

SESSION – 4

WATER BODIES IN METROPOLITAN ENVIRONMENT

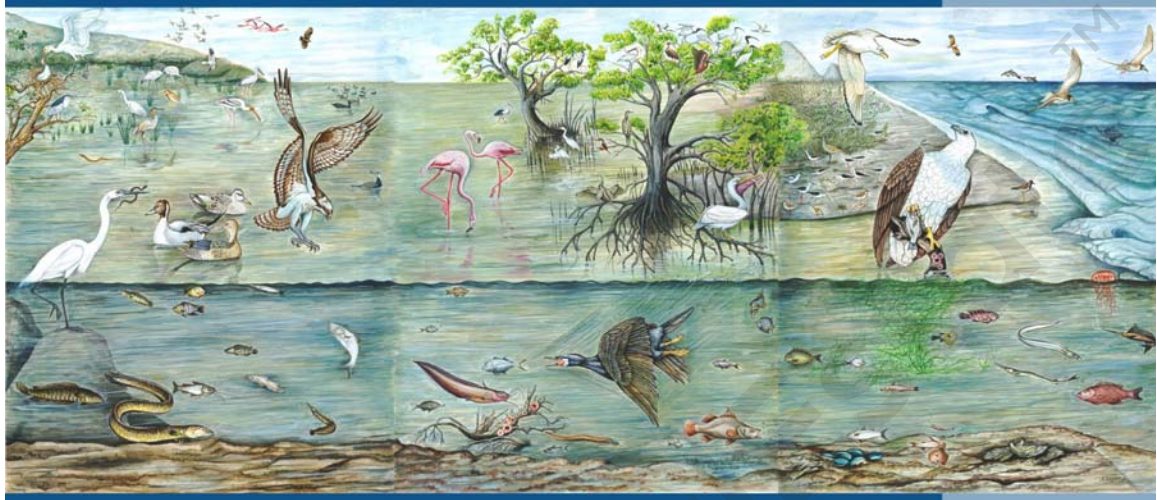
Session – IV

Adyar Poonga Development

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ADYAR POONGA



A challenge in linking people to an Urban Wetland Restoration site

THE COROMANDEL COASTAL REGION



French Map of the Coromandel Coast, 1753AD (Ref: wikipedia.org)

COROMANDEL COASTAL REGION

The Coromandel Coast refers to the stretch between Point Calimere, near the delta of the Kaveri River in the south, to the mouths of the Krishna River in the north along the Bay of Bengal.

The coast is home to the East Deccan dry evergreen forests, which run in a narrow strip along the coast. It also has extensive mangrove forests along the low-lying coast and river deltas, and several important wetlands that provide habitat to thousands of migrating and resident birds.



Mangrove swamps in Pichavaram



Tropical Dry Evergreen Forest in Orani



Pulicat Lake (Ref: wikimapia.org)



Kortalaayar River Mouth (Ref: wikimapia.org)



Adyar Estuary (Ref: wikimapia.org)



Palar River Mouth (Ref: wikimapia.org)



Kalveli Estuary (Ref: wikimapia.org)



Chunambar Estuary (Ref: wikimapia.org)



Coleroon River Mouth (Ref: wikimapia.org)



Point Calimere (Ref: wikimapia.org)

History of Adyar

7 th Century	: Pallava Port of Mylapore is believed to have been on the northern bounds of Adyar estuary
1798	: Adyar finds position in a British map as a suburb.
Late 18 th & early 19 th Century	: British garden houses were built on the northern bank of the river.
1840 AD	: Construction of Elphinstone Bridge, giving access to the southern bank of Adyar river.
1882 AD	: Acquisition of 27 acre of estate on the southern bank of the river, an early step towards the formation of today's 270 Acre Theosophical Society
Mid 20 th Century	: Fisheries department of Govt. of Tamil Nadu controls the creek area and sets up fish farms and related institutions.
1993	: Consumer Action Group, a city based NGO, filed a public interest petition to maintain Adyar Creek as a sanctuary, leading finally to the protection and formation of 58 Acres of Adyar Poonga.
Late 20 th & 21 st Century	: Waste water & sewage inflows, continual dumping of debris and garbage along the river, estuary and creek. Heavy construction activity along the creek's edges.

Genesis of the Poonga

The Government of Tamil Nadu has from 1997, been contemplating the creation of the Adyar Poonga. The Project initially envisaged the creation of an eco park to restore the ecological balance and raise public awareness on environmental issues. However realizing the larger ecological impact, the Government initiated an ambitious project to include and encompass the edge restoration of the Creek and Estuary as well, covering about 358 acres.

To effect the above, the State Government vide G.O.Ms.No.117 Municipal Administration and Water Supply, dated 11.10.2006, formed a Trust, headed by the Chief Secretary, under the name of "Adyar Poonga Trust" inter alia with the objective of developing, maintaining and serving an eco park by name "Adyar Poonga" and to create such other systems for the restoration of the Adyar Creek and the Estuary area.

The Board of Trustees, by a resolution dated 21.11.2006 appointed the Tamil Nadu Urban Infrastructure Financial Services Ltd., Chennai (TNUIFS) to identify and engage necessary consultants in the preparation of a concept/master plan, detailed planning and to invite competitive bidders for the development of the Rs 100 crore Eco-park.

Accordingly M/s.Pitchandikulam Forest Consultants, based in the international township of Auroville, which is recognized internationally for its ecological works, were appointed as consultants for developing a Master plan and other related activities. Pitchandikulam Forest Consultants are collaborating with several reputed specialist Consultants like Centre for Environmental Studies, Anna University, Idea Design (Cochin), House of Consultants, (Bangalore), Aurore (Auroville), SDA (Auroville), SCD India Ltd. (Chennai), Ceres (Australia) amongst others in the fields of Water Management, Environmental Education, Flora and Fauna habitat mapping, Social Impact Studies, Alternative Technology, Architecture and Landscaping.



Satellite image of Adyar area

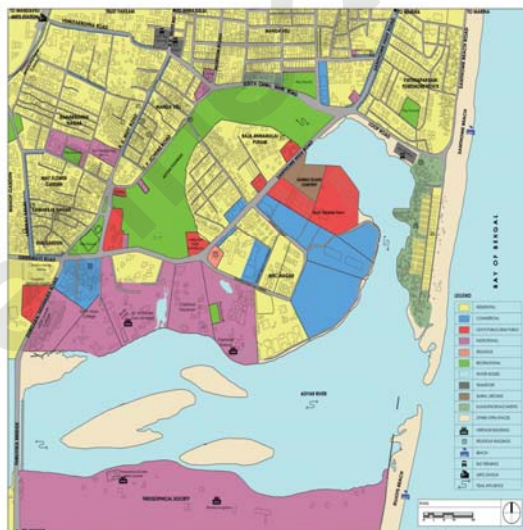


Photographs of Adyar Estuary and Creek, 2004



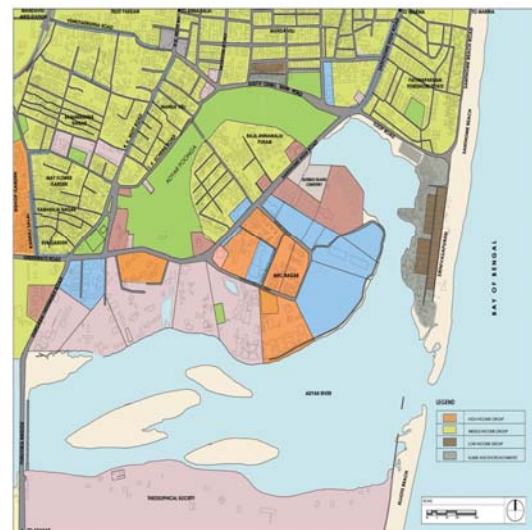
Land use

Settlement Pattern



LAND USE

This part of Adyar predominantly has mixed use residential and institutional zones. A concentrated city-level commercial development is coming up on the Quibble Island facing Srinivasapuram.



SETTLEMENT PATTERN

Housing areas mostly consist of lower and upper MIG residential districts, with a considerable share of HIG housing. LIG, EWS & slum areas are found in Srinivasapuram & Raja Grammi Thottam.



Edge Conditions



In the last decade, continual dumping of construction debris and garbage on the edges of Quibble island & Srinivasapuram has heavily polluted the Creek & estuary. The floating garbage on the river also accumulates on the edges of the creek & estuary.

Infrastructure Proposals



Most of the roads in this area have widening proposals including the Thiru Vi Ka Bridge. Reconstruction of Srinivasapuram, Foreshore estate and the elevated highway along the seafront are the major proposals in the area.



PLANNING CONCEPTS

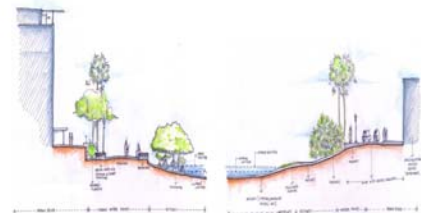
Ecological Restoration of the Creek & Estuary

The first step towards ecological restoration is to define and secure the edges of the creek and estuary from the surrounding urban development activities. The best method to secure the edges is to bring public watch and ward by providing public access to these edges. Once the edges are protected, restoration of these edges with mudflats, mangroves and other appropriate habitats would follow.

An Urban Walkway on the Waterfront

An Urban walkway is proposed along the edges of the creek abutting the Quibble Island. The walkway will provide an opportunity for people to enjoy the spectacular view of the creek and estuary.

On the other side of the creek, the walkway will follow the edges of Foreshore Estate Loop Road, Srinivasapuram Housing Colony as well as the beach, connecting public spaces and institutions such as ecological interpretation centers, marine aquarium etc.



ADYAR ESTUARY



The Adyar Estuary is a shadow of its former self. Surveys have revealed only a limited number of species. Some are shown below.



Avicennia marina



Little Cormorant



Intermediate Egret



Common Sandpiper



Kentish Plover



Black-winged Stilt



Catfish



Halavi's Gutterfish

There is still life in Adyar Estuary and because of this there is still hope

ESTUARINE ECOSYSTEM

An estuary is a transition zone between freshwater and seawater. As such it is perpetually in a state of flux as it is influenced both by the tides and floodwater. Due to this unique characteristic it is the place that is the most affected by anthropogenic factors - for example, all sewage and pollutants upstream settle on the substrate and cannot be flushed into the sea due to the incoming tidal action (except during the monsoons) and due to the formation of sand bars. The state of an estuary is a valuable indicator to the state of a waterway, and the biodiversity it contains is crucial in determining the health of this ecosystem.



Rhizophora mucronata



Avicennia marina



Sesuvium brachyactis



Suaeda maritima



Gracilaria sp.



Golden Plover



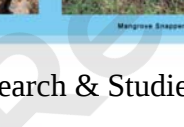
Mud Crab



Grey Sea Catfish



Sea Bass



Mangrove Snapper



Dory Snapper



Greasy Grouper

All these indicators of environmental health would return if only we work together to clean up the ecosystem

Many of the species shown below are of economic value. Sustainable harvesting of these bioresources is the ultimate indicator of ecorestoration success



Green Mussel



Green Mussel



Green Mussel

Research & Studies



Pied Cuckoo
Clamator jacobinus



Asian Koel - Male
Eudynamis scolopaceus



Asian Koel - Female
Eudynamis scolopaceus



Rose-ringed Parakeet
Psittacula krameri



Barn Owl
Tyto alba



Spotted Owlet
Athene brahma

In the master plan it was proposed that focused research would be carried on in the **Adyar Watershed Restoration & Research Institute (AWRI)**, which would be situated in the Green Centre, adjacent to the Poonga.

A Vertebrate diversity survey report of the Adyar wetland complex from Chembarampakkam till the estuary, was conducted.



Before transformation: Edges of the creek piled with debris and accumulated waste, sewage flowing into the creek polluting the water.



Before transformation: Edges of the estuary taken over by Prosopis and floating garbage, heritage structures hidden.



After transformation: Edges of the creek restored with mangroves and mudflats, sewage inflows stopped, encroachments removed and water front walkway established.



After transformation: Boardwalk experiencing edges reestablished with mangroves and visible heritage buildings.

IDEAS FOR TRANSFORMATION

Being a disaster prone area, the proposed waterfront walkway is to be constructed with durable natural materials capable of mitigating flood, storm etc. Accessibility and safety for children, old aged and disabled shall become the fundamental aspects of its design.

Various heritage structures such as Chettinad Palace, Brodie's Castle, and the ones in Theosophical Society would become visible from these walkways, which would improve the image of this heritage City. Boardwalks crossing over delicate natural edges would bring people closer to life in nature.



Before transformation: Floating garbage accumulated along the edges of the estuary, Prosopis covering the islands.



Before transformation: Floating garbage accumulated along the edges of the estuary, dumping of debris and garbage.



After transformation: Heritage walk, along the line of heritage buildings on the banks of the estuary, mangroves reestablished on the islands.



After transformation: Walkway overlooking the estuary; edges and island inside the estuary restored ecologically.

IDEAS FOR TRANSFORMATION

Though the ecological restoration process of reestablishing mangrove species and their associates over the islands and mudflats is given the priority, the walkway would ensure a clean and safe edge to the estuary.

The promenade would give the opportunity for the people of Chennai to enjoy this spectacular walk with the view of Adyar creek and estuary. A coordinated effort from various departments is required, if this project is to become a reality. Once completed, it would become a meaningful model for the city administration, who are working on the revival of the waterways of Chennai.

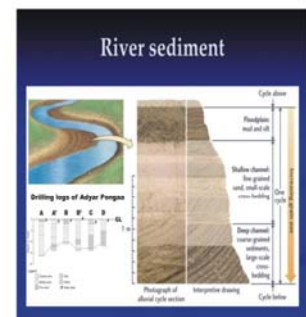
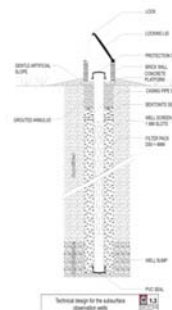


OBSERVATION WELLS

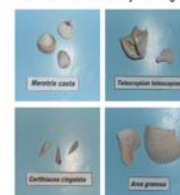
(Baseline Data Assessment by Centre for Environmental Studies, Anna University)

Six boreholes were sunk at Adyar Creek area to assess the geological conditions and to develop observation wells for ground water monitoring. The drillings were conducted to a depth of 20m approximately till the impermeable layer of the first water bearing aquifer. The observation wells were provided with screen pipe throughout the length of the aquifer to allow a continuous monitoring of the vertical differences in salinity.

Besides the physico-chemical analysis of the ground water, the water table and vertical salinity (EC) profiles were measured. The results will help to understand the ground water quality and its suitability for many purposes. Furthermore, it will support to identify the recharge of freshwater due to rainfall events by observing changes in the fresh-salt water interface.



Fossilized fauna of Adyar Pongaa



Historical formation of an Oxbow-lake





FLOW MEASUREMENT

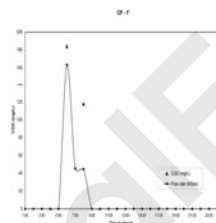
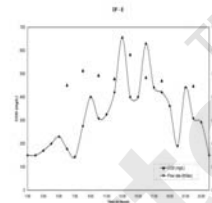
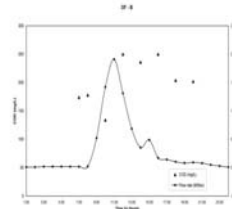
(Baseline Data Assessment by Centre for Environmental Studies, Anna University)

There are five outfalls entering into the park area including four storm water and one wastewater sewer. Storm water sewers have an important regulation function to drain off high rainfall peaks from adjacent residential zones and prevent these areas from getting logged by stagnating water. The creek and the estuary are natural storm water retention areas, which will buffer storm rainfalls occurring during monsoon season and due to cyclones.

To assess the characteristics of water entering into the park, flow measurement devices, such as V-notch, have been installed at each of the outfalls. Parallel to the flow measurement water samples have been taken and analyzed for common wastewater parameters to assess the pollution loads entering into the Adyar Creek area.



It was found that most of the sewers were transporting high loads of wastewater, with pollution levels much higher than CPCB permissible limits. Based on our recommendation. The entry of wastewater into the poonga was arrested in collaboration with CMWSSB. A "POLLUTION WATCH" was initiated to continuously monitor the flow in outfall.





ECOLOGICAL RESTORATION PLAN

Zone 1 - This is essentially a stormwater retention and infiltration zone. The periphery of this area is composed of earth berms covered with TDEF vegetation. The zone also includes a few freshwater ponds.

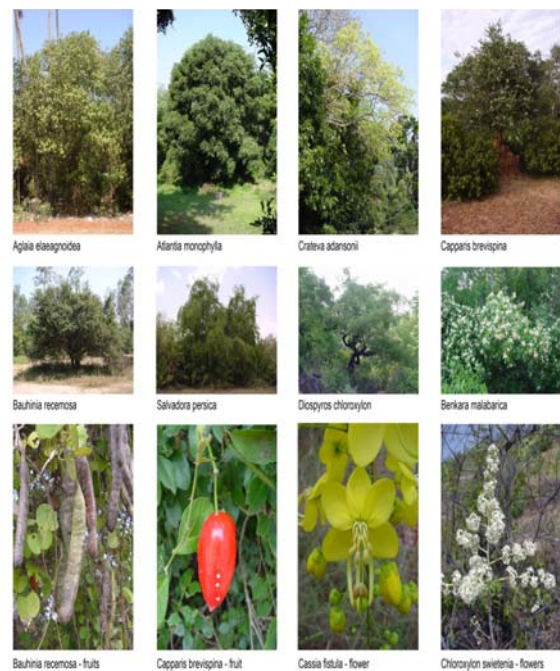
Zone 2 - This is a stormwater discharge area. Clear passage for stormwater is proposed by rebuilding the Karpagam Bridge. It is proposed to reuse the large amount of debris dumped in this area to create hillocks on either side of this zone. TDEF vegetation would cover the banks of the stormwater channel.

Zone 3 - This is a brackish water wetland zone connected directly to the creek and estuary. Mudflats naturally occur in this zone. Mangroves and mangrove associates will be planted here. The water quality of the creek and estuary need to be greatly improved for successful intervention in this area.



TROPICAL DRY EVERGREEN FOREST (TDEF)

This is a forest type found along the Coromandel Coast from Vishakapatnam to Point Calimere. Historically it existed only as a narrow belt approximately 40km along the coast. In the Poonga Master Plan, TDEF planting is mostly concentrated around storm water retention pond, in the dry areas.



BIODIVERSITY RESTORATION

Although it is impossible to restore the Poonga, Creek and Estuary to its former pristine state, bio intervention can convert the poonga space into an ecologically significant and sustainable one, and also mitigate many of the problems in the larger creek and estuarine region. The process has to start with the phased eradication of *Prosopis juliflora*, implementation of a water management plan and the deepening of existing water-logged areas to create a stormwater reservoir and finally the introduction of appropriate floral biodiversity.

HILLOCKS

Within the geographic region granite hillocks occur on bedrocks of charnockite. The variation of species on these hillocks vary distinctly from the apron around their base. The species on the hillocks are akin to the species of the Eastern Ghats.



Gynocarpus americanus



Sterculia foetida



Butea monosperma



Euphorbia antiquorum - flowers

PONDS

These are in fact small standing bodies of water. Along the Coromandel Coast such ponds are found near the paddy fields separated from the larger water systems. In the poonga 3 small fresh water ponds are proposed.



Eleocharis acutangula



Eelodea canadensis



Marsilea quadrifolia



Typha latifolia



Vallneria americana



Ruellia sp.



Pistia



Lemna minor

GRASSLANDS

Along the Coromandel Coast, grasslands are found interspersed with wetlands and tropical dry evergreen forests, forming a distinct ecotone. In the poonga, the grasslands are areas that add biodiversity to the wetlands and TDEF systems.



Aristida adscensionis



Cymbopogon citratus



Cyperus rotundus



Vetiveria zizanioides



Aristida hyalina



Cymbopogon citratus



Cynodon dactylon



Saccharum spontaneum

REEDS & MARSHES

Reeds and marshes are essential to maintain the ecological balance of the storm water retention area. They provide protective edge habitat supporting a large number of species.



Apogonon natans



Arystida sp.



Scirpus grossus



Typha angustata

MANGROVES & ASSOCIATES

Mangroves and mangrove associates are considered to be globally endangered and hence their introduction to the park has high conservation value. Mangroves and mangrove associates that are tolerant to inundation and salt, are proposed to be planted in the eastern reaches of the park.



Avicennia



Avicennia sp.



Rhizophora sp.



Thespesia populneoides



Sarcobolus carinatus



Suaeda maritima



Denis trifoliata



Salicornia sp.

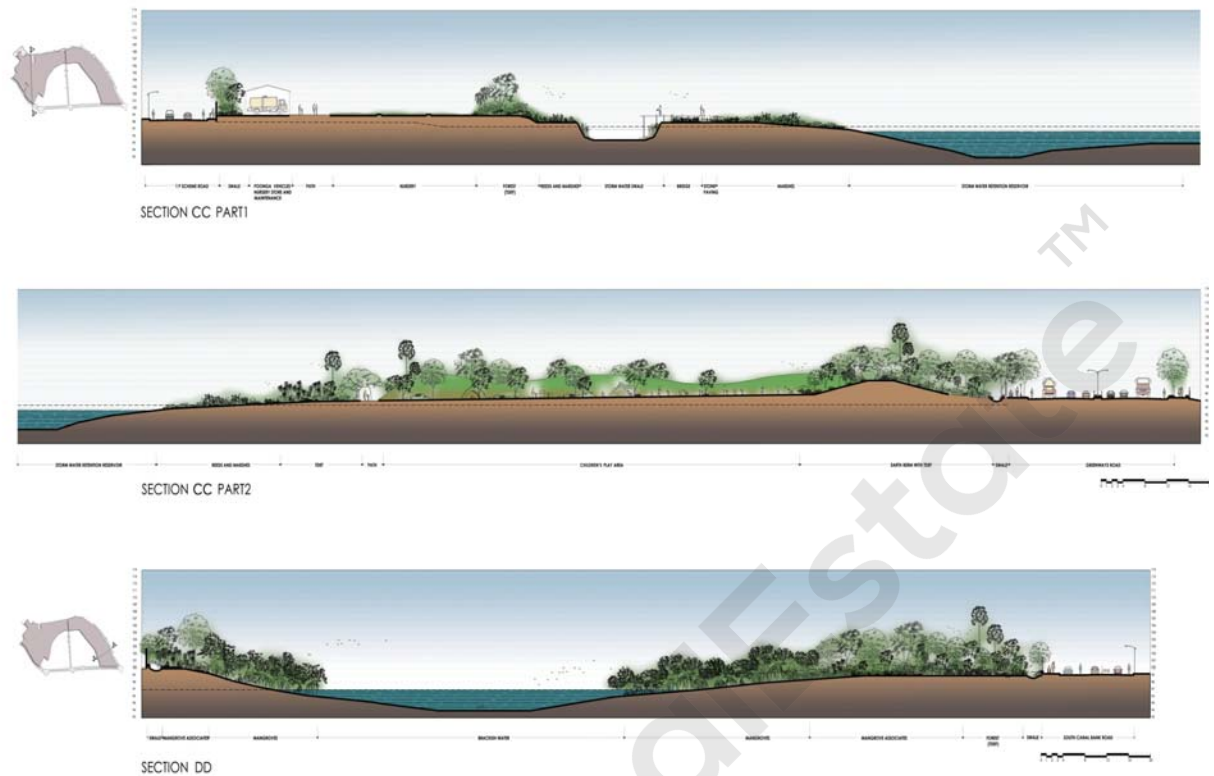


Suaeda maritima



INTEGRATING THE POONGA TO THE COASTAL WETLAND

Wetlands are the fundamental component of a coastal landscape. The marshlands, mudflats, mangroves and associated flora & fauna are its components. These are dynamic water systems, which encounter constant interaction of freshwater and saltwater supporting a variety of species in various stages of their life cycle. Adyar creek is one such system, which the master plan proposes to revive and restore into a healthy example of a coastal wetland.



EDUCATION CENTER

PLAYING A SUPPORTIVE, EMPOWERING ROLE TO THE RESTORATION WORK

The Poonga Education Center will offer a series of nature programs designed to create awareness about the basic principles of Ecology and Biology while nurturing an appreciation for and understanding of the natural world. Participants will become familiar with plants and animals native to Chennai and learn about their interrelationships and how human activities affect the environment.

THE EDUCATION CENTER WILL FOCUS ON THE FOLLOWING GROUPS:

- SCHOOLS - KINDERGARTEN, PRIMARY, INTERMEDIATE AND HIGHER SECONDARY.
- ADULT EDUCATION - TERTIARY, TRAINING FOR TEACHERS, ENVIRONMENTAL EDUCATORS, NGO AND COMMUNITY WORKERS.
- VOCATIONAL EDUCATION - LOCAL COMMUNITY MEMBERS, TRADE, HEALTH PROFESSIONALS.
- GENERAL VISITORS - LOCAL COMMUNITY MEMBERS, CHENNAI RESIDENTS, NATIONAL AND INTERNATIONAL VISITORS.
- PROFESSIONAL / RELATED NETWORKS - ECOLOGISTS, SCIENTISTS, TRADITIONAL HEALERS, RELATED ORGANIZATIONS, TEACHER ASSOCIATIONS.



VIEW



NORTH ELEVATION



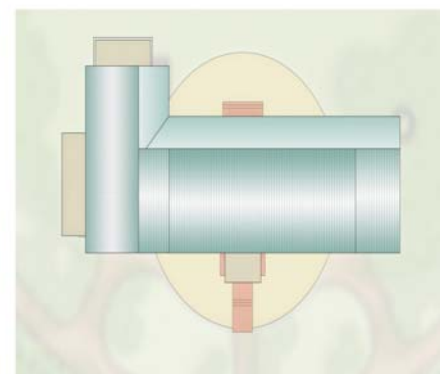
EAST ELEVATION



LONGITUDINAL SECTION



GROUND FLOOR PLAN



ROOF PLAN

ENVIRONMENTAL EDUCATION PROGRAM

A centre for excellence in environmental and sustainability education

Education : Conducting on-site and outreach educational experiences for schools and community

Researches : Contributing to and researching the latest innovations in environmental education pedagogy.

Awareness and Advocacy : Promote sustainable practices in energy and water use, afforestation and land use in the urban ecology context.



The education program will provide pathways for the local community to be actively involved in the restoration of the Adyar Ecosystem through certified vocational training and outreach programs. Long term volunteer programs will allow interested Chennai citizens, national and international visitors to participate in research, ecosystem restoration and maintenance.



Programs will centre on the following areas:

- Bioregional Studies
- Watersheds
- Land and Water
- Biodiversity
- Energy
- Waste recycling
- Organic Agriculture
- Water Ecosystem Exploration
- Energy Initiatives



During field visits participants will explore, examine and compare the fresh & marine water ecosystem. This highly hands-on experience will have activities like measuring pH, water temperature, dissolved oxygen and flow rate. Participants will also take an inventory of invertebrate species living in both fresh & marine waters.



School Programs

The programs are developed around a planned interface with the environment in the Poonga and an off site program in the schools for class work and de-briefing. The Adyar Poonga will serve as an open air classroom

ENVIRONMENTAL EDUCATION OUTREACH PROGRAM

Sustainable Schools Program

Action plans will be designed in collaboration with the school teachers by which the whole school - students, teachers, administration and maintenance - can incorporate sustainable education and practice into the operation of the school. The outcome of the SSP would be to create an eco-friendly school with a smaller ecological footprint and thereby conserve our sparse resources. A SSP star rating would be awarded to the school as it progresses through the requirements of each level and the competitiveness will also drive schools and their management to achieve this prestigious certificate from the APEC.

Continuing Education Programs

Will cater to adults who wish to take up a formal study of the various study themes offered at the centre.



City Farming

The process involves recycling kitchen garbage to grow fruits and vegetables at home and even on terraces, balconies, staircases, and even window sills. It will give the possibility for people living in the cities to grow some of their food requirements in an organic way. The technique has been successfully used to grow brinjals, sapotas (chikoo), mangoes, papayas, sugarcane, and even coconuts.



Art Classes for Nature Studies

Drawing classes for nature studies and projection geometry labs will be available to create an acute observation and expression ability.

The principles of Goethean observation are:

Exact sense perception, exact sensorial fantasy, seeing in beholding, being one with the object.



Bird watchers Study group (Ornithology)

The course is based on conservation values, with birds and the habitats that sustain them in constant focus. Topics such as Principles of Conservation, Habitat Study, Preservation of Bio-diversity, and Saving Endangered Species of Birds are important elements of this comprehensive programme in Bird Studies. The ecological role of birds in nature's scheme is a central point of departure. The aim ultimately is to draw students into active conservation work.

Adyar Poonga Bus

A mobile education exhibition and interpretation unit is also planned to build the outreach program. Known as the Adyar Poonga Bus, these units will periodically visit schools and build awareness on environmental themes.

Adyar Green Center

As part of the master plan, a proposal has been made to integrate the land adjacent to R K Mutt Road, now occupied by the Fisheries Department and Metro Water. A portion of the building at the Fisheries Training Institute site will become the Poonga Administration & Research Center. As part of this proposal, Adyar Green Center, an energy efficient facility with exhibition and orientation spaces would open onto the orientation zone of the park. The facility will also house necessary amenities for the orientation zone.

SETTING THE STAGE FOR VISITOR EXPERIENCE TO THE ADAYAR POONGA ECO PARK.

WITH COMPREHENSIVE INTERACTIVE DISPLAYS, THE CENTER GIVES AN OVERVIEW TO VISITORS OF THE PARKS RESTORATION WORK IN PROGRESS.

• THE CENTER WOULD BE THE FOCAL POINT FOR PROGRAM ACTIVITIES OF THE PARK.

• IT WILL BE A MODEL FACILITY FOR ILLUSTRATING ENERGY CONSERVATION.

• IT WILL ALSO PROVIDE AN ENVIRONMENT WHERE VISITORS CAN SIMPLY RELAX. CHILDREN'S PLAY AREAS THROUGHOUT THE CENTER AND PLENTY OF OPEN SPACES WOULD GIVE THE VISITORS AN OPPORTUNITY TO ENJOY THE NATURAL SURROUNDINGS.

• TOUCH OBJECTS AND HANDS ON FEATURES WILL ENCOURAGE VISITORS TO GET ACTIVELY INVOLVED. PEOPLE WOULD LEARN BY DOING OR REACTING TO THINGS RATHER THAN JUST BY READING.

• THERE WOULD BE DISPLAYS THAT CAN BE SEEN AS WELL AS SOME THAT ARE SHELLED, TOUCHED AND HEARD, FOR ALL AGE GROUPS.

• THE BOOK SHOP WOULD SELL NATURAL HISTORY BOOKS, FIELD GUIDES, AND OTHER ITEMS CONSISTENT WITH AND USEFUL TO THE OUTDOOR EDUCATION PROGRAMS.

SITE LAYOUT

VIEW

KEY PLAN

INSPIRING PEOPLE TO CARE ABOUT THE ENVIRONMENT

SITE INTEGRITY.

THE CENTER IS DESIGNED WITH AN UNDERSTANDING OF ALL ASPECTS OF THE BUILDINGS' SETTING.

• IT HAS BEEN DESIGNED AS SEPARATE SPACES THAT FORM A WHOLE BY MERGING IN THE NATURAL ENVIRONMENT, THE OPEN AND SEMI OPEN PATHWAYS FORMING THE GREEN CONNECTIONS BETWEEN THE VARIOUS BUILDINGS. THIS HAS BEEN DONE WITH A VIEW TO PRESERVE ALL THE TREES ON SITE.

• THE BUILDINGS OF THE CENTER ARE USED AS A SOUND BARRIER BETWEEN THE NOISY VEHICULAR ROAD AND THE POONGA ECO PARK.

• RETAINING AND ENHANCING EXISTING SITE FEATURES SUCH AS THE UNDERGROUND SUMP AND EXISTING CONTOURS.

LOW ENERGY / HIGH PERFORMANCE.

BUILDINGS IN THE CENTER COMBINE ELEGANTLY SIMPLE ELECTRICAL SYSTEMS WITH CLIMATIC COMMON SENSE TO ALLOW A WORKING WITH - RATHER THAN AGAINST - THE SUN, WIND AND TEMPERATURE IN THE AREA. ARTIFICIAL LIGHTING AND COOLING WOULD ONLY BE USED TO SUPPLEMENT WHAT NATURE ALREADY OFFERS.

• PV PANELS ON ROOF USE RENEWABLE ENERGY TO MEET A SUBSTANTIAL FRACTION OF THE BUILDINGS ENERGY NEEDS.

• A DOUBLE WALL FACADE WITH AIR CAVITY REDUCES HEAT GAIN WITHIN THE BUILDING.

• WINDOW OPENINGS ON OPPOSITE SIDES OF THE BUILDING ENHANCE CROSS VENTILATION DRIVEN BY BREEZES. WITH OPENINGS AT THE TOP SO WARM AIR CAN ESCAPE, WHILE COOLER AIR ENTERS THE BUILDING FROM OPENINGS NEAR THE GROUND.

• REDUCED DEPTH OF INTERNAL SPACES FOR OPTIMAL USE OF DAYLIGHT TO ILLUMINATE INTERIORS.

MATERIAL EFFICIENCY.

THE CENTER UTILIZES MATERIALS THAT MEET BASIC RESOURCE EFFICIENCY.

• USING RECYCLED CONTENT.

• USING LOCALLY AVAILABLE FINISHING MATERIALS TO REDUCE ENERGY USED IN TRANSPORTING MATERIALS.

• USING MATERIALS THAT MELLOWED WITH AGE AND WEATHERING WITHOUT LOSING CHARACTER OR STRENGTH.



THE GREEN CENTER



GREEN CENTER - ENTRANCE PLAZA



GREEN CENTER FIRST FLOOR PLAN



GREEN CENTER GROUND FLOOR PLAN



KEY PLAN



GREEN CENTER - TRANSVERSE SECTION



GREEN CENTER - LONGITUDINAL SECTION





June 2008

December 2008



June 2008

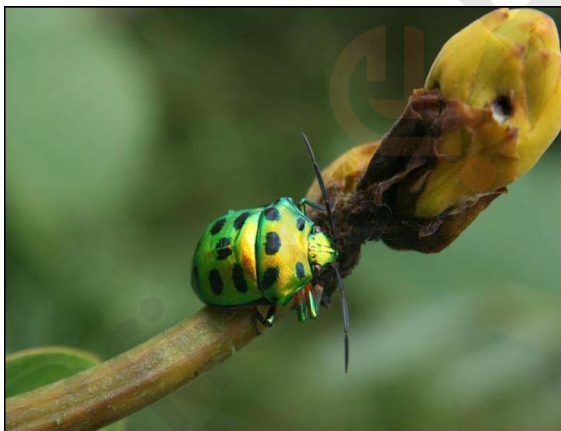
December 2008





90 thousand seedlings of 172 Indigenous species have been planted.







Signs of Regeneration in spite of many adverse conditions

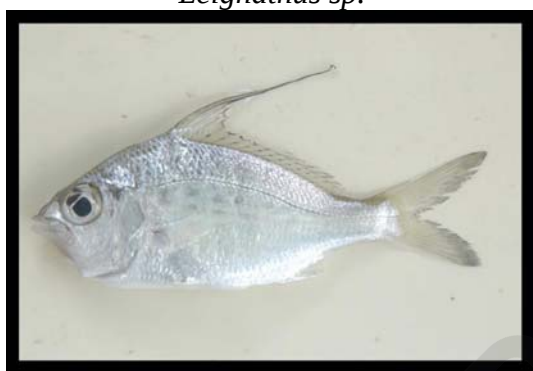


Ecological Monitoring





Vertebrate Survey
Leignathus sp.



The benchmark survey at the master plan stage recorded only 13 species. With the improvement in water quality the count has gone up to 34.



Scientific Monitoring is essential for planning conservation strategies for waterway and wetland restoration



Arrival and Orientation Zone



Arrival and Orientation Zone



Landscaping at the Entrance Plaza



Landscaping at the Entrance Plaza



Painting on War Widows Building



Painting on War Widows Building



Education centre under construction





Planning solid waste management strategies with the residents of the surrounding area



Planning solid waste management strategies with the residents of the surrounding area





Green Corner



CAMPAIGNS



Workshop on climate change at Adyar Poonga weather station



Students' Fauna Survey



Example: redevelopment of Amsterdam's industrial wasteland into social housing...Turned out to be a vibrant city commanding extremely high property prices...



Redevelopment of TNSCB/TNHB
– Housing Along Chennai's east
coast from the Lighthouse to the
Adyar-mouth

*by Mancini enterprises
in collaboration with PFC*

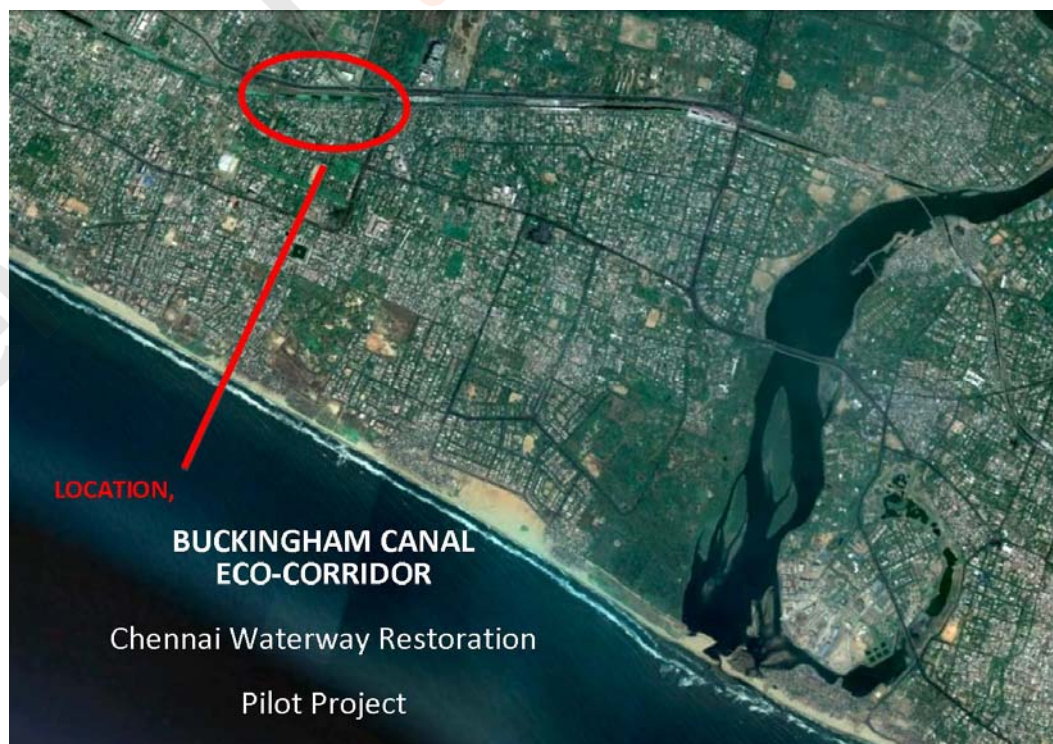


Example: redevelopment of Amsterdam's industrial wasteland into social housing...Turned out to be a vibrant city commanding extremely high property prices...





- location
- Proposed site
- Adyar poonga
- Existing road
- Heritage buildings
- Institutional buildings
- South canal rd taken into site
- Spreading green from adyar poonga







Session – IV
Landscaping along River Margins
Thiru K. Raguraman
Landscape Architect, Chennai

WATERWAY...

WHAT IS A WATERWAY

A WATERWAY IS ANY NAVIGABLE BODY OF WATER.

THESE INCLUDE RIVERS, LAKES, SEAS, OCEANS, AND CANALS. IN ORDER FOR A WATERWAY TO BE NAVIGABLE, IT MUST MEET SEVERAL CRITERIA:

- ❑ DEEP ENOUGH TO ALLOW THE DRAFT DEPTH OF THE VESSELS USING IT
- ❑ WIDE ENOUGH TO ALLOW PASSAGE FOR THE BEAM WIDTH OF THE VESSELS USING IT
- ❑ THE WATERWAY MUST BE FREE OF BARRIERS TO NAVIGATION SUCH AS WATERFALLS AND RAPIDS, OR HAVE A WAY AROUND
- ❑ THE CURRENT OF THE WATERWAY MUST BE MILD ENOUGH TO ALLOW VESSELS TO MAKE HEADWAY.

CHENNAI AND ITS WATERWAYS...

INTRODUCTION ON WATERWAYS IN CHENNAI

GENERAL INTRODUCTION

- ❑ CHENNAI, ONCE KNOWN AS THE QUEEN OF THE COROMANDEL COAST, THE GATEWAY TO THE SOUTH, IS THE CAPITAL CITY OF TAMIL NADU
- ❑ THE WATERWAYS IN THE CITY CONSTITUTE AN IMPORTANT ENVIRONMENTAL COMPONENT FOR ASSIMILATION OF WASTE WATER, RECHARGE OF GROUND WATER AQUIFERS AND ALSO FOR MAINTAINING THE AESTHETIC QUALITY.





□THREE MAJOR RIVERS IN CHENNAI

- ❖ADYAR RIVER
- ❖COOUM RIVER
- ❖KOSASTHALAIYAR RIVER

□BUCKINGHAM CANAL, A MAN MADE CANAL

GENERAL ISSUES

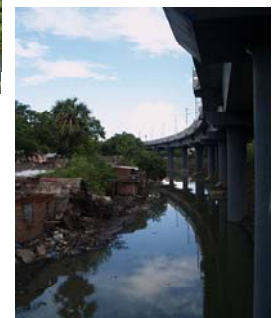
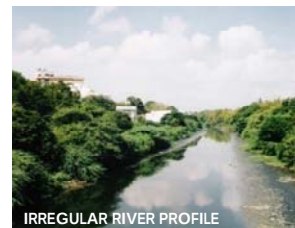
GENERAL ISSUES

- DEGRADATION OF WATERWAYS
- LACK OF PROTECTION AND ENHANCEMENT OF GREENWAY ALONG THE RIVERFRONT
- AND ISSUES LIKE
- I.INDUSTRIAL CHEMICAL WASTE
- II.AGRICULTURAL PESTICIDE RUNOFF
- III.URBAN AND NON URBAN SOURCE POINTS POLLUTANTS
- AQUATIC SPECIES, RIVERSIDE VEGETATION (RIPARIAN VEGETATION) AND HUMAN ALIKE SUFFER FROM DEVASTATING EFFECTS.

ISSUES AND GUIDELINES

ISSUES ALONG THE RIVERFRONT ...

CONTAMINATION OF WATERWAYS



WATER WAYS	ORIGIN/ CATCHMENT	RESERVOIR	RIVER MOUTH
ADYAR	PILLAPAKKAM AND KAVANUR TANK GROUP	CHEMBARAMB AKKAM RESERVOIR	ADYAR ESTUARY, BAY OF BENGAL
BUCKINGHAM CANAL	BEDHAKANJAM, VIJAYAWADA, A.P.	-	ONGUR RIVER, YEDAYANTHITU KALVELI NEAR CHEYAR
COOUM	NAGARI RIVER AND NANDI RIVER	KESAVARAM ANICUT	ENNORE ESTUARY, BAY OF BENGAL

LI	LENGTH OF WATER WAYS	CITY (KM)	CMA (KM)
AI	ADYAR	15	24
NI	NORTH BUCKINGHAM C/ CANAL	7.1	17.1
CI	CENTRAL BUCKINGHAM C/ CANAL	7.2	7.2
SC	SOUTH BUCKINGHAM C/ CANAL	4.2	16.1
CO	COOUM	18	40

ISSUES ALONG THE RIVERFRONT ...

ISSUES

ADYAR RIVER

- ❖ INACCESSIBILITY TO THE RIVERBED
- ❖ ENCROACHMENT AND IMPROPER SETTLEMENTS
- ❖ LACK OF AWARENESS TO THE PUBLIC
- ❖ LACK OF INTERESTING OPEN SPACES
- ❖ PROTECTION AND ENHANCEMENT OF GREENWAY ALONG THE RIVERFRONT
- ❖ DEGRADATION OF WATERWAYS
 1. AGRICULTURAL PESTICIDE RUNOFF
 2. SEWAGE OUTFALL INTO THE WATERWAYS
 - RIVERSIDE VEGETATION RIPARIAN VEGETATION SUFFER FROM DEVASTATING EFFECTS.

COOUM RIVER

- ❖ INACCESSIBILITY TO THE RIVERBED
- ❖ ENCROACHMENT AND IMPROPER SETTLEMENTS
- ❖ LACK OF AWARENESS TO THE PUBLIC
- ❖ LACK OF INTERESTING OPEN SPACES
- ❖ PROTECTION AND ENHANCEMENT OF GREENWAY ALONG THE RIVERFRONT
- ❖ DEGRADATION OF WATERWAYS
 1. INDUSTRIAL CHEMICAL WASTE
 2. SEWAGE OUTFALL INTO THE WATERWAYS
 - AQUATIC SPECIES, AND HUMAN ALIKE SUFFER FROM DEVASTATING EFFECTS.

BUCKINGHAM CANAL

- ❖ NO PROPER MAINTAINANCE
- ❖ LACK OF INTERESTING OPEN SPACES
- ❖ POTENTIAL TO TOURISM IS LOST DUE TO DEGRADATION
- ❖ DEBRIS ARE LEFT UNCLEARED ON SITE AFTER THE CONSTRUCTION OF MRTS

DESIGN STRATEGY...

POLICIES ALONG THE RIVERFRONT ...

POLICIES

- ❖ IDENTIFY & CLEAN, PROTECT THE GREENWAY
- ❖ TO PROVIDE OPEN SPACES ALONG THE RIVERFRONT
- ❖ INCREASING THE HISTORIC VALUES ALONG THE RIVERFRONT.
- ❖ TO IMPROVE AIR, WATER AND LAND RESOURCE QUALITY
- ❖ TO PROVIDE RECREATIONAL NEEDS.
- ❖ TO ENHANCE ECONOMIC DEVELOPMENT
- ❖ TO IMPROVE SCENIC QUALITIES AND VIEWS, VEGETATIVE FRINGE



GUIDELINES ALONG THE RIVERFRONT ...

GUIDELINES

- ❖ OBJECTIVES, GOALS ARE TO BE ESTABLISHED TO IMPROVE MANAGEMENT, REDUCE POLLUTION AND ULTIMATELY IMPROVE THE QUALITY OF RIVERFRONT DEVELOPMENT
- ❖ EFFORTS TO RESTORE AND PROTECT THE ENVIRONMENT, ECONOMIC, CULTURAL AND HISTORIC VALUES OF THE RIVERFRONT.



DESIGN STRATEGY ...

REQUIREMENTS

- ❑ PROVIDING PUBLIC AMENITIES ALONG THE RIVERFRONT
- ❑ DESIGNING OPEN SPACES, SUCH AS
 - a. RIVERFRONT PROMENADE
 - b. RIVERFRONT PARK
 - c. SEATING GALLERY
 - d. VIEW POINTS
 - e. BIRD WATCHER'S GALLERY



PROVIDING INTERACTIVE SPACES FOR THE PUBLIC TO USE POTENTIALLY LIKE PARKS AND GREEN POCKETS THAT WOULD ENHANCE THE VISUAL QUALITY OF THE RIVER.



PLAZAS, FOOD COURTS AND RIVER OVERLOOKS ARE PROVIDED TO EXPERIENCE THE OPEN SPACE ON A RIVERFRONT.



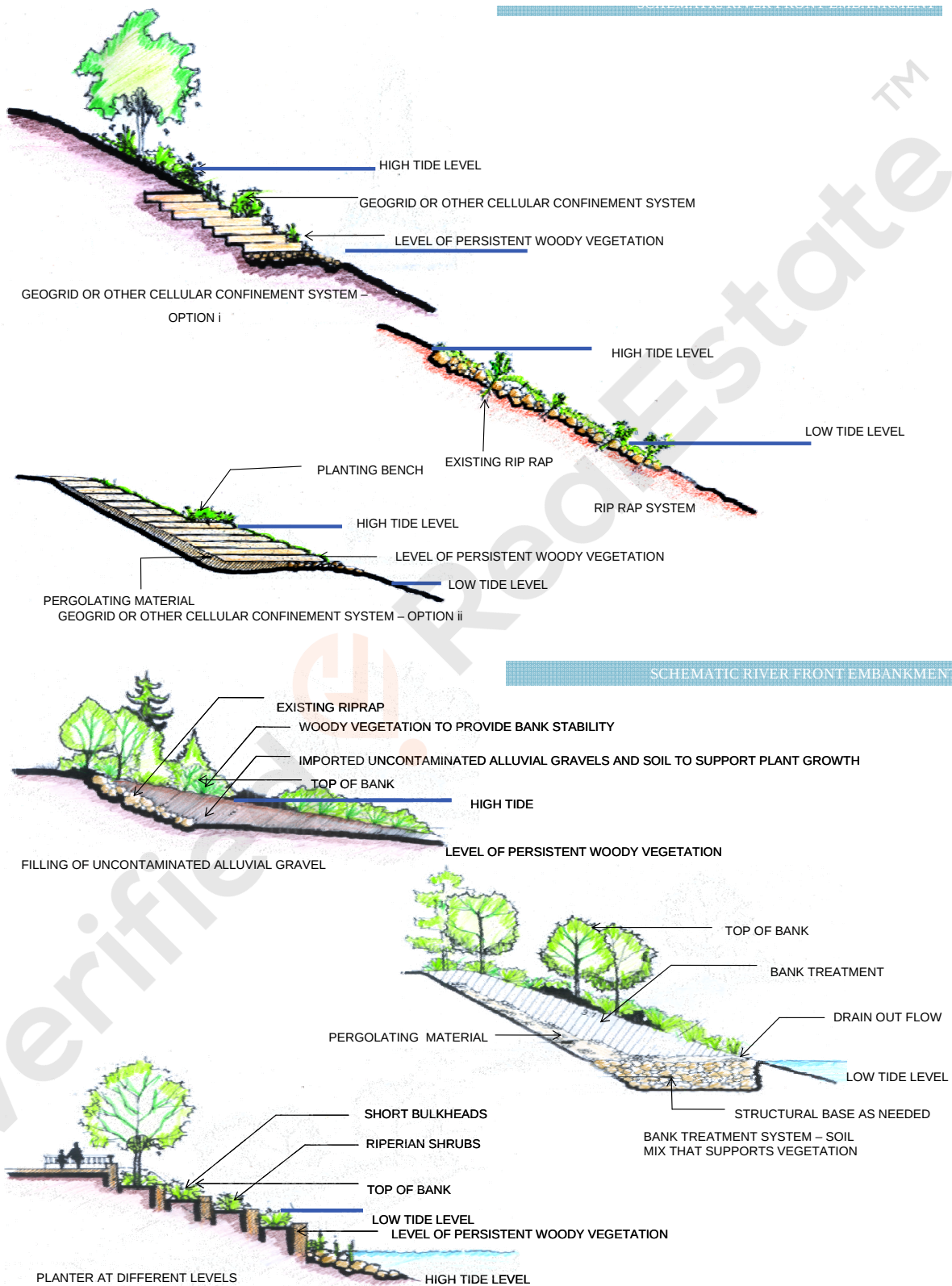


SKETCH OF BOAT JETTY AND PLAZAS ALONG THE RIVERFRONT

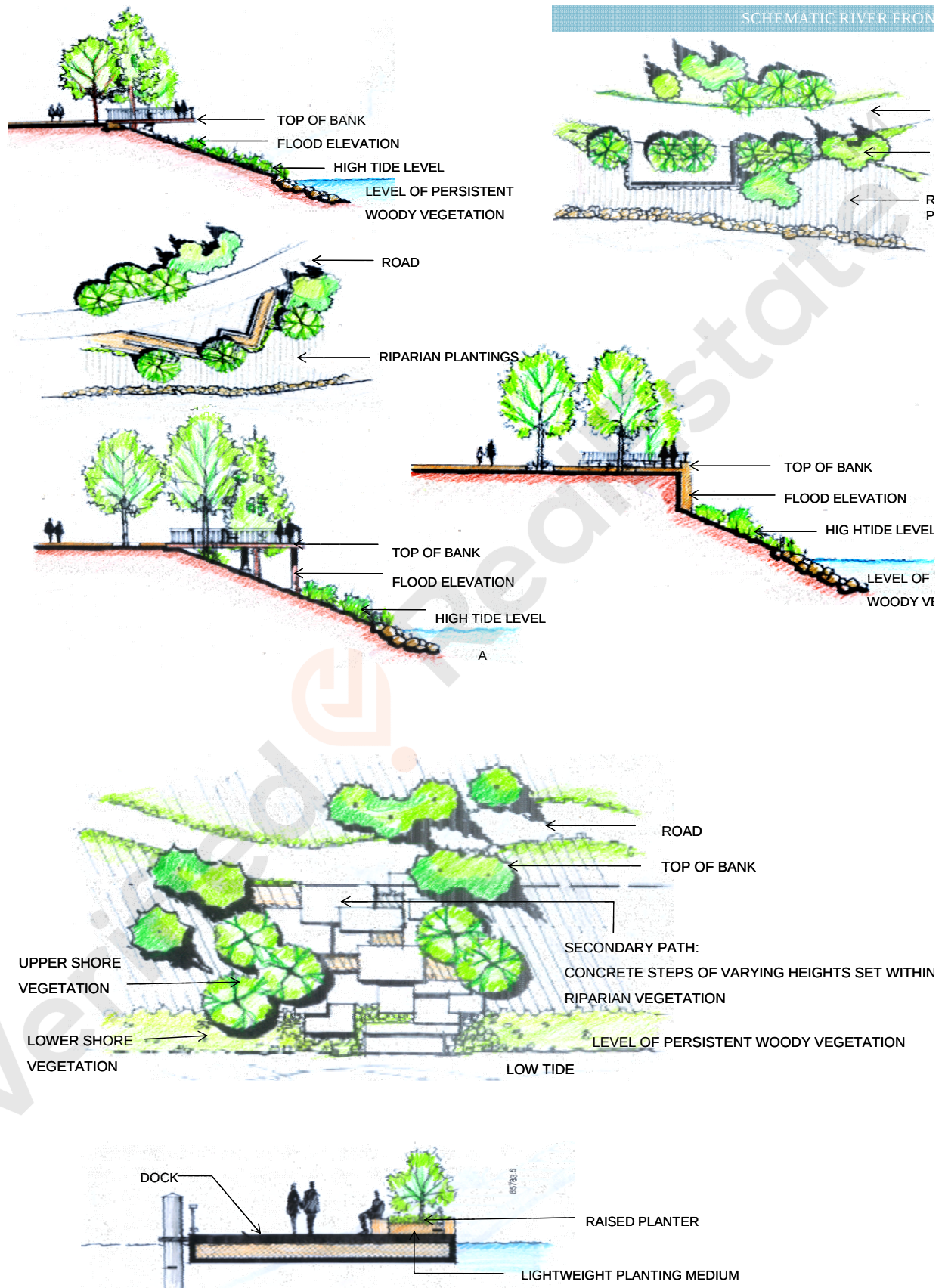


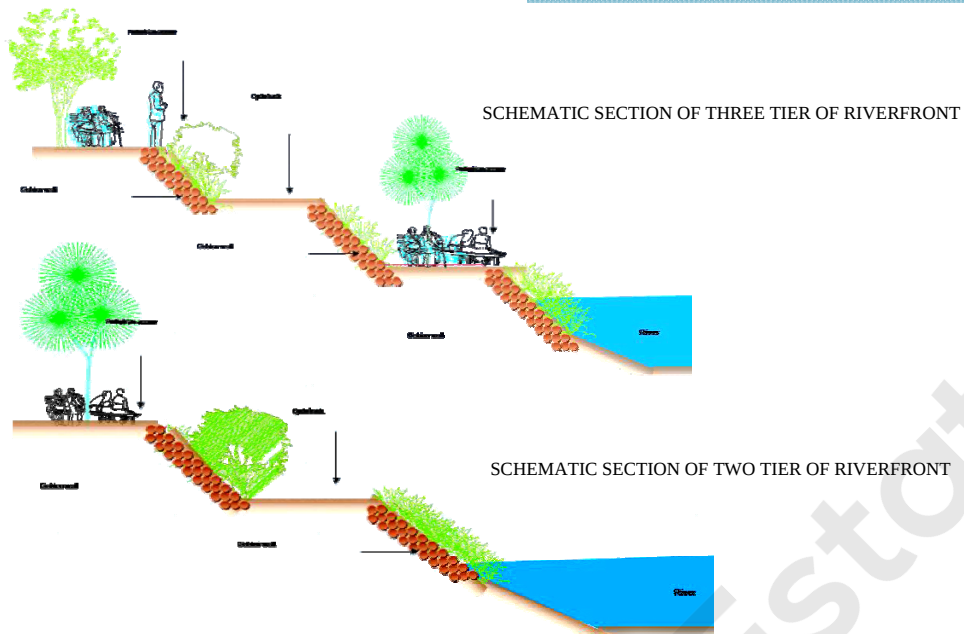
SCHEMATIC RIVERBUNDS...

SCHEMATIC RIVER FRONT EMBANKMENT



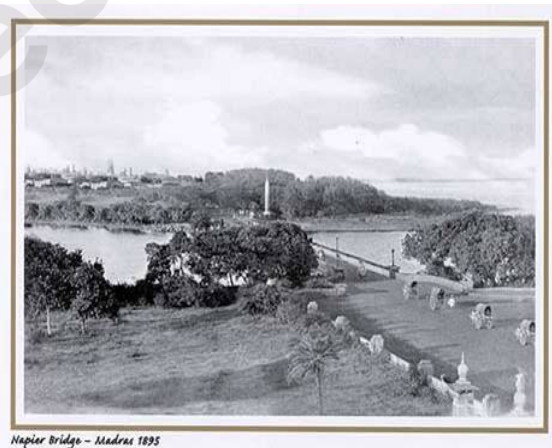
SCHEMATIC RIVERFRONT SECTIONS...





CASE STUDY

Past State No Pollution Natural River Edge Transportation Recreation Potable Water



Present State Pollution Slum Encroachment Dumping Of Waste Negligence Toxic Water



Future State To Minimise Pollution Resettlement Of Slums Land Reclamation Waste Management



COOUM RIVERFRONT - AT SIVANANDA SALAI STRETCH ...

LANDSCAPE DEVELOPMENT OF COOUM RIVERFRONT AT SIVANANDA SALAI



FEATURE WALLS

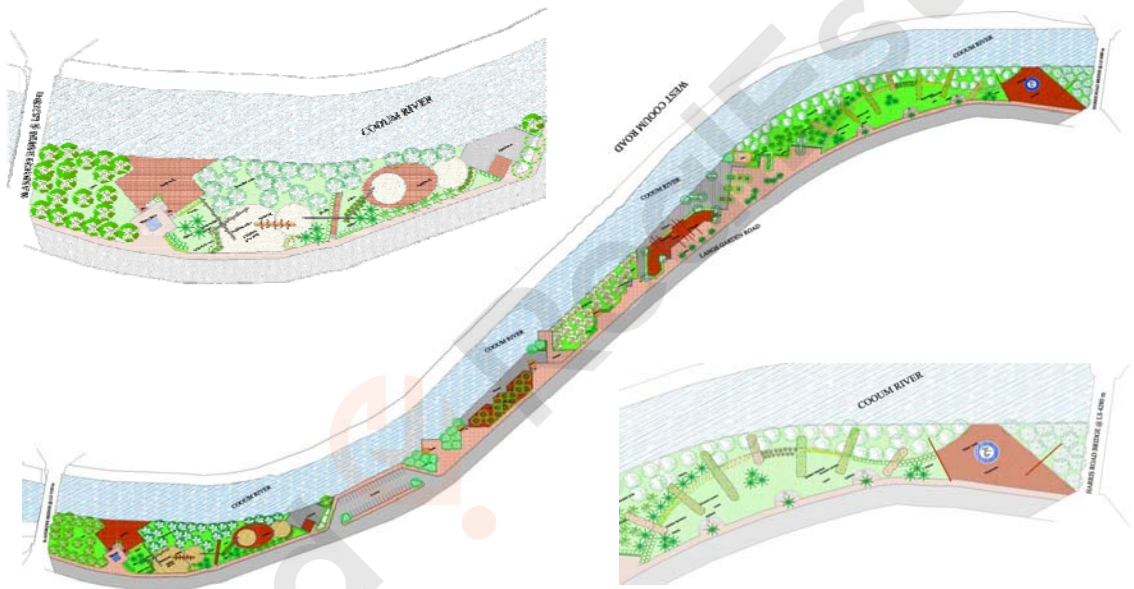


SEATING GALLERY



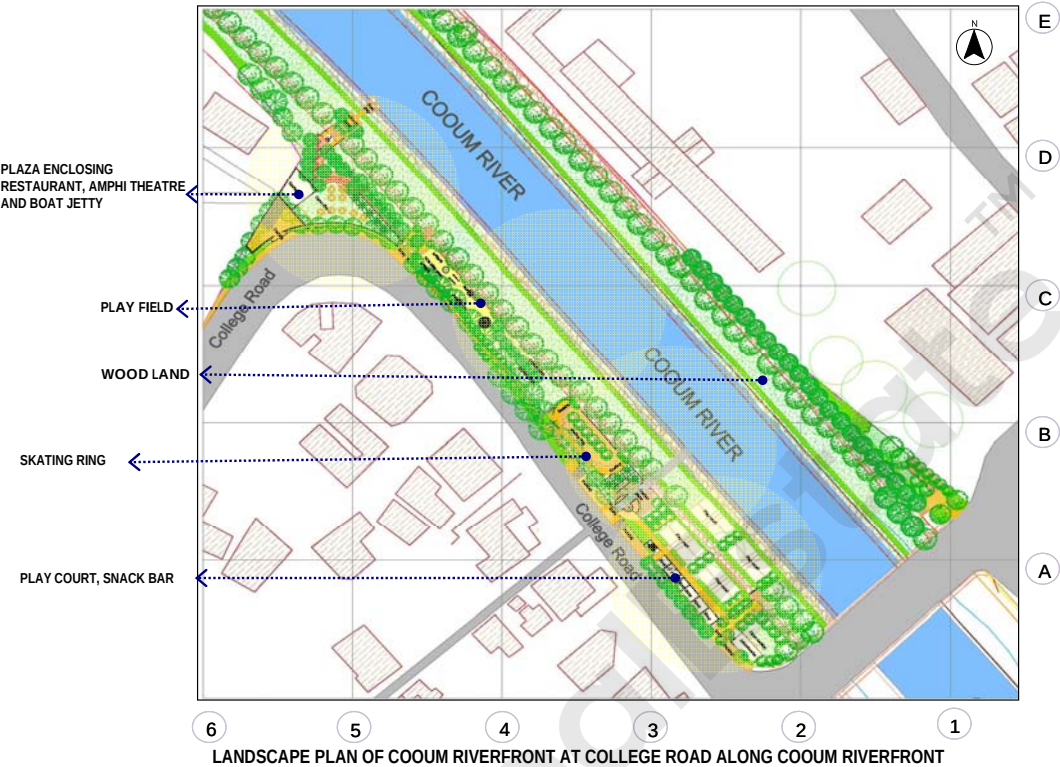


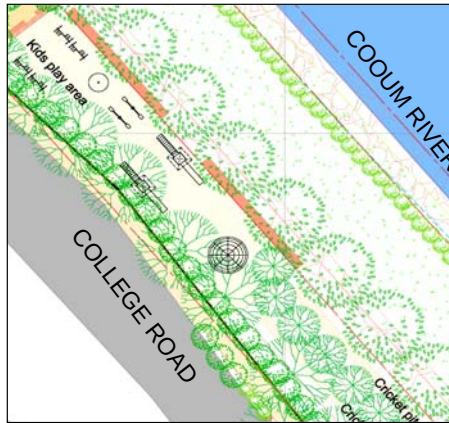
COOUM RIVERFRONT - AT LONGS GARDEN STRETCH ...



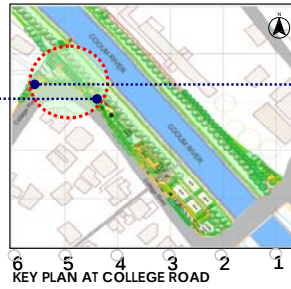
VIEWING GALLERY OVERLOOKING THE RIVER.

COOUM RIVERFRONT - AT COLLEGE ROAD STRETCH ...

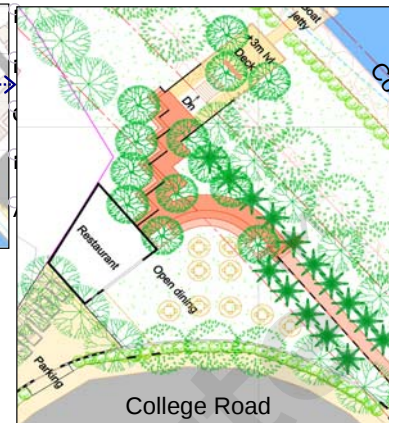




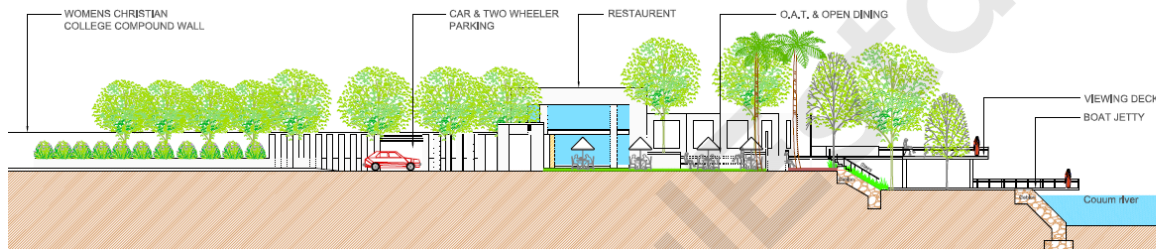
CHILDREN'S PLAY AREA



KEY PLAN AT COLLEGE ROAD



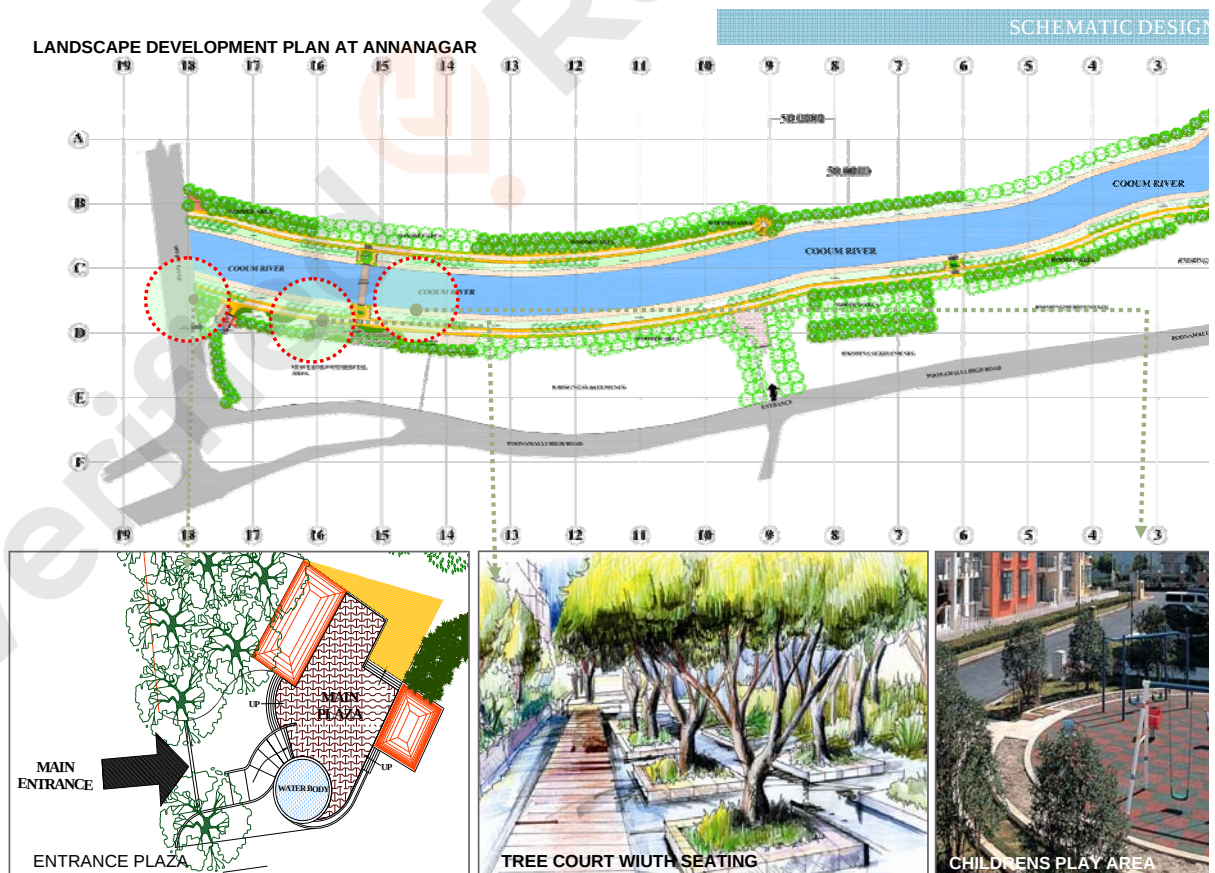
RESTAURANT OVERLOOKING



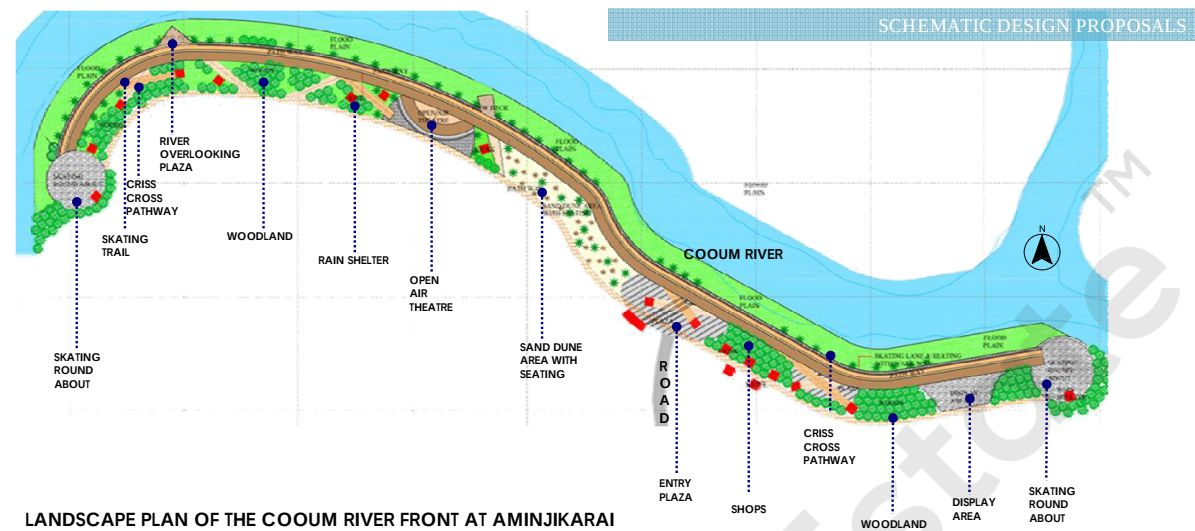
SCHEMATIC SECTION OF COOUM RIVER

COOUM RIVERFRONT - AT ANNANAGAR STRETCH ...

LANDSCAPE DEVELOPMENT PLAN AT ANNANAGAR

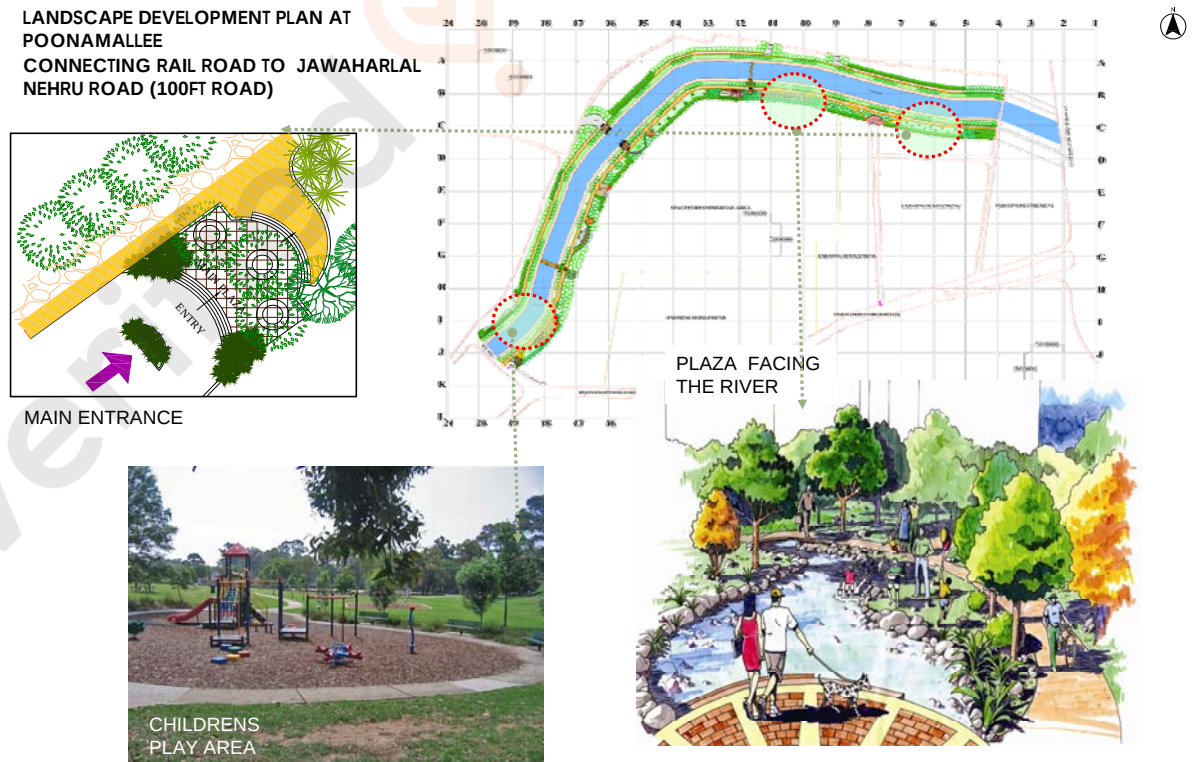


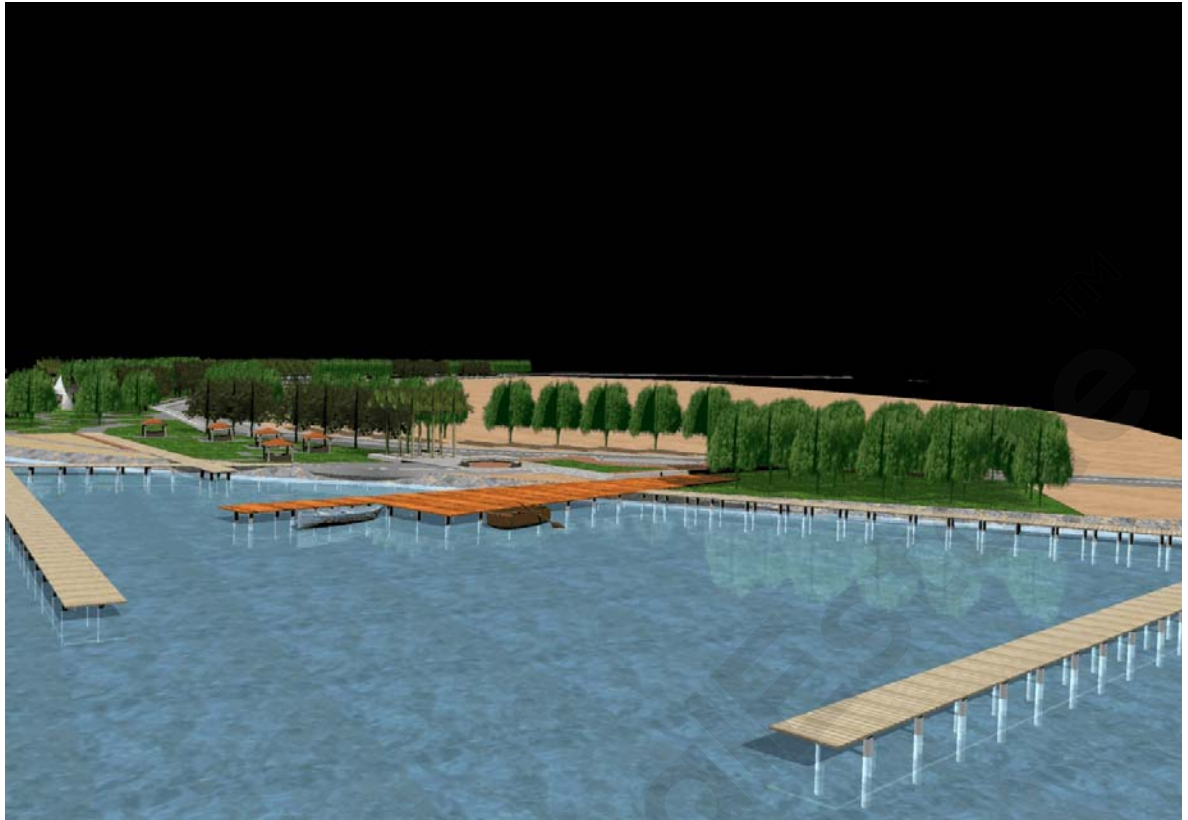
COOUM RIVERFRONT - AT AMINJIKARAI STRETCH...



COOUM RIVERFRONT - AT POONAMALLEE STRETCH ...

LANDSCAPE DEVELOPMENT PLAN AT POONAMALLEE
CONNECTING RAIL ROAD TO JAWAHARLAL
NEHRU ROAD (100FT ROAD)





CONCLUSION...

“ANY RIVER IS REALLY THE SUMMATION OF THE WHOLE VALLEY. TO THINK OF IT AS NOTHING BUT WATER IS TO IGNORE THE GREATER PART.”

REJUVENATING CITY CENTERS BY DEVELOPING VIBRANT RIVERFRONTS CAN BE YET ANOTHER TOOL IN REJUVENATING DOWNTOWNS AND COUNTERACTING URBAN SPRAWL. RESIDENTS AND TOURISTS WANT TO ENJOY AND GET CLOSE TO A RIVER, TO LEARN MORE ABOUT ITS CULTURAL AND NATURAL HISTORY, AND TO SEE WILDLIFE AND ENGAGE IN VARIOUS KINDS OF OUTDOOR RECREATION.

PROTECTING AND RECOVERING RIVER HEALTH MUST BE A CO-EQUAL GOAL WITH EFFORTS TO REVITALIZE RIVERFRONTS. WITHOUT QUESTION, THE CITIES THAT PAY CAREFUL ATTENTION TO BOTH THE NEEDS OF THE RIVER AND THE ECONOMIC AND SOCIAL NEEDS OF THEIR COMMUNITIES WILL REAP THE GREATEST REWARDS.

Session – IV
Ground Water Recharge Potentials in CMA
Dr. N. Varadaraj,
Regional Director, Central Ground Water Board

Introduction

- Ground water availability with variable quantity and quality to meet water demand in addition to Surface water & transported water by Govt. schemes
- Decentralized source at every point with wide variation in yield by bores/wells
- Policy decisions and scientific input for Recharge to ground water- RWH ordinance- CGWA norms
- Ground water recharge as tool for Drought & flood Management

Issues

- Space constrain for surface storage & facilitate for proper recharge
- Contamination of water bodies by waste water –domestic and industrial
- Torrential rains = huge quantity collection-Time required for infiltration/recharge is very long resulting water logging
- Increasing channel capacity -draining and discharging to sea. Not gainful use
- Abuse of Ponds and lakes in the Peri-urban area -Poor connectivity to water bearing layer
- Ground water development zone to be recharged -without contamination- Segregation of storm water and sewerage/ industrial pollution

CGWB – studies/ R&D

- CGWB Exploration & Aquifer studies- 775 m depth at Puduvayal
- Water level & quality monitoring
- Manali, Ambattur pollution studies
- Land fill- water regime studies
- Demonstrative AR schemes
- RWH at PWD& NTTTRI, CLRI
- R&D funding for studies on using treated waste water for GW recharge
- Specific yield- Recharge studies

Recharge potential

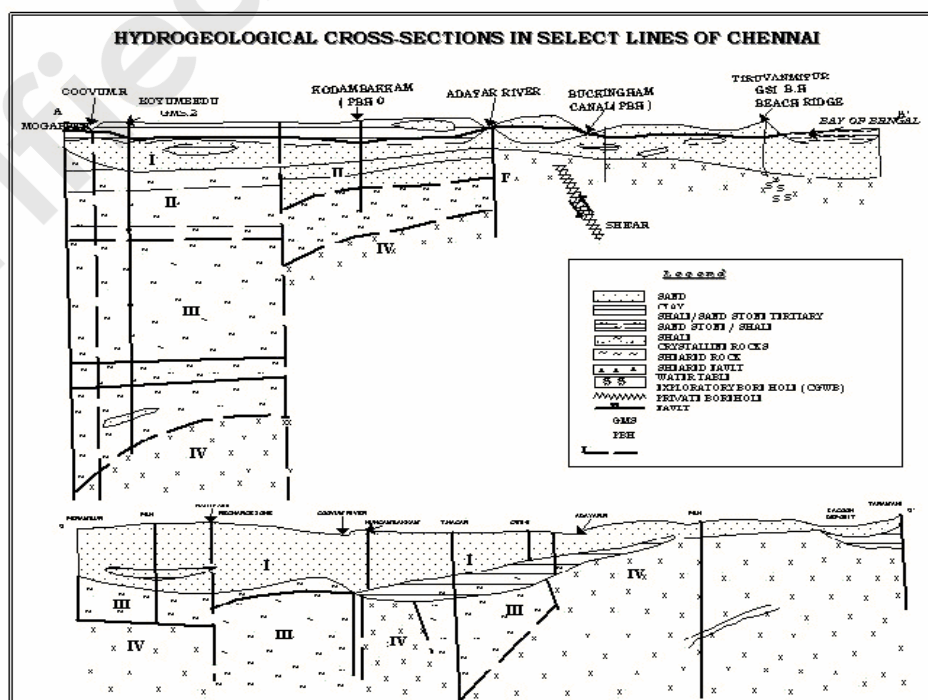
Table-1 Projected Land Use Pattern-2011		
Land use	MMA	City
Residential	19,277.65 (19.40%)	7,461.36 (45.97%)
Commercial	9,706.76 (09.77%)	2,201.65 (13.57%)
Industrial(Includes Special & hazardous industries)	7,481.50 (07.53%)	906.17 (05.58%)
Institutional (Includes roads & railways)	6,543.67 (06.59%)	4,456.82 (27.46%)
Open Space & Recreational	332.06 (00.33%)	567.50 (03.50%)
Water Bodies	11,696.33 (11.77%)	448.21 (02.76%)
Urbanisable	28,099.15 (28.29%)	89.58 (00.55%)
Non-Urbanisable	16,200.85 (16.33%)	98.10 (00.61%)
Total	99,337.97	16,229.39

Recharge potential

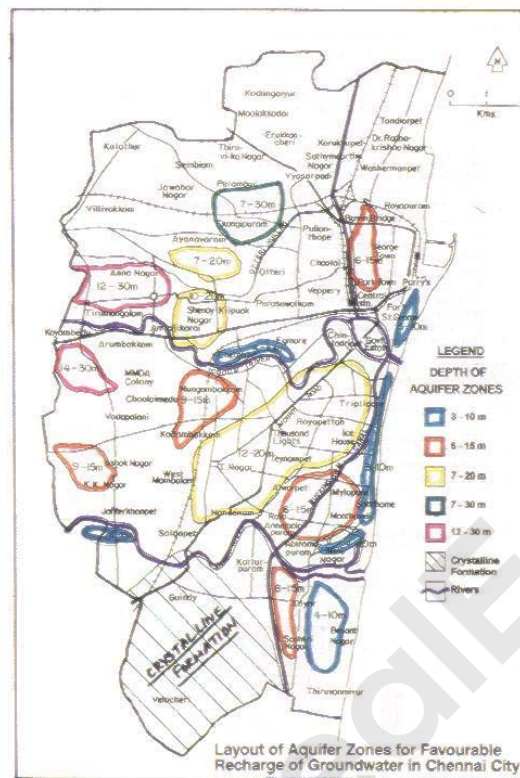
- Chennai city area-176 sq.km
- Present corporation area-426 sq.km
- Chennai Metropolitan area- 1189 Sq.km
- Practically, 100 % harvesting not feasible
- Considering the suitable area of about 50,000 ha in CMA area with effective annual rainfall of 1000 mm and co-efficient of 0.7, the rain water harvesting potential & recharge is 350 MCM. (Nearly 1000MLD)-100 MLD recharge in well field
- Additional recharge from upland flow
- Return flow from unpolluted rivers/lakes

**Priority area/ aquifers in Chennai City and
Urban Agglomeration for ground water rechar**

S. No.	Target area	Recharge prospects
1	Existing surface water bodies in Peri-urban area Temple tanks	2-3 times the storage capacity 4-5 times storage capacity
2	Recharge ponds in each park/ institutions North Chennai Well Fields (MLD)	10 times storage capacity
	i) Minjur	27.3
	ii) Panjetty	31.8
	iii) Tamaraiakkam	36.4
	iv) Kannigaiper	13.6
	v) Poondi	27.3
	vi) Flood plains	13.6
3	South Chennai well Fields (MLD)	
	i) Palavakkam	1.5
	ii) Porur well field	4.5
	iii) Belur near Kilpakkam	45.5
	iv) Palavakkam	4.5



Segregating storm water and sewage and treating for industrial use as well as aquifer recharge to improve ground water availability- quantity & quality



Case study-CLRI

Water Availability

• Catchment area (sq. m)	:	2500
• Average Rainfall (m)	:	0.70
• Runoff Coefficient (%)	:	70
• Surface water available (Cu.m)	:	12250
• Committed Storage (Cu.m)	:	100
• Surplus Water available (Cu.m)	:	12150

Quantum of Water harvested

• Total storage Capacity of ponds (Cu.m)	:	3850
• No. of fillings (Oct-Dec)	:	3
• Total water harvested (Cu.m)	:	11550

Evaporation Losses

• Total water spread area of 2 ponds (sq.m)	:	2500
• Average rate of evaporation per month (m)	:	0.15

Filter chamber at CLRI for collecting road side run off



Recharge pit



Recharge pit



Collection channel



Filled recharge pond



Water level measuring in post construction

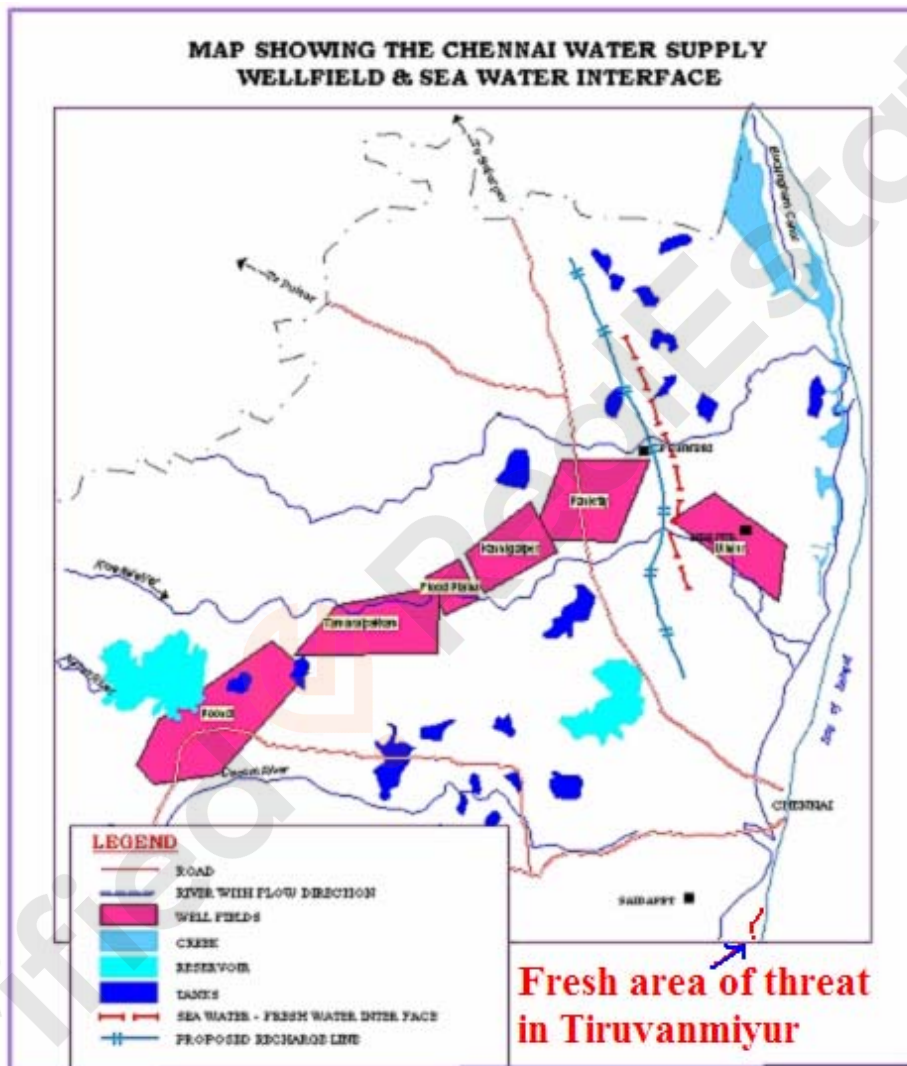


Contamination of coastal Sandy aquifers

- The coastal aquifers are at stress due to urbanization and unlined sanitary landfills and septic tanks.
- 100 % sewerage line to avoid contamination of sandy aquifer is needed on priority

Recharge-Kosataliar Proposal

- ▶ To harvest surplus monsoon run off and flood water discharge to Sea in Korataliar River and to recharge the surplus run off in to the groundwater system.
- ▶ Sustainability of existing well fields with dedicated flood water collection, storage and injection along the coast



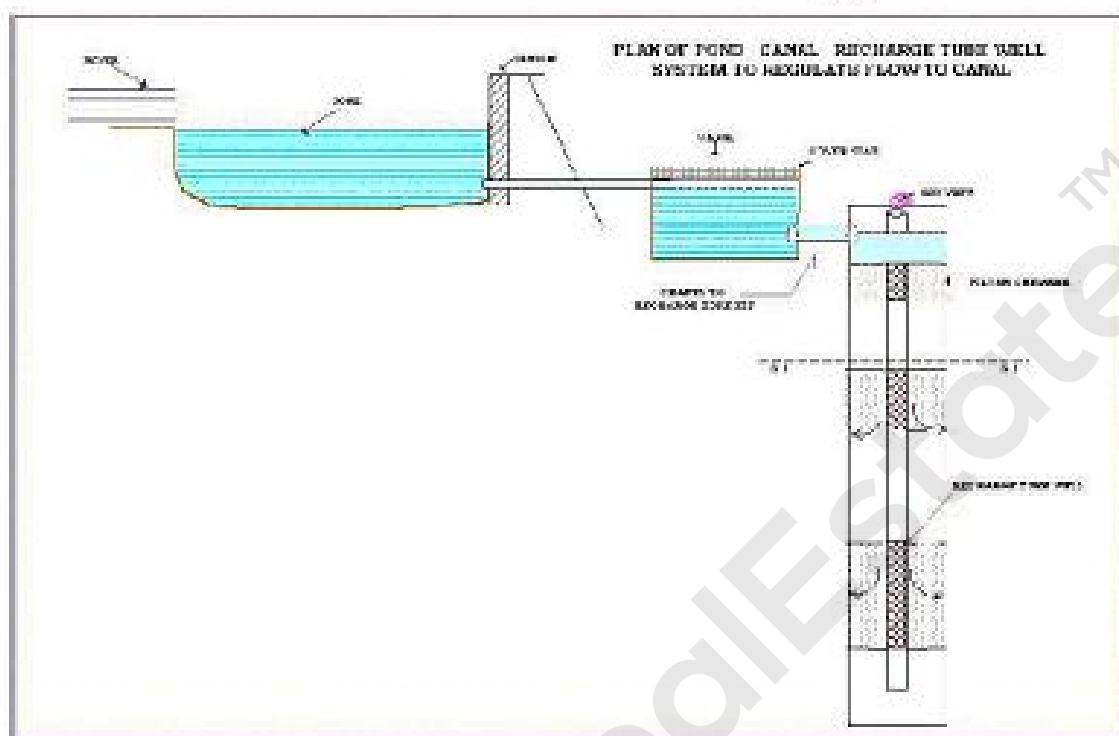
Kosataliar Proposal

Divert the flow between 6 & 13.5 km from coast through check dam & routing the flow through surface water system (5 nos storage tanks to be constructed)

- A channel (4 m wide) is proposed for transporting the water from the surface storage systems for the entire length of aquifers, which is about 50 km.
- construct injection wells tapping the entire thickness of alluvium of 30 m thickness with the spacing of 200 m on the bed of the channel

Treated water storage- Recharge pit/ Tube well

Fig-4



Fresh water Ridge

Construct another channel of same dimension at a distance of 5 km from coast in identified zones and divert a part of the surplus flow. Thus the first channel will function as recharge ridge and the second would assist in dilution and improvement of quality. Divert 70% of flow through the channel for injection and remaining 30% of flow to Channel at 5 km distance from sea.

- On the basis of earlier studies, the viable injection rate has been worked out as 300 Cu.m/day. Taking into account a seepage loss of 20%, it is envisaged that flow during the month of June to December would be able to sustain injection for 150 days in a year.

Kosataliar Proposal

Tangible Benefits

1	Quantum of water proposed to be recharged in a normal rainfall year and maximum available floodwater as and when it occurs.	20.9 Million Cubic Metre
2	Area in which Augmentation Measures are to be taken up	650 sq.km

Note: 1. The augmentation measure would prevent the landward migration freshwater-seawater interface.
2. Preservation of fragile coastal ecosystem.

Recharge Cooum- Adyar basin

Cooum river originates in surplus weir of Cooum tank in Tiruvallore District

It has thick sand in Tirumazhisai area and sand mining over years has left the river as isolated mine pits

Enters urban area with untreated sewage flow and reaches sea near Chepauk

Seawater intrusion and canal seepage

The Buckingham canal in Chennai urban area has introduced saline water in the fragile ground water system, may be inadvertently, but has deteriorated the water quality of shallow aquifers in both sides of the canal.

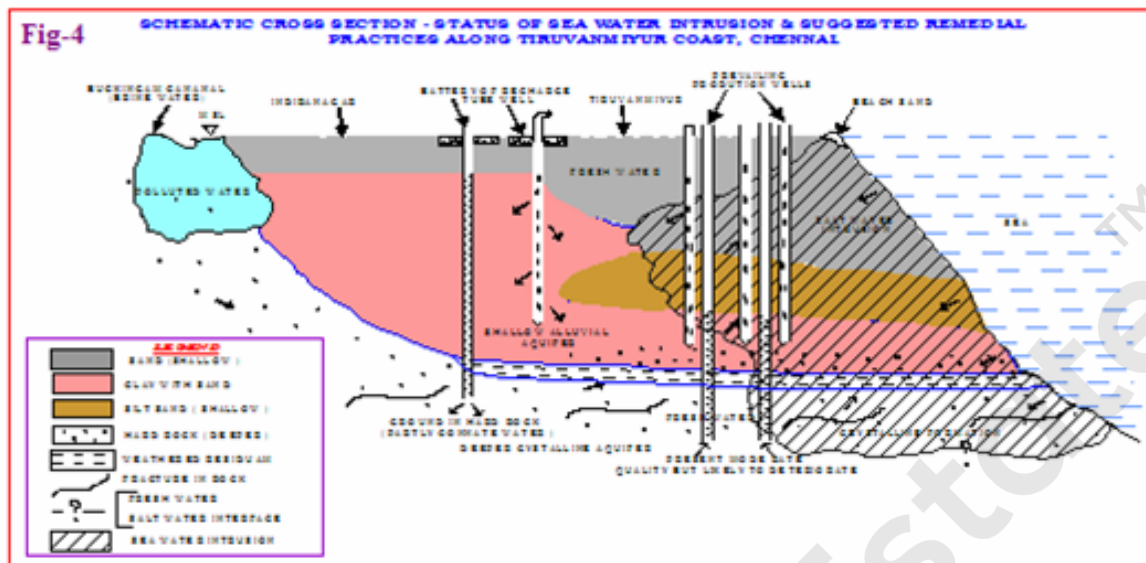
Further, the canal is acting as open drain and place of waste disposal in the urban sector over years and the present stage of contamination of surface water and in turn the ground water

Buckingham Canal

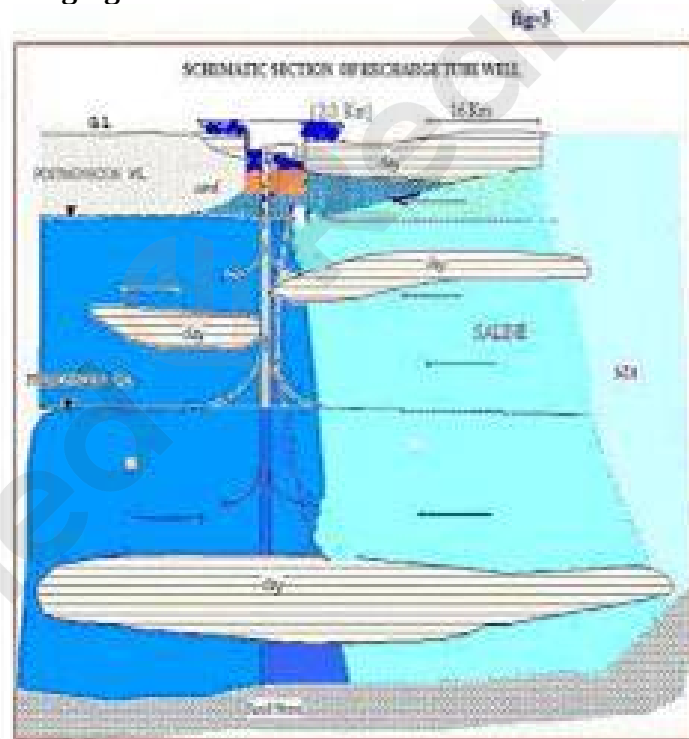


Polluted Buckingham Canal





Managing salt water-fresh/brackish water interface



Proposal for south Chennai

- To harvest the surface water runoff of rainwater which is presently lost to the sea at Tharamani area which is clay covered
- To mitigate flooding at waterlogged Tharamani area
- To recharge the groundwater system at Besant Nagar – Thiruvanmiyur area which is under constant stress
- To prevent sea water intrusion at Besant Nagar – Thiruvanmiyur area.

PHOTOGRAPH SHOWING THE FLOOD AND WATER LOGGING IN THARAMANI
DURING DECEMBER 2005

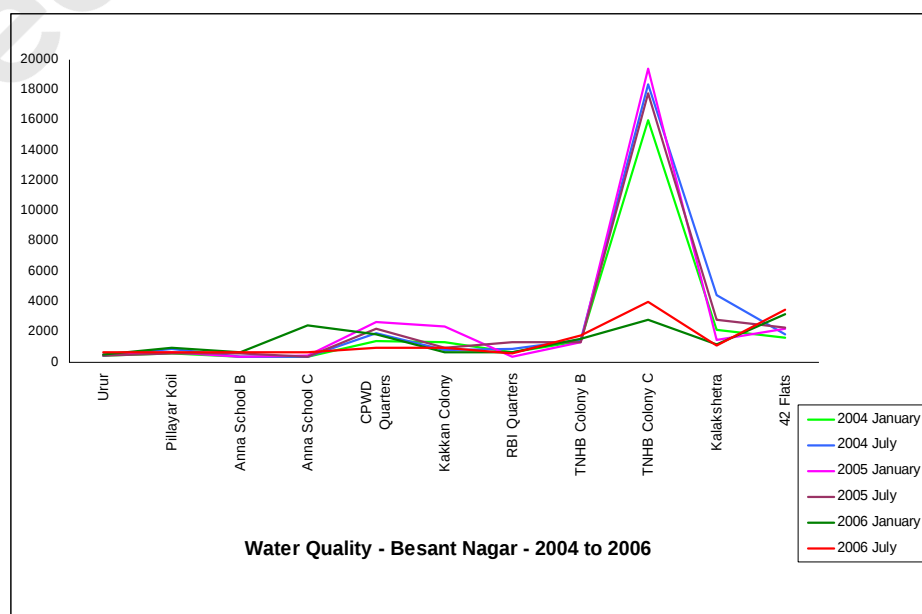
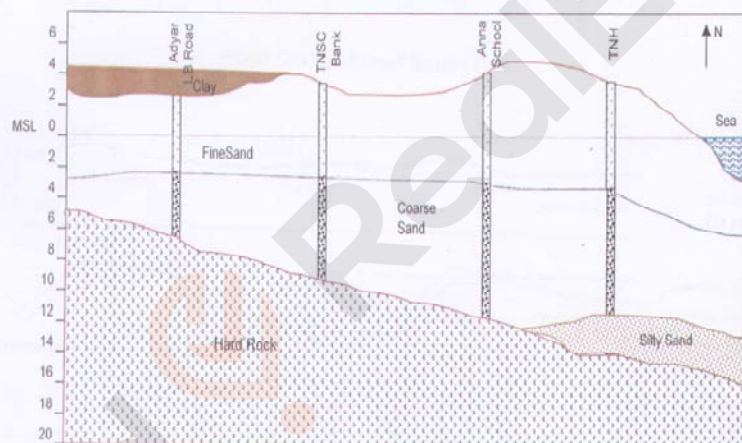


Marutheeswar temple tank before filling of clay

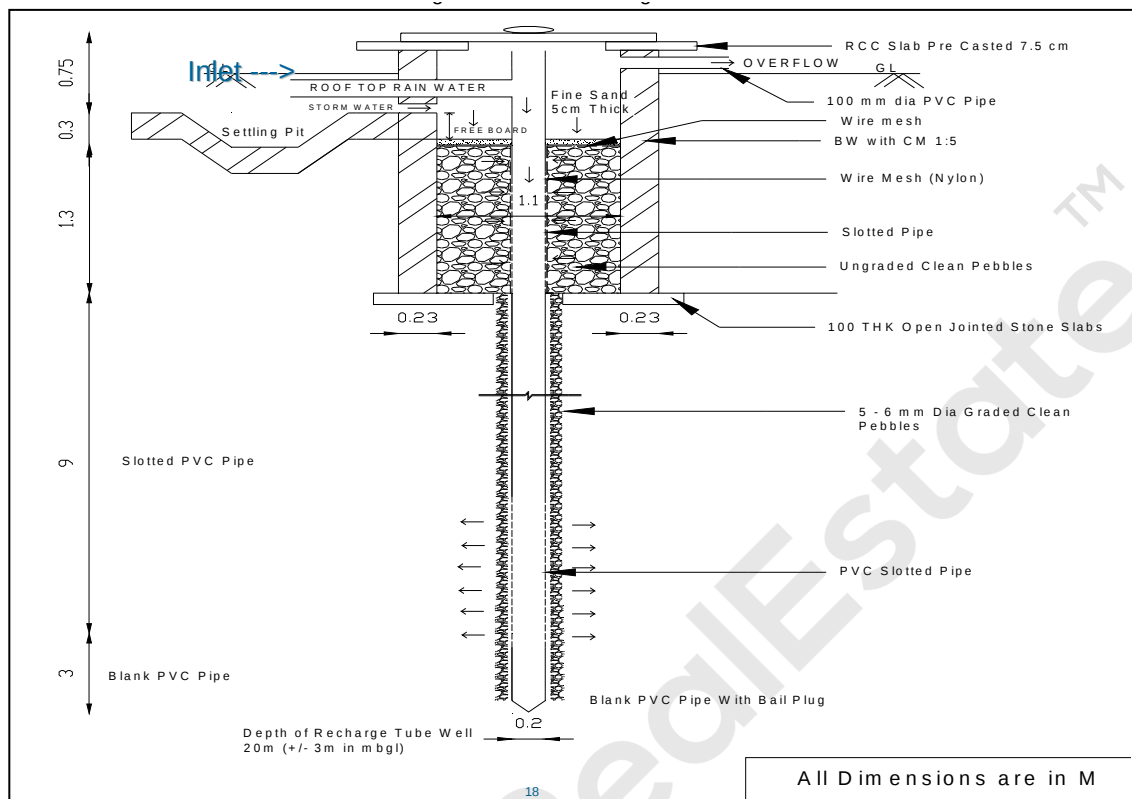


Marutheeswar temple tank before filling of clay

LITHOLOGICAL CROSS SECTION, BESANT NAGAR AREA



RECHARGE TUBE WELL



Recommendations

- The flood waters from the catchment area from western uplands of Chennai can be diverted to Well field area in Aranyar –Kosadalaiyar basin for recharge- the earlier recharge program failed for want of source water for which the long term monitoring of rain fall run off and state of art injection well field to be created and maintained.
- Dedicated reservoir-canal-recharge tube wells to provide long duration injection & creation of ridge of fresh water to prevent land ward migration of sea water and improve sustainability of well fields
- The prevailing ground water scenario and RWH strategies in the CMA area needs area specific design and more collection of storm water for storage in sump/ suitable aquifer layer –Principle of Zero discharge of rainwater from the land holding
- Percolation pond matching rainwater harvesting potential of land as mandatory for all institutions and industries- CGWA & PCB is already made it mandatory for ground water clearance for new industries as per the category of Block-Over exploited, critical, semi-critical and Safe
- Managing water flow/quality in lakes and rivers in CMA and preventing large flow to sea with integrated Multi-disciplinary approach in parts starting from upland on

watershed basis. The corrections required in problematic segments in upper reach will be less and easily addressed. with the improvement in upper reaches only, downstream to be taken up.

- Restore the system tanks or create new ones with interlinking channels to divert flood water to water deficient north Chennai aquifer system
- Providing recharge shafts in each unpolluted water body for distributed ground water recharge in entire CMA
- Proper treatment of waste water in urban area and reuse to be ensured by involving all stake holders with independent monitoring mechanism for its efficiency and efficacy
