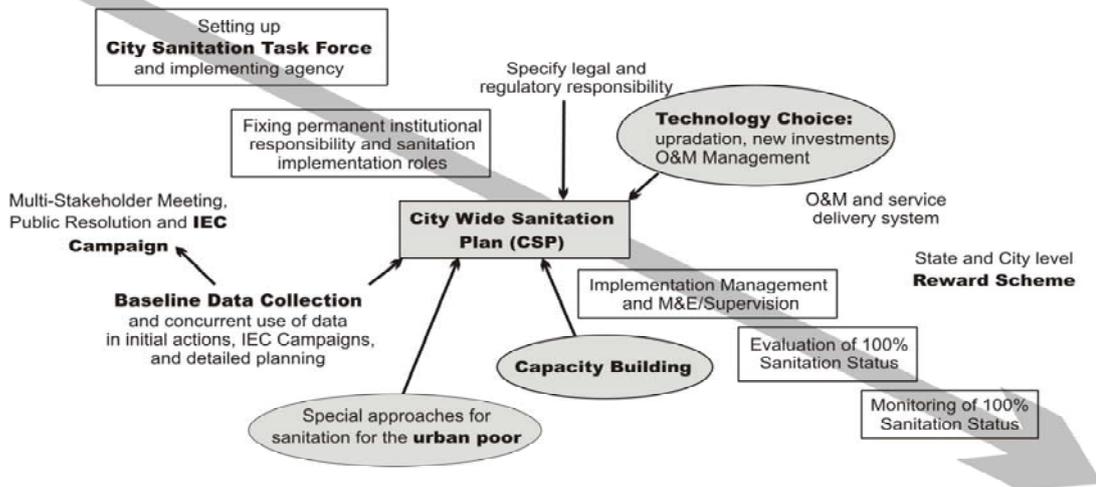


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City Sanitation Plans (CSP)

Generic elements of City-wide sanitation

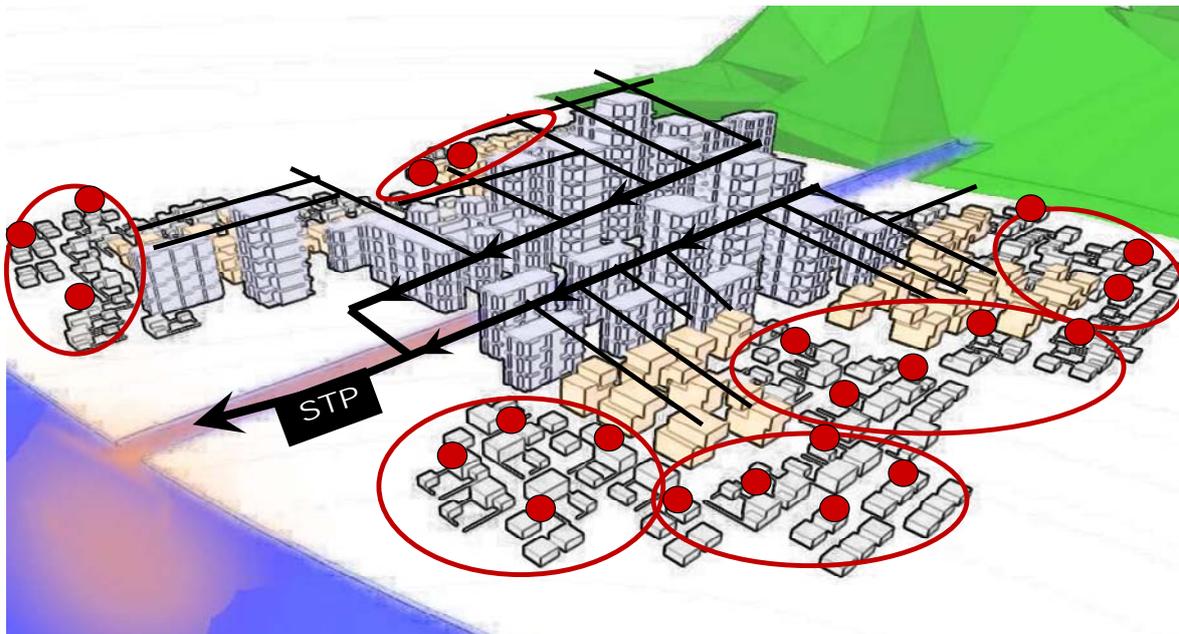


(Source: National Urban Sanitation Policy MoUD 2008) IEC= information, education, communication

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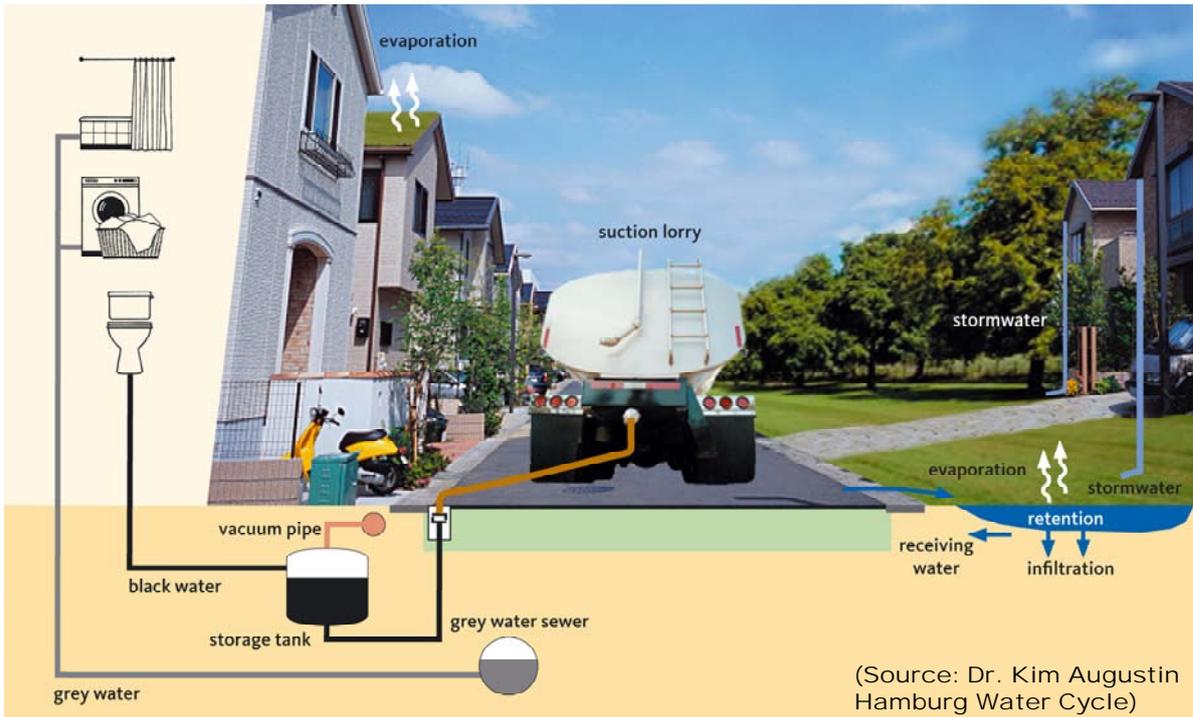
GTZ contribution to CSP - from centralized to combined solution-



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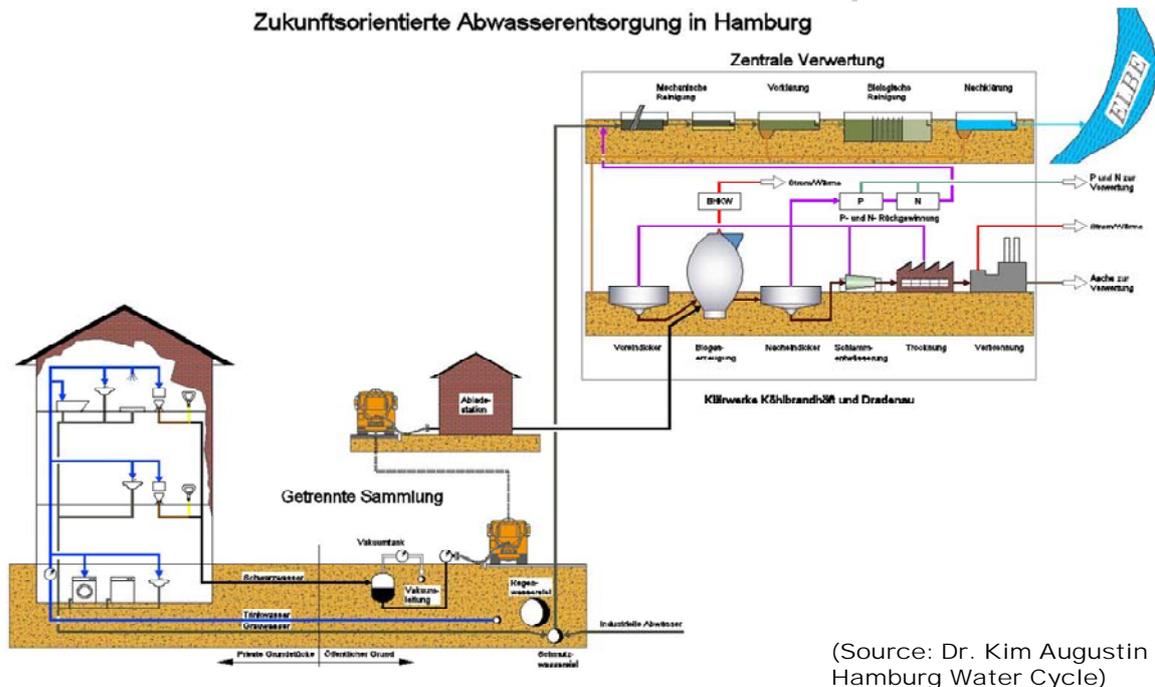
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Decentralization of wastewater disposal for unserved areas



Innovative solution for sewer free wastewater treatment concept

Zukunftsorientierte Abwasserentsorgung in Hamburg



**Green Cities
-Water for Life-**

Thank You!



Ministry of Environment & Forests
Government of India



gtz



Ministry of Housing and Urban Poverty Alleviation
Government of India



Ministry of Urban Development
Government of India

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