

# **PATNA RIVER FRONT DEVELOPMENT PHASE II (FROM NAUZER GHAT TO NURPUR GHAT)**

## **CONCEPT PLAN**



**August 2013**



**SPONSORED BY: BUIDCo**  
Bihar Urban Infrastructure Development Corporation Limited  
(A Government of Bihar Undertaking)



**PREPARED BY: INTACH**  
The Indian National Trust for Art and Culture Heritage  
New Delhi

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## 1. Background

1.1 Urban settlements invariably require large supplies of water for their sustenance and hence, more often than not, are based on river banks. The ancient Patliputra, which was the seat of major empires, thus came to be situated on the Ganga River. The location was commercially vibrant with embedded as it was in fertile plains, but more importantly, at the confluence [prayag of 5 rivers], enabling riverine transport access to a large hinterland. The river course lay adjacent the 'uttar path' of north India, which linked westwards. Most importantly, the river constituted the sole trade lifeline as the bulk transport was by river till pre-colonial era. This aspect of the river effected the circulation pattern of the city with numerous riverside ghats [quays] situated at regular intervals servicing the river borne trade. This function of the river remained significant even in the colonial era and the colonial government connected ghats at Digha and Patna Sahib with adjunct railway tracks to transfer the goods to the main railway line from Delhi to Calcutta.

**In the last few decades the river borne trade has yielded to rail and road transport and efforts to revive it have thus far been fruitless. Consequently, the river banks, which were teeming with activity, became a neglected backyard of the city, which began orienting towards the New Capital Area to the west of Patliputra.**

1.2 Rivers in the Gangetic plains have a habit of meandering, i.e., changing course. In India this is a prominent feature of rivers which swell in the monsoon, occasionally suddenly, and the torrential movement carves out a new course in the soft alluvial plain. The Ganga River, in Patna, has meandered and migrated northwards in the Patliputra area. This migration has resulted in deposition of earth on the south [right] bank of the river and created a massive space of a few hundred hectares between the urban development line and the active river channel. Today, decision makers recognize the value of public access to the waterfronts. A renewed waterfront offers investors a promising return on capital. Cities enjoy increased tourism, employment and growth. Resident gains new recreation opportunities and an expanded awareness of the natural aspects of river life.

1.3 Under the National Ganga River Basin project the Govt. of Bihar has taken a decision to actively shape the river front. The focus of the proposed project is to revive the River Ganga through river cleaning and interventions, aimed at enhancing the functional and scenic heritage of the river. Special attention is being laid to ensure reviving and conservation of the inner city fabric in the core city area along the river banks. The river front has been divided in to two parts :

- **RFD I** which constitutes the reach from Collectorate Ghat to Rani Ghat
- **RFD II** which will address the reach from Nauzar Ghat to a point approximately 7.5 km. downstream [Bakhtiyarpur]

The current thinking amongst administrative circles is to undo the unregulated development and activity on the southern shoreline, conserve the historical landmarks, integrate the open spaces with the built areas of the city and majorly enhance the quality of life for the citizenry.

## 2. Project Aim

The project has multiple objectives as follows:

- To develop the Ganga River Front area from Nauzer Ghat to 7.5 km downstream inclusive as a public space in Patna city
- To re-orient the city towards the river
- To strengthen the city's identification with the river
- To provide the congested Patna City [Patliputra] with green lungs
- To prevent the unregulated use of the large parcel of land

## 3. Scope of Work

- Compiling of data base
- Preparation of master plan.
- Preparation of landscape plan.
- Preparing Architectural design of proposed building components.
- Structure analysis & design of proposed infrastructure components ( ghats, facilities, building etc.)
- Necessary support and active involvement in getting approval and clearness from state & central govt. regulatory bodies.
- Preparing detail specification, BoQ, costing & tender documents.

The following works will carried out :

- i) Inception Report : background, area description, stakeholder requirements and opportunities
- ii) Database Report:
  - **Secondary Database**
    - Data from Irrigation Dept & Flood Control Department including details of protection works, High Flood Level, Scouring and Erosion Risks, lean season river depth, soil investigations including lithologs and water table depth [the data will be provided in a timely manner by these departments to our personnel with assistance of BUIDCO]
    - Data regarding alignment of Ganga Expressway in subject stretch [the data will be provided in a timely manner by these departments to our personnel with assistance of BUIDCO]
    - Data from Revenue Department regarding land ownership [the data will be provided in a timely manner by these departments to our personnel with assistance of BUIDCO]

- Data from Municipal Corporation regarding ownership and extent of encroachment of select properties in built area along river front [the data will be provided in a timely manner by these departments to our personnel with assistance of BUIDCO]
- Data from land registration department regarding land/property price of select properties [the data will be provided in a timely manner by these departments to our personnel with assistance of BUIDCO]
- Draft Master Plan proposals
- Other proposals for infrastructure improvement around Patna Sahib
- Demographic data of adjacent wards

- **Primary Database**

- Plane table survey of the project area
- Soil bio-chemical composition testing at 6 locations
- Location and significance of heritage and institutional assets along the building line
- Location and quality of existing access streets to river front
- Drainage outfalls in the area
- Analysis of impacts of proposed RFD plan on adjacent city area and interface with Expressway

iii) **Conceptual Plan** : The concept plan would include :

- Expressway alignment and works as proposed by authorities
- RFD proposals emerging from analysis of data base including block cost estimates
- Presentation, discussion and approval of Conceptual Plan at stakeholders workshop

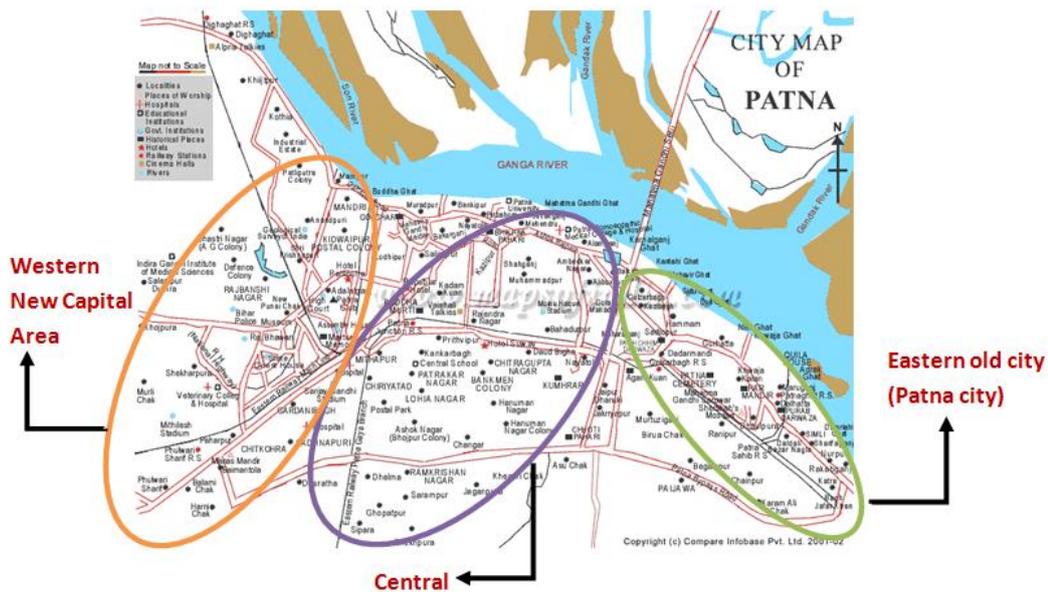
iv) **Final Plan and DPR** : This would include :

- Final proposals for RFD with detailed drawings
- 3 D view
- Detailed specifications, BoQ, cost estimates, tender documents broken down into separate DPR packages
- Preparation of Tender Documents and assist BUIDCo in selection of Contractors during their evaluation and negotiations.

## 4. Location

4.1 Patna, the capital of Bihar, is located 53 metres above sea level, latitude 25°35'40" North, longitude 85°08'38" East. The city is situated in a high risk earthquake zone, as well as a flood risk zone, particularly with regard to the Punpun and Ganga rivers. Embankments have been built along the former to control flooding, but during the monsoon, spill over from the Ganga frequently floods large parts of the city.

## PATNA RIVER FRONT DEVELOPMENT PHASE II (From Nauzer Ghat to Nurpur Ghat)



Map I Division of Patna

## 5. Brief History of City Evolution

**5.1** The history of Patna goes back well over two millennia. The city was the seat of government for a series of successive kingdoms that dominated North-eastern India – and sometimes beyond – between the 6th century BC and the 4th century AD, and remained a regionally important centre subsequently. Patna was originally known as “Pataliputra”, and its renown was such that it is mentioned by the Greek historian Megasthenes in his writings during the 4th century BC (Gupta, 1998). The city was built due to its location presenting certain key strategic advantages. It is a riverine settlement, surrounded by the Ganges to the North, the Punpun to the south, and the Son to the east, with a fourth river, the Gandak, just a little to the North of the city. This particular geography gave Pataliputra an undeniable edge over rival cities, both in terms of being an easily defensible site, but also by virtue of being able to control trade, which at the time mainly operated along river waterways.

**5.2** Pataliputra grew rapidly during the next few centuries, and became a centre for scholarship and religion. The world’s first university was founded in nearby Nalanda, while the Buddha achieved enlightenment in Bodhgaya, also not far away. The rulers of Pataliputra – including the famous Emperor Ashoka – actively extended their patronage to Buddhism, as well as to Jainism, another major world religion which also emerged locally around the same time. Indeed, the city’s association with religion has persisted through the ages. Guru Gobind Singhji, the 10th Guru of the Sikhs, was born in Patna in 1666 AD and has endowed the city with the Takht Harmandir Sahib and with the Kangan Ghat Gurdwara as well as the Kangan Ghat on the river bank. The city was also the founding place of an important Sufi sect, the Firdausi. Indeed, Patna today remains the gateway to major international religious centres, and is a stop on numerous pilgrimages.

- 5.3** Although Pataliputra lost its capital status during the reign of the Guptas in the 4<sup>th</sup> century AD, the city nevertheless remained as an important cultural and economic centre. During the early medieval period, however, Pataliputra began to lose its pre-eminence as economic and political power moved to the Northwest of the subcontinent with the invasion of the Turks and the Mughals from the 11<sup>th</sup> century onwards. Because of its strategic location, Delhi became the new political centre of India, but Pataliputra remained an important provincial capital. The name Pataliputra was changed to Patna by a 16th century governor called Sher Shah Suri, although later, during the governorship of Azimusshan, the son of the Mughal emperor Aurangzeb, the name of Patna was changed to Azimabad.
- 5.4** Following the decline of the Mughals, the city passed into the control of the Nawabs of Bengal, and became known as Patna once again. During the 17th century, Patna became an important trade centre. The Portugese, Dutch, French, English, and the Danes all came to Patna due to the city's position along major river waterways, and it became a major depot centre for calicos (cotton cloths), dye and food grains, as well as saltpetre, something which became increasingly important due to its importance for the manufacture of gunpowder. The British trader Peter Mundy, writing in 1632, called Patna "the greatest mart of the Eastern region".
- 5.5** Patna fell into the hands of the East India Company following the battle of Buxar in 1765, which marks the beginning of the British colonial period in Bihar. Patna remained an important regional trading centre, as well as a gateway to Calcutta – present day Kolkata – from the Northwest, and became the capital of Bihar Province following the division of Bengal Province in 1911. Since India's independence in 1947, Patna has served as the state capital of Bihar. It remains the most important city in the state.

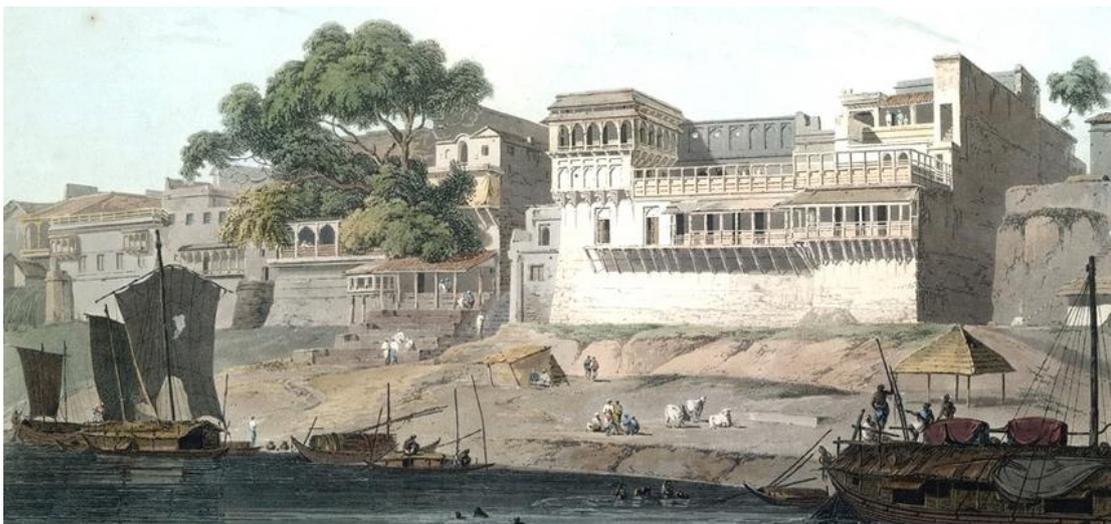


Figure 1: Patna River Front During Ashoka Period

- 5.6** It is a linear city which has grown on either sides of the main road (Ashok Raj Path) running east to west on a ridge, almost parallel to the bank of the Ganges river. Patna's urban development was more or less unplanned until the beginning of the 20th century. During British colonial rule, monumental edifices such as the Patna Museum or the High Court were

built to the West of the old historic city, in an area known as the New Capital Area. This was further developed following Patna's devastation by an earthquake in 1934. Patna is thus divided into three areas – an eastern old city (Patna City), a central area extending from Mahendru to Patna Gaya Road, and the western New Capital Area.

**5.7** The city had an intimate association with the river due to the river borne trade. This trade resulted in the city having numerous ghats [quays]. Some of these Ghats were well constructed with steps to negotiate the water level in the river. The Ghats were connected to the city through lanes, adequately wide at one time, but now quite narrow. Boats would be anchored here and the boatmen would live around them. Steamer service would come in all the way from Calcutta and go further up the river. With the decline of river borne trade the Ghats are now out of service and the city has turned its back to the river.

**5.8** A large number of Devotees offer prayers to Lord Sun at the bank of River Ganga during Chhath Puja in Patna. It is also seen that the old Patna City abuts the RFD II and this segment of the city is an organic development with congested lanes, deficit in open spaces and green infrastructure. The gaping water filled pits made by the kiln owners are also akin to cesspools and act as a vector breeding sites. The lanes connecting the RFD II to the city cross these pits over narrow causeways. It is a moot point whether to conserve these pits as water bodies or to fill them up and landscape the land.

## 6. Vision of River Front

**6.1** Historically, riverfront began as transportation hub as well as commerce centre and seen as focal point in many cities. Due to various reasons such as changing in transportation and character, riverfronts declined in its popularity. Awareness of the natural environment and preservation of ecosystem and resources has increased the public demand for revitalization. Outdoor recreation is becoming popular among people, and riverfront parks are one of the favorite locations for such activities. A good riverfront development is development that considers diversity, community engagement, safety and security, environment and



Figure 2: River Front Section West of Gandhi Sethu

sustainability. **Creative landscapes in riverfront development will perform functions in**

providing light, air and “restorative” green spaces. Embedding these types of green infrastructure features into walkways, streets and open space can create physical, visible and conceptual connections between upland areas (and their residents) and the public space in riverfront area. The main objective of green infrastructure is to establish a healthy green edge to riverfront or riverside area by increasing riverfront access and diversifying transport options, combined with developing a sustainable storm water management initiative. The integration of soft infrastructure such as shrubbery and trees along the greenway creates a pedestrian-friendly path and an attractive.

**River Front Development has several objectives :**

- a) Foremost is to reconnect the river Ganga with the city by enabling access and providing a public social and recreational space which attracts the public
- b) A riverfront is an asset to the image of the city
- c) To re-orient the city towards the river
- d) To strengthen the city’s identification with the river
- e) To provide the congested Patna City [Patliputra] with green lungs
- f) To prevent the unregulated use of the large parcel of land
- g) Inner city regeneration by linkages to new circulation routes, increased land values

## 7. Ganga Ghats

**7.1** A number of ghats have developed over the course of time and often their names [such as Mirchi Ghat] disclose their main purpose.. Some ghats are new whereas most of the ghats are old, having some story behind it. At present there are 16 ghats in the stretch of Nauzar ghat to Nurpur ghat. Damiahi Ghat near the SE end of RFD II is now the only active Ghat with regular boat crossings to the northern bank. Many of the Ghats are now defunct and are only a name with no structure or steps to demarcate their presence.



**Figure 4: View of Ganga Ghats During Chhath Puja**



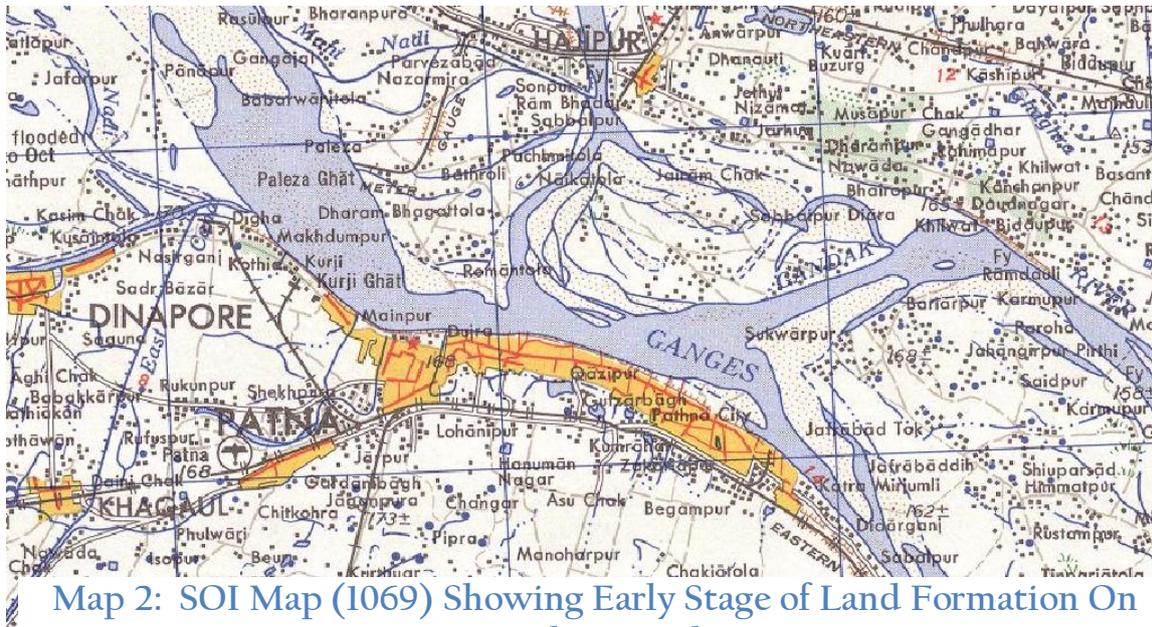
**Figure 3: Construction of Road at Kangan Ghat**

**7.2** Most of the ghats have temples situated nearby. Guru Govind Singh Ghat is situated in the Patna City area, roughly 200 yards from Takht Harmandir Sahib. It is popularly

known as Kangan Ghat, where child Guru Govind Singhji had thrown his gold bangles. This ghat is quite popular among the residents. A concrete pathway is being laid by the local govt. from Gurdwara Kangan Ghat to the river.

## 8. The River Front

**8.1 Meandering Of The River:** The river has meandered away from the southern bank. The Sol map of 1931 shows the land formation on the southern bank in the Takhat



Patna Sahib stretch in progress. However, now the land formation is complete and the need is to protect it from erosion during high discharge in the river.

### 8.2 Physical Parameters:

- The maximum width of the land [between built area line upto active flow channel is 600m opposite Patna Ghat Station
- The minimum width of land strip is on the extremes coming down to as little as 25m
- The total length of RFD II works out to 7.5 km. from Nauzar Ghat to Nurpur Ghat plus.
- The total land mass to be addressed is 210 ha of which approximately 160 ha is adjacent Takhat Sahib
- Area of land under water ponds is 24 ha

**8.3 Land Ownership:** In the main the land belongs to the Govt. of Bihar. However, it is observed that the area has been captured in the main by brick kiln owners [approximately 45 no.s] who have excavated the soil for brick making, housed their onsite offices and labour, and their excavations have pockmarked the plain with gaping pits filled with water having an area spread of 24 ha. It is understood that the kiln owners do not own the land and that their illegal occupation will be ended by the GoB for the purpose of the project. The Takhat Sahib committee also claims ownership of some of the land. The building line

is not regular and several legal and illegal constructions extend beyond the building line towards the river. Temporary settlements of kiln labour and other free loaders using the land for local dairy activities dot the landscape.

**8.4 Jurisdiction :** The land in question falls in Vaishali Distt. As such the Patna local bodies will have to deal with Vaishali Distt. to consolidate the land.

**8.5 Architectural Character :** Most of the architecture fronting the river stretch in RFD II [unlike RFD I] is of a non-descript nature and displeasing to the eye. There is no elegance, discipline or style. Very few of the buildings have character. This downgrades the entire visual aspect and is a major problem to be dealt with. Buildings with a distinct architectural style may be noted as follows [see map] :

- a) Govt. Press at Nauzer Ghat [formerly the Opium Godown]
- b) Chitragupta Temple 300m downstream
- c) Masjid Astana [Khanqah] further 1000 m downstream
- d) Diwan Mohalla at Mitan Ghat further 300m downstream
- e) Infan Jesus School further 600m downstream at Terhi Ghat
- f) Rani Sati Mandir further 400m downstream at Keshorai Ghat
- g) Shiv Mandir, Kangan Ghat Gurdwara further 400m downstream
- h) Masjid further 100m downstream
- i) Qila House further 200m downstream
- j) Masjid 400m downstream

In general the architectural façade has little character and discipline which visual frame is getting distorted by the unregulated construction of high rise modern blocks as illustrated by the following examples:



Figure 5: Brick Making Activity Dominates The Stretch



Figure 8: Heritage Building Visible On RFD II



Figure 6: Shelters of Brick Kiln Workers Occupy Flood Plain



Figure 7: Distinct Architecture Of The Quila House Getting Concealed Behind Jhuggis



Figure 9: Unregulated Multi-storey Flats Near Takhat Sahib Projecting Visually On The Landscape



Figure 10: NIO Building Architecture Strikes A Discordant Note



Figure 11: Geobags Experiment By GoB To Prevent Bank Erosion



Figure 12: Bank Erosion As A Result Of Flood Flow



Figure 13: Unregulated Multi-storey Flats Near Takhat Sahib Projecting Visually On The Landscape



Figure 14: Garbage Dumping & Defecation Ground Presently



Figure 17: Industrial Architecture Forms The Skyline Towards Eastern End



Figure 15 : Poor Architecture Will Ruin The Character Of The RFD II



Figure 16: Several Masjids Are Part Of The Line Building

## 9. The Ganga Expressway

- 9.1 Of great significance is the proposal for Ganga Expressway which is proposed as a local urban artery from near Hajipur Bridge [Ashok Rajpath] south-eastwards to NH 30 along the shoreline. The Expressway has been proposed as some 60m wide and is partly based on piers in the river bed and on surface wherever available. The project will bring in some heavy traffic movement which will vitiate the ambience of the river front. It will also cut off direct access to the river for residents. In the view of INTACH it would be best if the project were avoided [an arterial road parallel and just south of the railway line would be a better substitute at this point of time]. If the Expressway cannot be avoided then it should be narrowed down to a 4 lane road 30 m wide [this will greatly reduce costs] and be regulated to exclude commercial goods traffic. The on-surface sections should also be based on piers in order to remain serviceable in the face of extreme flood erosion.

## 10. Access

- 10.1 In general the access to the river front from the city is rather poor, being through narrow winding lanes which cannot be easily widened. These range between 2m – 5m wide average width being about 3.5m. Five possibilities of main access are as follows:

- Lane east of Govt. Press
- Sadr Gali at Khajekalan Ghat
- Proposed access widening at Kangan Ghat
- Proposed access through Patna Ghat Station
- Access from NH30 at Bakhtiarpur

In view of the restrictions to any form of traffic movement commercial and institutional areas would not find this location encouraging unless smooth traffic access and parking is guaranteed.

## 11. How To Hold Up A Bank

- 11.1 The shoreline is greatly prone to erosion especially in the monsoons. Earlier methods of stone pitching have not been effective and on experimental basis geobags piling is being



Figure 18: Erosion Control with Sedge Grass



Figure 19: Erosion Control with Jute Bags

carried out. Natural solutions, in this case are cheapest and most effective using grass binding. The natural grass suitable for this purpose and native to the area is *carex caryophylla* which is also known as 'wet meadow sedge'. This is highly effective and economic form of soil retention as the root system of the grass grips the soil closely and the dense grass dulls the erosive effect of high velocity river flow by leaving little space for soil and moving water contact.

## 12. High Flood Level And City Drainage

12.1 Floods regularly hit Bihar during the June-September monsoon season as the Ganga and its tributaries, many of which flow in from neighbouring Nepal, breach their banks. After several continuous floods, govt raised the river bank which does not allow flood water to enter in the city. Still, substantial area of RFD II is prone to flood inundation.

The lean season flow in the river is at a level of 51.5 mamsl whereas the high flood level is at 61 mamsl a difference of 8.5m in elevation. It is seen that the entire RFD II area [average level 53 mamsl] gets submerged under water in the monsoon season to an extent of 7m and water comes into the building line inside the various 'gallis' [lanes] as can be seen in the following images. The implications are :

- that large parts of the RFD II will remain unusable for perhaps a couple of months until the water level goes down
- that little permanent constructions of buildings can be advised and that all built features would be constructed above HFL either by way of being made on stilts or on raised earth mounds
- that circulation features must be built above the HFL at say 62 mamsl



--- High flood level

Map 3; High Flood Level And Area Submerged Under Flood

- that thanks to the Ganga Expressway, which will be built on a raised berm in most of RFD II, the surface area will be partially protected from river submergence while simultaneously facing a lesser degree of submergence from stormwater influx from Patna City as well as direct rainfall which will be difficult to drain off while the river level is higher than 53m level
- that electrical features would require especial safety precautions



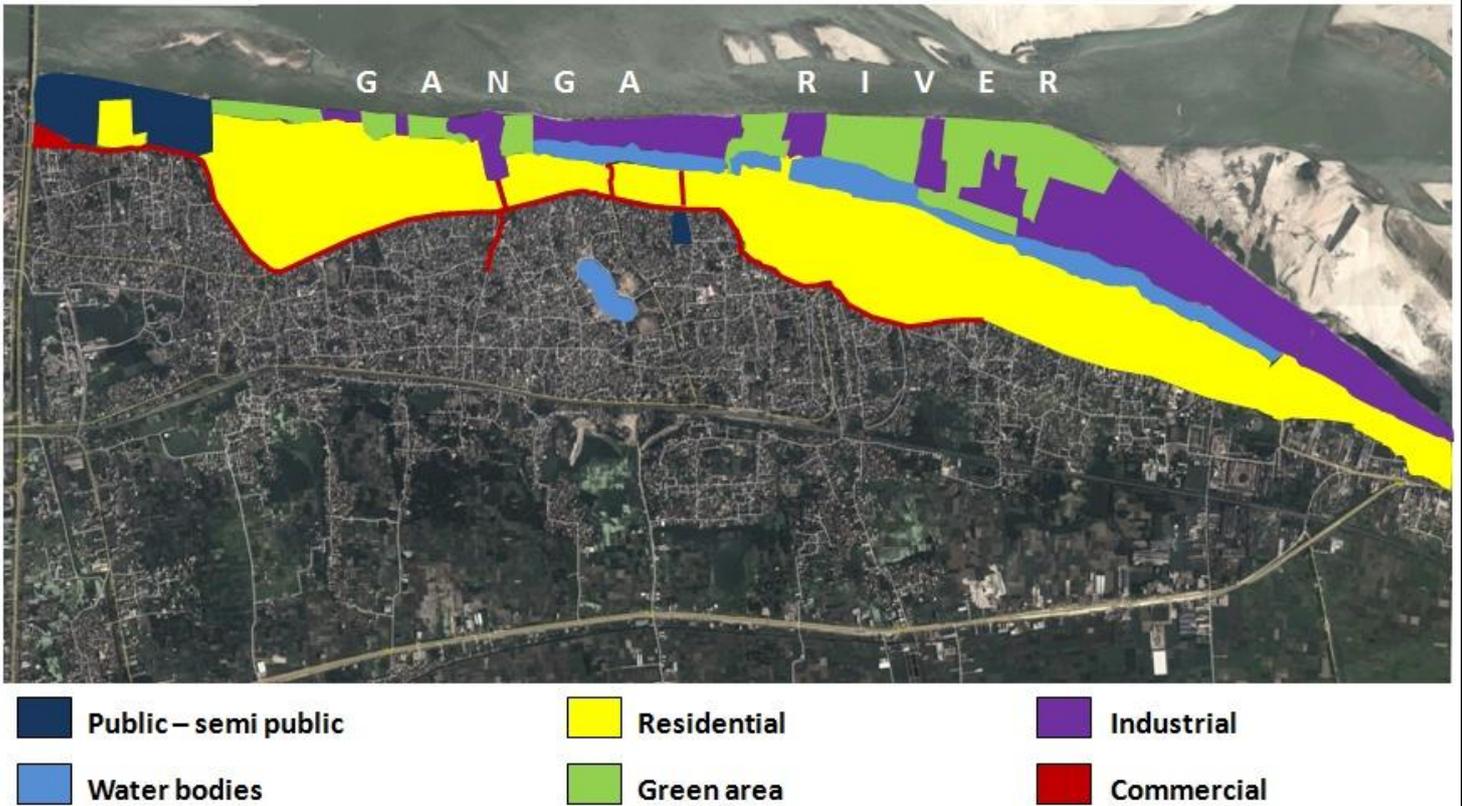
Figure 20: Water Enters Building Line On Kangan Ghat [1 August, 2013 – This Is Still 1 m Below HFL]



Figure 22: Under Construction Pathway To Kangan Ghat Facing Submergence



Figure 21: Building Encroachments On RFD Plain Unusable



Map 4: Land Use Map of Patna City along River Ganga

### 13. Physical Infrastructure condition

**13.1** Patna suffers from a problem of plenty of water, sewage and solid waste. It depends on the Ganga and groundwater for drinking. Less than 10 per cent of the city's population is connected to a sewage network; which means 90 per cent of the city's excreta is discharged into open drains and eventually into the Ganga river.



Figure 23 : Untreated Sewage Discharge In Ganga



Figure 24 : Poor Living Condition



Figure 27 : Lack of proper drainage system



Figure 28 : Chocked Drain & Water Spread On the Road



Figure 25 : Dumped Solid Waste Near Water Bodies



Figure 26 : Solid Waste Near Residential Area

## 14. The Planning Criteria

Having familiarized with relevant characteristics of the river front and its abutting premises as well as the overarching feature of the Ganga Expressway and the concepts proposed in RFD I, the following planning criteria emerge :

- 14.1 Access to river front, presently, is through narrow lanes. This picture will change with
- construction of Expressway
  - road access from Old Patna Ghat Station to be extended to X-Way
  - Sadr Gali upgradation
  - Road adjacent Govt. Press
  - Provision of a 7.5 km long pedestrian pathway to which all lanes will connect
  - Formal upgradation of Ghats with occasional jetties enabling dispersed boat embarkation/disembarkation points combined with tunnels under Expressway to connect with land mass

- 14.2 As reported earlier the architecture of the built area edge is visually repulsive in the main and this situation is further compromised by lack of regulation of building activity. While the access features proposed above would re-orient the city edge towards the river and, combined with good building regulations seriously implemented, may over a couple of decades, improve the river facing architecture quality, this is not inevitable. Hence, it is proposed to create a screen of trees in the main. Apart from trees at suitable stretches where supported by road access a tightly controlled architectural component consisting of mixed use and institutional areas would be developed as a screen in other areas – this would also provide a remunerative element from which maintenance of the river front could be financed. Architectural landmarks such as Quila House, Kangan Ghat Gurdwara and Takht Sahib, Chitragupta Mandir and Govt. Press would be highlighted to retain the positive elements of the city fabric.
- 14.3 Water Channel :The water filled linear pits occupy a length of 5 km. These would be costly to fill up and the landscaped area would require heavy maintenance cost. Instead, the pits can be combined and connected at eastern and western end to the river. This would result in an internal water channel which would be reminiscent of the old location of the river channel. This would require careful estimation of the bed levels and control of silt inflow during the flood season by installation of gates below the X-Way.
- 14.4 Patna City [Patliputra] in the RFD II stretch is a very congested area with high population density, narrow roads and lacking in a network of green spaces. To a great extent the RFD II will compensate for this lacuna by providing a varied green landscape, recreational and sports facilities. Several forest zones will also be provided to increase carbon sinks and fresh air.
- 14.5 The old Ghats structure will be retained and highlighted. Prominence to ghats will be given by formalizing their structure and facilitating passenger boat landing. A major jetty would be added at Patna Sahib Station axis and Damiahi Ghat
- 14.6 Erosion of River Bank : the vulnerability of the river edge to erosive forces during flood season would be addressed by planting a strip of tall native grass [*carex caryophyllea* which is also known as ‘wet meadow sedge’]. This would not only prevent erosion by biological methods which are highly economic and requiring no maintenance but also provide riparian habitats to birds and river fauna.
- 14.7 Inundation aspects : once the topographical survey of the area has been completed the area vulnerable to inundation will be known. Here, it will have to be adjudged as to the extent of protection the X-Way embankment would afford to the RFD II area and to what extent it would act as a hindrance to drainage outflow to the river and keep

the vast plain under submergence. A possible trap drain may have to be considered along the linear pathway adjacent the building line to channel the city drainage to the extremes

- 14.8 Lighting : Solar photovoltaics based lighting will be promoted along the walkways. Other floodlighting with sodium vapour lamps would be introduced to light up the open spaces.
- 14.9 Temporary city and mela grounds: a space has been earmarked for a temporary tented city for pilgrims coming to attend the 350<sup>th</sup> birth anniversary celebrations of Shri Guru Gobind Singh. This would be supported by mobile toilets and no permanent construction is envisaged. Post the event the grounds will be available as a mela ground or exhibition ground against revenue.
- 14.10 Public conveniences and commercial kiosks would be provided at suitable locations. This will keep the area buzzing with activity while providing ‘eyes on the street’ for security purposes.

## 15. Block Cost Estimate

S No.	Sub-Project No.	Item Description	Cost [Rs.]
1		Provision For Land Acquisitions x 30 ha	50,00,00,000/-
		<b>Sub-Total I</b>	<b>50,00,00,000/-</b>
2	RA1	Earthworks : <ul style="list-style-type: none"> <li>Realignment of internal water channel [cut and fill] including dewatering for achieving the same [500,000 cu.m.]</li> <li>Dredging of internal water channel to align with river bed levels for flow [600,000 cu.m.]</li> </ul>	15,00,00,000/- 12,00,00,000/-
3	RA2	Earthworks : Bringing earth [3 MCM] from outside, laying in layers and dressed to shape, consolidated, for raising : <ul style="list-style-type: none"> <li>various walkways</li> <li>tree planting strips</li> <li>parking areas</li> <li>institutional area</li> <li>riverside facilities</li> <li>landscape grading</li> </ul>	90,00,00,000/-
		<b>Sub-Total II</b>	<b>117,00,00,000/-</b>
4	RB1	Making steps and Ghats along river edge incorporating : <ul style="list-style-type: none"> <li>excavation</li> </ul>	

**PATNA RIVER FRONT DEVELOPMENT PHASE II (From Nauzer Ghat to Nurpur Ghat)**

		<ul style="list-style-type: none"> <li>• dewatering</li> <li>• Lean concrete foundation</li> <li>• RCC foundation incl. steel reinforcement</li> <li>• Construction of steps in RCC</li> <li>• Red sandstone flooring</li> <li>• Red sandstone chattris and stone pillar lamps</li> </ul>	4,00,00,000/-
5	RB 2*	Construction of Riverside facilities : <ul style="list-style-type: none"> <li>• Boat jetties at Damiahi Ghat and Patna Ghat</li> <li>• Viewing Tower with Elevators [PPP basis]</li> <li>• Riverside Facilities [PPP basis]</li> <li>• Construction of Kiosks</li> <li>• Construction of Public Conveniences</li> </ul>	30,00,00,000/-
6	RB3	Erosion Control : Plantation and establishment of river edge sedge grass [25000 sq.m]	40,00,000/-
<b>Sub-Total III</b>			<b>34,40,00,000/-</b>
7	W 1	Construction of Walkways [Brush finished RCC [M 200] with MS reinforcement, over LC [1:4:8], over consolidated earth] <ul style="list-style-type: none"> <li>• 15m wide [5500 m]</li> <li>• 10 m wide [5000 m]</li> </ul>	29,75,00,000/- 18,00,00,000/-
8	W2	Improvement of 16 No. Lanes [approx length 150m each] accessing RFD II :	12,00,00,000/-
9	W3	Construction of Bridges [15 No.s] crossing internal water channel	15,00,00,000/-
10	W4	Construction of stepped ghats on both sides of internal water channel	50,00,00,000/-
11	W 5	Construction of mechanically operated gates for controlling water flow and silt at both ends of internal water channel at connection points to River	10,00,00,000/-
<b>Sub-Total IV</b>			<b>134,75,00,000/-</b>
12	L 1	Plantation of trees in screening strip, forest zones, etc. Including pit preparation, tree guards	15,00,000/-
13	L 2	Landscape works [grass, flowers, pavings, features]	15,00,00,000/-
14	L 3	Dancing Water Fountains [15 no.s]	2,00,00,000/-
15	L 4	Construction of sports facilities and courts [incl. astro turf hockey field]	5,00,00,000/-
16	L 5	Jal Mahal and geometric gardens and pathways	10,00,00,000/-
17	L 6	Construction of floating stages in inner water channel	1,00,00,000/-
<b>Sub-Total V</b>			<b>33,15,00,000/-</b>
18	B 1**	Construction of Club [3 ha plot area] in PPP mode	16,00,00,000/-
19	B 2**	Construction of institutional area/mixed use development with controlled facades [11 ha plot area, built area 100,000 sq.m.] in PPP mode	250,00,00,000/-
<b>Sub-Total VI [Not Taken in Total As Privately Financed]</b>			<b>266,00,00,000/-</b>

**PATNA RIVER FRONT DEVELOPMENT PHASE II (From Nauzer Ghat to Nurpur Ghat)**

20	E 1	Installation of high mast floodlights [20 no.s]	1,00,00,000/-
21	E 2	Installation of LCD streetlights @ 20m spacing along walkways [750 no.s] [solar photovoltaics supported]	4,50,00,000/-
22	E 3	Electrical cabling, switchgear, sub-station, gen set backup, miscellaneous lighting and power supply	15,00,00,000/-
		<b>Sub-Total VII</b>	<b>20,50,00,000/-</b>
23	M 1	Street Furniture	2,00,00,000/-
24	M 2	Graphic Signages	1,00,00,000/-
25	M 3	Playground Equipment [including boats]	2,00,00,000/-
26	M 4	Chain link fencing	4,00,00,000/-
		<b>Sub-Total VIII</b>	<b>7,00,00,000/-</b>
27	T 1	Construction of Road to Patna Ghat [350m x 45m ROW]	9,50,00,000/-
28	T 2	Construction of Road from Old Patna Ghat Station to X-Way [2800m x 30m ROW]	50,00,00,000/-
		<b>Sub-Total IX</b>	<b>59,50,00,000/-</b>
29	H 1	Water Supply Infrastructure for Irrigation, public conveniences, proposed institutional buildings and mixed developments consisting of : <ul style="list-style-type: none"> <li>• Shallow Tubewells x 15 no.s</li> <li>• 5 MLD local water treatment plant</li> <li>• Supply pipelines</li> <li>• Sprinkler system</li> </ul>	1,00,00,000/- 2,50,00,000/- 2,50,00,000/- 4,00,00,000/-
		<b>Sub-Total IX</b>	<b>10,00,00,000/-</b>
30		<b>Contingencies</b>	<b>45,00,00,000/-</b>
		<b>GRAND TOTAL</b>	<b>511,30,00,000/-</b>

**[Rupees Five Hundred Eleven Crores Thirty Lakhs Only]**

\*Remunerative Projects

\*\* Remunerative projects not taken into estimated cost

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