‘LIVING ON THE EDGE’

Water and the city of Pune

Aditya Deshmukh | EMU | Venice2014

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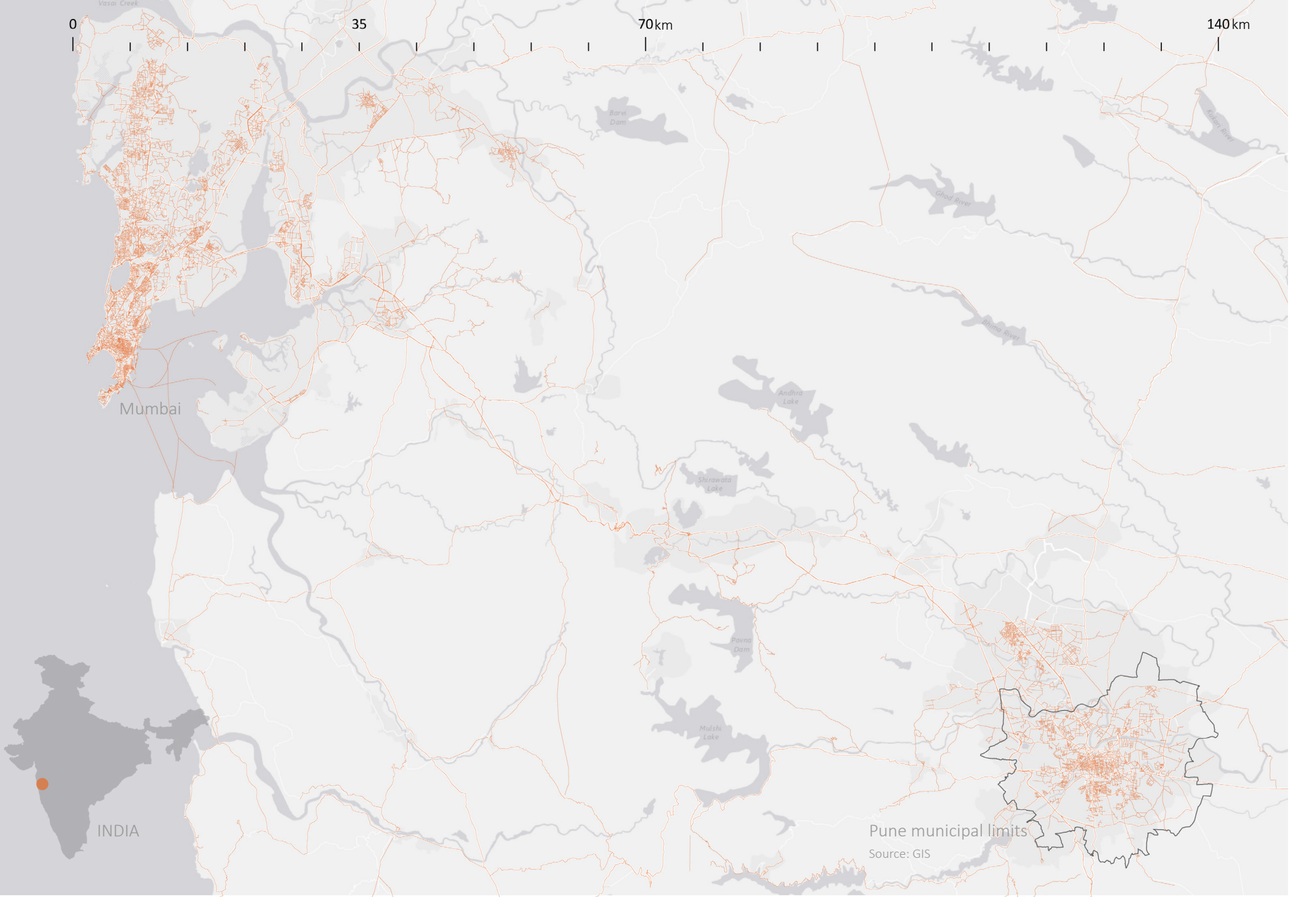

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Recent illustration about Pune city highlights the river as common element between old and new parts of the city, where this common reference point between the two in in state of neglect.

Preface

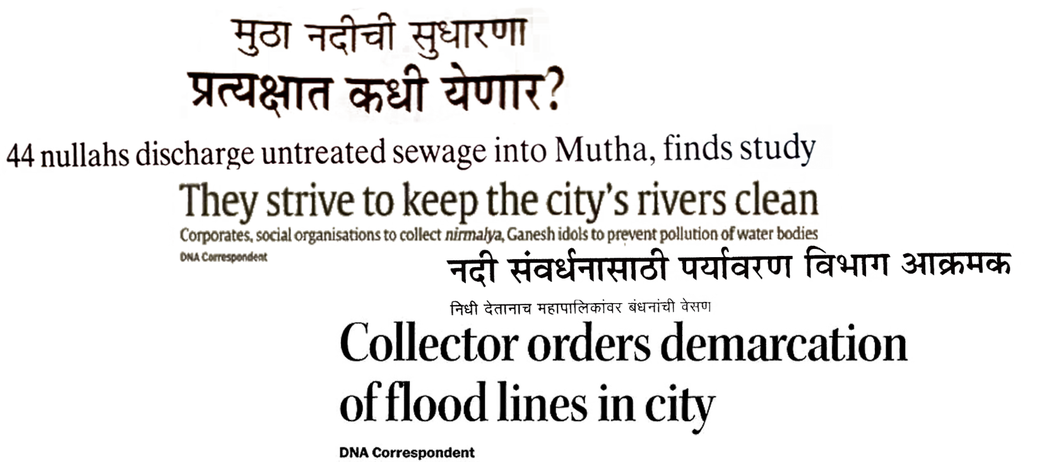
Pune (India) city is located 180km to the south-east of Mumbai, in the country's one of the biggest state of Maharashtra. With a population of 3.11 million (Population census, 2011), it is the 8th largest city in India. In the last two decades it has experienced a tremendous urbanised growth but it still remains a place where past meets the present. Rich cultural heritage, vernacular architecture and traditional customs make the city cultural capital of the region. Moreover, Pune is also known as the Oxford of the East for its large number of high quality educational institutions, of which some date back to the British rule. On the other hand Pune hosts, the country's second biggest InfoTech Park with more than 200 global software companies having their offices spread over approximately an area of 100 hectare. Alongside the Info tech Park the northern edge of the city is shared by the industrial twin town of Pimpri-Chinchwad. As these two areas play an important role in the city's economics, they also act as magnets, attracting influx of migrant population in the city. However, this population also includes economically poor sections from rural areas of the country, resulting in the rise of informal settlements within the city [As of 2012 32.5% of the total population in Pune live in informal settlements (Times of India, 2012)]. Therefore, in this time of shifting realities, one can not only experience the old traditional alleys and vernacular architecture in the old city, but also can encounter the globalized face of the city in the form of high-rise integrated residential townships and commercial big boxes along with a localized decay in the form of informal settlements. This mixture of old and new in a particular way is the identity of the city today. Thus a true citizen (Punekar) always exclaims by saying:

"पुणे तेथे काय उणे!!!"
(There is nothing lacking in Pune)

However, the two paradoxical faces of Pune share one thing in common, and that is the natural water courses (rivers and streams) flowing through the city, originating in the range of hills to the west and south of the city. Just like most of the cities around the world which initiated along water courses, Pune too laid its first stone along the right edge of river Mutha (flowing south-west to north-east) which formed its western boundary. River Mutha meets river Mula (flowing north-west to east) at the north cast tip of the city (the confluence termed as Sangam in local parlance). The joint river Mula-Mutha formed the city's northern edge. Subsequently over the course of time the city jumped over its river to expand its boundaries. Looking back carefully to the past, close association of the city with water can be seen through social and cultural production of space along the water edge, in the form of temples and gardens, as water being one of the sacred elements in Hindu mythology. However, on the contrary, today the rivers are not more than sewers in the city. Disposal of solid domestic waste has led to high levels of pollution in the water, and as the matter of the fact these water courses are channelized and engineered to get the water out of the city as early as possible. This as a whole is not only affecting the ground water table and ecology within the city, but also influencing the contextual social and cultural association of the city with water.

The cultural past of the city cannot be perceived without considering the existence of water in the city. Whereas the present state of negligence highlights the urgency and the impact of the issue especially in these crucial times of climate change. Therefore the immediate questions which arise are how and why did the cultural and social association of the city with water led to negligence in the contemporary context? Can city and nature reciprocate each other for a better and resilient future? Can the issue of negligence be tackled by means of urban planning and design? These are the questions which led me towards my thesis.

This research, through planning and design will give me an opportunity to investigate and reflect onto many topics, such as interdependency of city and nature and the metabolism of the city which encompass different material and energy flows within the city and their reciprocities. Whereas on the other hand this research will also give me chance to contemplate on to the role of different actors in steering up the change, not only through local initiatives, but also top down decisions, influential on local, regional and metropolitan scale. The knowledge gained in the past two years through different research and design studios in the European post-graduate masters in Urbanism (EMU) - the relationship between urbanization and mobility (Urban Region Networks); the landscape urbanism approach to study how city and nature are part of the same system (Constructing the sustainable Delta city); the city seen as a renewable resource, subject to recycling (Recycling City) - is cogitated and expressed in the following work on Pune city.


मुठा नदीची सुधारणा
प्रत्यक्षात कधी येणार?

44 nullahs discharge untreated sewage into Mutha, finds study

They strive to keep the city's rivers clean

Corporates, social organisations to collect *nirmalya*, Ganesh idols to prevent pollution of water bodies

DNA Correspondent

नदी संवर्धनासाठी पर्यावरण विभाग आक्रमक

निधी देतानाच महापालिकांवर बंधनांची वेसण

Collector orders demarcation of flood lines in city

DNA Correspondent

News paper headlines on various water raelated issues in the city

Introduction

With only 2% of the world population urbanized in 1800, global population reached 15% mark in 1900 and today almost 1, 80,000 people are adding up the world's urban population every day (Pitale, 2011). However urbanism can not only be argued to be the science of the city, but also postulated as a discipline that holds the capacity to steer the transformations of the city and its rational development (De Meulder and Shannon, 2008). In order to gain public interest or impose policy agendas, evolving topics and shifting matters like deplorable housing conditions, unsanitary conditions or crumbling infrastructure etc. redirects interest of Urbanism.

Water appears to be one such issue that is (re) surfacing the contemporary agenda of urbanism in the cultural capital of Maharashtra. Probably it is not such a surprise for the city which is in transition, where water pollution, seasonal monsoon floods, low levels of water in dry periods, has a great impact on the urban life of the city. At the same time the top-down 'efforts' of cultural production of spaces along polluted water edge and pretentious engineering remain socially unjust and politically incorrect (De Meulder and Shannon, 2008), which finally results in the disappearance of water. Knowing the fact that these strategies are vital in the case of Pune, our task is to find right balance between top-down and bottom-up approach, reciprocating to the various water related issues in the city. Therefore this thesis will highlight various spatial issues over time which led to water negligence in the city today and in return, it will explore the potential of Communities, Infrastructure, Ecology and Economy to reciprocate the issue by understanding today's needs and tomorrows worries.

The title used as metaphor highlighting the present condition of the city, 'Living on the Edge' is not only about the problematic 'edges' in between water and the urban fabric, but also about the spatial connections of hydrology with the hinterland. In order to improve the present state of the city, it is crucial to understand and explore the interaction of the city with water and the evolution of such interaction over time since its provenance. Water and roads each have spatially thematized the directions of the city. City originated near the confluence of two rivers, more precisely in between two streams (Ambil and Nagzari) that ended up their courses into river Mutha to the north. Hence the urbanization as seen through a cultural and political perspective was developed along north-south axis in the first half of 18th century. But today, in the globalized world, the realities have shifted, the city which once structured itself along the water edge, today is orienting towards the 'money lanes' (highways) connecting Pune to the surrounding industries and globalized capitals of the country. This also has led to a strong contrast between old and new urbanization patterns in the city. Furthermore, today the rivers and streams in the city are channelized to regulate the flow of water during monsoon floods. As a result, from the historical dynamic and meandering flow, they have become more of a utilitarian infrastructure disconnected from its natural and urban environment. Paradoxical to the infrastructural developments, there is an alarming rise in the number of informal settlements in the city, who have encroached most of the areas along the stream and some parts of the river, in spite of the risk of flooding in heavy monsoons. These encroachments are equally responsible for the pollution in the water course as to the pollution caused due to poor maintenance of sewage lines along the river and streams. Hence it is an object of mere sanitation and purification processes with a tendency to get the water out of the city as soon as possible. Thus, the engineering works and waste disposal in the city is resulting in flash floods and ecological damage to the urbanized areas and farmlands downstream. Hence the urban water in Pune can be said to be absent as it is sanitized, covered, canalized or piped.

In the present disturbed terrain due to the urbanization process and continued rise in population, there is an urgency to find a dynamic balance between the city and nature. As a key element of nature, water will play a major role in this rebalancing. Moreover these natural infrastructures have a potential to be the 'breathing lungs' for a city like Pune that are extremely necessary for its resilient and sustainable future. Taking this into consideration, as specialists can we question ourselves about the role of urban planning and design, to take up a soft approach where the mitigation is proactive rather than reactive and where strategies and interventions help city and nature benefit mutually?

The following thesis is structured into three main

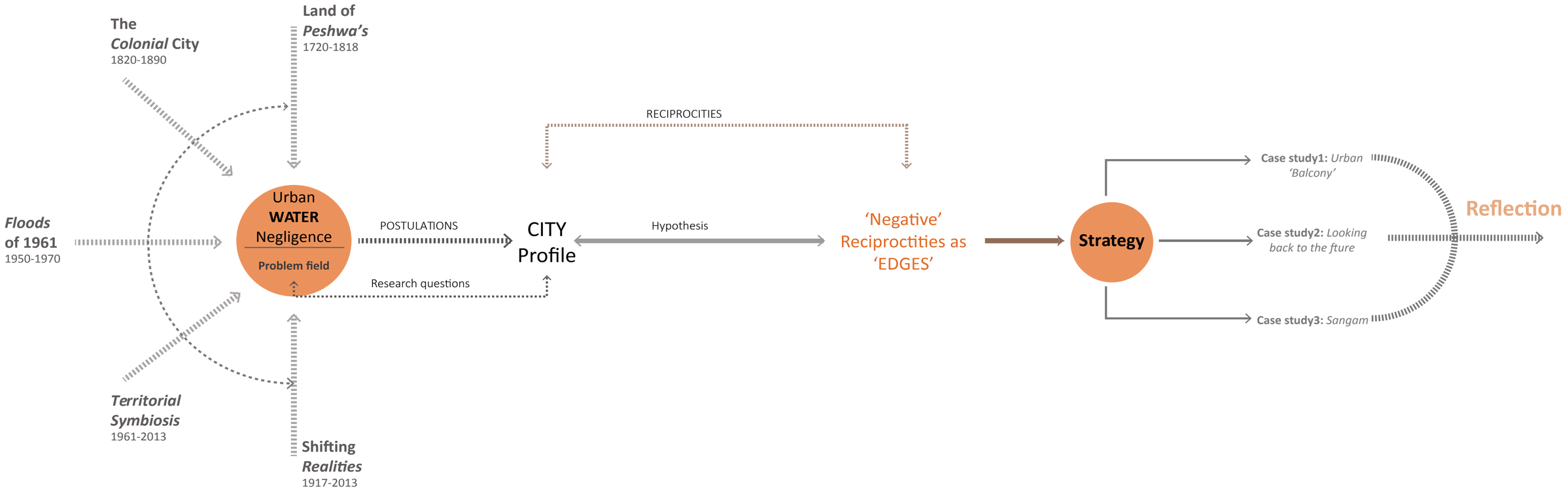
chapters along with the reflection at the end. The first segment will theoretically and analytically analyse Pun city's historical evolution with context to water, since the time of Peshwa (Royal family) rule, to the second half of 20th century. The historical insight elaborates the city's changing relation with water, moreover so highlights the cultural, economical, structural transformations in each era, which helps in analysing the problems faced by the city today. Following, the chapter on territorial symbiosis inspects the relation of the city with its surrounding natural setting on a territorial background. The theme of reciprocities introduced in the thesis, helps to formulate research tools based on the analysis to translate into spatial ideas and concepts for the following interventions. Followed by the key postulations framed from the historical study the second segment analyses the problem field with the help of factual corroborations in the present context. In the third segment a strategy is formulated based on the postulations raised from the historical analysis under the theme of reciprocities with the present day evidence of the conflicting elements in between water and the city explored in the second part. The strategy will be tested with the help of three design case studies. The theoretical background, research themes, methodology and the design exercise will be contemplated through final reflection; moreover the lessons learnt from the design case studies with their possible implications in the contextual contemporary cities will also be discussed.

Methodology

Although there is a linear structure in the methodology, there have been numerous iterations and redefinitions of the issues that have constructed the thesis. Research and design, instead of being two independent entities of the same process, have a reciprocating relation in this thesis.

To understand the present, historically changing context of water with the city is scrutinized in the first section. This will not only highlight the changing relation of the city with water, but also help comprise and define the problem field through sequential overlapping of the same. The historical periods defined here are based on the major transformations happened during different political rules in the city. Hence, each era was theoretically reviewed, interpreted and subsequently hypothesized, highlighting the dominant spatial character of that period. The observations and interpretations are illustrated either with the help of mapping, sketches or by abstract symbolic representations. The overall theoretical background is then postulated with precise observations that led to the formation of research questions for the following analysis and design interventions.

The statistical data, infrastructure and spatial study help to analyse the current form of the city and also answer the questions from the postulations. Along with the analyses, interviews and cognitive mapping help to identify local potentialities and understand conflicting metaphorical spatial environment. This in totality will help narrow down the problem filed to precise problematic 'edges'. Therefore the strategy is built on the lessons learnt from the past with the conflicts occurring at present, for a resilient future. In the strategy, the reciprocities between Community, Economy and Ecology play a pivotal role in mitigating the conflict between city and nature. Consequently three design case studies are meant to test the strategy addressing the problem at three different scales which is along the stream, along the river and the confluence.


The
Colonial City
1820-1890
Land of
Peshwa's
1720-1818
Floods
of 1961
1950-1970
Urban
WATER
Negligence
Problem field
POSTULATIONS
CITY
Profile
RECIPROCITIES
Hypothesis
'Negative'
Reciproctities as
'EDGES'
Strategy
Case study1: *Urban 'Balcony'*
Case study2: *Looking back to the fture*
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Reflection
Research questions
Territorial
Symbiosis
1961-2013
Shifting
Realities
1917-2013

Holy WATER

Ghats of Varanasi, India

Cognizance of water can be vividly seen, practically in most of the cultures around the globe. Water is given a significantly high status in these cultures. Praying and worshiping water in many cultures and religions, such as Indian, ingrained a sense of respect, importance and value in appropriate use of it (Samant, 2004).

Since the ancient times, water has been given a unique status in the social and religious traditions of India,. Water is 'very closely referred to as 'nectar', 'source of life', 'cleanser of sins', 'generator of prosperity' and so on. In the mythological descriptions rivers are considered to be divine and hence worshiped as Goddesses, for its use for daily rituals and ablutions, and its ability to create an environment favouring spiritual peace and contemplation (Sharma, 2009).

'Ghats', an built form on the edge of a water body, exemplifies the symbolic and religious significance towards water, making them spiritual centres and places for human congregation. The ghat establishes contact between land and water, varying from small pond to a major river and everything in between (De Meulder and Shannon, 2008). The word 'ghat' has originated from the Sanskrit word 'Ghatta', meaning a landing place or steps to the water body (Samant, 2004). These are linear elements built parallel to the water edge, to not only allow easy access to the water, but also to stabilize and define the banks and protect the settlements from flooding in the case of rivers. Ghats are also used as major economic resource, bustling with activities and acting as hubs for formal/ informal transport and commerce (De Meulder and Shannon, 2008). Ghats, in terms of design and engineering delineate water architecture of South Asia.

Image on the left:
Scarcity of water in Natwargadh, Gujrat, India

''Ghats represent a totally different physicality to an urban space and is the 'place' where the sacred and the profane make subtle distinctions, not only by a demarcation of domains but also by emphasizing their conjoined nature''
U. S. Andhare (1993)

Maintaining discipline with respect to Nature was strictly followed in ancient times. However, it is paradoxical, that ignorance of these facets of water cultures and exploitation of these natural resources for personal benefits has got us to this critical present of global climate change, scarcity of water and problem of water pollution, and is leading us to a dark and unpredictable future.

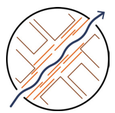
Why did the meaning of water, from being a source of life, key stone of the constructed urban tissue has changed over time to be the subject of negligence? What are the urban processes that can be held responsible for this change?

Trying to find answers to the above questions, I will highlight the cultural, social, political, technical and ecological changes over time, in the urbanization of water, focusing on to the case of Pune city.

Urban water Negligence

(Above)Illustration showing one of the first settlements built by the rule with the fort next to the stream.
Source: Re-drawn by the author based on the theoretical description
1. Bajirao Peshwa (Ruler)
2. Vishrambaughwada (vernacular architecture)
3. Shaniwarwada (Fort)
Source: Paintings by Mohan Jadhav

The Land of *Peshwa's*



1720-1818

As aforementioned, Pune originated as a small hamlet precisely between two streams (Ambil and Nagzari) and on the right bank of Mutha River. The river meets Mula River at the north-cast tip of the city, place known as Sangam or the confluence. This joint river formed its northern boundary and the east was bounded by Nagzari stream ending its course into the river to the north.

Pune's good times began after the emergence of Peshwa (Royal family) empire by defeating the Mughal's in the 18th century. Peshwa made Pune as their capital city, and hence the period of the Peshwa rule has been described as the golden age of Pune's past (Diddee and Gupta, 2000). River Mutha being a non-perennial, Ambil stream was regarded as the major source of water supply to the settlement. Bajirao Peshve (first ruler of the Peshwa empire) was a visionary behind the expansion of the hamlet to a system of peths(wards structured with regards to different occupations within the community) and hence each peth was named after a day of the week, when the occupants of that a particular peth could set up their open market (Dhoot,2005). Moreover the king not only built numerous wadas (vernacular residential buildings), temples, ghats along the river and the stream, but also set up many community baugs or gardens within the neighbourhood's to maximize social cohesion (Narkhede, 2008). *Sarasbaug* was one such temple garden built on an island of an artificial lake to the south of the city along the stream. Hence a strong north south oriented urbanization pattern could be seen in the Peshwa city.

As Pune lies within the moderate rainfall zone, the city witnessed a heavy monsoon rains in the year 1753 (Diddee and Gupta, 2000), resulting in flooding of many streams and river. The floods in the Ambil stream affected the peths to a lager extent, which led to many casualties in the settlement. To avoid future possibilities of such events, the ruler took a decision of diverting the stream from the lake temple (Sarasbaug to the south) towards the river Mutha to the west of the settlement. This diversion of the stream led to the sprawl of the wards (which was prior mostly oriented north-south) to spread east-west.

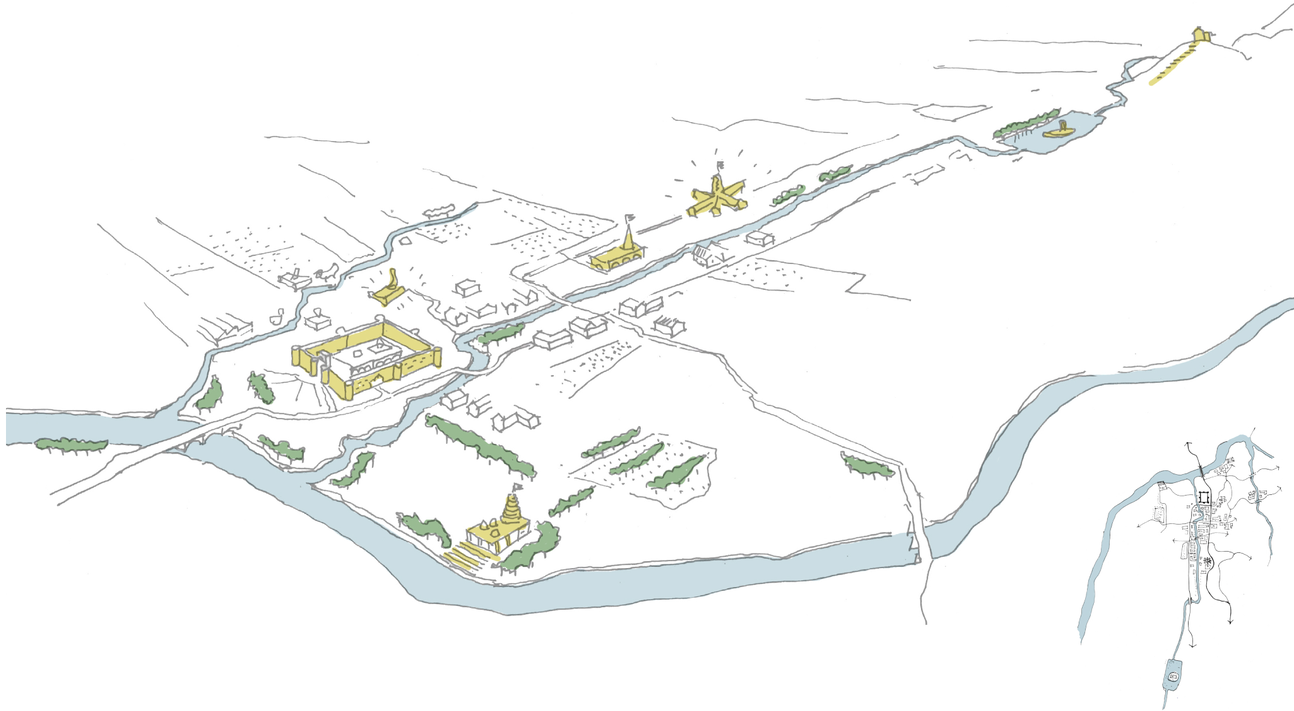
Diversion of the stream had some negative consequences too. As the stream was a major source of water to the settlement, taming the watercourse led to water scarcity in the settlement. To tackle this issue, the king undertook, what is said to be the most remarkable water management projects of that time. Two masonry dams, roughly ten kilometres to the south of the city, were built upstream on the Ambil water course. First dam was meant for filtration and silting of soil in the water while other was aimed for storing water. Moreover and underground network of aqueduct channels was built leading to the city and supplying water to the neighbourhoods via disconnecting chambers known as uchchwas, ending up into an underground storage tanks or Hauds. These underground tanks were designed for an easy access to the water and performing domestic activities like washing clothes, bathing etc. These areas later turned out to be spaces for public congregation.

Thus, the stream which played an important role in structuring the *Peshwa* city was in a way re-introduced to the urban fabric for practical benefits. This in turn engineered a reciprocal response in form of cultural production of spaces.

(Left) Map showing north-south urbanization pattern along the stream.
Source: Based on theoretical description

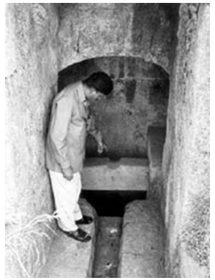
(Above) Vernacular housing typology (wada) in one of the alleys of the old city core.
Source: Sketch by Nikhil Chaudhary

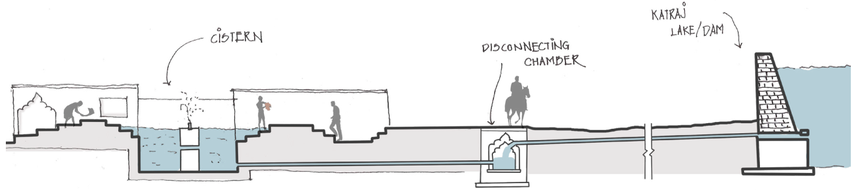
Original flow of *Ambil* stream with series of Temples, gardens*(baug's)* and the fort *(Shaniwarwada)* along its edge.



(Left) Map showing the trajectory of the aqueduct built by the Peshwa's with their outlets as underground water tanks*(Hauds)*
Source: Based on theoretical description

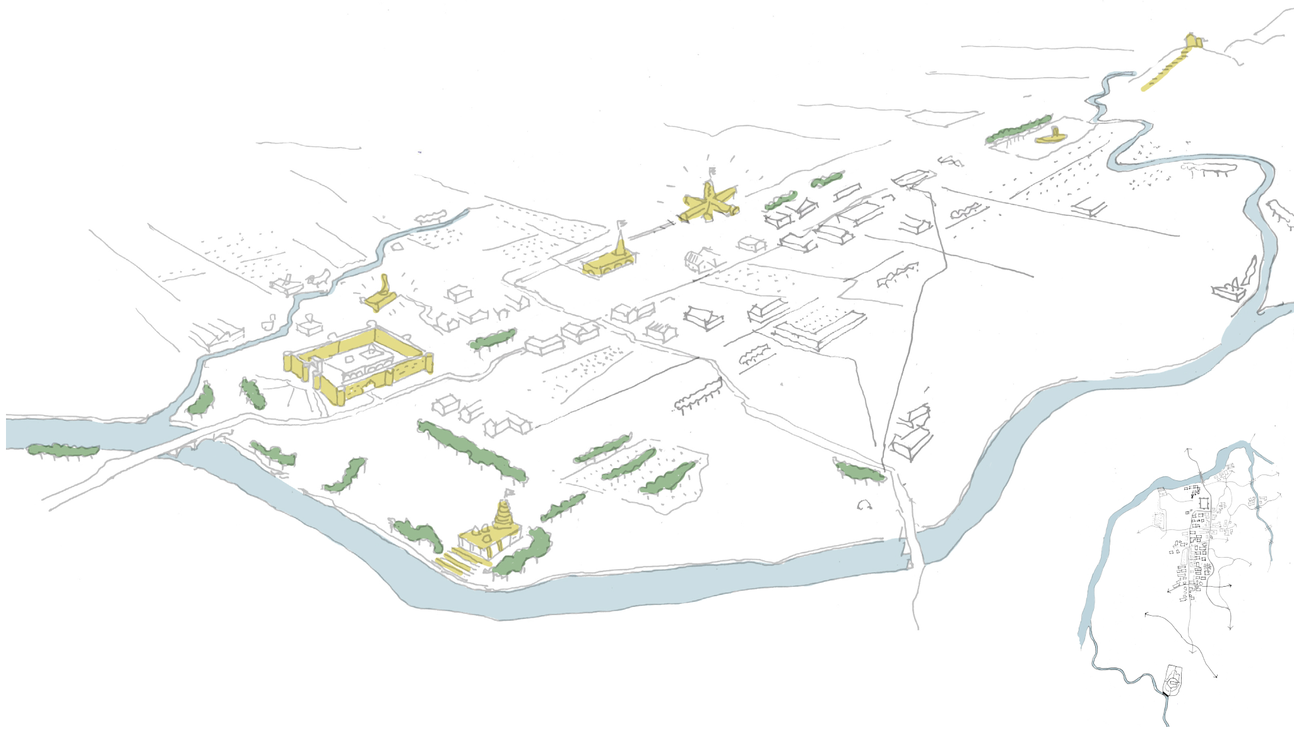
(Below right) Picture of the lake temple taken in 1860
(Below left) The present condition of the aqueduct.

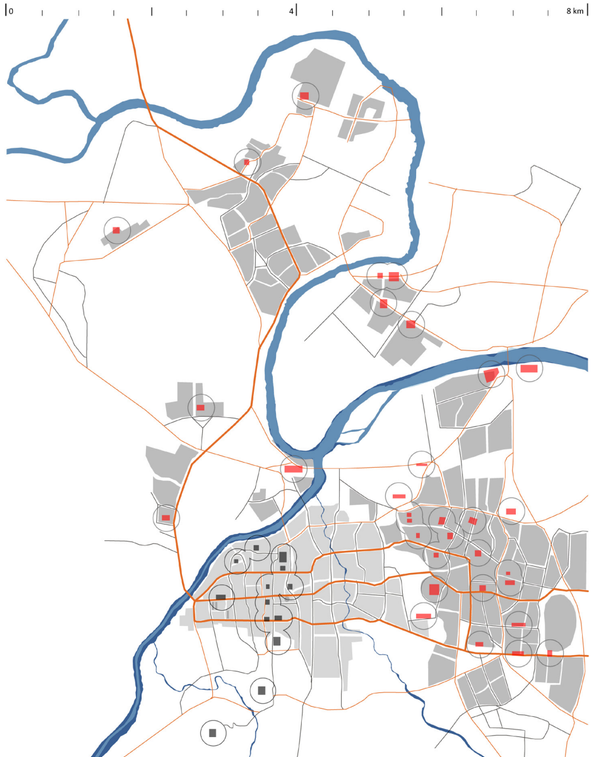




Schematic section of the underground aqueduct's built by the Peshwa's
Source: Author's own illustration based on written discription in the book Pune: Queen of the Deccan

Diversion of the stream led to densification within the neighbourhoods *(Peths)*.





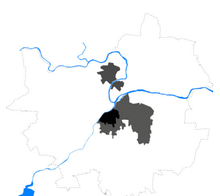
Peshwa city
Colonial cantonments
East-West thoroughfares
Peshwa centralities (Temples, Gardens)
Colonial centralities (Markets, Hospitals, Churches, Educational institutes)

(Left) Map showingColonial cantonments with connecting east-west thoroughfares

(Above) Paintings of Governors house (now Uiversity) and Fergusson college below.

Source: Mohan Jadhav

Colonial City



1820-1947

The cultural and social developments discussed in the last chapter were governed by the British in India after, one of the great Anglo –Indian war in 1818.

Period between 1820-1890 is considered to be the face changing period for the city in true sense, as a strong impact of the colonial rule can be seen on the form and structure of the city (Diddee and Gupta, 2000). After taking over the city administration, British East India Company planned a cantonment area to the west of the city (Khadki). This cantonment was basically planned for the army infantry and residential districts for administrative officials. Further, another cantonment was set up to the eastern edge of the city, leaving a wider berth between the old city and the cantonment. The belt of fields and gardens became a natural barrier between the old and the new district of the city.

Two major events that shaped the civic growth of the city took place in 1850. In this decade, the great Indian peninsular railway reached Pune and the Municipality was formed (Dhoot, K 2005). The rail connection not only paced up the commerce within the city, but was also seen as a connector and transporter of troops and officials to the other parts of the country.

In 1863, the Municipality of Pune, put A. H Leith in charge of an enquiry into the sanitary conditions of the city (Diddee and Gupta, 2000). The natural drainage had become inadequate and the two main streams (Ambil and Nagzari) were polluted by sewage, due to the congestion in the old peths of the city. The street pattern of the city during the Peshwa period was mostly north-south as most the urbanization was along the Ambil stream. Therefore Leith's immediate reaction to the sanitary problem was east-west thoroughfares. Many temple complexes, and vernacular residential buildings were demolished in order to connect east-west and as well for the 'free flow of air'. This was very much in keeping with general nineteenth century town planning principals (Diddee and Gupta, 2000). Proposal of these east-west cutting streets was seen as means not only to improve traffic congestion, but also to remove slums and densely settled areas. Thus sanitation and road making became the main motives in town planning for the colonial government.

Implementation of these town planning principles resulted in social disruption within the city as many traditional public spaces in forms of temples or tanks were demolished. To make the community more socially cohesive, the government built many vegetable markets within the old city and the cantonment. One of them was Mandai market, located on the southern edge of the city. These new neo-gothic structures were juxtaposed against the traditional vernacular temple architecture, to its sides and formed a curious contrast, signifying two historical periods. Moreover, they also were the pioneers in setting up many educational institutions and governor's residence across the river, for which Pune was also known as the Oxford of the east.

However, British hydraulic interventions in Pune city were the most significant of all developments, throughout the course of nineteenth century, which radically transformed a vast spectrum of precolonial hydraulic relationships that had defined and sustained complex equations between land and water.

Water during the British rule can be discussed in two overlapping but distinct clusters. The first cluster can be explored through the aspects of decline and elimination of traditional water supply technologies (D'souza R, 2006). The second cluster explores colonial experiences with control over society and nature.

Concerned with the growing population in the old city and the cantonments, the British government became instrumental in sanctioning four major water management projects in the city. First was construction of a dam over Mula River, ten miles south-west of the city. The second was, construction of a dam over a stream flowing north-west, for supplying water to the governors house to the west of the city, over the other side of the river. The third was construction of a dam downstream of river Mula-Mutha flowing eastwards to overcome water scarcity in the cantonment area. Fourth was the drawing of two canals, Mutha Left and right bank, aimed for encouraging agricultural activities in and around the city. As a result, there was a large influx of population coming to the city. But, in return to this, heavy water tax was charged for a 'regular' supply of water to the fields. On the other hand this water management also reduced the dependency on the aqueduct system built by the Peshwa's, naturally suffered from neglect. Instead of incorporating the excellent system into the new arrangements, a good source of precious water was lost.

However, these canals are also significantly ending up reorienting ecological relations between land and water, notably through 'irrigation science'. That is, the waterworks with commercial and revenue calculations for colonialism also worked to order distinct social and physical colonial contexts.

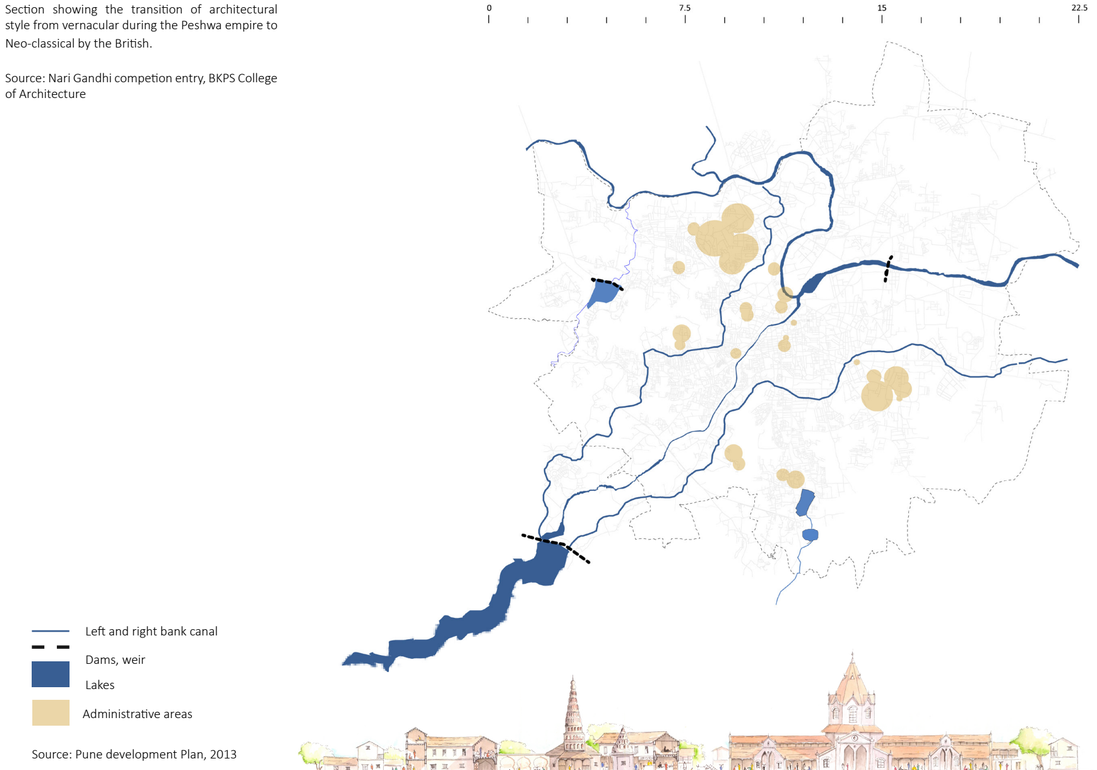
Thus, the term 'colonial hydrology' can be argued to be the varied hydrolic interventions of colonialism to simultaneously alter the city's economical, social and fluvial worlds.

Painting by Henry Salt (1804) overlooking the confluence

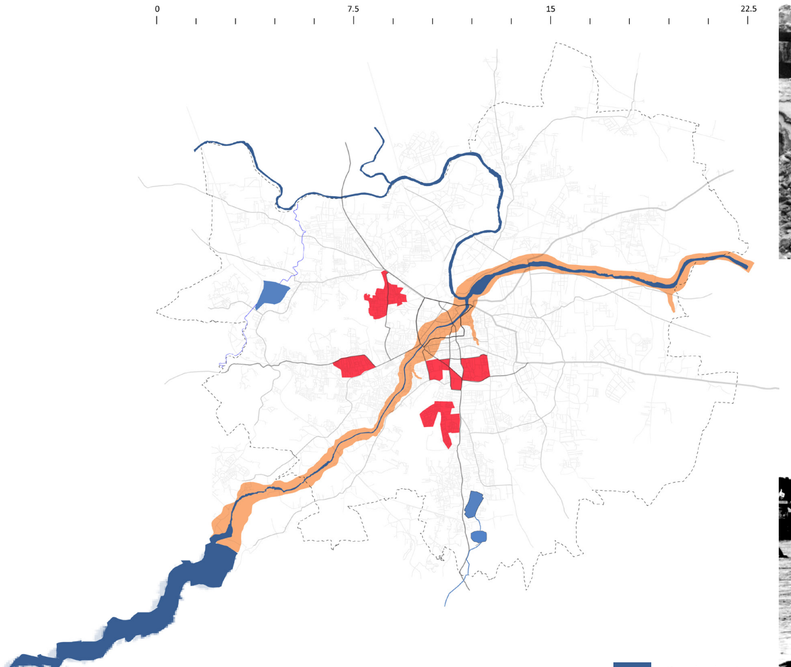
Source: British library online archieve

Section showing the transition of architectural style from vernacular during the Peshwa empire to Neo-classical by the British.

Source: Nari Gandhi competion entry, BKPS College of Architecture



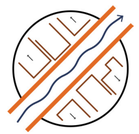
Source: Pune development Plan, 2013



Source: Tracing based on theoretical description.

(Above) Flood affected areas

12th July 1961- A day that changed Pune!



12th July 1961- this fateful day will remain forever etched in Pune's history. After the independence in the year 1947, construction of major waterworks was one of the prime agenda of the Indian government. One of them was a much bigger reservoir, by damming the river Ambi, further upstream to Khadkwasala reservoir built by the British. This proposed reservoir was a feeder or secondary water supply source to Khadakwsala lake.

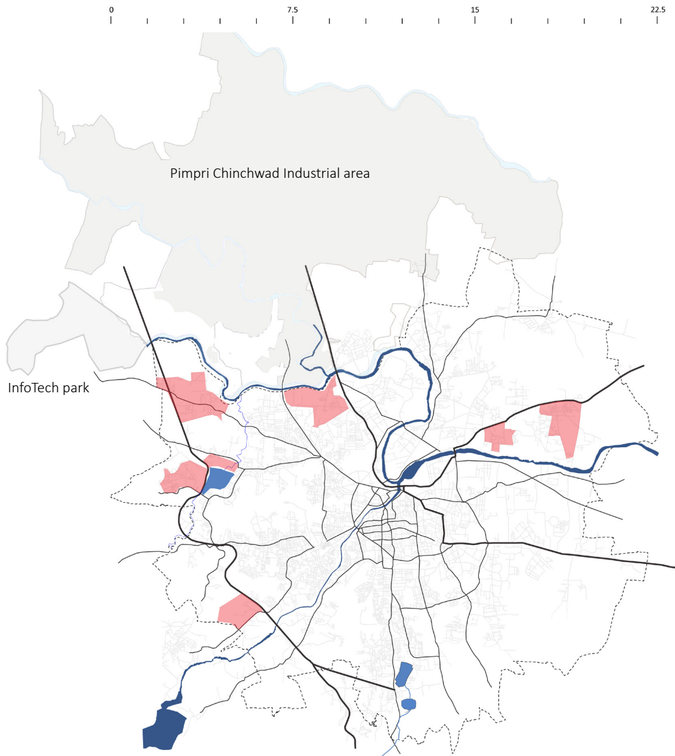
Construction of this dam began in the year 1955 and was complete by 1961. In the very same year, onto the onset of monsoon the reservoir was seen filling up at a greater pace. At the same time some cracks were observed in the masonry construction of the dam wall. Last minute efforts were made to save the dam failed, and the dam breached. Due to the excess overflow of water into Khadakwasala reservoir downstream with its storage capacity stretched to the limits, a decision was taken to mechanically breach the dam built by the British. This lead to inherent flash floods cutting a wide swath through Pune city, the furious river dislocated civic life. By the time that the water went down the next day, it had not only damaged to the old Peshwa Pune, but also destructed the new urban developments on the west bank of the river Mutha.

After this incident the old face of the city changed completely. Many temples, residential buildings (wadas), river front ghats were washed off. While taking efforts to resettle, the compact form of the city broke and it rapidly began to spread outwards, forming new neighbourhoods to the south (Lokmanyanagar, Sahakarnagar), Gokhale nagar to the west and Kothrud to the south-west of the city. Arguably, Kothrud later on went to become the fastest urbanizing suburbs of India.

On the other hand, water which was culturally important in the city planning for the Peshwa and economically useful for the British government was looked onto as a element of threat after the flash flood incident. This led to the construction of flood retaining walls along the banks of the river, and along smaller network of streams within the city in order to avoid similar casualties in the future.

Therefore the consequences of this event can arguably catalyzed the start of the segregation between nature and the urban tissue, resulting in the change of social and cultural relations of the city with water.

1950-1970



(Above) New real estate development along the highways

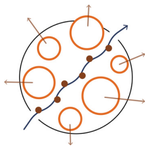
Industrial area, PCMC

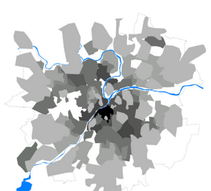
New residential developments

Highway

Source: GIS

Shifting 'realities'





1970-2013

After the disastrous floods of 1961, urbanization in Pune started to spread like a sheet of water. In the year 1961-62 Mumbai-Pune corridor suddenly emerged as the most vibrant economic belt of the nation, due to a proposed industrial district in the twin city of Pimpri-Chinchwad to the North of Pune. The establishment of large scale industries led to the growth of ancillary and small scale industries in and around the industrial zone.

The booming industries to the north-west of the city led to a proposal of highway connecting Mumbai-Pune and passing down further to the south of India (Chennai). Taking the industrial development into consideration, the highway was supplemented by Mumbai-Pune expressway in the year 2000 (Bhailume s, 2011). Knowing the financial importance of the corridor between Mumbai and Pune, India's second biggest software technology park was proposed along the expressway, next to the industrial belt. Furthermore Pune emerged as the forefront of the Indian software technological revolution that changed the business dynamics of the service industry.

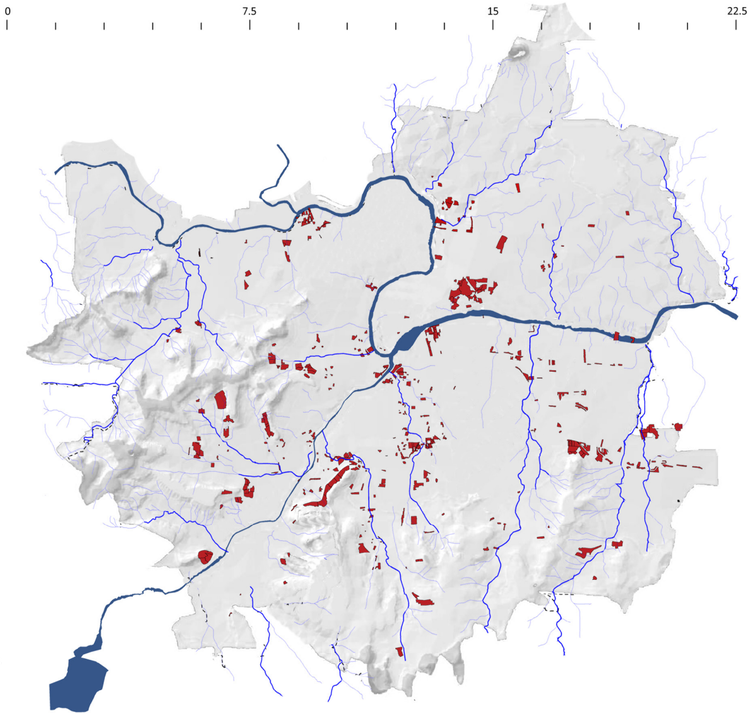
As a result of this, the employment base widened and Pune experienced a tremendous increase in migrant population. These changes led to an urban development in a ribbon form along the highway stretch, resulting in hybrid patterns of urbanization (Patkar M, Keskar, Y, 2014). As this hybrid urbanization was oriented more to the 'hard infrastructure', the natural land parcelling formed by the fluvial processes in the river.

On the contrary, Pune still struggles with many of its basic needs. At present 32.5% of the population of the city is living in informal settlements and 70% of the total number of slums are located along the dense network of natural water streams within the city (Times of India, 2012) . As a result of unsanitary conditions and appalling settlement, most of the streams are getting polluted by the direct solid waste disposal by the slum dwellers in to the streams. This inturn is affecting the entire hydrology of the city.

The combination of flood barrier walls meant for preventing floods and the pilling of pollution in the rivers and streams, has resulted in the city classically 'turning it backs 'to its own rivers (Dandekar P, 2010)

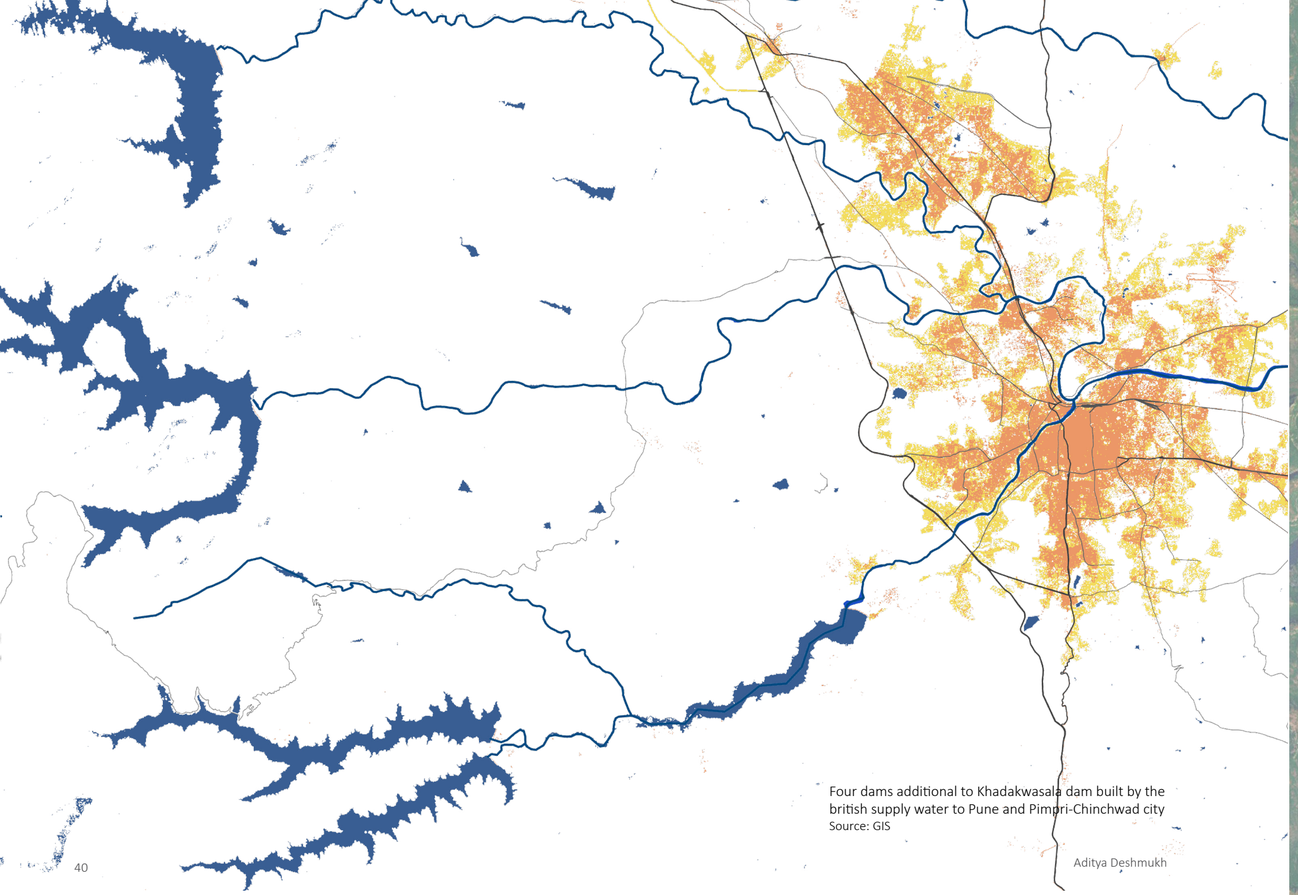
In the time of Peshwa's, when water was part of the city, today has become an element of 'neglect'. Urban water in the city of Pune has just become an object of mere sanitation and, river/ streams are being channelized to get the water out of the city as early as possible. Hence the era of 'clean urbanism' (De Meulder, 1997) has begun with the visual banishment of water. Hence the urban water in Pune can be said to be absent as it is either sanitized, covered, canalized or piped.

'Tradition' does not imply that everything should remain as it was. Tradition provides a basis for the manner in which a system can accommodate change without the necessity of forgetting, without "breaking with the past"'
- Henco Bekkering (2001)



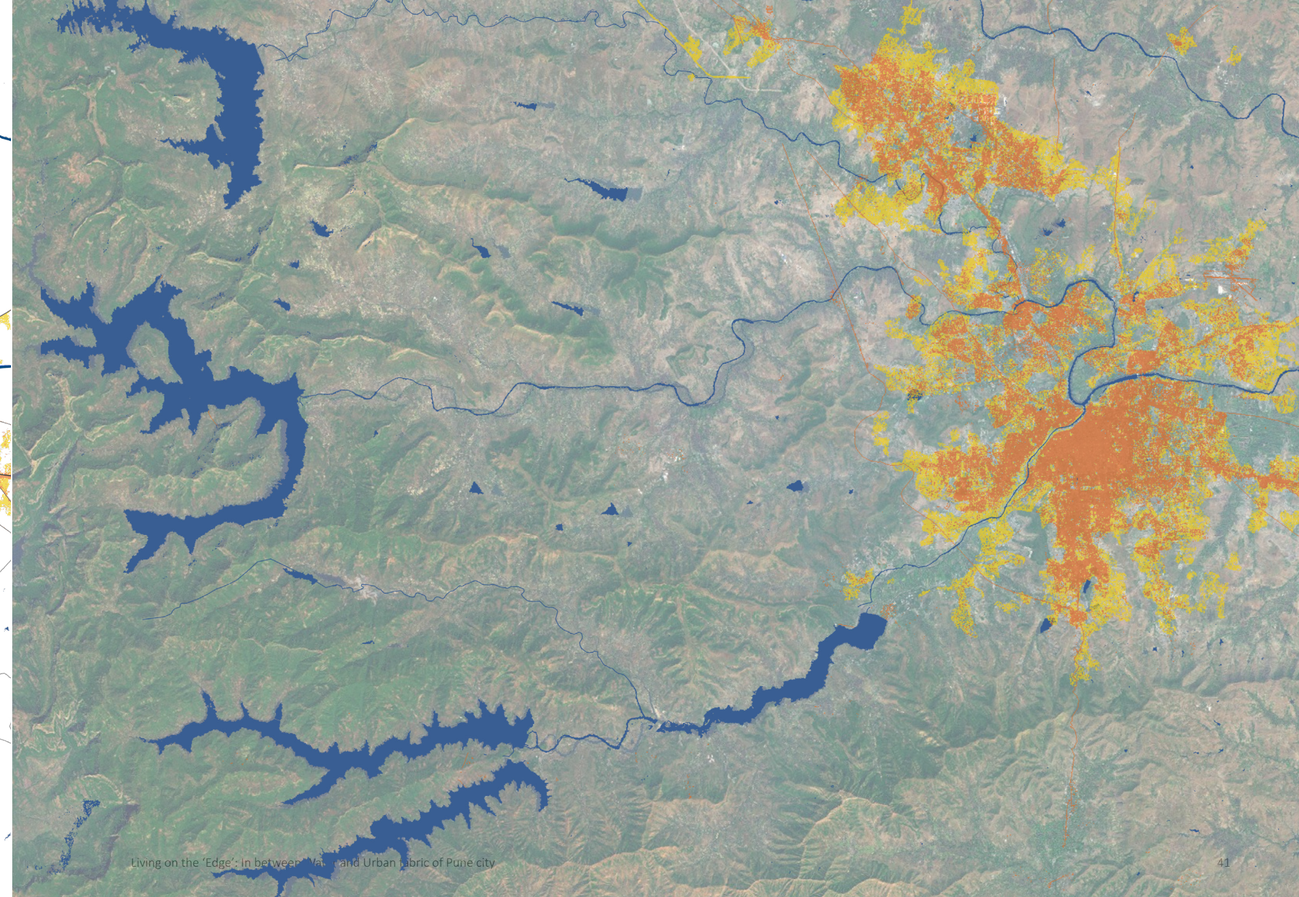
The southern and the south-eastern side of the city is sourrounded by hills where most of the natural streams originate. Today 70% of the informal settlements reside along these streams converting them to sewers by disposing off domestic solid waste.

Informal settlements in red
Source: Pune Municipal corporation Development plan, 2013.

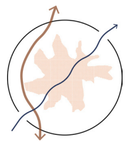


Four dams additional to Khadakwasala dam built by the british supply water to Pune and Pimpri-Chinchwad city
Source: GIS

Aditya Deshmukh



Territorial Symbiosis



Pune lies on the western margin of Deccan plateau at the confluence of Mula and Mutha. The rivers originate from Mulshi and are Monsoon based. They together form a tributary of the Bhima River in the plateau. The Pavana and Indrayani rivers traverse the northwestern outskirts of metropolitan Pune.

This water system was the backbone of the urbanization pattern in the pre-colonial period when the city sprawled on one side of the river. Infrastructural developments during the British rule in the 19th century started to take lead in structuring the city. The rivers were dammed to cater to the increasing water demands of the expanding city.

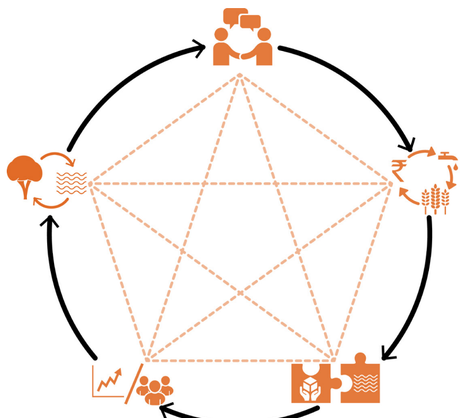
During the second half of the 20th century, due to Pune's emergence as an important industrial node in the western part of the country, Pune started to develop global infrastructural connections. As Pune came in light as an important emerging city, the city's infrastructure knew no bound to grow. Many roads, bridges, high speed highways were built for easy connectivity. The in migration increased and people started to reside wherever possible, resulting in unplanned sprawl of the city. To cater to the economical prosperity, four more dams were constructed in addition to Khadakwasla Dam built by the British. At the local scale, the occasionally flooding river Mutha was channelized to minimize the threats of flood. Till today, the municipal corporation seeks to line the river banks, create retaining walls and dredge the river.

These infrastructural advancements had positive and negative consequences on the territorial and city scale. Though they were aimed for economical sustainability, global connections have led to densification and heavy urbanization within the city affecting the river and its ecology to greater extent.

The river is providing water for all but is it ready to take the waste of urbanization all? Is there a symbiosis between natural element and the 'urban' city?

The question arises strongly especially when one can see a reciprocal relationship between dams and the ecology in the south-west part of the city. The dams built along the mountain ranges, have been positively responded by nature, which can be seen through flourishing flora and fauna in this corridor.

The interaction between these natural and man-made systems always needs a closer attention. It is all about the correct human interference between ecology and economy that helps in boosting the both simultaneously. Therefore it is an important aspect to consider, how economy and ecology in a way have an interrelation, with a hidden conflict between city and nature. There is a need to find out model of symbiosis between river and the city.



Reciprocities

As already seen, water which played a prime role in cultural and economic vibrancy of the city has been sidelined from the daily routine of the city.

During the Peshwa regime, water was seen as a cultural and sacred commodity and thus the infrastructure development was directed towards building Ghats, temples along the river edge. The city responded to it positively and the water was seen as a sacrosanct resource. Even after the stream was diverted, water was re-introduced in to the fabric for practical benefits, water was used for cultural and social production of space.

In the British period, when dams were constructed to get the water in abundance for the city, the idea was to get economical benefit out of such valuable resource. But it ultimately revived the ecology of the area around dams. Today, this positive relationship between a water resource and the urban fabric is somewhere missing and moreover the pessimistic approach of the city towards the water has turned it into more dismal state. River has become a place which no one wants to explore. The edges of the streams have turned into 'reserved' spaces to reside for the informal settlements. Further these informal ghettos have 'turned their back' to the streams converting them into garbage bins. The ecosystem of the river and its catchment area is getting affected and the river which once was a proud element of the cityscape has become an ignored drain. The infrastructure development happening around the water is no longer being beneficial to the water, nor the residential development being beneficiary of the presence of water along it.

It is for this concept of 'Reciprocities' where one needs to understand the present relation between water and the urban fabric of Pune and come up with solutions so that together they work for the betterment of both.

Reciprocities: A mutual cooperation by doing a good deed for another and the favour will be returned.

In its true sense, the relationship between the city fabric and the river in ancient times was reciprocal. Moreover, the fact is the birth of the modern civilization is also a result of the reciprocities between cities, their surrounding hinterlands, technology and the human being. But over the years, the augmentation of urbanization has scratched the natural resources to such an extent that this mutual cooperation between them has come to an end.

"Infrastructures, which were mutually reinforcing and totalizing, are becoming more and more competitive and local: they no longer pretend to create functioning wholes but now spin off functional entities. Instead of network and organisation, the new infrastructure creates enclave and impasse: no longer the grand recite but the parasitic swerve"
- Rem Koolhaas

Historically, urbanism is considered not only as the study of character of this urban life and physical needs of the society, but also is regarded as the discipline that holds the capacity to steer the transformation of the city and its rational development. In other words, urbanism documents and interprets the city (De Meulder, Shannon, 2008). Urbanism, over the course of time has been redirecting its

attention to the new themes and shifting issues corresponding to public interest, for example, problematic housings, unsanitary conditions, boosting branding and creativity etc.

Water is one such issue which is succeeding the rest in the contemporary context. The very sustainability of cities and practices of everyday life that constitute 'the urban' are predicted upon and conditioned by supply, circulation and elimination of water and this sustainability of cities is being threatened by the facts of global warming, rise in sea levels, water pollution etc (Swyngedouw E, 2004).

On the other hand, according to United Nations, the world population is expected to increase from 7 billion to over 9.3 billion by 2050, a 40 percent increase in population in less than 40 years. The number of urban dwellers is expected to rise from 3.6 to 6.3 billion while the rural regions will see their population plunge by 300 million within the same time period (World's bank, World development report, 2009). A 95 percent of urban growth will be in developing countries and by 2050 an expected total of 3 billion people will live in informal settlements (United Nations, 2012). This rise in population is going to affect the greenhouse gas emissions adversely and the cities are expected to accommodate the population growth. Therefore in order to get going, urban productivity needs to be intensified. This is going to make urban regions more complex and chaotic as the number of economic, material and financial nodes connecting them will aggregate to the point, where traditional spatial and political boundaries will, in time effectively disappear. Taking that into consideration, Can we ask ourselves that what about the relationship between cities and the region, whose reciprocity has defined our society since the dawn of history? Will it simply be forgotten?

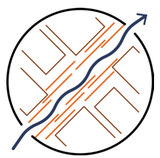
Where it is certain that this forever mounting urbanizing process is going to have major impacts on the social, economical character of the city and surrounding ecological system in general, it is of utmost importance to monitor the track of these changes. C. S. Holling (1973) in his article, "Resilience and stability of ecological systems", described ecological systems as having the characteristics of resilience, adaptability and transformability. Resilience is used in ecology to describe the characteristic of an ecological or socio-ecological system's ability to deal with changes in the environment, whereas adaptability is the capacity of actors to influence systems resilience and transformability is the ability of actors to display a fundamentally new system when ecological, economic or socio-political conditions make the existing system outdated (Walker, Holling, et al. 2004). Through this perspective, a 'resilient city' can be understood as a city with sustainable network of interconnected physical systems and communities (Godschalk, 2002). It can also be related to sustainable urbanism which is an attempt of creating communities beneficial to both human and environment and to shape up more sustainable places and lifestyles.

Architect Christopher Alexander once rightly stated, "The city is not a tree". While sustainable urbanism might not be the philosopher's stone that instantly solves climate change and resource scarcity, it offers opportunities for pragmatic and resilient design of new and existing areas based on the principle of decentralized, interconnected and polycentric urban systems. Not only will urban planners need to re-examine traditional political and geographic boundaries, but the scalability of solutions, infrastructure, interrelated networks and the role of public space as well. Moreover most of the European cities are trying to incorporate and encourage elements of 'self-organization' within the community in order to balance technical requirements with spatial and social quality. In order for sustainable urbanism to succeed there must be a complete redesigning of urban profiles, where human needs, and the presence of green communal spaces and the integrated design and presence of water bodies become fundamental to urban comfort. (Van Timmeren, 2013).

As we know from the statistics that that humanity will continue to flock to cities for the foreseeable future and natural resources are dwindling. We also know that earth's natural systems that provide our resources are slowly failing and our current way of life is unsustainable. In case of urban water management the challenges in Indian cities are immense- and promise to increase due to the predicted effects of climate change, disturbed terrain due to urbanization processes, and a continued rise in population. It is paradoxical that the old, low-tech/ low cost and rich systems of irrigation networks, tanks, ponds and Ghats are not maintained and, in fact, disappearing while largest investments are being made to build new dams, contain water in pipes and embank riverfronts. The challenges are about the absence of mutual relation between water and informal settlements, the disregard to the river as as cultural heritage and the degradation of environment surrounding the water body that perhaps need an intense attention.

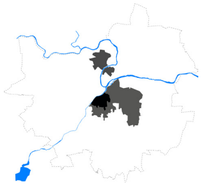
It is an urgency to seriously re-examine our guiding ethos and the reciprocal manifold between Man, Nature, urban areas, technology and design. Therefore the question arises can the city with its elements (Community, infrastructure, economy, nature) itself help us to reciprocate for better and resilient future?

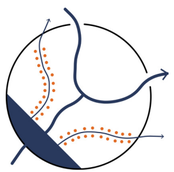
The Land of Peshwa's



Ambil stream played and important role in North-South structuring of the *Peshwa* city.

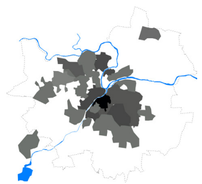
Colonial City

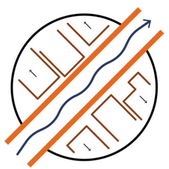




Construction of Dams, canals and weirs, 'Colonial hydrology' completely changed the land water dynamics of the city.

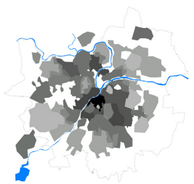
Floods of 1961

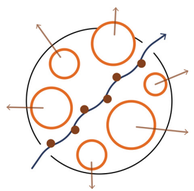




After the disastreous floods of 1961, urban water was seen as a threat to the city.

Shifting realities

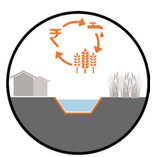




Industrialization and economic prosperity led to developments away from the city and its hydrological context

Postulations

Utilitarian way of re-introduing water to the urban fabric, in turn engineered a reciprocal response in the form of cultural production of space

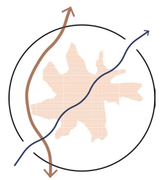


Water was for socio-economic regeneration of the city

Construction of flood walls made the city safe, but disconnected the urban life of the city with its hydrology.

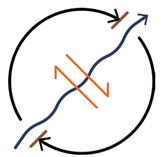
Water edge, which in the past was place for social cohesion beacme a place for social exclusion

Territorial Symbios



urbanization and sprawl due to the infrastructural developments is degrading the ecology in the city.

Reciprocities



Possible research and design concepts

Though human interference on city scale is leading to degrading ecology, an opposite effect can be seen on a territorial scale where nature reciproctes to human intervention

Community, Economy and Ecology have played an important role in structuring the city in the pasr. Can the reciprocities between them help to deal with the problem of water negligence?

Research questions

What are the effects of change of reciprocities over time on Pune?

How can the urban fabric be adjusted to requalify the problematic edge conditions?

Can the cultural relation of water with the city be revived by contemperary methods of urban designing

How can the informal settlements be made resilient to mitagate the problem of floods and pollution?

Can the water corriodors be used as network for slow movement?

What type of interventions do we need to reciprocte *Economy* and *Ecology* at the same time?

City today?!

bank
Drinking
Flooding
Dam
River
Worship
Lakes
Cultural
Conservation
Rowing
Reservoirs
birds
Canal
Migratory
Nature
Street
Ghat
Pastures
Confluence
Slums
Stream
Crossing
Temple
Fishing
Recreations
Sewers
Pollution

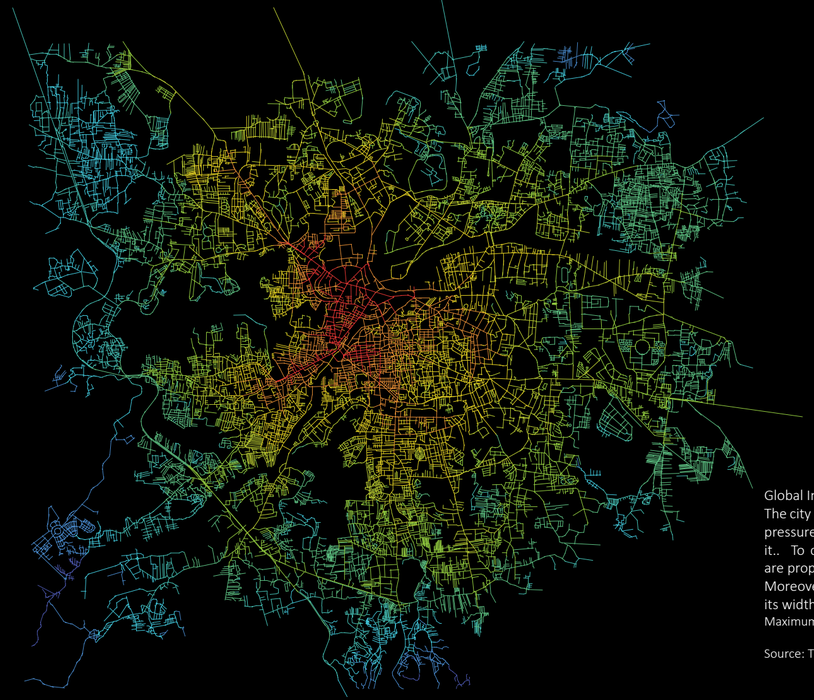
Density

Pune hostes a population of 3.11 million with an average density of 603/per sqkm (Census, 2011).
The city centre being one of the dense areas in the city, a donut shaped ring of high density can be observered. These are the areas where most of the informal settlements can be found.
(Areas in white are army cantonment areas which operate administratively as different municipalities)

Source: GIS

0 5.625 11.25 22.5km

Global Intergration



Global Integration R6
The city centre which is highly integrated and dense puts pressure on the natural water system flowing through it.. To cater to the increasing traffice river side roads are proposed, which are adding to the water pollution . Moreover the river is most heavily channelized reducing its width to bear some meters.
Maximum (red)- Minimum (blue)

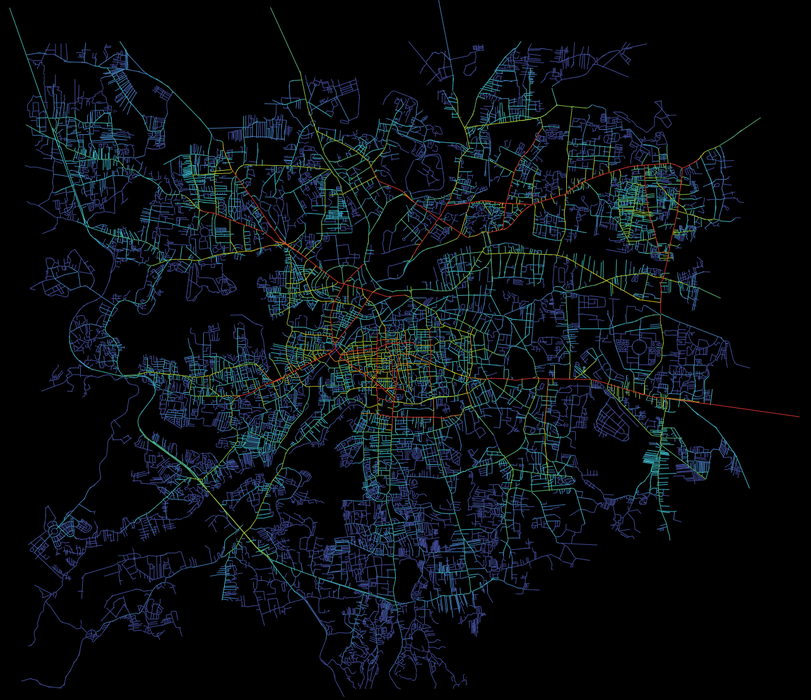
Source: Tracing based on Google street maps

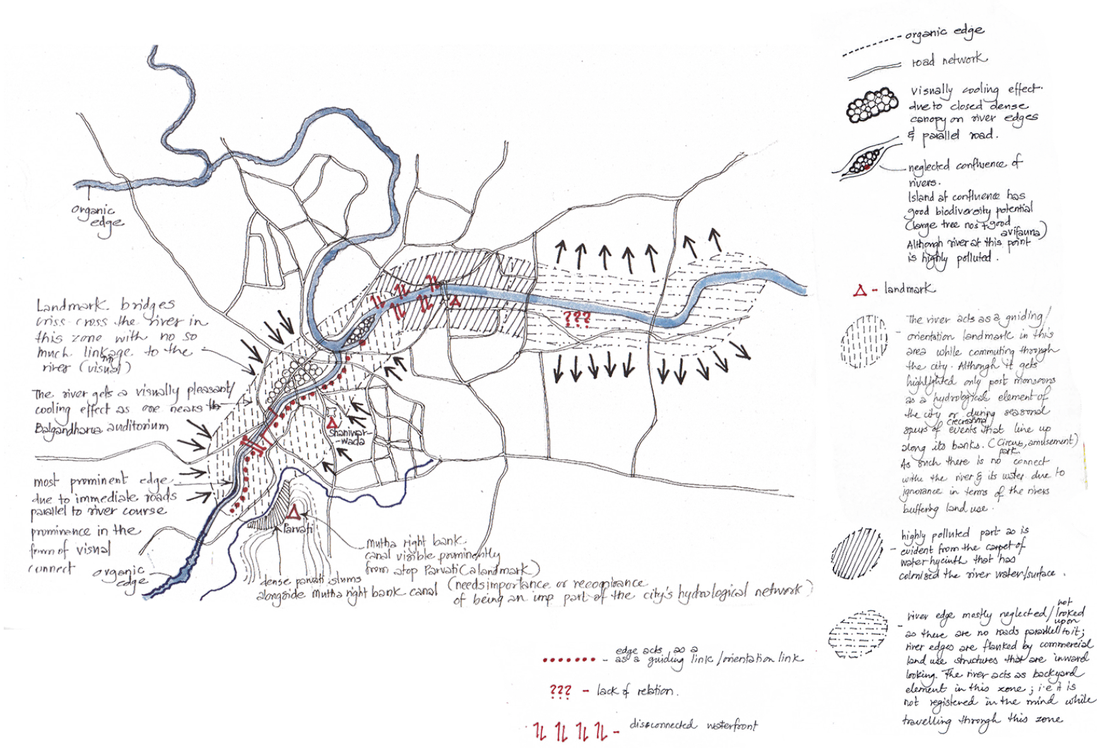
Segmental Analysis

Segment map: R3

Source: Tracing based on google street maps

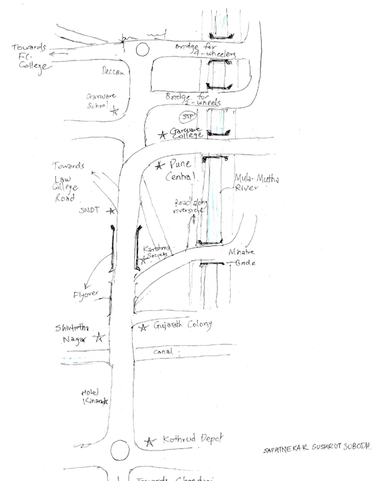
0 5.625 11.25 22.5km



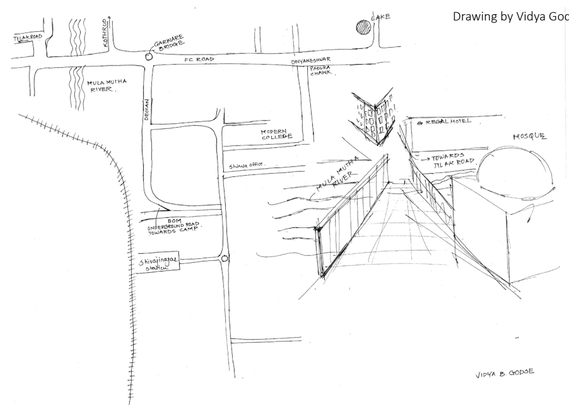


Drawing by Tanuja Godse

Workshop drawings

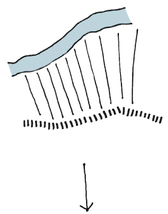


Drawing by Sushrut Sapatnekar

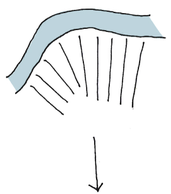


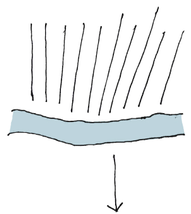
Drawing by Vidya Godse

Based on the congnitive mapping methods described by Kevin Lynch in his book 'Image of the city', similiar exercise was undertaken during the time of field visit. Citizens and professionals in the field architecture, engineeering were asked to visualise and sketch there perception about the river and the streams in the city and their spatial relations. Where as through most of the drawings it was evident that citizens considered the crossings over the river as spatial reference point. Landscape architect Tanuja Godse scrutinized the fact that why people consider the river as a spatial reference point. For some its crossing the river (which was also quite prominent in the illustration we saw at the start of the thesis) while others are encouraged by the commerciality of the place.



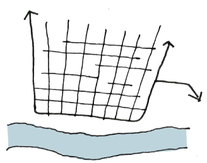
Natural parcelling





Koregaonpark

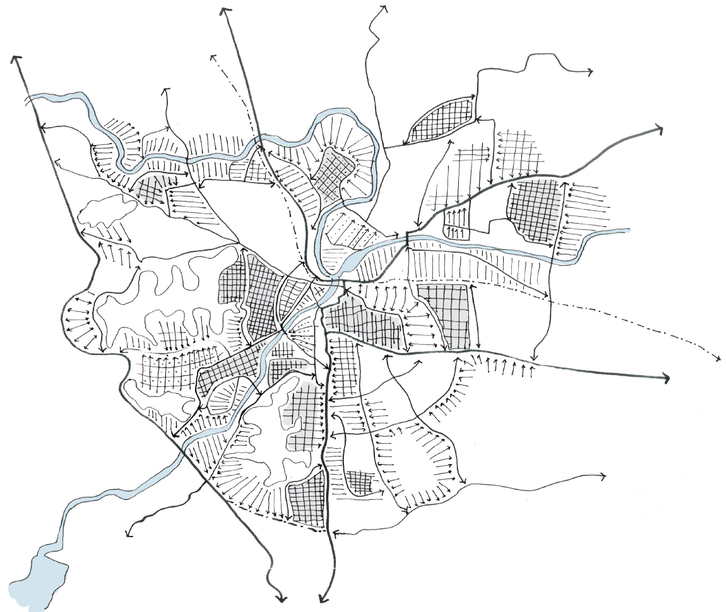
Balewadi



Kalyani nagar

Present urbanization pattern

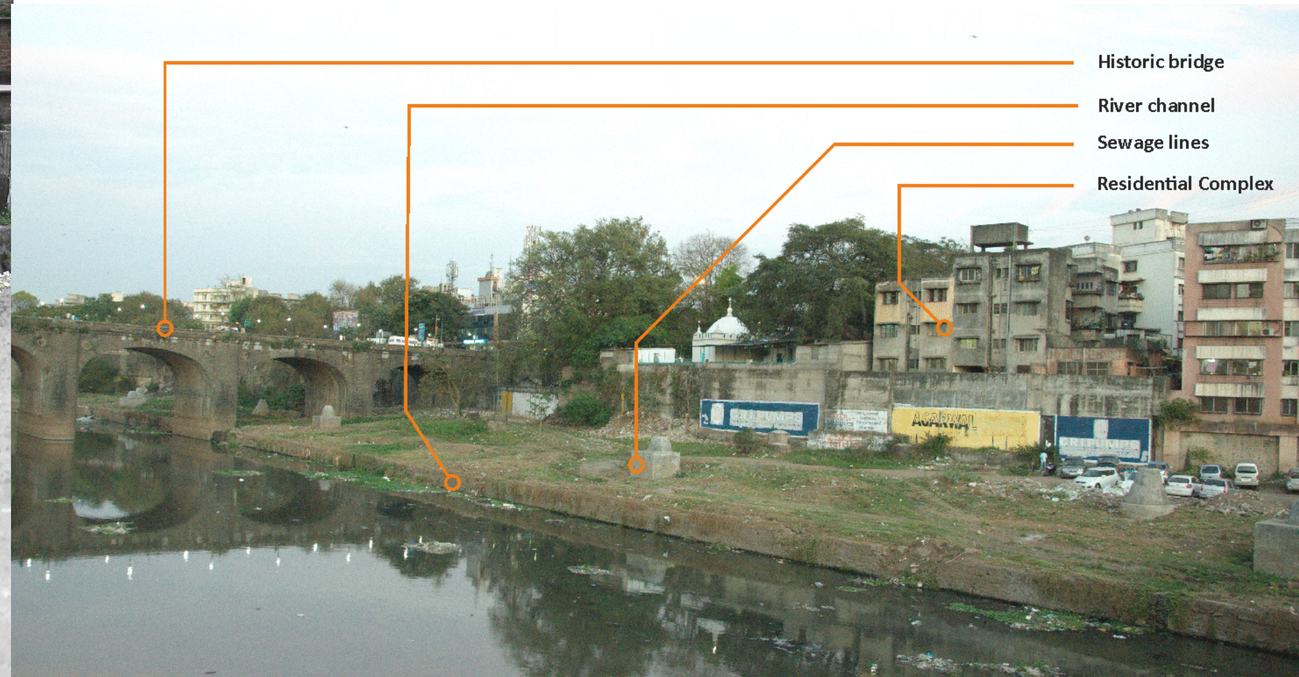
Urbanization patterns



The parcelling of land formed by he natural flow of the river has been completely disturbed by the recent urbaanization process. The street pattern evolved is contradictory to the parcelling creating uneven disturbed landscape. As the parcels are naturally designed drains, overlapping street patterns are creating conflicting 'edges' which is causing flash floods on local level during high monsoon season. In order to understand this complexity and conflicts we should understand the limits this complexity sets for future developments. Instead of fighting agains this fragmented nature can we co-operate with it and attempt to enhance its existing qualities (Palmboom, 1987).

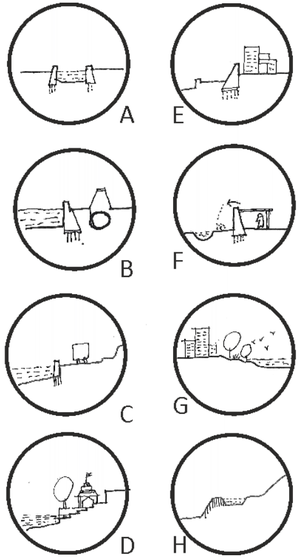
Conflicts between the urbanization and the natural water courses

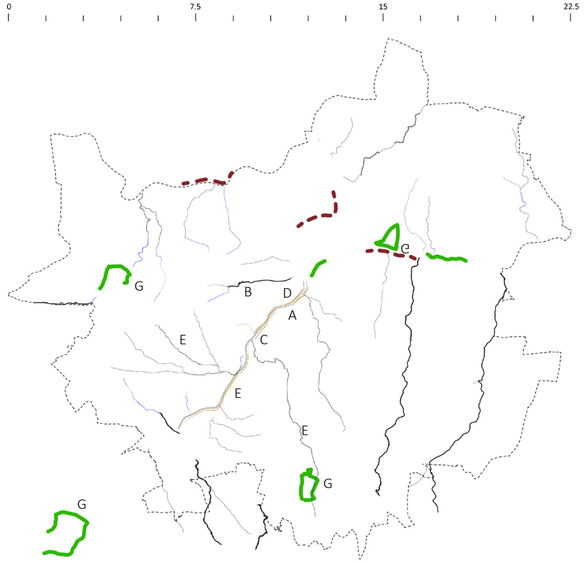

Informal settlements
Flood barrier
Sewage line


Historic bridge
River channel
Sewage lines
Residential Complex

Negative reciprocities as'Edges'

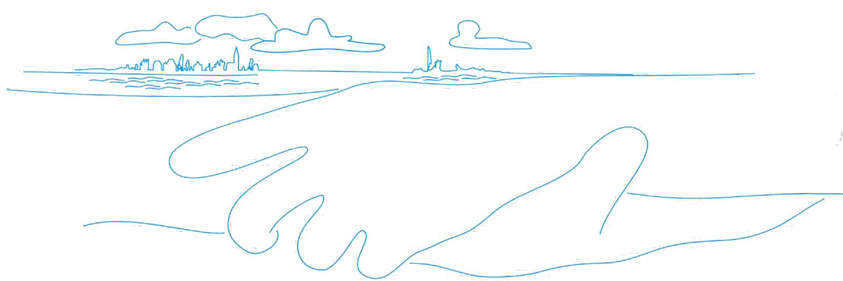
The floods of 1961 and the recent economical shifting realities has resulted in negativer reciprocities where the river is no more the part of the city, the streams are encroached by informality. Therefore it will be important to understand what types of negativer reciprocities the city is facing today.





A- Channelized riivers and streams
B- Sewer lines along the water body
C- Streets along the river, leading to pollution
D- Neglected historical water fronts
E- Flood barriers
F- Informal settlement along the streams
G- Urbanization on the edge along nature reserve
H- Urbanization along the open canals

Strategy



Source: Artery: A guidebook for riverside regeneration

Problem Field	Urban Water Negligence		Contradicting man-made and natural structures	Shifting Realities	Society	Ecology	
Mitigation	Builtform< >Watersystem		City< >Nature	Old< >New	Formal<Public Space >Informal	Flooding< >Pollution	
Concepts	No Barriers	Slow and fast networks	Living with the water	Historic Regeneration	Reciprocities	Adaptability	Blue and green networks	Social justice

Strategy

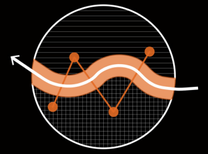
Learning from the history suggests that, water has played a pivotal role in shaping the urban life, of Pune city since ages. Water bodies in the city have had positive or negative reciprocities either with Community, Economy or and Ecology of the areas around them. A stream, which once was a place for social cohesion(first *ghats* and later tanks or *Haud's* along the water) today has become paradoxically a place for social exclusion(informal settlememts and illegal constructions). Whereas to contrast with the history when the commercial hubs evolved in close proximity to the river, today's shifting realities exemplify that water is no longer considered as an element for economical regeneration. Lastly water on one hand has been flourishing ecology through human intervention on the other as a result of same human interventions, ecology around the urban water is degrading.

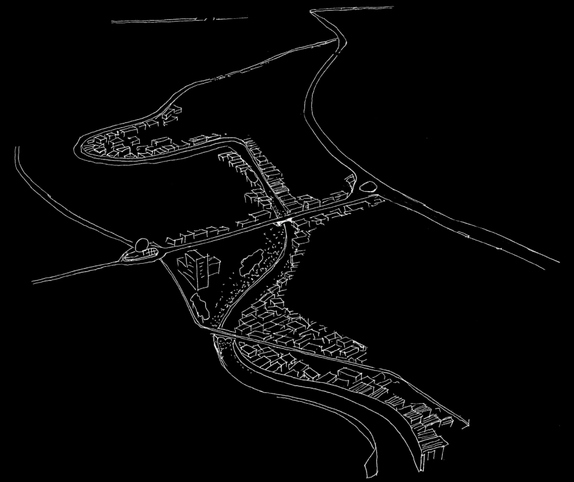
Hence in order to rethink the mutual co-operation of city and nature by understanding today's needs and tomorrows worries, reciprocities between Community, Economy, Nature and the urban fabric will play an important role. To understand the coherent inter relation in between these components, the strategy is articulated at three different scales and locations, where relative varying degree of importance is assigned to each of the components considering the contextual negative/positive reciprocities. To connect it back to the history from where it all began, the sites chosen for testing the strategies are :

1. Informal edge along the historical Ambil stream.
2. Riverfront along the historical city centre
3. Area along th
gam).

CASE STUDY 1:

Urban ‘Balcony’



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Ambil stream

Covering a surface area of 2.4 hectares and population density of about 3,500/hectare (Shelter associates, 2013), informal settlement along the historical Ambil stream is one of the densest slum in Pune city. Encroaching a privately owned land in the year 1965, this settlement since then has been politically and socially one of the most sensitive ghettos in the city. Interestingly till date the inhabitants pay regular monthly rent to the land owner as per the type of dwelling (*Kuccha*-temporary structure, *Pucca*- Permanent structure). Due to its geographical position along the informal settlement is juxtaposed in between the old and new part of the city. Close proximity of the stream makes the settlement susceptible to seasonal flooding during heavy monsoons (Seasonal flood level is +1m , while heavy monsoons can give rise to the water levels upto +1.75m) . Therefore, as precautionary measure, the municipality has built concrete walls along the full lengths of the stream; additionally it is also channelized to avoid water stagnation. On the other hand, lack of basic infrastructural facilities within the settlement the stream acts as a garbage disposal site for many of the dwellings along its edge. Poor maintenance by the municipality and negligence by the inhabitants, ambil stream today is no more that an open sewer.

As the site mingles between the old and new part of the city it is, at the same time heavily bounded by congested streets and a host of commercial activities. One of such activity taking place at the roundabout to the north of the site (picture5) is known as ‘Majoor adda’ or a labour camp, which essentially is a job hunting place for most of the unskilled construction workers from the settlement on daily basis. Therefore the prioritization of commercial activities along congested streets ads up to the negligence towards the stream.


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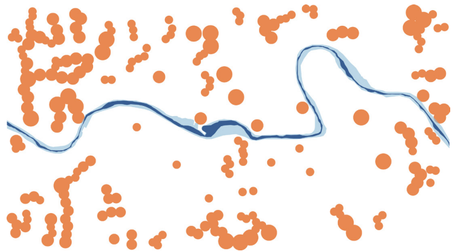
Site



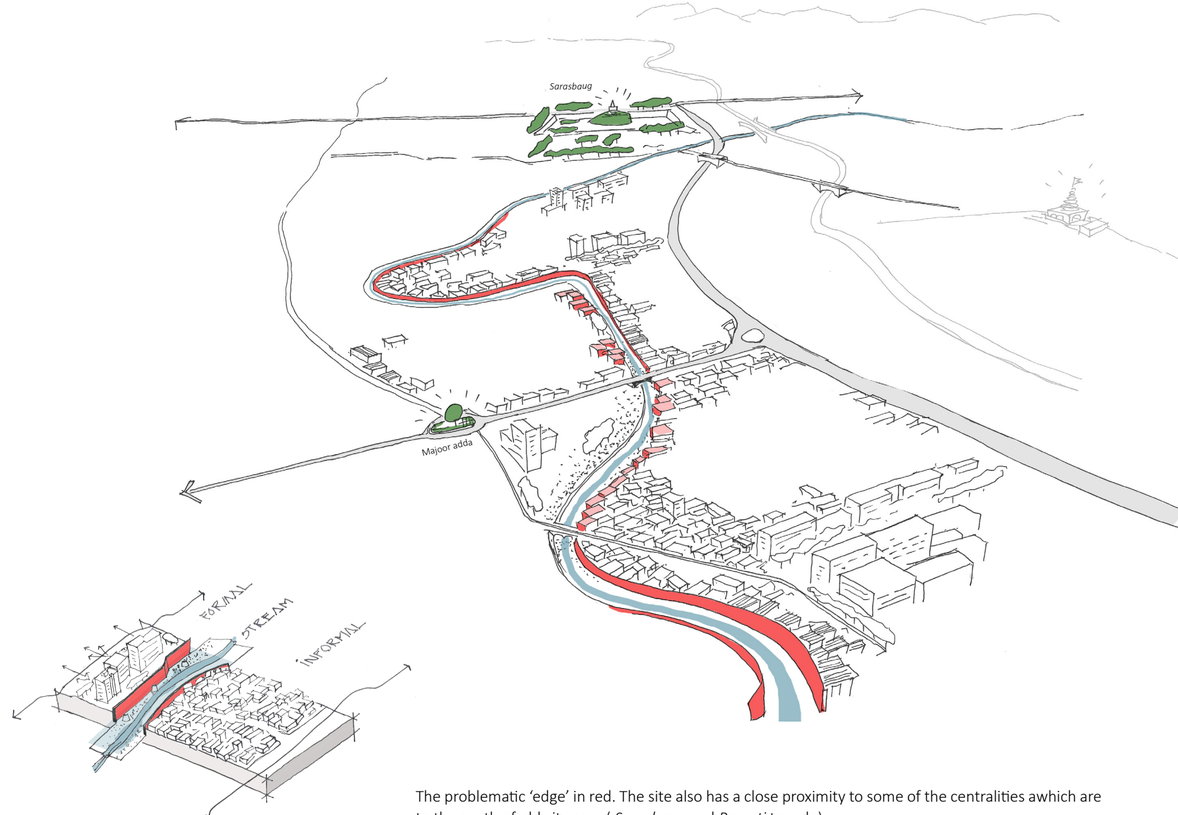
Blue_Green

Formal_Informal

Edges

In spite of close proximity to the water, the informal settlement is deprived of green cover due to pollution in the stream and congestion within the settlement. On the other hand it is well connected to the rest of the city by a main north south street passing through it.

Though the southern edge of the stream is abutted by densely packed informal settlement, northern edge on the contrary has small fragments of abandoned open spaces are a result of formal settlements 'turning its back' to the stream.



The problematic 'edge' in red. The site also has a close proximity to some of the centralities awhich are to the south of old city core (*Sarasbaug* and *Parvati* temple)

What they have to say!...

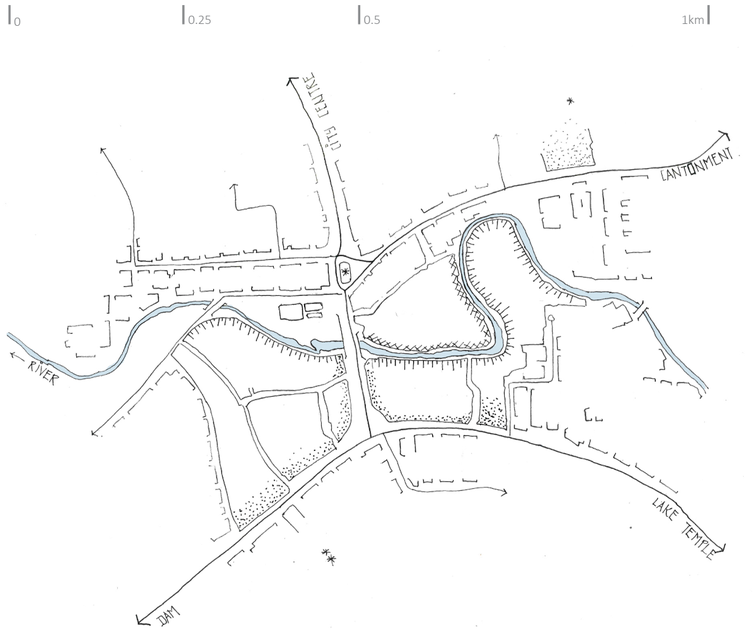
" My tenement is just next to the flood wall. Though we are protected by flood wall, still every year we have to be prepared for the monsoons, as the drainage choks and overflows anytime due to the waste accumulated."

"There is no provision for garbage disposal in the neighbourhood. Naturally people end up throwing garbage over the wall, but they don't see what is piling up in the stream. We are aware that this has a severe impact on our health.
I would be happy to be a part any community development programme."

" I donot like the place where the *majoor adda* (informal labour camp) is at present near the round about. Limited space, no basic amenities, traffic jams during morning peak hours has made that place unbearable"

"We do not have open space to play within this settlement. And my mother does not allow me to play near the stream as she tells me that it is unhealthy! "

Programme



One can seriously question if the term ‘natural water stream’ can be used for the Ambil stream. The unchecked disposal of waste into this stream has practically turned it into a sewer. Therefore the ultimate goal of the proposal is to re-orient the settlement towards the water and give the settlement a place of their own, which today is virtually non-existent. Step-by-step re-activation of vacant and underused spaces by engaging the community will give an additional leverage to the re-orientation. Through this project it is proposed that by redesigning the edge condition we can initiate the process of rehabilitation and provide guidelines for further in-situ rehabilitation of the entire settlement.

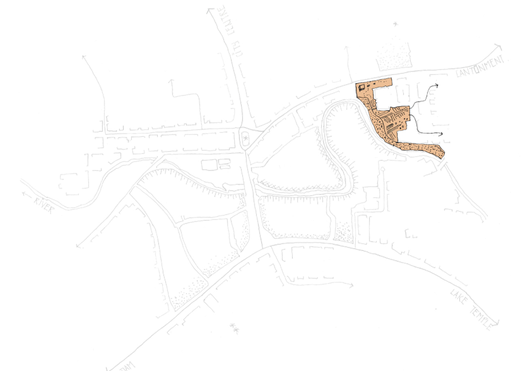
Enacting actors

Creation of unitary framework, where in the local community will take control of the development and sustainability of their surrounding environment. Involvement of local NGO’s working in this sector will additionally help in reactivation of the vacant spaces along the stream with activities planned keeping in mind the needs of the inhabitants.

Whereas, municipality will play an instrumental role in maintaining the engineering works in the stream. On the other hand to start of the cleanliness drive municipality can also work on formulating policies regarding garbage exchange programme. Today garbage collection is not provided as garbage trucks cannot enter the densely populated informal areas. With the money that is invested for the minimal cleaning of informal settlement, an garbage exchange program can be setup where in compensation in the form of food and other domestic products can be given in return of certain number of waste bags per family given at the collection centre. This will not only drastically reduce the amount of waste thrown into the stream, but also in return will help the municipality in maintaining the stream.

During the phase of re-construction of the informal settlement, along with planners and architects, the community can be involved in the planning, designing and construction process. As most of the working population in the settlement are construction workers, involving them in the re-building can help reduce the extra costs.

Existing site condition...

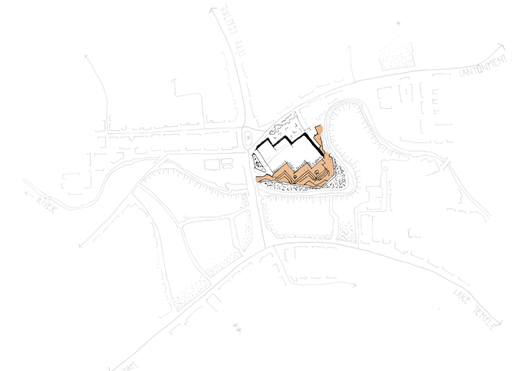


Productive allotment garden

As mentioned before the framework starts with re-activation of vacant, underused and leftover spaces. One of such plot is to the east of the settlement, on the other side of the stream. A pedestrian bridge over the stream connects this plot with the settlement further to the main street. Considering the area of the plot (3000sqm) and its strategic location in between formal and informal settlements, an allotment productive garden is proposed, where small scale flower and food production can be done. This gives an opportunity to the housewives within the settlement to earn a living for their family.

Majoor adda

The existing Majoor adda (labour camp) is creating as well as at the same time facing many problems due to limited amount of space and traffic congestions caused by it during morning peak hours. Therefore a leftover space, which essentially is a 'backyard' of an existing office building, is redesigned, by taking its topographical advantage, into a stepped profiled public space, which also houses the labour camp with the contractors offices occupying the ground floor of the office building. This will not only provide a comfortable interaction space for the workers but will also ease out traffic issues at the roundabout.



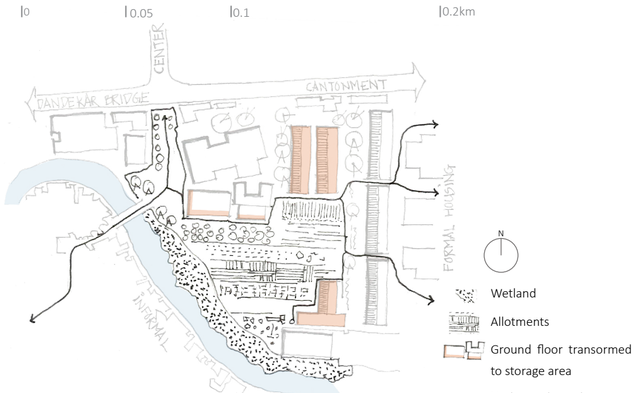
Informal commercial

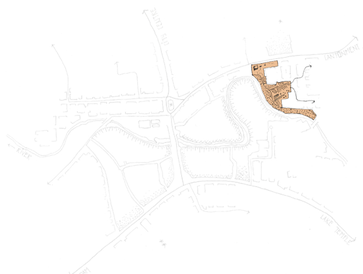
In January 2014, land previously occupied by informal settlement was 'bought' by a private developer and the settlement as rehabilitated away from the site in a multi-storeyed low cost apartment building. A shopping complex is proposed on the site. Therefore with the help of various governing and non governing bodies, the proposed shopping complex is integrated with the existing urban framework by housing the informal commercial shops abutting the street to be proposed along the water edge of the shopping complex.

Slow movement corridor

After re-qualifying these fragmented plots by local initiatives, the municipality gets an added pressure to valorise the stream corridor by cleaning and maintaining the engineering works of the same. Hence this corridor is proposed as a corridor of slow movement which will not only weave all the water side activities but also will give an easy access to the nearby destinations (Sarasbaug to the east and river basin to the west).This in totality will give an additional leverage to initiate the process of re-orientation.

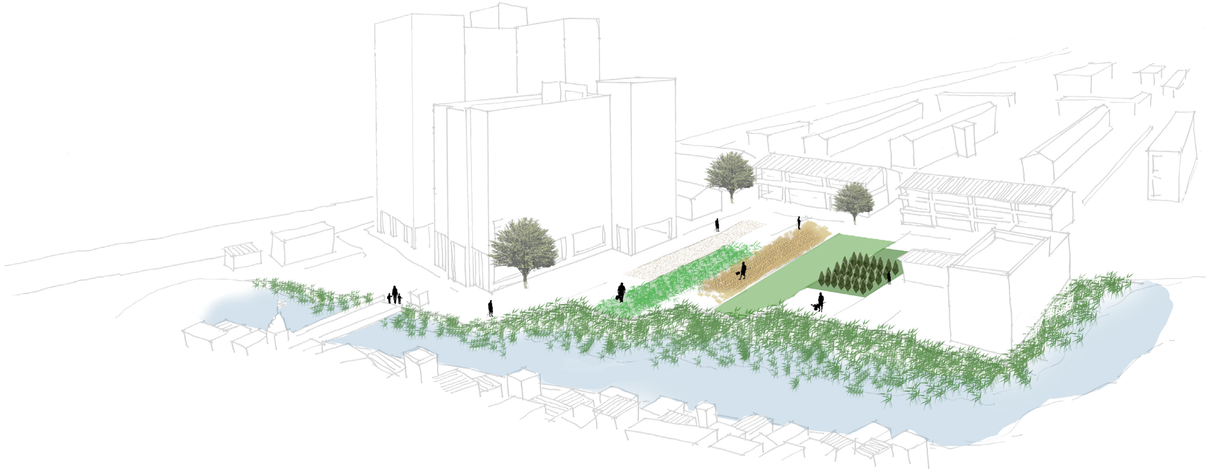
Detail
Productive allotment garden





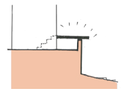
Along the edge of the allotments, a buffer of wetlands is proposed which will to some extent help in the cleaning process. Furthermore, during high waters in monsoon this buffer along with some allotments will accommodate excess water.

Existing situation

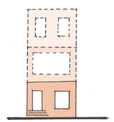


Step1_Proposed situation

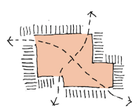
Framework for Re-Orientation of the settlement



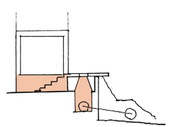
An elevated pedestrian deck can be built upon the existing concrete flood wall. Houses along the water edge can be easily accessed and this space can also be used for semi public activities.



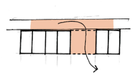
Indian government under the JNNURM (Jawaharlal Nehru Nation Urban Renewal Mission) scheme initiates a grant of euro 4500/ per family for incrementation of houses in the informal settlement. Taking an advantage of this scheme, incremental housing can be proposed for in-situ rehabilitation. These housing blocks can be transformed and altered according to the needs of the inhabitants. As most of settlement dwellers are construction workers, the whole community can be engaged in the construction.



The proposed housing can be clustered around series of interconnecting courtyards, which can be used for festivals and community gatherings. Moreover, by doing this the organic patterns evolved over time can be preserved giving respect to the existing social networks.



The proposed houses along the water edge can be oriented along the pedestrian deck. These blocks also need to have raised plinths for easy access and to also to create necessary space for services.

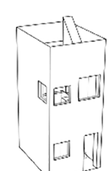


Intermediate access routes to the courtyrad from the deck should be provided

Possibilties..

One of the architectural projects which can be implemented within the specified framework, is an incremental housing project proposed at Netaji nagar(Pune) in 2008 by Brazilian born architect Filipe Balestra in association with SPARC (Society for the Promotion of Area Resources, India) and local architect Prassnna Desai. A flexible strategy for in-situ rehabilitation is developed wherein the designed housing typologies can also be implemented elsewhere with similar needs and conditions.

Inhabitants can choose from three different typologies. House A is a two story home, engineered like a 3 story home to ensure safety in future vertical extension; House B has incremental ground floor, which is left open for either parking or for the family to turn that open space into a shop. House C has an incremental middle floor, to hang clothes or to be used like a living room. All proposals are for one family and 270 sq foot area. These typologies when arranged in permutations and combinations form an interesting architectural composition.



Typology A
Source: Dezeen magazine

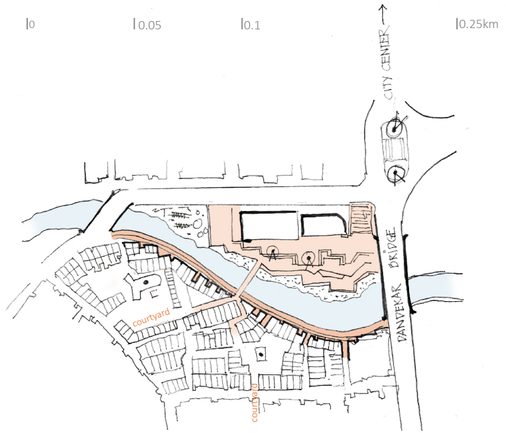
Typology B

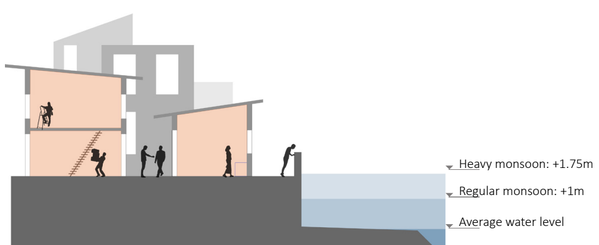
Typology C

Composition of different typologies
Source: Dezeen magazine

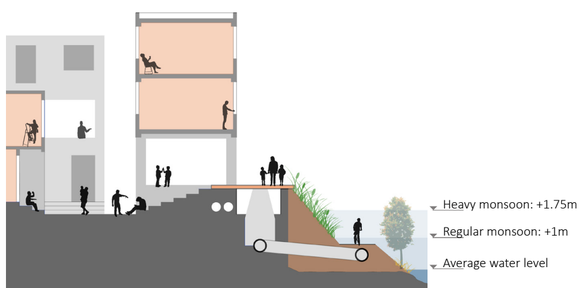
Illustration of the possible implementation in Netaji nagar
Source: Dezeen magazine

End possibility
Public space *(Majoor adda)* and re-oriented settlement

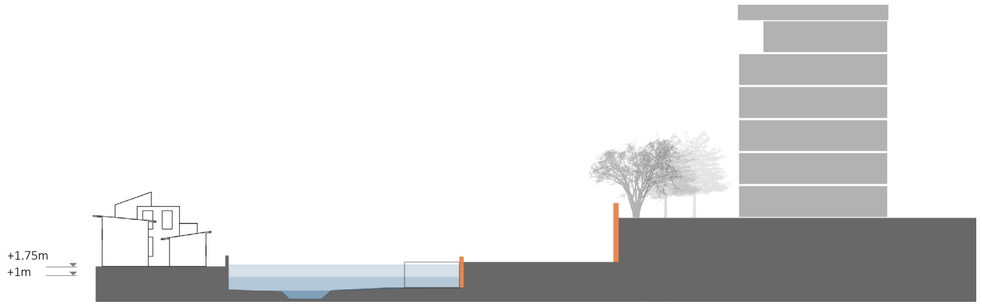




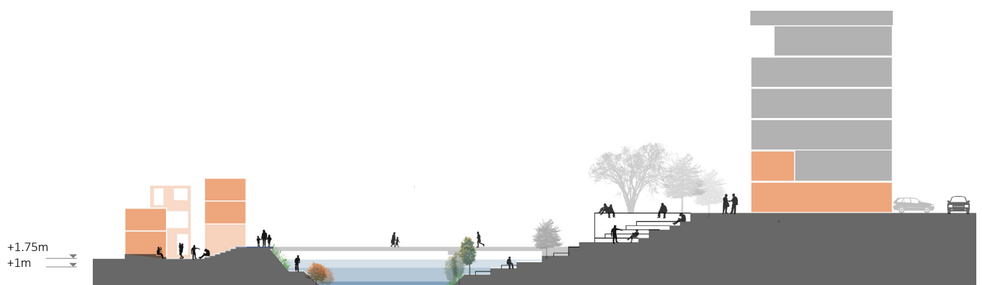
Existing situation



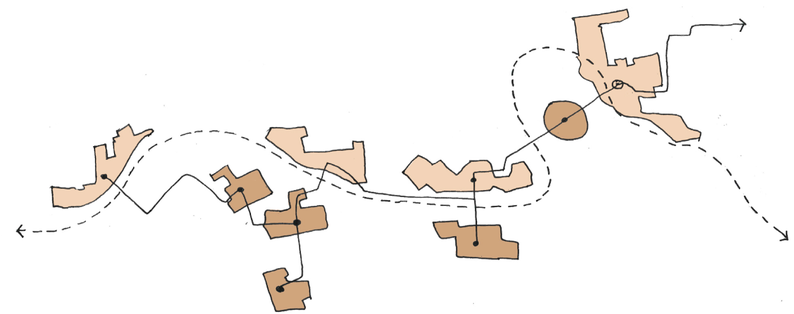
Proposed simulation



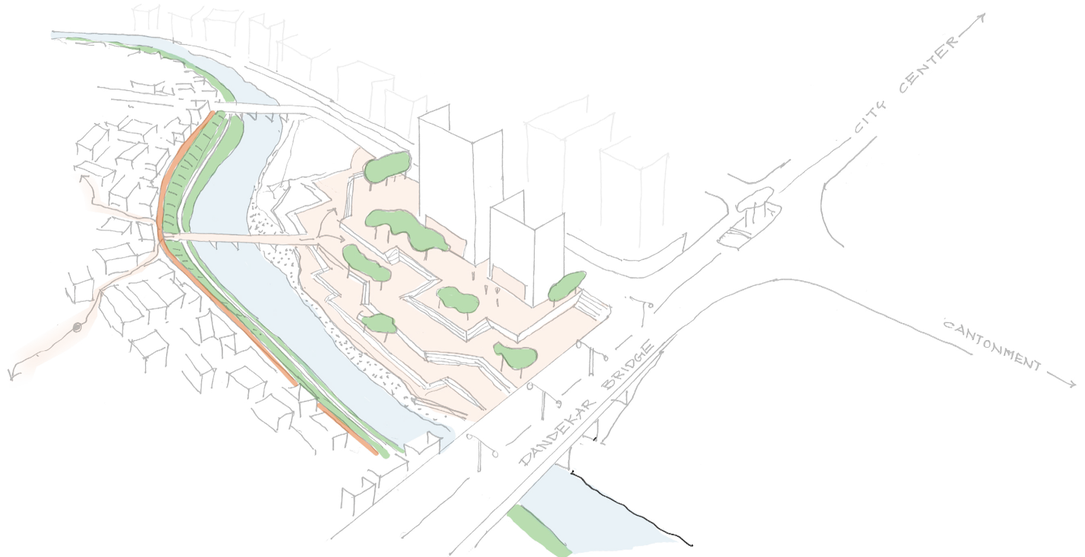
Existing situation

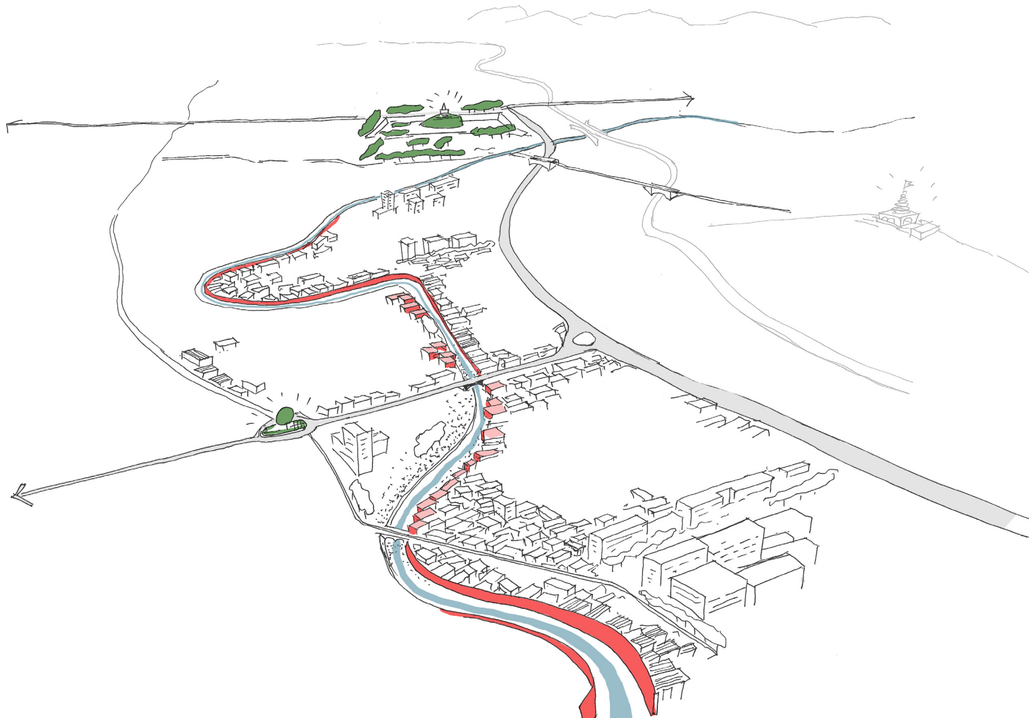


Proposed simulation



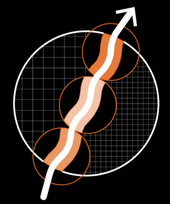
The proposed public spaces and the semi-public courtyards with the settlement are articulted by series of pedestrain crossings over the stream





CASE STUDY 2:

Looking back to the future



River *Mutha*

The site of the second project is one of the most important stretches of the river Mutha. It is situated in between two historically important bridges of the city, one to the south, which exists since the time of the Peshwa's (Lakdi Pul), whereas the other built during the British rule (Nava Pul), to the north. The old city centre adjoining the eastern edge of the river was greatly affected during the disastrous floods of 1961. The retaining wall built has gradually cut off the river from the city. The bridges help you cross only a barren riverfront and a stream of polluted water. The traditional value of the river has ceased to exist. Poor maintenance of the sewage lines and pollution caused by the river side street and illegal parking lots add up to its ecological degradation. During the seasonal monsoon floods these streets cannot be accessed. Even though negatively, this stretch interacts the most with the city due to the number of crossings (six) connecting the old commercial areas to the new residential districts. This explains why it is considered to be a reference point in the city, which was also quite evident in many of the workshop drawings we saw earlier

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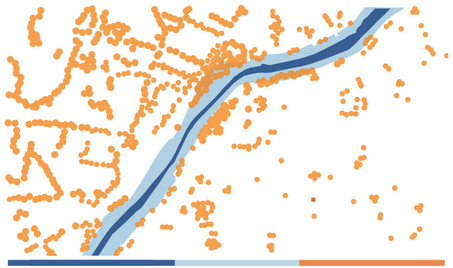
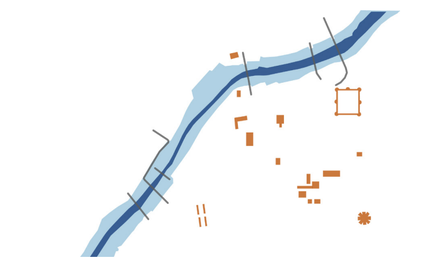
City's two most important commercial shopping streets, namely Laxmi road; a traditional shopping street which is a result of the east-west thoroughfares proposed by the British, and J. M road a contemporary shopping street, converge at Lakdi pul. This makes it an important node in the city.

Site

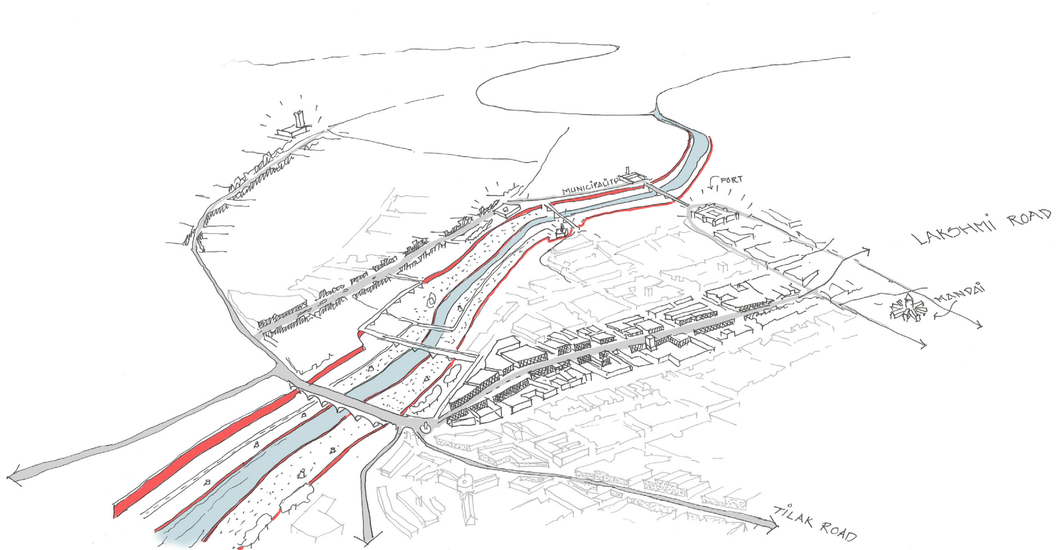


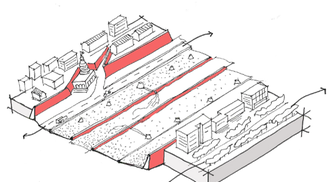
Blue_Green

Commercial zone



The flood walls not only restrict the interaction of the city centre with water, but also the possible interaction between the old and new parts of the cty.





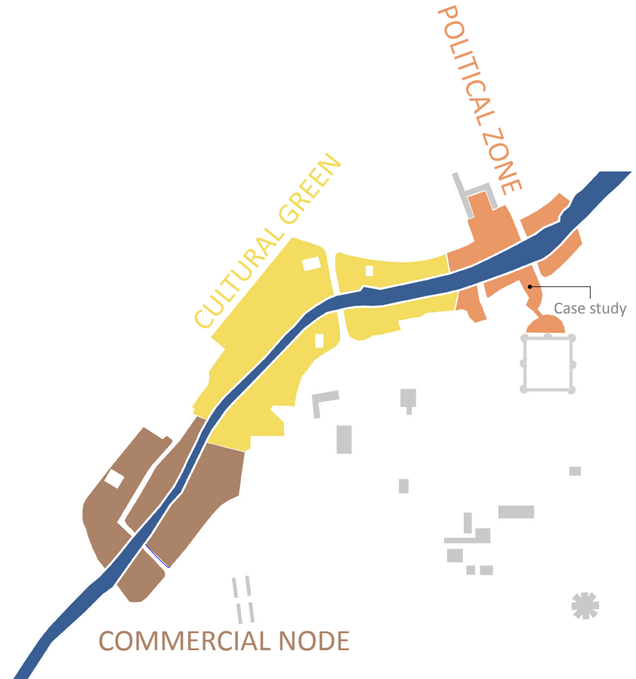
The flood walls not only restrict the interaction of the city centre with water, but also the possible interaction between the old and new parts of the cty.

Centre

The site has a potential to showcase its rich contrast between the cultural past and the globalising present. Bridging the gap between its degrading identities via contemporary strategies will give the city a new image of its own.

Proposal

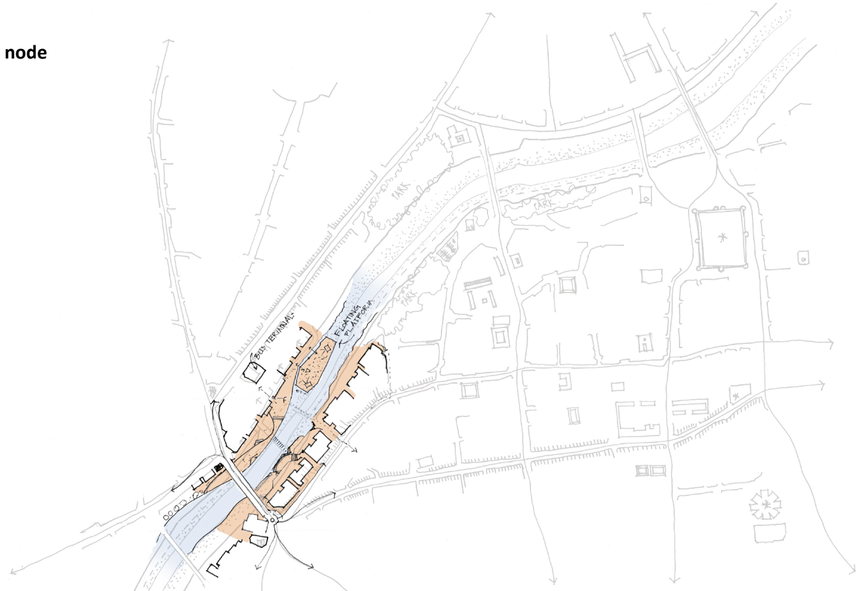
Taking the inherent qualities of the two contrasting world's into consideration, the proposal is programmed into different zones. First is the 'commercial node' where two spatially and thematically different shopping streets converge. The second zone is defined as 'cultural green' wherein the existing green areas are valorised and extended to the congested city core. Whereas the third one is showcased as a political zone where the 'old Peshwa capital (Shaniwarwada) stands opposite to the contemporary capital of the city- Municipality. All the three zones are interlinked with proposed slow movement corridor.



Cultural green

To untangle the complexity of the site the proposal starts with the implementation of green corridor in the central region of the site. This region has a historical importance due to the presence of a Omkareshwar temple (built by the Peshwa's) in the river basin. Whereas the other side of the bank hosts an old drama theatre exemplifying the artistic side of Pune. Both the structures are surrounded by dense cover of trees, in private and communal gardens, which stand isolated in between the river and the urban fabric. Moreover the riverside street disconnects the virtual reality between the river and the temple. Therefore taking advantage of the green potentialities the proposal integrates the two banks of the river by extending the green areas while de-channelizing and eliminating the existing street. An archipelago of wetland mounds are proposed in the river bed, which help in natural cleaning of the water. Moreover they are interlinked by pedestrian decks connected to the slow movement corridors along the banks. Whereas the vehicular bridge connecting the two sides is transformed into open street market during the weekends. Further, the green areas alongside the temple are extended to the city centre, with areas hosting traditional schools and educational facilities through 'green fingers' promoting slow mobility in the centre.

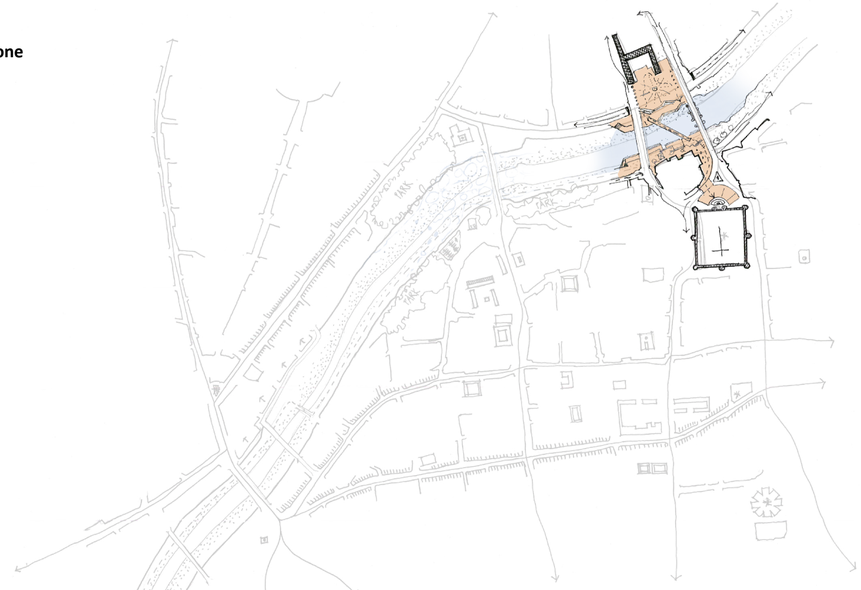
Commercial node



Convergence of two important commercial streets at Lakdi Pul makes this area an important node and a point of spatial reference in the city. Global connection through Lakdi pul and more local connections via crossings in the river bed make this area highly integrated. On the other hand the accessibility is negatively reciprocated by the urban life. Encroachment of food stalls, informal car parking lots, river side street are in totality degrading the ecology of the water course.

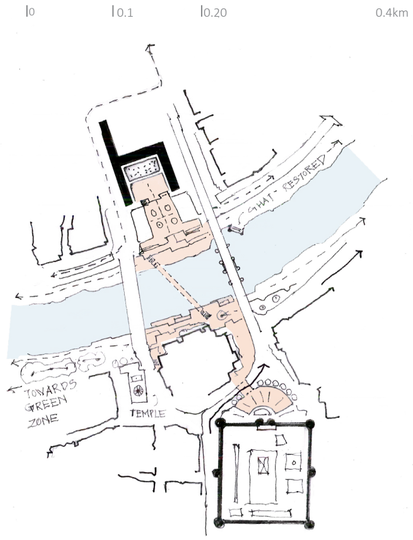
Taking advantage of its commercial proximity, identity as a place for social gatherings and as a spatial reference point right from human scale to city scale, a business district encapsulating local and regional business with a contemporary waterfront is proposed. Real estate investments along the water front will act as anchors for the development and economic sustainability of the area. Whereas pedestrianizing of the waterfront and allocated public spaces acting as water retention zones during heavy monsoon floods will cater to its social and ecological needs. Moreover the dramatic experience of the floods can be experienced from proposed floating platforms along the

Political zone



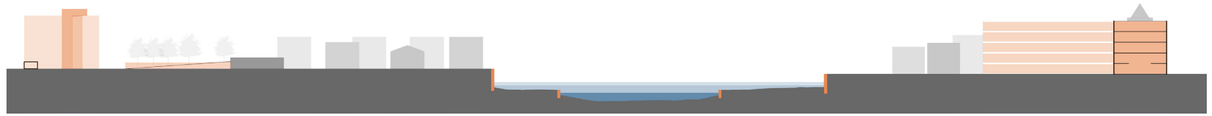
The third zone is juxtaposed by two ‘political’ capitals of their times. One is the historical fortress (Shaniwarwada) and the other is the new municipality building. The open area in front of Shaniwarwada was recently transformed in to a public space by proposing an open air amphitheatre for social and communal gatherings with the fortress as its backdrop. Though the project is a success in terms of formulating an open space in highly congested area, it is disconnected with the surrounding urban fabric due to heavy traffic lanes bordering it. On the other hand the area in front of the municipality is highly congested and chaotic due to the presence of public transit node and lack of pedestrian infrastructure.

Detail

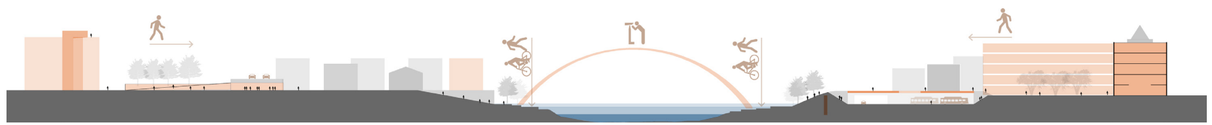


The proposal aims to connect the two fragmented public open spaces by restoring the waterfront. The amphitheatre is connected to the waterfront through a pedestrian subway crossing the street to the riverfront. A pedestrain plaza is proposed in front of the municipality by taking the existing public transport terminus four meters below ground level. The public plaza overlaps the transit node and connects the riverfront to the proposed courtyard park within the municipality building. The two sides of the waterfront are connected by a parabolic viewing platform which gives an overview of the two ‘capitals’.
Linking the river environment to the existing open spaces shall bring life to the deserted riverfront. The development on the land-water interface shall address the importance of river in the changed urban context

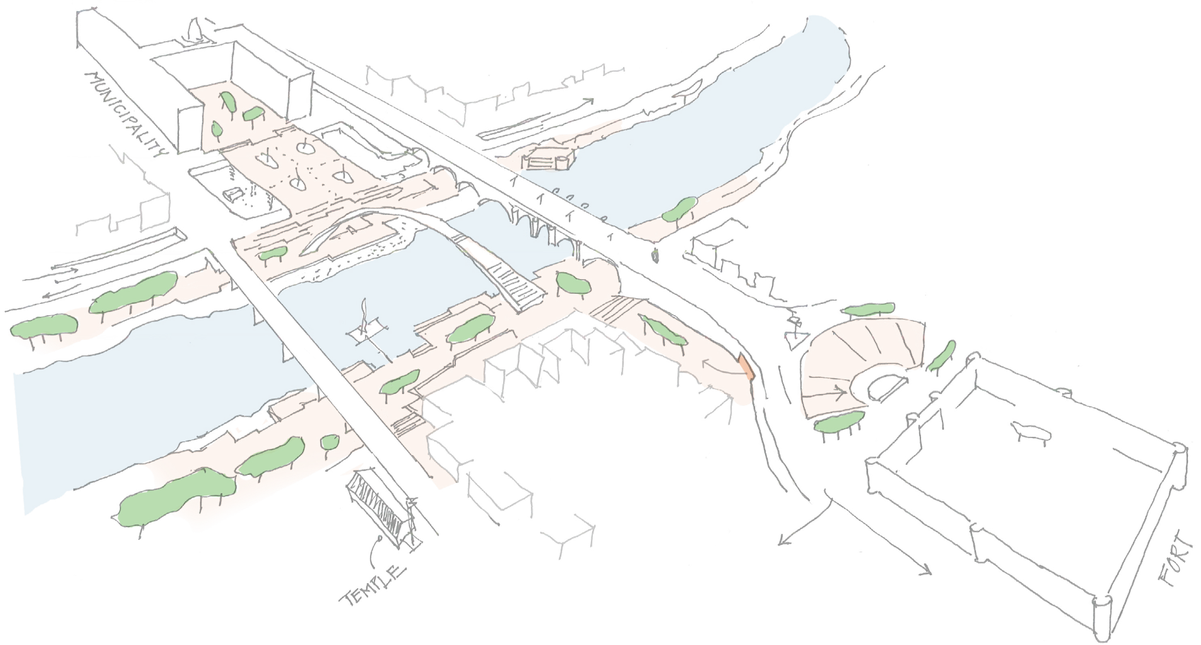
- Fortress *(Shaniwarwada)*
- Municipality
- Pedestrian plaza (Transit node below)
- Amphitheatre
- Parabolic viewing deck

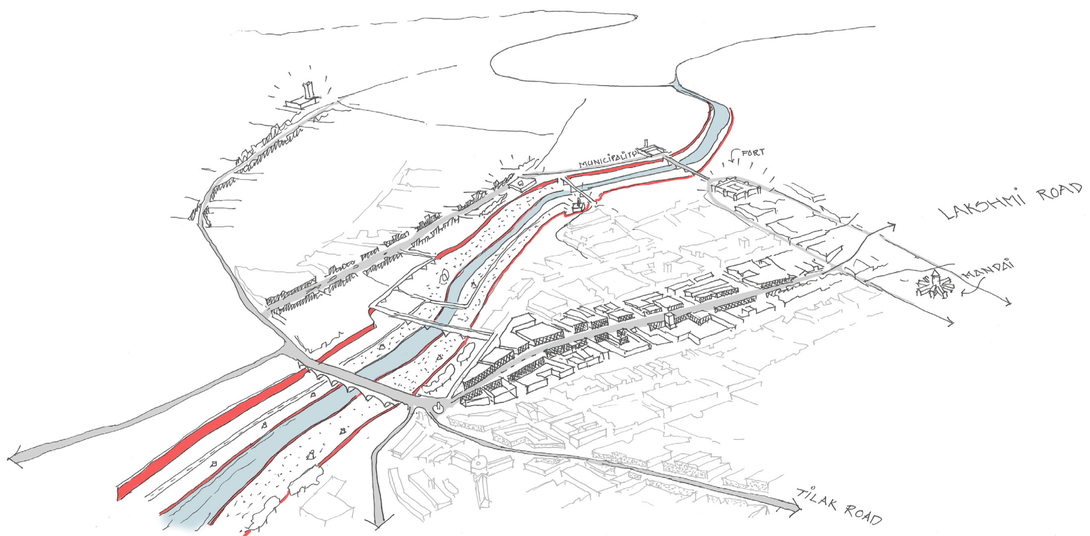


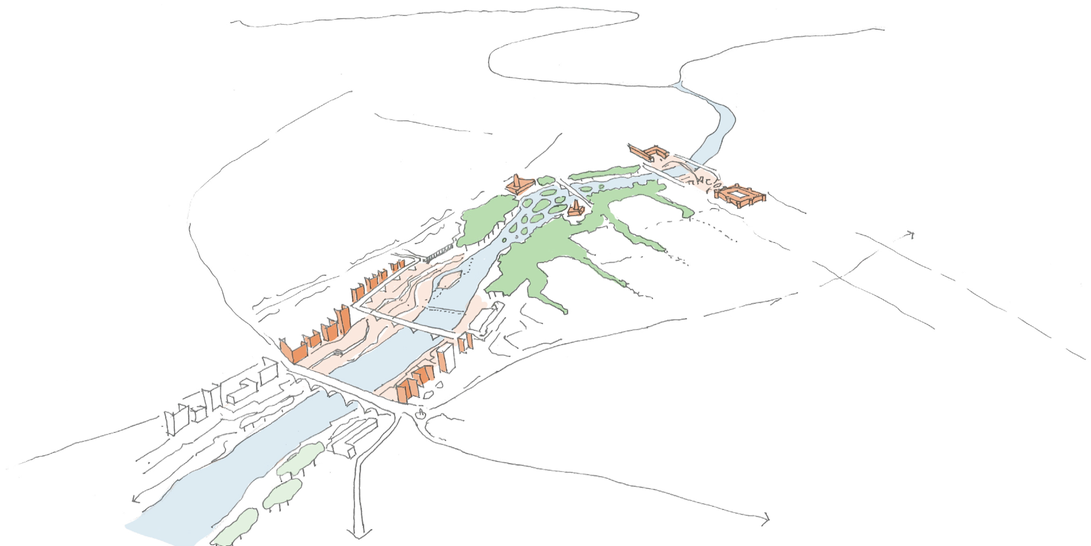
Existing situation



Proposed simulation

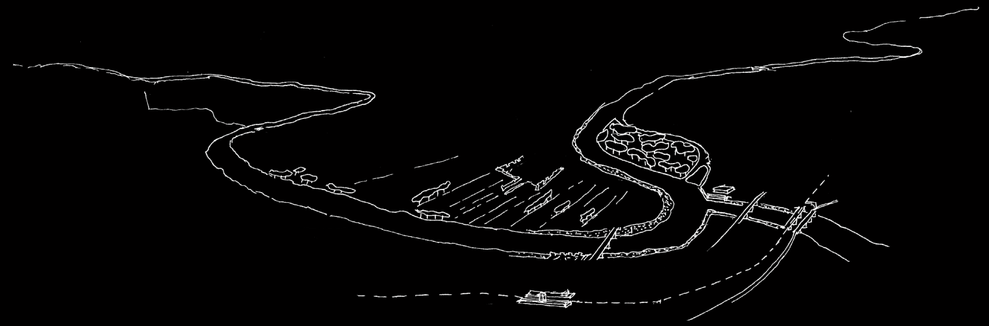



MUNICIPALITY
PORT
LAKSHMI ROAD
MANDAI
TILAK ROAD

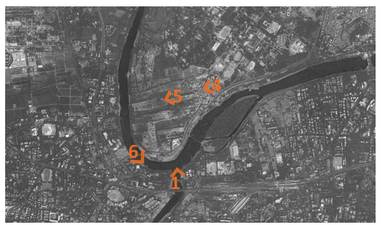


CASE STUDY 3:

Sangam



A place where two or more river meet is known as *Sangam* in Sanskrit language. Historically and geographically the confluence of rivers Mula and Mutha hold a special position in Pune city. The city centre being to the south of the confluence, the southern side is heavily urbanized, whereas the northern side has an agglomeration of variety of different 'green' covers in the area, which also includes an island to the east of the confluence which has a forest of dense trees (*Naik bet*).



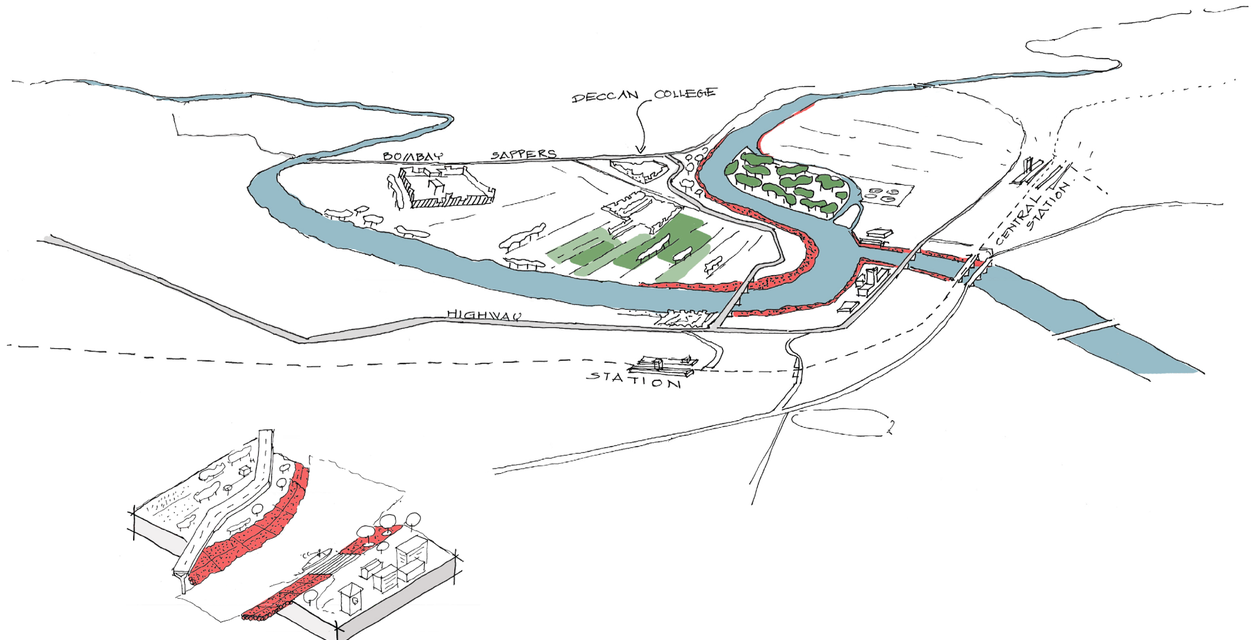
Site

Urbanization

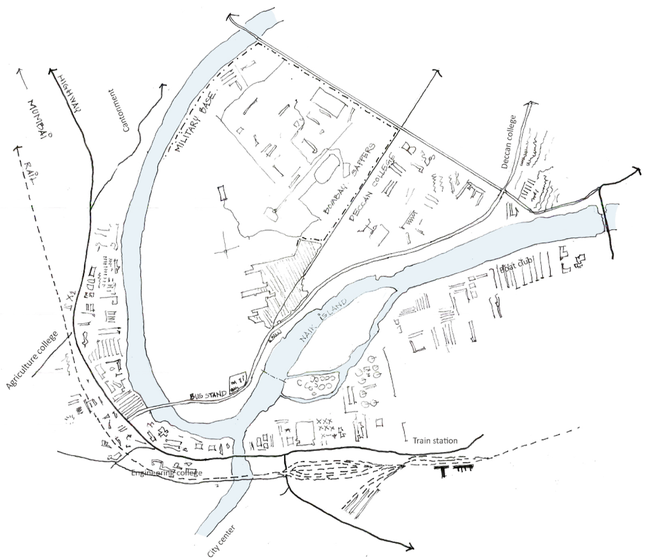
Blue_Green

Barriers

For easier access, a bypass connecting the north and south of the city passing through this area was proposed, which today has lead to encroachments in the form of informal bus terminal and sprawl in the existing settlement (Sangamwadi). Though this part of river is free from channelization, the northern edge of the water course is embanked by stone wall to lessen the severity of floods during monsoons and prevent the edge from eroding.



At the confluence..



The site has a potential to showcase its rich contrast between the cultural past and the globalising present. Bridging the gap between its degrading identities via contemporary strategies will give the city a new image of its own.

Programme

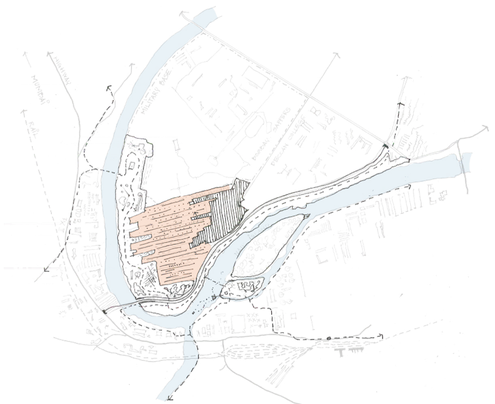
The proposal aims to integrate and valorize the existing variety of green by strictly regulating laws with regards to the interference of the surrounding urban context.

Downgrading the existing north-south bypass route to light traffic.

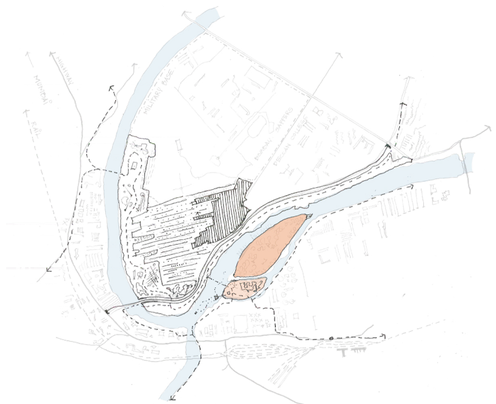
Relocation of the existing private bus terminal to the north of the bypass route.

No further extensions of the existing settlement towards the farmlands and re-formulating densification strategies within the settlement.

Green infrastructure integrated with the existing vegetation to create a buffer zone together with sports and leisure activities. The existing embankment will be replaced by natural vegetation suitable for defending soil erosion which will in turn help in purifying the water to some extent.. Moreover low lying areas along the buffer zone will be water retention zones during monsoon high waters.



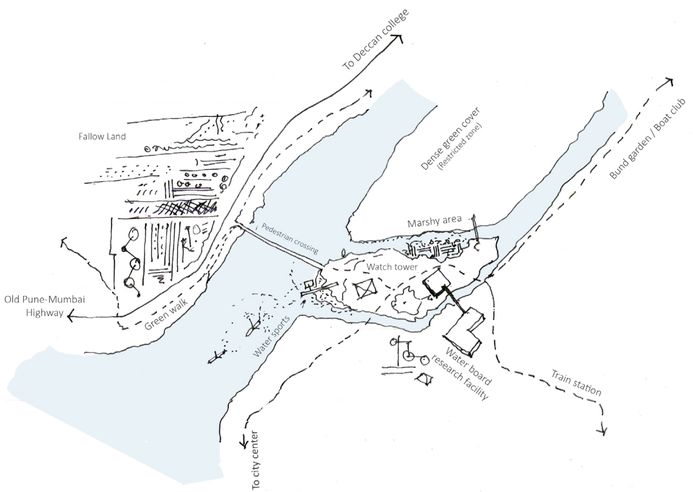
Agriculture land will be protected from public interference and supported by research centre and learning centre for the farmers is proposed. This action for the economic sustainability of the farmers in the neighbouring community (Sangamwadi) , but in return will also ensure the ecological prosperity of the area.



The island (Naik bet) with thick forest of trees will be protected and isolated from human interference. Whereas the small adjoin island will host small scale water sports and nature watching facilities, along with water board office and small scale hydrology study centre will be merged with the existing engineering faculty.

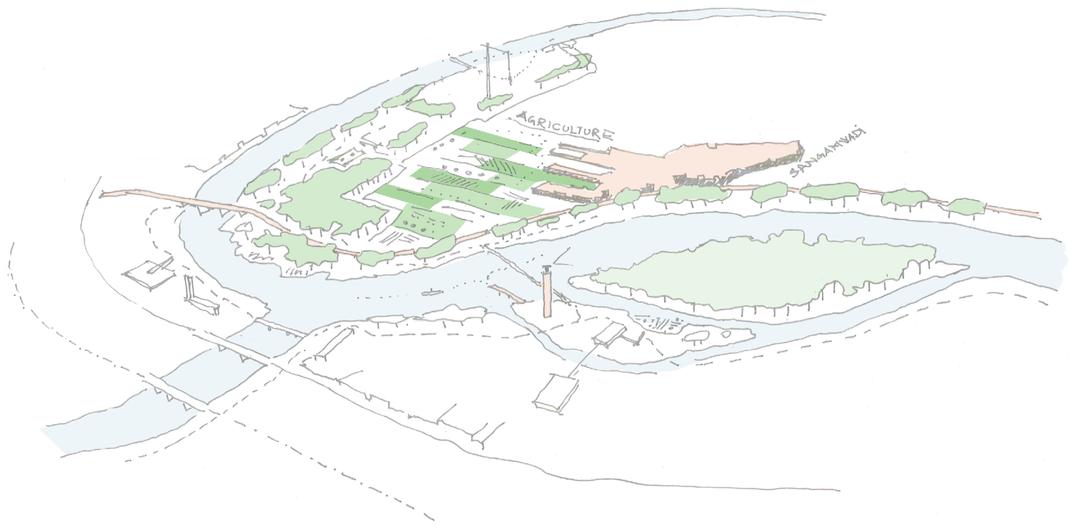
All the areas will be interlinked with green infrastructure and further extended to the adjoining urban areas (Agriculture and engineering college, city centre, train station, Boat club etc.)

Detail
Leisure island park



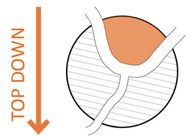
In the drawing shown is the small island adjoining the much bigger one (Naik bet), hosts series of small scale water sport and nature watching facilities. Extension of the adjoining engineering faculty will bring water board office and small scale hydro research facility to the island. The green infrastructure intersecting the site will further extend to the city centre, train station, boat club etc.

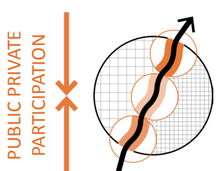
'Top-down' actions reciprocating to the ecology of the water have a great potential in transforming the area into a 'Green heart' for the city of Pune.

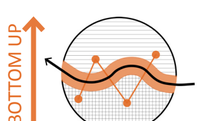


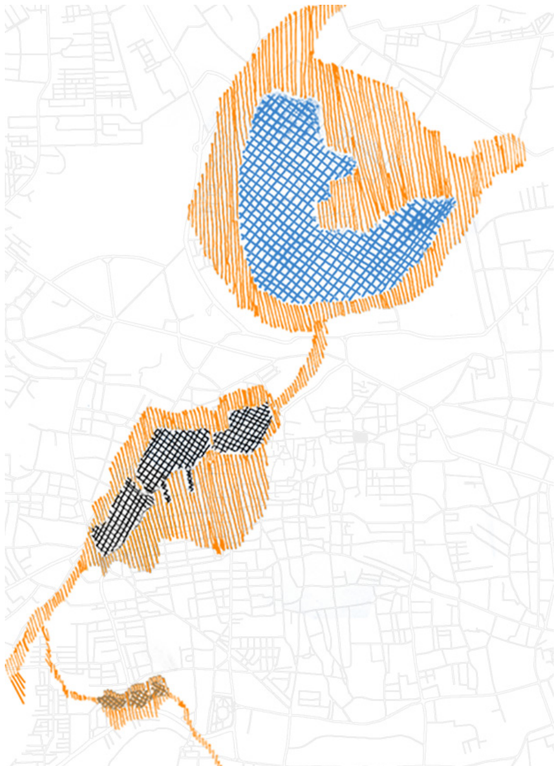
Interrelation

The casestudies not only on three different scales but three different approach are meant to negate the conflict between city and nature by 'opening' the city to its hydrologiccal context, which in return interact in more symbiotic way with its wider territory.



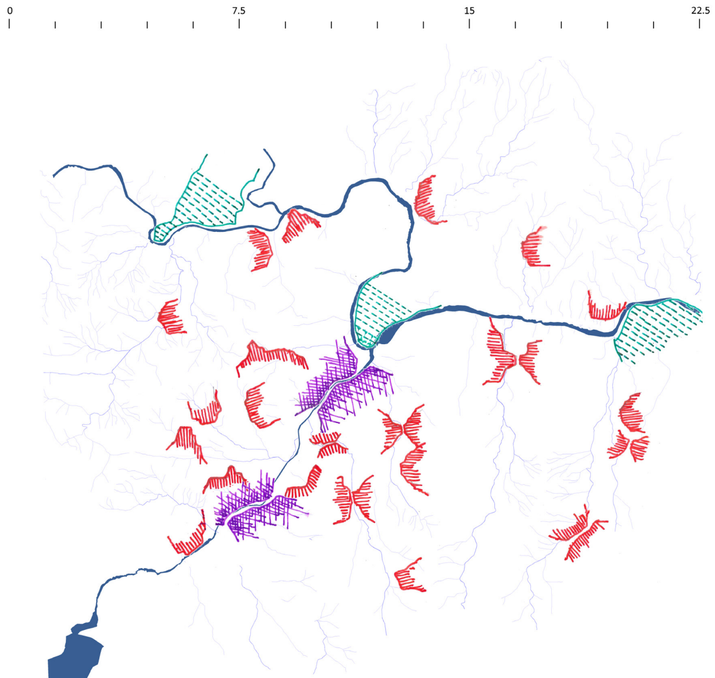






Possible applications

A symbolic representation of applications of the principles derived in three case studies at various possible locations within the city. The red ' butterflies' which represent the context of informality along the stream, instead as a weakness can it reinforce the city's natural asset?



Can the water courses be the 'backbone'of urban enviornment in the cities?

Reflections

The spatial outcomes of the case studies demonstrated here are just images of various possible solutions of dealing with an issue. The concepts and principles which guide an outcome are more important in this case. Therefore it is possible for us to speculate the array of possibilities of instrumenting these concepts and principles to achieve a desired outcome. What role does water play in unfolding the complexities of an urban environment. The approach of re-integrating water into the urban fabric may not be limited to the city of Pune itself. The concepts and strategies used to bring back water as an integral part of the urban fabric by fostering a symbiotic relationship of water with the city to achieve social, economical and ecological reciprocities can be implemented in other cities as well, that have neglected their water-edges.

Cities are a result of a complicated superposition of different spatial, political, ecological and social transformations over time. Therefore while attempting to tackle urban problems, it is important for us planners, designers and professionals to understand the city layer by layer by studying its hidden complexities. Same philosophy applies in the context of the study of natural water systems in the city. Historical overlaps since its provenance unfold the close relation of the city with the water. In the case of Pune, over the years each political rule defined its own way of tackling with the water system. This sometimes not only changed the spatial structure of the city, but also played important role in the socio-economical dynamics of the city. Therefore the present state of the water structure or the problem associated with it is a series of different transformations and translations.

With growing population and every increasing migration, human intervention in nature to maximize the utilization of natural resources is inevitable. But depending on the extent of such human intervention, the adjoining ecology has a drastically different response on the territorial and the city scale. The contrasting response arises strongly when one can see a reciprocal relationship between the human intervention (dams) and the ecology in the south-west part of the city. The dams built along the mountain ranges, have been positively responded by nature, which can be seen through flourishing flora and fauna in this corridor. But when the same water enters the city, excessive human intervention breaks down this equilibrium. The river provides water to the city but in return only gets neglect in addition to the pollution and waste that comes from the city. .In order to resolve this conflict between city and nature, the interaction between these natural and manmade systems needs a closer attention. It is all about building a symbiotic relationship between ecology and economy so that both the natural element as well as the urban city supports each other as they themselves thrive.

The second theme which is discussed here is that of 'Reciprocities'. In its true sense, the relationship between the city fabric and the river in ancient times was reciprocal. In fact the birth of the modern civilization is also a result of the reciprocities between cities, their surrounding hinterlands, technology and the human being. But over the years, the augmentation of urbanization has burdened the natural resources to such an extent that this mutual cooperation between them has come to an end. In the case of Pune, water bodies in the city have

had positive or negative reciprocities with Community, Economy and Ecology of the areas around them. The river, which once was a place for social cohesion (ghats built along the banks), today, has paradoxically become a place for social exclusion (informal settlements and illegal encroachments). In contrast with the history when the commercial hubs evolved in close proximity to the river, today's shifting realities no longer consider water as an element for economical regeneration. Lastly water on one hand has been flourishing ecology through human intervention on the other as a result of same human interventions, ecology around water is degrading. Hence in order to rethink the mutual co-operation of city and nature by understanding today's needs and tomorrows worries, reciprocities between Community, Economy Nature and the urban fabric will play an important role. Moreover I think that the reciprocities between these three components cannot be just constrained to the relation of water and the city, but these reciprocities will also play an important role in stabilizing the cities suffering from great social divides, economical crisis, natural hazards etc. For a sustainable and resilient world reciprocities within different entities within the urban and rural agglomeration will be crucial.

To sum up, this thesis is an attempt to Work on the Conflicting and potential relationships between water and the city. It is about the strategies and interventions which will help the city and nature benefit mutually..

The territorial symbiosis, the reciprocities all are telling a story about a strong bond between water and the urban fabric. Hence though there are still open questions, about the issue of urban water negligence, but at least have been framed and speculated in the case of Pune.

Image credits

Pg 10,
Illustration by Niloufer Wadia
Retrieved from: http://www.illustrationartist.in/portfolio/illustrating-a-map.shtml
Picture: Authors own

pp10, 22,23, 28-29, 52 , 60-64,72-75,78, 94-97, 110-111, 120-121: Author's own photographs

pp 18-19, Photograph by Tan Yilmaz
https://www.flickr.com/photos/26034413@N04/8393025133/in/photostream/

pp20, Photograph by Amit Dave/Reuters
http://www.theatlantic.com/infocus/2011/10/population-7-billion/100176/

pp28(Left), Photograph by Rahul Chandawarkar
http://www.downtoearth.org.in/node/11323
pp28(right), Photographer unknown
http://www.rareindianfacts.org/2012/12/vintage-and-rare-photos-of-old-pune.html

pp81, Photograph by urbanouveau
http://www.dezeen.com/2009/05/05/incremental-housing-strategy-by-filipe-balestra-and-sara-goransson/

pp38, Photograph by Joel Hernbäck

pp124, Xray
http://www.mi9.com/1920x1080/x-ray_80597.html

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