

**DRAFT
ZONAL DEVELOPMENT PLAN
FOR
RIVER YAMUNA/RIVER FRONT, ZONE 'O'**



JULY 2008

**APPROVED BY DELHI DEVELOPMENT AUTHORITY
VIDE RESOLUTION NO.34/2008 DATED 18.6.2008
FOR INVITING PUBLIC OBJECTIONS/SUGGESTIONS**

DELHI DEVELOPMENT AUTHORITY

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PREAMBLE

In accordance with Authority's Resolution in its meeting held on 6.9.2007, genuine pre-existing institutions, i.e. before 01.01.2006, rendering cultural, religious (including spiritual), health care and educational services to the people, but which do not form part of the ridge or Gram Sabha or public land, shall be incorporated vis-a-vis their current land uses in the respective Zonal Plans keeping in view Clauses 3 and 4 of the Master Plan-2021. Such institutions will, however, be subject to reasonable policy and procedural stipulations regarding factual verification, FAR, Development Charges, Land-use, etc.

ZONAL DEVELOPMENT PLAN FOR RIVER YAMUNA / RIVER FRONT

(Zone 'O')

1.0 Introduction

1.1 As per MPD - 2021 notified on 7.2.2007, the National Capital Territory of Delhi has been divided into fifteen zones (Divisions) designated 'A' to 'P' (except zone 'I'), eight in urban Delhi ('A' to 'H'), six in Urban Extension ('J' to 'N' & 'P') and one for River Yamuna/River front which has been designated as Zone 'O' (**ANNEXURE- I**).

1.2 The River Yamuna/ River front, Zone 'O' has special characteristics and ecological significance for which various studies have been conducted from time to time. As such, the Zonal Development Plan of Zone 'O' is conceived to set the strategies for rejuvenation of river Yamuna and eco-friendly development.

2.0 Statutory provisions and objectives

2.1 The Zonal (divisional) Plan of the area is prepared under Section-8 and processed under Section -10 and simultaneously the modification of the land uses to be processed under Section 11(A) of the Delhi Development Act, 1957.

2.2 Section-8 of the Delhi Development Act 1957 defines the contents of the Zonal Plan. As per the MPD - 2021, a Zonal Development Plan means a Plan for one of the zones (divisions) of the National Capital Territory of Delhi containing detailed information regarding provisions of social infrastructure, parks and open spaces and circulation system etc. The Zonal (Divisional) plan, details out the policies of the Master Plan.

3.0 Location, Boundaries and Area

3.1 River Yamuna enters from Palla (on north side) traverses a length of 48 km through National Capital Territory of Delhi and leaves it at Jaitpur (south side). The zone 'O' covers about 9700 ha area (as per MPD 2001) from Northern boundary of National Capital Territory of Delhi up to the Southern boundary of the National Capital Territory of Delhi.

The River Yamuna/ River front, Zone 'O' is bounded as under:

- North : NCTD Boundary
- South : NCTD Boundary
- East : Marginal Bund and NCTD Boundary
- West : Marginal Bund, Ring Road and proposed
NH-2 bypass along Agra canal

4.0 Existing Characteristics/ Developments

4.1 The following are the predominant characteristics of this Zone:

- i) River Yamuna in Delhi covers a length of about 48 km including 22 km in urban area and its spread varies from 1.5 km to 3.0 km.
- ii) Seven Road Bridges, two Railway Bridges, one Metro Bridge and two fair weather Pontoon Bridges cross River Yamuna.
- iii) Twenty two major drains are discharging effluents into the river.
- iv) The river bed gently slopes from 208 msl in the north to 199 msl in the south. Thus the gradient of the river from north to south is about 9m.
- v) The zone has an assortment of activities like Delhi Secretariat, Samadhi complex, Cremation Grounds, Sports Complexes, and Thermal & Gas Power Stations, Bathing Ghats, Sewerage Treatment Plants, fly-ash ponds and fly ash brick plants etc. Some of the pockets are under thick plantation and most of the river basin area in Zone 'O' is being used for agriculture, horticulture and has a wealth of flora and fauna. The encroachments in the River bed area aggravate the pollution in river Yamuna. In some parts land from river basin has been reclaimed for unauthorized constructions.

4.2 Existing characteristics of various part/ stretches of River Yamuna on either side are as under:

Sub-Zone	Description of Area	Existing characteristics/ Developments in Zone 'O'	
		West	East
1	NCTD Boundary to Wazirabad Barrage	Agriculture, Biodiversity park, Jagatpur village, Wazirabad Village, monuments, Unauthorized colonies, Wazirabad Water works, Ghats.	Agriculture, Water works, Facility centre, CRPF Camp, Delhi Police Firing range, Unauthorized colony.
2	Wazirabad Barrage to ISBT Bridge	Unauthorised colonies, Unauthorised religious structures, CNG station, Bathing ghat.	220 KV ESS, water ponds, grass farms, Marshes, Gurudwara & Agriculture.
3	ISBT Bridge to Old Yamuna Rail cum Road Bridge	Nigambodh ghat, unauthorized growth of Yamuna Bazaar, Salimgarh fort, ghats, ESS.	Unauthorized colony, Agriculture, DMRC Depot, IT Park, PSP site.
4	Old Yamuna Bridge to ITO Barrage	Electric crematorium, Vijay ghat, Shanti van, Shakti sthal, Raghat, Gandhi darshan, I.G. stadium complex, Power house, Delhi secretariat, Fly ash brick plant.	Agriculture, cremation ground.

5	ITO Barrage to Nizamuddin Rly Bridge	I P power house, Gas turbine power house, STP.	Agriculture, Forest, Site for DMRC Depot & Station.
6	Nizamuddin Rly Bridge to N H 24	Fly ash pond, Fly ash brick plant.	Agriculture, PSP site Akshardham temple complex, Parking, CWG Village Complex.
7	NH24 to Okhla Barrage	Electric crematorium, Rajiv Gandhi Smriti Van, unauthorized petrol pump, unauthorized encroachment, Electric sub-station, site of underground water reservoir, unauthorised colonies.	Agriculture.
8	Okhla barrage to NCTD Boundary	Unauthorized colonies, water body, agriculture, Madanpur Khadar resettlement scheme ,LPG bottling plant.	Agriculture & Water body

4.2.1. EXISTING LAND USE

S.No.	LANDUSE	AREA(Ha)	%
1	RESIDENTIAL		
	A*	62.21	0.64
	B**	980.00	10.10
2	COMMERCIAL	39.50	0.41
3	INDUSTRIAL	34.04	0.35
4	RECREATIONAL	528.40	5.45
5	TRANSPORTATION***	345.65	3.56
6	UTILITIES	166.00	1.71
7	GOVERNMENT	1.80	0.02
8	PUBLIC & SEMIPUBLIC	179.84	1.85
9	RIVER & WATER BODY(including Agriculture)	7362.56	75.90
	TOTAL	9700.00	100.00

A*=Approved residential scheme (Madanpur Khadar Resettlement colony (51.21)Ha and 11.0 Ha Residential Use at CWG-Village)

B**=Unauthorized colonies falling in Zone 'O'.

*** The Transportation use includes the DMRC Depot & Stations at Shastri Park and south of Vikas Marg in addition to the area under circulation such as roads, rail, and metro corridor.

5.0 Various Proposals & Recommendations

5.1 MPD - 1962

The entire area north and south of Wazirabad barrage has been shown as floodable and recommended, development of District Parks, Play Grounds and Open Spaces on the western bank of River Yamuna and in the area south of Wazirabad Barrage. It further recommends shifting of existing Thermal Power Stations i.e Rajghat and Indraprastha after their machinery becomes obsolete and formulation of scheme for discontinuing sewage outflow into the River Yamuna.

5.2 MPD - 2001 Proposals

River Yamuna is to be made pollution free through various measures. On the big expanse of its banks large recreational areas are to be developed and to be integrated with other urban developments so that the river is an integral part of the city physically and visually. It has also recommended channelisation of river with the following provisions:

- i) After the result of the model studies for the channelisation of the river Yamuna become available, development of river front should be taken up, considering all the ecological and scientific aspects as a project of special significance for the city.
- ii) Strict enforcement of Water Pollution Act is needed to keep the river clean.

5.3 DUAC - Conceptual Plan-2001

The Conceptual Plan-2001 envisages that “through proper channelisation, a sizeable area can be made available for recreational activities with some areas on either side of the river to be preserved for three dimensional developments”.

5.4 NCR - Regional Plan-2021

NCRPB in the NCR Regional Plan-2021 has identified river zone as natural conservation zone and recommends that the water bodies be kept free from any encroachment/development to allow free flow of water. Construction activity for human habitation or for any other ancillary purpose not to be permitted. Suitable measures to be taken to maintain the water body with the minimal flow/water level.

The following activities have been recommended in the natural conservation zone:

- i) Agriculture and horticulture
- ii) Pisciculture
- iii) Social forestry/ plantation including afforestation
- iv) Regional recreational activity with no construction exceeding 0.5% of the area with the permission of competent authority.

5.5 Yamuna Action Plan of Slum Wing, MCD/NCTD

Under the Yamuna Action Plan, the following facilities have been developed in this zone:

- i) Low cost toilets
- ii) Sewage treatment plants
- iii) Electric crematoria

- iv) Bathing ghats
- v) Plantation

5.6 MPD - 2021

- i) Rejuvenation of River Yamuna through a number of measures including ensuring adequate flow in river by release of water by riparian states, refurbishment of trunk sewers, treatment of drains, sewerage of unsewered areas, treatment of industrial effluent, recycling of treated effluent and removal of coliforms at STPs (**ANNEXURE- II**).
- ii) The natural features such as Forest, Wildlife Sanctuary, River Yamuna and other water bodies should be conserved and kept free from unrestricted and unplanned urban development.
- iii) Designation and delineation of appropriate land uses and aesthetics of the river front which should be more/ fully integrated with the city and made more accessible-physically, functionally and visually.
- iv) Water bodies, having a minimum size of surface area of 1 ha shall be preserved by the concerned authorities. Further effort shall be made at the local level to retain smaller water bodies.

6.0 Studies Undertaken for the Zone

6.1 CWPRS, Hydraulic Model Studies on Channelisation

The CWPRS, Pune submitted its Technical Report No.3062 in May, 1993. The summary of findings and recommendations are given as under:

- i) Indraprastha barrage, Nizamuddin railway bridge and Nizamuddin road bridge are closely located in river reach of 3 kms. The waterways provided for these structures are around 550 m. The river flow between these structures is more or less confined in a width of 550 m. Therefore, by joining the guide bunds of these structures in this reach, it was seen that there was no increase in water level or change in flow conditions due to channelisation. Hence it appeared technically feasible to channelise the river in this reach.
- ii) The bottom of the old rail-cum-road bridge is at RL 206.3 m and it was seen that with discharges above 7022 cum/s, the bund was getting submerged with channelisation. With channelisation the water level observed at this bridge was RL 209.3 m when river discharge of 12750 cum/s. In case of Wazirabad barrage the bottom of decking is RL 209.75 m. With the channelisation, water level observed was RL 211.1 m with a discharge of 12750 cum/s. Thus channelisation between Indraprastha barrage and Wazirabad barrage could be taken up only after renovation of these two bridges. The guide bunds of the structures which are not designed for water discharge of 12750 cum/s will have to be strengthened

as 22 drains discharging into the river Yamuna would face the problem of blockage due to increased water level in the river by channelisation. At the outfall of these structures, cross regulators would have to be provided along with arrangements for pumping the drain water into the river, whenever water level in the river would be higher than the permissible water level in the drain.

iii) It may be mentioned that due to channelisation, the storage capacity at the three barrages namely, Wazirabad Barrage, Indraprastha barrage and Okhla barrage would reduce. Overcoming all these limitation/constraints, channelisation in three phases as mentioned below could be implemented.

- i) Phase- I Indraprastha barrage to Okhla barrage
- ii) Phase-II Indraprastha barrage to Wazirabad barrage
- iii) Phase-III Wazirabad barrage to Palla

6.2 Inland Waterways Authority of India (IWAI)

The Inland Waterways Authority of India (IWAI), an autonomous body for the development, management, maintenance and better utilization of national waterways carried out a pre-feasibility study for navigational potential of River Yamuna for passenger service, cargo service, development of water sports, recreational facilities in River Yamuna in November/December, 1988 and submitted its report in January, 1989 to the Hon. Lt. Governor, Delhi.

The study based on Talwegs Soundings Survey conducted between Wazirabad Barrage and Okhla Barrage noted that for the entire stretch, except for few isolated locations, a 2.0 m deep water channel is available. The study suggested that to make available a 300 - 450 m wide continuous channel of min 2.0 m depth, dredging efforts have to be made by excavating 90000 cum of earth every season, which is possible using a single portable cutter suction dredger. The study recommended that in-stream navigation should be integrated with the scheme for development, pollution abatement and flood control.

6.3 Study on Planning & Development of Yamuna River Bed by School of Planning & Architecture (SPA), New Delhi

A study was assigned to the School of Planning and Architecture, New Delhi for identifying alternative approaches to planning and development. Three alternative approaches have been suggested in this study. They are:

6.3.1 Eco-system Based Approach

This is purely an environmental approach to the river bed development and comprises of the following components.

- i) Augmenting water recharge potential in the form of retent and detention ponds.

ii) Reducing pollution of Yamuna water through installation of STP at the outfall points and effluent management of adjoining rural areas.

iii) Conservation of Natural areas.

iv) Hierarchy of green areas to be developed with varying use like remnant forests, landscaped parks, zoological and botanical gardens with significant emphasis on pollution control.

v) Recreation in form of 'eco-tourism' such as passive greens and water sports facilities where environmentally viable.

vi) Continuation and Renewal of existing Areas.

6.3.2 Integrated Development Scenario

With proper inclusion of such uses that would give citizens desirable proximity to the river:

i) Retention of essential features of the eco-based scenario such as augmentation of ground water recharge, pollution control and conservation of natural areas.

ii) Assignment of uses, according to demand and suitability, mainly incorporating those uses which are either presently under consideration or are derived to facilitate improvement of the perceived quality of life of other areas.

iii) Modification of certain existing/ ongoing uses to improve their respective environmental qualities.

iv) Integrated tourism development, through development of appropriate infrastructure, networks and facilities.

v) Higher levels of recreational activities including water sports and other recreational uses.

vi) Inland water transportation is also envisaged for development, subject to feasibility.

vii) Management of higher order as an essential requirement to ensure economic viability and sustenance of integrated development.

6.3.3 Post Channelisation Development Scenario

It is an extension of the Integrated Development Scenario with partial/limited channelisation as a precondition. This Scenario also requires:

i) Reduction of peak flood water release, as flow volumes are likely to increase on channelisation.

ii) Pumping regulation to prevent backflow of existing drains and consequent flooding in other areas of Delhi.

iii) Limited assignment of religious and other water bound facilities as channelisation will restrict the stream width will not permit stream bifurcation and will permit limited in stream uses.

iv) The study proposes alternatives models of public-private partnerships, and recommends integrated development model, which foresees only partial channelisation.

6.4 NEERI Study on 'Environmental Management Plan for Rejuvenation of River Yamuna'.

The DDA assigned a study on "Environmental Management Plan for Rejuvenation of River Yamuna in NCT" to the NEERI. The NEERI in its report gives a study of the existing situation in the flood plains and guidelines for further development. The NEERI has recommended sub-zone wise development, based on which the zonal development plan proposals have been worked out. Plan is placed at **ANNEXURE-III**

6.4.1 Recommended Activities in Sub Zones by NEERI:

Category	Use/Activity	Suggested Location	
		Sub Zone	Segment
I. Low Development, No Built up	Botanical Garden	06	East
	Nurseries	02	East & West
		03	West
		05	East
	Forest & Picnic Spots	02	East
		07	East
	Golf Course & Polo Ground	07	West
	Special Parks (Like Herbal Garden)	06	East
		07	East
II. Moderate Development, Low built up	Open Air Stadia	07	East
	Amphitheatre	07	East
	Race Course	07	West
	Theme Parks (Like Rock Garden)	07	West
	Zoological Garden	01	West
	Aqua Sports	08	West
	Camping Grounds	06	East
	Recreational Clubs	07	East
	Congregation grounds	07	East
	Idle Parking	06,08	West
		03	East

III. Extensive Development, Moderate built-up	Convention Centres Secretariat & Assembly Museums Financial District	07 04 04 07	East & West West West East
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6.4.2 Proposed Land Utilisation in different Sub Zones by NEERI

Sub Zone	Land Availability under Return Year flood (Area in Ha)				Proposed land Use	
	10	50	100	Safe	Western bank	Eastern bank
01: Palla to Wazirabad Barrage	-	-	-	-	Water Storage, Flood water Moderation & Tubewells	Water Storage, Flood water Moderation & Tubewells
02: Wazirabad barrage to ISBT Bridge	475	342	180	39	Nil	Play grounds, park, zoological & botanical gardens, picnic spots, nurseries (10 & 50 yrs) Sport complex, theatre, food shops. Parking area (100 yr & safe)
03: ISBT Bridge to Old Railway Bridge	82	25	-	-	Nil	(Metro Rail), Nurseries, Idle parking
04: Old Railway Bridge to ITO Barrage	192	78	19	-	Heritage Park, Museum, Garden	Play Fields
05: ITO Barrage to New Railway Bridge	179	106	50	-	City cultural centre	Play fields (10 yr) Parks, picnic spot (50 yr), Botanical garden, mini-sport complex (100 yr)
06: New Railway Bridge to NH-24 Bridge	206	104	60	-	Fly ash Brick Plant, Parking & constructed wet land	Garden, parking, camp site (10 & 50 yrs) Public/Semipublic use (100 yr)
07: NH-24 Bridge to Okhla Barrage Block-1 Area between NH-24 and ILFS bridge Block-2 Area between ILFS bridge and Okhla Weir	1063	474	236	78	Block 1 & 2 Play grounds, golf course (10 yr), Botanical garden, zoological park, rock garden, tourist cottages, camping sites with public conveniences (50 & 100 yrs) Convention centre, small shopping plaza, pleasure parks, parking	Block 1: Golf course, polo ground, racecourse (10 & 50 yrs), Congregation Ground (100 yr) Open air & amphitheatres (safe) Block 2 & Block 3: Nil

Block-3 Area between Okhla Weir and Okhla Barage					facility(safe)	
08: Okhla Barrage to Jaitpur	-	-	-	-	Agriculture &Tubewells	Agriculture &Tubewells
Total	2197	1129	545	117		

Grand Total 3988 Ha.

** Source: NEERI report on Environmental Plan for Rejuvenation of River Yamuna in NCT*

6.5 Draft Zonal Plan based on MPD-2001.

i) As per provisions of MPD-2001, the draft Zonal development Plan for Zone 'O' & Part 'P' covering an area of 9700 ha was prepared and discussed in the 53rd meeting of NCR Planning Board held on 28th January 2005. The Board suggested that the draft Zonal development Plan should be within the framework of MPD-2021.

ii) The draft Zonal development Plan of Zone 'O' and part 'P' based on MPD-2001 was published for inviting objections/ suggestions vide Public Notice dated 21.8.2006. About 112 objections/ suggestions were received in response to the Public Notice which was considered by the Board of Enquiry and Hearing in its meeting held on 11.5.2007. The Board of Enquiry and Hearing recommended that since MPD-2021 has already been notified on February 2007, the Zonal Plan may be based on the provisions of MPD-2021, thus it may be reviewed and revised as per provisions of MPD-2021 and the objections/ suggestions received in response to the Public Notice may be considered along with the objection/ suggestion to be received in response to the Public Notice on the draft Zonal Plan to be published based on the provisions of MPD-2021.

6.6 River Yamuna/River Front, Zone 'O' MPD-2021

i) As per MPD-2001, the area of Zone 'O' and part 'P' is 9700 Ha. As per MPD-2021, the area of Zone 'O' is 8070 Ha., since the boundary of the river zone shown in both the Plans is same, modification in area of the zone 'O' boundary in MPD-2021 needs to be carried out.

ii) The zonal boundary of Zone 'O' as shown in the plan of National Capital Territory of Delhi Zones (Divisions) in MPD-2021 document be modified as per the Plan 'Sub-division for Zones (divisions) A to H. Modification in MPD-2021 in this regard needs to be carried out. **(ANNEXURE- IV).**

6.7 DUAC 'Imagining Delhi' -2006

DUAC exhibition 2006, on 'Imagining Delhi' has recommended the conservation and rejuvenation of river Yamuna – a new space with green/ recreational area along the river bank.

7.0 Conservation, Villages, Squatter Settlements, Resettlement Colonies and Unauthorized Colonies

7.1 Conservation of built heritage

The list of monuments/ built heritage in and along River Yamuna as per the listing Delhi: The Built Heritage by INTACH ,Delhi Chapter is given below:

Protected

- i) Mosque, Shah Alam's Tomb, (north of Wazirabad Road)
- ii) Bridge at Wazirabad
- iii) Salimgarh, Gateway, Mosque

Un-protected

- i) Embankment of Wazirabad Bridge
- ii) Nigambodh Ghat
- iii) Nili Chhatri Temple at Yamuna Bazaar
- iv) Jail, Museum, Ammunition room at Salim Garh

7.2 Villages

Villages are characterised by a mix of different land uses and have similarities in compact built form, narrow circulation space and low-rise high-density developments. These mainly accommodate residential, commercial and industrial uses and function as a mix of such uses. The list of urban villages in River Yamuna is given below;

- i. Subhepur
- ii. Jagatpur
- iii. Wazirabad
- iv. Jaitpur
- v. Mithapur

The continuance of these villages in River Yamuna/ River front, Zone'O' is required to be examined in view of the eco-sensitive nature of the zone. Preparation of the redevelopment plans by the concerned local bodies within three years. Villages to be treated as special area where special area regulations shall be applicable.

7.3 Squatter Settlement

Hon'ble High Court has passed orders from time to time, the same are to be considered while planning and development of this zone.

7.4 Resettlement Colonies

- i) As per MPD 2021 provisions, in-situ up-gradation of the land pockets of slum and JJ Clusters, which are not required for public / priority use is the first option for provision of affordable housing for rehabilitation of squatters. Resettlement colonies through planned schemes, are also to be upgraded in a similar way for infrastructure provision.
- ii) A Resettlement colony, Madanpur Khadar spreading over an area of 51.2 Ha. with provisions for Public & Semi-public facilities is existing in this zone.

7.5 Unauthorised Colony

A tentative list of unauthorized colonies in River Yamuna/ River front, Zone 'O' as per GNCTD is given as **ANNEXURE - V**. The continuance of these unauthorized colonies in River Yamuna/ River front, Zone 'O' is required to be examined in view of the eco-sensitive nature of the Zone. Wherever required, the change of land use will be processed separately as per approved Layout/ Regularisation Plan of the colony.

8.0 Objectives and Framework for the Zonal Development Plan

8.1 Keeping in view the various studies and the conclusions arrived at, the Zonal Development Plan strives to achieve the following objectives

- i) Water Supply Augmentation
- ii) Pollution Abatement
- iii) Land Utilization/ Management
- iv) Eco-friendly development

8.2 Other critical concerns for the rejuvenation of the river areas are as under:-

- i) Involvement of multiple agencies
- ii) High resource requirement
- iii) Special significance of the area and its linkage with the other states upstream and downstream, development/ re-development of the existing areas.

- iv) The development should not increase the pollution within the River Yamuna/ River front,zone'O' area rather it should regenerate a healthy environment.
- v) The development should be safe from flood, even at peak flood level.
- vi) The resource requirement is partially recovered with the development of land in the river zone without imposing compromises on the quality of the environment.
- vii) Identifying the stretches which can be/ should be developed on priority and do not require large financial resources and are prone to encroachments.
- viii) To mitigate the constraints of land for public and semi-public uses of the adjoining areas more so of Trans Yamuna area.
- ix) To prepare up-to-date digital maps using Geographical Information System (GIS) and satellite images/Aerial photography, visual/ physical surveys.
- x) Overall ground truth assessment.
- xi) Study of Drainage and Flood Control including River Engineering/Hydrology of Yamuna River.
- xii) Review of the study on Rejuvenation and Environmental Management Plan of Yamuna River front prepared by National Environmental Engineering Research Institute (NEERI), Nagpur.
- xiii) To study the plans of water supply augmentation.
- xiv) To study the plans of sewerage/sanitation and pollution abatement.
- xv) Landscape flora/fauna and Urban Design studies.
- xvi) Transportation/networks studies.
- xvii)To integrate the plans of water supply augmentation / pollution abatement/ sanitation/ sewerage/ drainage/ flood control and environment management into a Sustainable Landuse Plan in a legal framework

8.3 Strategy

The basic goal of the Zonal Plan is to rejuvenate river Yamuna as a 'CITY LIFELINE' by striking a balance between developmental parameters and ecological aspects. Several approaches have been integrated to achieve sustainable Riverfront development, as given below:

8.3.1 Water supply augmentation

i) Availability of water in the river throughout the year

- Capacity Augmentation of the existing barrages.
- Planning & Development of 'regulated flood plain reservoirs' in low lying areas (25 year flood plain).
- Construction of storage reservoir upstream, to collect the monsoon excess flow and regulate the flow.

ii) Up-gradation of river water quality to prescribed standards through:

- Innovative low-cost technologies and using alternative techniques such as bio-remediation of the drains, the major sources polluting the river.
- Effective and in-depth monitoring by concerned agencies to take action and reduce impacts of waste and strict enforcement of Water Pollution Act.
- Installation of treatment facilities by polluting units, through regime of control and command industry and ensure efficient and effective functioning of the STP's and ETP's.
- Removing non-compatible and pollution generating land uses from the river bed.

iii) Increased accessibility to the river physical, functional and visual, e.g. in the basin areas lying behind Raj Ghat, Gandhi Nagar, between Wazirabad and ITO etc.

iv) Development with suitable land forms/ landscape (in phases) is recommended based on certain environmental and technical limitations. This will not only make more land available for recreational, development remunerative purposes but also improve the aesthetics of the river front.

v) Identification of developable, un-developable and degraded land based on identified environmental parameters as the following.

- Conceptualize the river development in terraces and utilize the high land areas by identifying the various inundation levels.

- Removal of non-conforming and polluting landuses, e.g. JJ clusters and unauthorised construction.

- Adopting suitable, positive, compatible and conforming landuses.

vi) Better co-ordination among different agencies involved in the management of the Yamuna, its drains, canals and water treatment works in Delhi.

vii) Adopting special zoning controls for a regulated three-dimensional comprehensive development.

viii) Strengthening commitments of various stakeholders by addressing the issues and implementing mitigation measures. Promoting community awareness and participation methods- conduct surveys, workshops etc, to significantly expand citizen participation in the planning and design of the river front.

ix) The riverfront development will be a lifeline for the community and a mark of distinction and pride for generations to come.

8.4 Rejuvenating the River Front

- i) Preventing dumping of urban wastes, untreated sewage etc
- ii) Compatible and conforming landuses along the basin.
- iii) Use of infiltration beds, buffer strips, along the river to absorb and filter contaminants and sediment in runoff from paved surfaces.
- iv) Utilising vegetation to stabilize banks from erosion.
- v) Designing with porous paving material that allow rain to be absorbed rather than running off of trails, parking lots etc. carrying sediment and other urban pollutants into river/ streams.
- vi) Adding natural in-stream elements, e.g. root wads of downed trees that provide essential slow-water habitat for young fish and insects and replanting native wetland and upland plants and trees that will provide ambient growth environment for fish, migratory bird and other wildlife habitat.
- vii) Providing wildlife observation areas, theme parks and interpretive nature/ historical trails that explain river ecology and the historical significance

8.5 Strategies for riverfront development

- i) To establish riverfront walkway, trails, parks.
- ii) To create visually pleasing order to the river's edge.
- iii) To attract people and investment to the riverfront.
- iv) To develop an arts/entertainment/cultural district.
- v) To expand leisure and recreational use of the river and riverfront.
- vi) To emphasize pedestrian streets that connects to the riverfront.
- vii) To provide outdoor activities for the people.
- viii) To provide opportunities for boat launching and storage.

Reclaiming the riverfront ensures not only its environmental integrity but also stimulates the economy. The aim is to achieve maximum economic benefit with minimum public investment to ensure a self-sustaining set up. Thus, the riverfront development will be based on financial and environmental catalysts. The revenue generated by the various activities will allow the riverfront to further develop parks and trails, commercial sites and infrastructure improvement within the area for an economically and environmentally healthier riverfront. This healthier vision is critical, as it is the foundation for new, long-term economic growth in the city and region.

8.6 Infrastructure Improvement

Sufficient infrastructure is critical for developing the Riverfront. Several infrastructure improvements for this area that have been previously identified as regional transportation priorities. Improved infrastructure will serve the riverfront and provide easy access to several recreational and development sites. This infrastructure will attract people and organizations, expanding the local tax base and fueling economic growth for years to come.

8.7 Cleaner, Quieter and Multiple Use

The river front vision includes multiple land uses that will provide access to all people in several different ways. These uses include parks and trails : a riverfront park – including a trail system – would be a welcome addition to the riverfront area. It allows the City to provide green spaces for use by the public and helps restore the area to its natural state.

8.8 Ensure availability of sufficient quantity of water in river

- i) By using 'regulated flood plain reservoirs', in identified low lying areas in the river basin, for water retention during dry seasons.

- ii) These reservoirs can be created at the existing barrages, e.g. North of Wazirabad, at Okhla etc. or by utilizing the existing embankments.
- iii) A survey of water bodies, catchment area feeder channels and water retention capacity is required to be undertaken with suggestion to improve storage of water
- iv) State Govt. and city authority may take action for implementing programme for renovation of water bodies.
- v) Central Water Commission(CWC), CPCB may estimate minimum flow requirement at different points of River Yamuna
- vi) CWC to prepare schemes for release of minimum flow in the Yamuna in Delhi based on fresh water saved as per objective at v) above and availability of water from lake and ponds.

Source: CSE (2007) Sewage Canal – How to clean the Yamuna

8.9 Capacity augmentation of the existing barrages can be done by :

- i) Desilting
- ii) Increase the existing pondage areas
- iii) Increase the height of the existing barrages
- iv) As per the orders of the Supreme Court, Min10 cumecs of water is to be let downstream into the river to ensure water in the river through out.
- v) Construction of Dams (micro) upstream to collect the monsoonal excess flow and regulate the flow.

8.10 Strategies of Pollution Abatement and Up-gradation of river water quality to prescribed standards:

- i) By improving the quality of water in the drains (especially the major ones, e.g. Najafgarh etc.), dumping untreated sewage into the river. This can be achieved by steps such as bio-remediation, using alternative technologies such as oxidation ponds, aeration machines etc.
- ii) There is a need to identify innovative low-cost technologies. Greater contamination implies higher costs for treatment, as costs depend on technologies and scale. It is also important to understand that each technology has its limitations and no one technology can be expected to deal with all the substances. Western technologies (Activated Carbon Method, using ozone and granulated activated carbon along with conventional or chemical treatment) for removal of pesticide traces are available, but they are costly and involve higher energy consumption, problems in maintenance of expensive equipment.

For treatment of pesticide traces, the following actions are suggested:

- i) Capping the existing sand filter with bituminous charcoal or coconut shells. The filters would have to be extended by nearly 40%. The advantage of this method is that the pesticide traces would get absorbed for an additional cost of 10%.
- ii) Increasing flocculants by adding powdered activated carbon (PAC) or bentonite clay with doses varying from 25-30 mg/l. The costs would go up by 20%, the use of granular activated carbon, on the other hand, would double the present cost of water treatment.
- iii) Use of clay beds. Here, raw water tanks need to be protected by claybeds. But this system would be difficult to operate in the monsoons when clay beds may get washed away.
- iv) The best way to get rid of the pesticides (non-point) and industrial toxins is through 'Source protection measures', i.e. protect the catchments itself, through methods such as organic or biological farming etc.
- v) Ensure upgradation of effective and more in-depth monitoring capabilities by concerned agencies to take action and reduce impacts of waste and strict enforcement of Water Pollution Act.
- vi) To enforce installation of treatment facilities by polluting units, through regime of control and command industry, ensuring efficient functioning of the STPs and the ETPs.

Strategies for Pollution Abatement

The city withdraws clean water but returns only waste water. No fresh water is released to dilute or clean this waste water. 22 drains carry majority of the waste in Delhi. Out of these, 6 large ones contribute 90% of the wastewater discharged into the Yamuna.

Key objectives of the strategy should be

- i) Maximising utilization of existing treatment facilities.
- ii) Cleaning the drains in Delhi.
- iii) Ensuring reuse of treated effluent (so that treated and untreated sewage do not mix)
- iv) Improving monitoring systems and setting progressive standards.
- v) Achieving dilution in the river.

Cleaning the drains

- i) Delhi's drains can also be cleaned by tapping and connecting them to existing STPs. In this way, waste water can be reduced by 733.5 mld
- ii) By following these strategies, the Najafgarh drain – contributing the maximum individual pollution load –can be converted into a fresh water channel.
- iii) A treatment capacity of 295 mld exists in the catchment of Shahdara drain. If this capacity is fully utilized, waste water flow in drain will go down to 586mld.
- iv) All waste, legal and illegal, generated in the catchment area is trapped and treated.
- v) Augment and optimize treatment facilities, where needed, to treat this waste. Appropriate technologies of scale (centralized or local) should be adopted.
- vi) Treated effluent to be reused and not mixed with untreated effluent before it flows into river.
- vii) Treating the residual waste biologically in the drain itself. Thereafter, treating all residual sewage at riverfront.
- viii) Regular and accurate monitoring of flow and pollution in drains. Monitor pollution at outlet point at river.
- ix) Polluters in the catchment of each drain to pay for dirtying it.
- x) To clean the Yamuna, sewage from unsewered areas must also be treated. According to estimates, 50% of Delhi is unsewered..
- xi) There are five types of unsewered areas : unauthorised and unregularised, unauthoised and regularized, resettlement, urban villages and rural villages.

Action points for unsewered colonies

- i) Estimate of water use and waste generation
- ii) Preparing plans for decentralized sewage treatment in illegal and legal unsewered colonies, urban and rural villages.

- iii) Developing reuse plans for treated effluent.
- iv) Setting up pilot projects in selected representative colonies in terms of water use, density of population and type of colony.
- v) Review of pilot projects and preparing plans for replication in other colonies.
- vi) Implementation of waste management projects.

Action points for promoting treatment at source

- i) Putting out information on the best available technology for localized wastewater treatment and its costs so that the users can take an informed decision.
- ii) Setting up minimum quality standards for treatment and setting up a monitoring protocol.
- iii) Document on how to operate and maintain localized treatment systems so that local bodies and individuals can efficiently manage their systems.
- iv) Pilot projects on decentralised waste treatment and reuse for colonies so that we can demonstrate the effectiveness of the systems.
- v) This needs a policy backing for promoting decentralised wastewater systems. Incentives may include rebate on property tax, subsidy on water charges if recycled water is used. Disincentives to include high sewerage charges for disposal without treatment.

Treating wastewater in minor drains

- i) Wastewater treatment and recycling to be implemented at the colony-level, users to be alerted on best available technologies.
- ii) Minimum quality standards to which wastewater should be treated, before it is considered fit for reuse, must be notified.
- iii) Incentives like rebate on property tax, subsidy on water charges, or disincentives like high sewerage charges if waste is released without treatment, to be used.

Treatment where drains outfall into the River

- i) While there are 22 major drains in Delhi, having 22 treatment facilities is unfeasible. Obstacles range from variation in flow to lack of space.
- ii) While at some places the flow is too little and setting up treatment facilities is not cost-effective, at other, land is not available for construction.
- iii) It is important to provide treatment facilities right where drains discharge into the Yamuna. Drains must also be divided into eight groups.

Strategy for cleaning drains in Delhi is given in **ANNEXURE-VI**

Action points for reusing treated sewage from STPs

- i) Policy on wastewater reuse.
- ii) Notifying reuse standards based on health aspects and for various uses of treated wastewater.
- iii) Implementation of strategies to make treated sewage safe.
- iv) Action plan for reuse of treated wastewater in each STP should detail the options available.
- v) Implementation of action plan for reuse in a phased manner
 - a. 40 per cent reuse
 - b. 50 per cent reuse
 - c. 75 per cent reuse

Action points for waste reduction through water conservation

- i) Policy on water saving gadgets and fixtures
- ii) Policy on water efficiency rating of water gadgets.
- iii) Incentives for using water efficient gadgets and a public campaign to promote awareness on the connection between water use, waste generation, pollution, and public health.
- iv) Leakage management in the centralized water supply system. By reducing leakage from present levels to half in phase I and thereafter in phase II reducing leakage to 15 per cent of best achievable level.

v) Ensuring not only the adequate installation but also efficient and effective functioning of the sewage and waste treatment facilities.

*Source: CSE(2007) Sewage Canal- How to clean the Yamuna

9.0 Planning Proposals

9.1 Delineation of Sub-Zones

Keeping in view the magnitude of the area and the nature of the problems which different stretches of river Yamuna are exposed to in its different reaches, it is proposed to divide the entire area into sub zones keeping in view the following.

- i) Natural and man-made features/barriers
- ii) Recommendation/conclusions arrived at by the statutory plans and studies made so far.

Accordingly following are the broad sub zones.

Sub Zone	Reach	Approx. Area (Ha)
01	UP Border - Wazirabad Barrage	3620
02	Wazirabad Barrage - ISBT Bridge	1100
03	ISBT Bridge - Old Rly Bridge	225
04	Old Rly Bridge - I.P. Barrage	800
05	I.P. Barrage - New Rly Bridge	365
06	New Rly Bridge - NH 24 Bridge	390
07	NH 24 Bridge - Okhla Barrage	1300
08	Okhla Barrage - Haryana Border	1900
Total	River Yamuna Area (NCTD)	9700

9.2 Proposed Land Use

Keeping in view the existing development in the various sub zones, their proximity to the transportation network and other essential infrastructure, land availability and suitability and flood zoning etc. the following uses are proposed in the various sub zones. The extent of land which can be utilized for various uses/activities can be determined at the time of the formulation of detailed schemes.

9.2.1 Proposed Use Activities in Sub-Zones

Sub - Zone	Segment	Proposed Use
01	East	Recreation, Pondage (Water Harvesting), Ghats
	West	Recreation, Pondage (Water Harvesting), Ghats, PSP
02	East	Recreation, Pondage (Water Harvesting) Ghats
	West	Recreation, Ghats
03	East	Recreation, Pondage (Water Harvesting), Ghats
	West	Recreation, Ghats
04	East	Recreation, Pondage (Water Harvesting), Ghats
	West	Recreation,
05	East	Recreation, Metro Depot,
	West	Recreation, Ghat
06	East	Recreation
	West	Recreation
07 (NH 24 to IL & FS Bridge)	East	Recreation
	West	Recreation, Public and Semi Public Facilities[Cremation & grave yard(0.8 ha)], Utilities
(IL & FS bridge to Okhla Barage)	East	Water body
	West	PSP, Stadium Complex, Recreational, Water body
08 Okhla Barage to Haryana.Border	West	Water body, Recreational

9.2.2 Proposed Land Use

S.No	LANDUSE	Proposed	
		Area (Ha)	%
1	RESIDENTIAL*	62.21	0.64
2	COMMERCIAL**	39.50	0.41
3	INDUSTRIAL* (Fly ash brick plant)	34.04	0.35
4	RECREATIONAL(GREEN)***	2103.00	21.68
5	TRANSPORTATION	582.93	6.01
6	UTILITIES	172.66	1.78
7	GOVERNMENT*	1.80	0.02
8	PUBLIC & SEMIPUBLIC*	179.84	1.85
9	RIVER & WATER BODY	6524.02****	67.26
	TOTAL	9700.00	100.00

* No additional areas other than existing / earmarked have been proposed under Residential, Commercial, Industrial, Government and Public and Semi-Public use zones.

** Commercial includes existing IT Park (6.0 Ha), Bottling Plant (28.0 Ha), at Madanpur Khadar, Commercial/Hotel(5.5 Ha) site at CWG Village.

***Proposed Recreational uses will be considered as Green use zone in which green stretches, bio-diversity park, forest, botanical park/ herbal park, science park, theme park, etc will be permitted without any pucca / permanent construction'

**** The area of "River & Water Body" may decrease by 980Ha (apprx.) after the regularization and subsequent change of land use of Unauthorised Colonies as per Govt. Guidelines/ Govt. policy, falling in Zone 'O'

i) The area known as Yamuna Bazaar located south of Nigambodh Ghat for which a layout plan was prepared by DIT and allotment of land has been made by DIT for Hospital and DDA for Gas godowns may be considered for redevelopment / urban renewal within the framework of Govt. policies. The area has been shown as District Park in MPD-2021.

ii) The continuance of unauthorized colonies in River Yamuna/ River front, Zone'O' is required to be examined in view of the eco-sensitive nature of the Zone. Where ever required, the change of land use will be processed separately as per the approved layout/ Regularisation plan.

iii) All thermal Power plants located in Zone'O' either should be shifted or gradually be converted to gas based power plants. Thus the existing fly ash brick plants located in this zone will not be required and thus to be closed. The area under the plants will be developed for green/ recreational areas/ part of comprehensive scheme.

iv) As development is a continuous process and has to appropriately respond to the needs and aspirations of its beneficiaries, the Zonal Plan does not limit the variety of possible uses. However, it is absolutely necessary that any future use/ activity has to be planned in keeping in view with the overall spirit of this Zonal Plan i.e. all uses / activities should be either environment regenerating or at least should not degrade the existing environment on any count and this may be interpreted to include even social and other physical aspects like safety, aesthetics etc.

v) The precise use of the Recreational/green area will be determined as per the detailed lay out plan to be prepared.

vi) The River zone has three distinct morphologies:

- i) River bed ie, the area under River water
- ii) River flood plain ie, the area between River water course and embankments
- iii) River front ie, the area outside the embankments

The area under water course is part of the river hydrology. The area between water course and embankment is to be conserved as flood plain. Any development in this areas should be taken up only after the detailed hydrological studies and with approval of Yamuna Standing Committee/ Central Water Commission. The area out side the flood plain ie out side embankments (River front) should be conserved and developed considering the eco-sensitive nature of the river zone and based on comprehensive scheme.

vii) The existing bottling plant near Madanpur Khadar be shifted to an alternate site.

9.3 Increased accessibility to the river

Pedestrian promenade (based on Ghats concept), construction of special paving, with benches, ornamental street lighting etc. to create a new opportunity for citizens of the community to exercise and engage in active recreation pursuits by providing an environment that is fully accessible to all are proposed.

9.4 Development priority

9.4.1 The development of stretch between Wazirabad and ITO and between New Railway Bridge can be taken-up immediately

During the lean season with improved river water quality, if developed, the river would be more accessible and also aesthetically pleasing. The development can be done between Wazirabad and ITO and between ITO to Nizamuddin bridge , wherever it is technically more

feasible than the former, to make more land available for eco-sensitive and remunerative uses.

9.4.2 i) The river can be conceptualized into terraces, therefore the inundation levels in various flood levels have to be identified (exercise in flood plain zoning).

ii) The floodplains are divided into 25, 50, 100 yrs floodplain levels. The highest flood levels reached was approx. 207 m above msl in September, 1978 (the danger level mark of the Old Railway Bridge was at 204 m above msl).

iii) Certain highland pockets can be identified in the river basin for any kind of proposed development. The lowland pockets can be utilized to create reservoirs and store the excess monsoonal over flow. Simultaneously, following actions should be taken

- a) Identification of developable, undevelopable and degraded land based on identified environmental parameters.
- b) Removal of nonconforming and polluting landuses , e.g. JJ clusters and unauthorised construction.
- c) Adopting positive, compatible and conforming landuses for these lands NEERI recommendations.
- d) Recreational development like Sports, water sports, theme parks, stadiums (east of the proposed NH-2 bypass).
- e) To create pedestrian links directly to this valuable resource and provide additional access points to the riverfront to complement the revitalization efforts.
- f) Better coordination and management of Yamuna, its drains, canals and water treatment works.
- g) Special zoning controls and regulated three-dimensional comprehensive development

10.0 Transportation

A number of Master Plan roads and Railway lines are passing over the River Yamuna connecting both sides of the city. This zone has come to prominence after the proposed location of the Commonwealth Games Village. The Eastern Bank of the Sub – zone 5, 6 & 7 has been proposed for locating the Recreational facilities. Hence, in addition to the present roads the following roads are proposed which will not only increase the efficiency of movement over the existing traffic corridors but will also

provide access to the new areas proposed for future development in the sub - zones.

- i) Signature Bridge Road (45 m R/W) connecting NH -2 and Marginal bund Road south of Wazirabad Road.
- ii) Geeta Colony Bridge Road (30 m R/W) connecting Marginal bund Road and Ring Road.
- iii) 30 m R/W Urban Relief Road from Salimgarh Fort to Yamuna Velodrome behind Samadhi Complex to function as a diversion route for Ring Road.
- iv) N.H - 2 by-pass (90 m R/W) from Ring Road at DND fly way to UT Border along Agra canal.
- v) 30 m R/W road from Ring Road along Barapula Nallah to Mayur Vihar.
- vi) 30 m R/W Road from Ring Road to Marginal Bund Road along north of Railway line.

MRTS corridor

Presently the MRTS corridor from Shahadara to Rithala is passing along the ISBT Road. Another Metro corridor from New Ashok Nagar to Barakhamba Road has been proposed to pass along Marginal bund Road connecting the proposed Commonwealth Games Village site to Connaught Place. Further a MRTS corridor from Anand Vihar to Barakhamba Road has been proposed which will meet the New Ashok Nagar corridor south of Vikas Marg, thus providing a changeover point in this zone.

11.0 Urban design

The River Front Development provides a unique opportunity for developing a strong city image. Keeping this in view, broad urban design guidelines have been formulated. Two levels of urban design inputs are envisaged:

- i) River Front Development: At present the width of the river bed varies between 1.5 kms to 3.0 kms and at most sections neither the water course nor the opposite banks are visible. In order to integrate the river within the larger framework of the city and to bring the river closer to the citizens, at certain stretches, 'aesthetic' and 'active' river front development is desirable. These stretches may comprise of the following activities/uses with full complement of recreational activities for all sections of citizens
 - a) Bathing Ghats
 - b) Pedestrian Boulevards
 - c) Landscaped venues
 - d) Sports activities, play fields

ii) Wherever feasible, for short stretches of 2.3 kms, light motorways may be developed, suitably grade separated from the pedestrian corridors to provide exclusively for pleasure drives. Strong emphases needs to given to selection and design of appropriate hard and soft landscapes, signage system and outdoor furniture. Outdoor publicity in the form of large hoardings to be totally discouraged.

Development of other areas within existing bunds: In keeping with the vision of the MPD 2021 and DUAC (Conceptual Plan 2001 and Imaging Delhi) three dimensional development(restricted) is envisaged in the central areas which have good locational potential and are either comparatively free from inundation or can be made free from inundation expeditiously and/or at low cost.

12.0 Development Phasing

Keeping in view the fact that the zone presents different characteristics in different proposed sub - zones and also that the total area which is to be judiciously planned, phasing of development is imperative. The phasing of the development works could be on the following basis.

Certain proposals may not require any major development works and have relatively low financial implications. Some such proposals also covered under the Yamuna Action Plan like afforestation and plantation etc. similarly the pockets in the zone outside the Embankment will not require technical clearances of CWC (Yamuna committee). Lands under public ownership, with no specific assignment of uses and having good accessibility is highly susceptible to encroachment and unauthorized development and construction. Priority development of such lands will ease stress on the land management system. The suggested phasing is as follows:

12.1 Development Phasing

Phase	Stretch	Segment	Sub Zone	Approx Area(Ha)	Suggested Predominant Use
1	i) New Rly Bridge -NH 24 Bridge	East & West	06	To be decided based on data from concerned agencies considering safety against floods.	Recreational
	ii) NH24 Bridge -Proposed IL&FS Bridge		07		P & SP, Recreation, Utilities
	iii) IL&SF Bridge -Okhla barrage	West	07		Sports facilities ,PSP
	iv) ISBT Bridge -ITO Barrage	East & West	03&04		Recreation, Water Harvesting.

2	i) ITO Barrage - New Rly Bridge	East	05	-do-	Recreational, Transport
	ii) OKhla Barrage -UP Border	West(Part)	08		P & SP, Recreational
	iii) Wazirabad Barrage -ISBT Bridge	East & West	02		Recreational, Pondage, (water Harvesting)
3	i) Wazirabad barrage - Haryana border	East & West	01	-do-	Water Harvesting, Recreation

However, all areas susceptible to encroachments and /or unauthorized occupation will be taken up for planning and development on priority irrespective of the phasing suggested above.