TU Delft Department of Architecture
BK Bouwkunde

Building Resilience with Vernacular Practice

Along River Jhelum, Kashmir.

Annam Irfan I P5 Graduation Report

COLOPHON

P5 Graduation Report

Author: Annam Irfan
Student number: 5233585

First mentor: Dr. Marcin Dabrowski
Second Mentor: Dr. Claudiu Forgaci
Research Studio: Planning Complex Cities Course: M.Sc. Urbanism

Faculty of Architecture and Built Environment Delft University of Technology
The Netherlands

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All photographs are the authors unless mentioned.
All Maps point to North as upward unless mentioned.

Old Jhelum Riverfront with Pashmina Shawls being washed and dried

Reader's Guide

The intention of this thesis to is to guide future climate resilience of cities with age old customs and traditions. The reports intent is to lead the reader to understanding of vernacular practices of the past as the key to future sustainability and resilience to climate adaption.

The personal motivation of the author was is to read the region for post-graduation research opportunities in the area. Another motivation is to define the role of a planner with advocacy and climate adaptation.

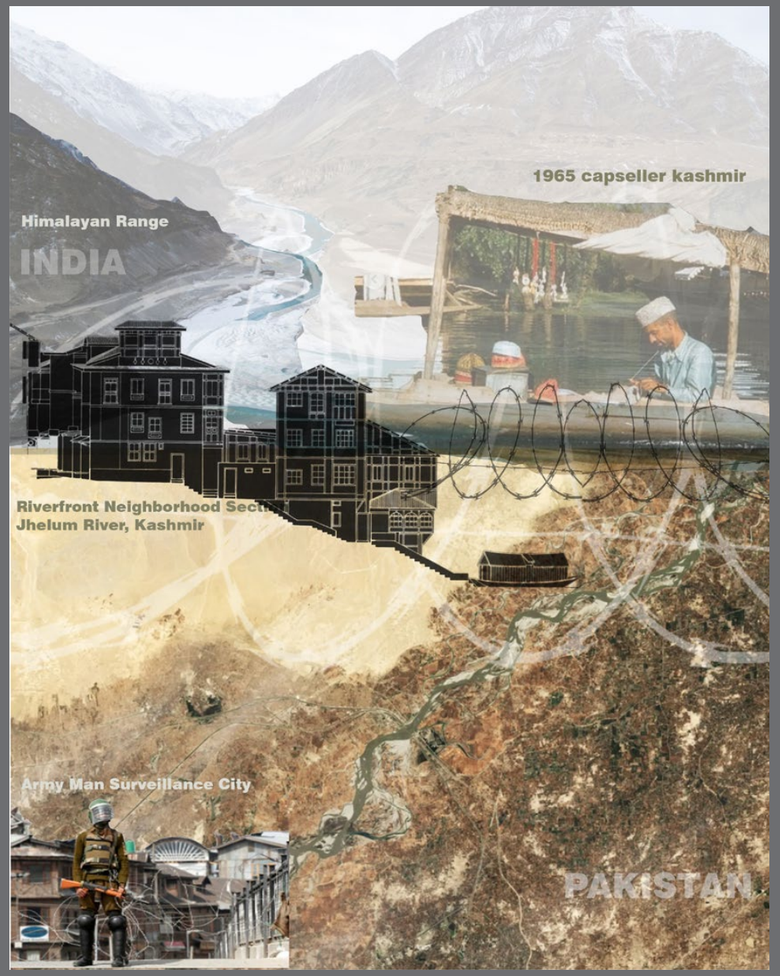
Abstract

The thesis is situated in a contested region at the border between India and Pakistan along a shared basin of River Jhelum. It investigates the impact of rapid urbanization amidst a conflict that strained Vernacular-water relationships, evolved over centuries. These local ties of a water-based community called *Haenji*, were the strength and richness of Srinagar City's heritage. But the situation now is one of abandonment with conflict created distrust at Jhelum, resulting in a 'dying water culture'. The Planning gap with vernacular persists due to a top-down planning culture that has proved to be inefficient for the condition of Jhelum and its wetlands to the 2014 catastrophic floods.

The city of Srinagar was analyzed spatially to reveal typical case study wetlands to read this planning and vernacular gap. This followed a field visit and interview with experts regarding the shifting planning perspectives, post-2014 floods towards resilience as presented in the Srinagar's Master-plan 2035. The analysis led to set of resilience principles and a strategy toolkit that helped develop three Resilience Themes for the City vision. These themes are then tested at the neighborhood pilot at the Jhelum riverfront. The design strategy here aims at a model of vernacular sustainable neighborhood guarding its waters through relationships built on diversity, adaptability and trust.

This thesis proposes a revival of vernacular socio-ecological bonds at River Jhelum in the city of Srinagar, suggesting that sustainable living with water necessitates the inclusion of vernacular practices that evolved to adapt best to surroundings. Theoretically, this borrows from the concept of socio-ecological resilience. It aims at adaptive spatial planning through an advocacy led approach from local solutions to city vision for resilience. Building on vernacular water culture serves as a middle ground between planning authorities, wetland ecosystems and residents of the city to develop trust and bridge the planning vernacular gap.

Keywords:
Socio-ecological Resilience, Adaptive Spatial Planning, Vernacular Water Practices, Climate Adaptation



Collage on thesis location: Jhelum Basin

Contents

“The pressures of modernization have unfortunately produced distortions which obscure the traditional urban values which found elegant expression in the river-front development.

It is, however, clear that this development is one of the more beautiful examples of community architecture and urban planning that still exist in India.” (Ganju, A.)

A former architect laments in a design journal about the traditional Jhelum Riverfront.

An organic neighborhood of Haenji Community that rose as a mini city within Dal Lake.

Defining Research Lens : River Jhelum Spatial Conflict

Context as Academic Niche

There is an extensive body of literature that touches upon urbanization and its ill effects on wetland ecosystems. In the global south, such discussions also involve unplanned encroachments and touch upon issues of socio-economic class inequalities. Adding to this body of literature is urban flooding and the effects of the climate crisis. This is in the context of recent catastrophic Jhelum flood of 2014 and a consequent shift towards flood management and resilience. The planning consensus is that our cities need to adapt and grow to such challenges , simply restraining or avoiding is not enough. This is the academic niche where the thesis is placed at.

Limitations of existing studies

The limitations the author observed in these studies are in the response to resilience as a generic tool-set that overlooks the planning and specific challenges to cities in Asia. The hard and soft structural and non-structural measures can are often recommended in resilience textbooks, and guidebooks like the one from WFF: Natural and Nature-Based Flood management: A guide to flood resilience. The guides employ sophisticated and academically produced solutions to challenges faced by the most vulnerable.
This thesis however would explore the collaborative potential of vernacular practices and planning principles that can supplement the body of knowledge on urban flooding resilience. In this thesis, the author explores the solutions vernacular could offer in engaging with urban resilience.

Key themes and literature employed in this thesis to investigate the hypothesis are:

1. Climate change aggravated Water Conflicts
This refers to the cross-border tensions but also the local inequalities at water ecosystems. The impacts of climate change often affects the most vulnerable as was observed in the Jhelum floods of 2014 and this inclused the local ecology and social groups as well as city and basin scale infrastructure.
(Alam, 2021, Flood risk assessment of Srinagar city in Jammu and Kashmir, India)

2. Unplanned Urbanization - Shrinking Lakes
The urban growth of the City of Srinagar has led to the increased vulnerability of its population along the banks. Often such growth is termed unplanned and as encroachments. The thesis would venture into these specific terms, and their spatial and policy implications.

3. Planning for Resilience:
With Policy changes and using traditional principles and practice. The balancing act between planning formal development and informal practices of the vernacular will be an important step to explore in the thesis.

4. Vernacular Water Culture
Vernacular water wisdom is the traditional know-how of living with wetland ecosystems that can inform better planning decisions leading to sustainable development.
Often these principles are analogous to nature-based flood resilience strategies. While building the adaptation capacity of resilient cities, opportunity lies in looking at social structures and practices that have *evolved and sustained over time.*

Fig. The Floating “Raft Gardens”at Dal Lake (1881)
Source: Ermens 1881 :322, Floating Economies, M. Casimir

Shrinking wetlands blamed on Boatmen Encroachments

The case of shrinking wetlands and their encroachment by unplanned or poorly planned urbanization is seen as an important trigger for flooding. Illegal structures had mushroomed on Jhelum’s banks and around its lakes, clogging drainage channels. While it is believed that boatmen (locally known as Ha’enz) are the main culprits responsible for changing land use and land cover of the lake (Fazal and Amin, 2012), there are policy failures that have led to the majority of the lake area as highly deteriorated.

Academic Literature from this region cites a 500% of urban growth in the valley in a span of a century. (See Fig 1.4 Shrinking wetlands) During the last 50 years, the rapid increase in houseboats, population pressure, encroachment, urbanization, pollution, and sewage have resulted in the decline of the quality of lake water (Amin et al., 2014).

While the vernacular practices of the Haenji need to be regulated their contribution to Jhelum Waters was vital for maintaining it as a transport and economic spine. The were responsible in keeping it clean and regulating its waters. However with unbated tourism in the last few decades with rising political tensions in the valley their role has been made insignificant along with the vitality of Jhelum for Srinagar. The marginalized socio-economic status of the water dwellers often leads to the exploitation. Their future generations of the boatmen would be caught in the vicious cycle of vulnerability due to being stripped from their livelihoods in the form of eviction and resettlement. The city would suffer a loss of critical water heritage.

Fig: Boatmen Neighborhood on a Lake.

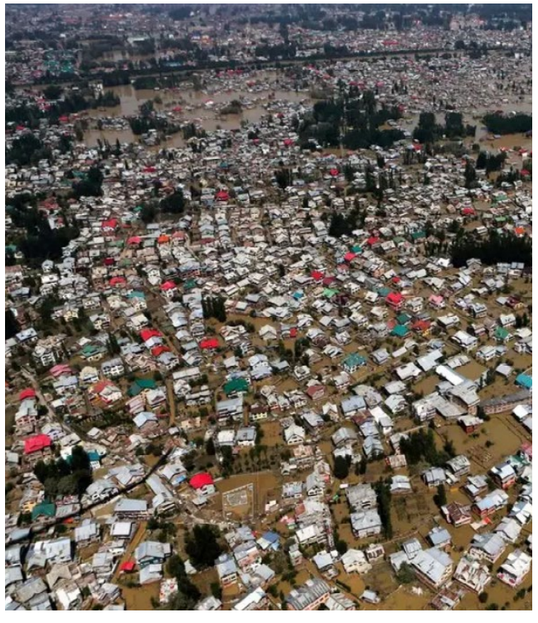


Fig: Catastrophic Floods of 2014. Image Source: Dar Yasin
https://www.nytimes.com/2014/09/11/world/asia/floods-india-pakistan.html

Planning Vernacular Gap

Misrepresentation and a communication gap in a top down authoritative conflict state leads to a gap with the vernacular in the form of distrust, degradation of water ecosystems and abandonment of historic wetland functions.

The dichotomy exists with seeing the local people connected to wetlands as encroacher due to the unplanned and excessive nature of agriculture by the planners govt officials to protect these reserves in conservation and lake action plans that call for resettlement of vernacular. Whereas environmentalists see them as vital for tourism and stewards who best know these ecosystems.

On Basin Scale: Environmental challenges relating to the - Cross Border Conflict exist specifically with respect to Hydro-power projects, like the construction of the Kishenganga project at Wular is contested by border countries for fear of water scarcity and flooding. This regional conflicts affect the politics of planning on a city and local scale.

Dal dwellers' rehabilitation will help restore, preserve Dal Lake: DC Sgr

A news headline highlighting the planning vernacular gap as reiterated by the District Commissioner

Fig Top and Below : Dal Dwellers Microcosm a city within a lake. An example of resilience that is misrepresented.

Appendix, A1: Threats to wetlands table and management perceived impacts

1.2 Problem Statement

Vernacular water heritage, like the settlement of Haenji, Boatmen on the jhelum waters, strengthen the vibrancy of life on Jhelum.

However the planning authorities in wake of wetland conservation see the boatmen community as encroacher on water systems to be evicted. Such a loss of vernacular heritage would only exacerbate vulnerability.

Resilient design should build on the long evolved resilience of the vernacular and suggest adaptation to sustainability through an advocacy planning approach rather than the current regulation and conservation led approach.

Planning Timeline- Srinagar City

Settlement around Jhelum
Till 1900s

1.
The Srinagar Master Plan 1971-91
The first ever comprehensive plan , in the aftermath of **devastating floods of 1902**. Mr. W.G. Harris, a British Engineer was hired by the State for **comprehensive flood management**

2.
Master- plan 2000
Poorly executed, administrative inertia, conflict crisis

3.
Master plan 2035, Srinagar Metropolitan Region
Threshold Population from 1.8 increased to 3 Million by 2035. The Srinagar Metropolitan Area increases from 416 Sq. Km to 766 Sq. Km., 84% increase.

Source: Srinagar Masterplan 2035 Report

1.3 Theoretical Frameworks

This section will elaborate on the key theories and concepts researched to develop a framework to guide the next steps of analysis. For this, the key concepts of Adaptive Spatial Planning, Socio-Ecological Resilience and Water Ethics were considered.

The key concepts explored are the following

- **Water Ethics,**
- **Adaptive Spatial Planning**
- **Socio-Ecological Resilience**

Water Ethics

Defined as inclusion of Vernacular values, and beliefs assigned to water. These can be defined as principles part of a philosophical discourse around water that guide responsible intervention of technology and human in water systems are termed Water Ethics.

Water Ethics consider water as a common resource, and that its heritage value associated with a community is respected. ‘Ethics’ is derived from Ethos (Greek) for character and Mores (Latin) for customs. Together it defines what is believed to be good for an individual, society and the interrelations.

Water Ethics theoretically is closely tied to the component of Water Justice which includes access to water and healthy water ecosystems for meeting economic and livelihood needs, as well as aesthetic, spiritual, and psychological needs. It can be seen as a democratic planning principle that calls for advocacy planning.

Some sets of ethical principles have been proposed for water ethics (Groen Feldt 2013). The UNESCO (2011, pp. 18ff) unfolds the normative dimension of water ethics along principles stemming partially from law and partially from ethics. Relevant principles to thesis are :

• Principle of human dignity and the right to water
• Principle of the vicinity
• Principle of frugality
• Principle of multiple and beneficial uses of water
• Principle of compensation and user pays
• Principle of polluter pays
• Principle of participation
• Principle of equitable and reasonable utilization

Ethics, however, need not be seen as a pure philosophical abstraction but can be very practical from individual to society at large. Ethics does not solve the problem but clarifies priorities to suggest where to look for solutions. An ethical framework guides when working with competing values around water. These can inform decision makers to facilitate mediation and be utilized for co-mapping, and co-design and conflict resolution.

The concept of water ethics is seen mobilized in ‘Rooted Water Democracies’ as:
People’s movements for water preservation and addressing local issues. Rooted water democracies are social movements organized for direct/ indirect organization of water conflicts. These indulge in the rootedness of heritage shared by a community around water, their internal structure and capacities.

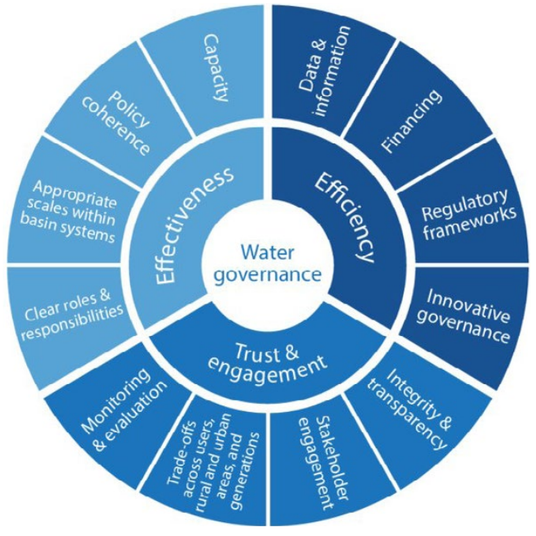


Fig: Water Governance Framework that highlights water ethics
Source: OECD Water Governance

Adaptive Spatial Planning

Adaptive spatial planning is the adjustment of socio-spatial structures in the wake of climate crises. Adaptation capacity requires both flexibility and robustness. The response to such an adjustment necessitates dialogue across scales with models of network governance for example.

Climate adaptation necessitates navigating flexibility and robustness. This leads to an emerging “Adaptive spatial planning approach”. While many definitions of adaptation to climate change are in circulation, one of the most used definitions is the IPCC’s, which defines adaptation as: “The adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploit beneficial opportunities.”

The adaptive spatial planning approach examines policies that would be required to support the sustainable transition from water scarcity to security. The author adopts this lens and ties it with the concept of Integrated Water Resource Management to map how can community networks can adapt to flood resilience. To chart the burden and benefits across scales and look for adaptive pathways is the emerging approach to planning. A dialogue between stakeholders to co-map, co address and co-design is the need of the hour.

Significant principles from this theoretical concept would be:

• From hierarchical to networked governance (Polycentric)

• Landscape as a socio-ecological system and Integrated. Landscape management (both social and ecological systems should be considered together Principle of Integration) cross-sectoral

• Adaptation focuses on anticipating climate impacts in three ways. These are minimizing potential damage, coping with the consequences of impacts, and taking advantage of opportunities. (A. van Buuren et al. 2013)

The elements of Adaptive spatial planning identified from the literature study are:

1. Institutional Context of adaptive spatial planning, What is the role of government?

2. Governance Processes, organization of planning process, How are the demands of flexibility and robustness managed within the planning process?

3. Instruments/ Responsibilities: local, financial, stimulating and allocating responsibility. What is an efficient allocation of responsibilities and distribution of costs and obligations in planning processes?

Comparison with traditional Planning.

Spatial Planning could be defined as strategies used by government agencies to influence decisions on various spatial scales.

The traditional top-down model of planning prevalent in the region relies heavily on precautionary principles results in rigidity of planning documents, lack of transparency, clarity, and interpretation from paper to practice.

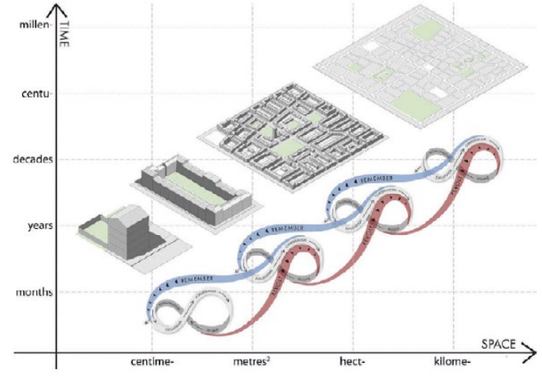


Fig: Panarchy, Nested Adaptive cycles in a city.

Socio Ecological Resilience

The term ‘resilience’ comes from Latin: to spring back, recoil.

Resilience has become a buzzword in the planning field just as sustainable development. In the resilience rule book, both robustness and adaptability are required. However often Policy docs (London Climate Adaptation Strategy) lean on persistence more than adaptability last transforms this does not favor the status quo.

In contrast to this evolutionary resilience seeks to return to a new and better normal. It leans less on the idea of persistence and more on looking at transformabilty as an opportunity through social learning and innovation to paint desirable trajectories. ‘

This theoretical notion is also linked to adaptive planning.

Evolutionary Resilience necessitates the ability of social networks to *evolve*. Social learning in river basin management refers to developing and sustaining the capacity of different authorities, experts, interest groups and the public to manage their river basins effectively. Collective action and the resolution of conflicts require that people recognize their interdependence and their differences and learn to deal with them constructively. The different groups need to learn and increase their awareness about their biophysical environment and the complexity of social interactions. (Wostl, 2006)

Shifting from earlier concepts of engineering resilience that emphasized the ability of systems to maintain stable equilibrium and ecological resilience that emphasizes adapting capacities of natural ecosystems, evolutionary resilience is socio-ecological resilience argues in favour of “people and nature as interdependent systems” (Folke et al., 2010: 21).
Rather than conceiving resilience as “a return to normalcy” (Pendall et al. 2010:76), this perspective interprets it as the ability of complex social-ecological systems to change, adapt, or transform in response to stresses and strains (Carpenter et al., 2005). Given the similarities between this view of resilience and the evolutionary perspective, as suggested by Simmie and Martin (2010) in the context of economic geography, Davoudi (2012a) calls this approach evolutionary resilience.

The principles of evolutionary resilience are:
I. Respect the inherent coping mechanisms of an ecosystem.
II. Recognize the interdependence of ecosystems
III. Principle of complementarity and synergy
IV. Principle of Subsidiarity (management at the lowest practical level)
Some tools employed with this theory from the literature reviewed were:
• Environmental Impact Assessment.
• Inventory of anthropogenic activities and impacts on the basin.
• Mapping local Perceptions of the value of water systems in the basin
• Perceiving water as commons and as an economic resource

Water governance is a shared responsibility of both public institutions and stakeholder groups. Informal water systems that may co-exist with public systems also need to be accommodated. This accounts for responsibilities principles of “integrity” transparency, accountability, and engagement of stakeholder groups.

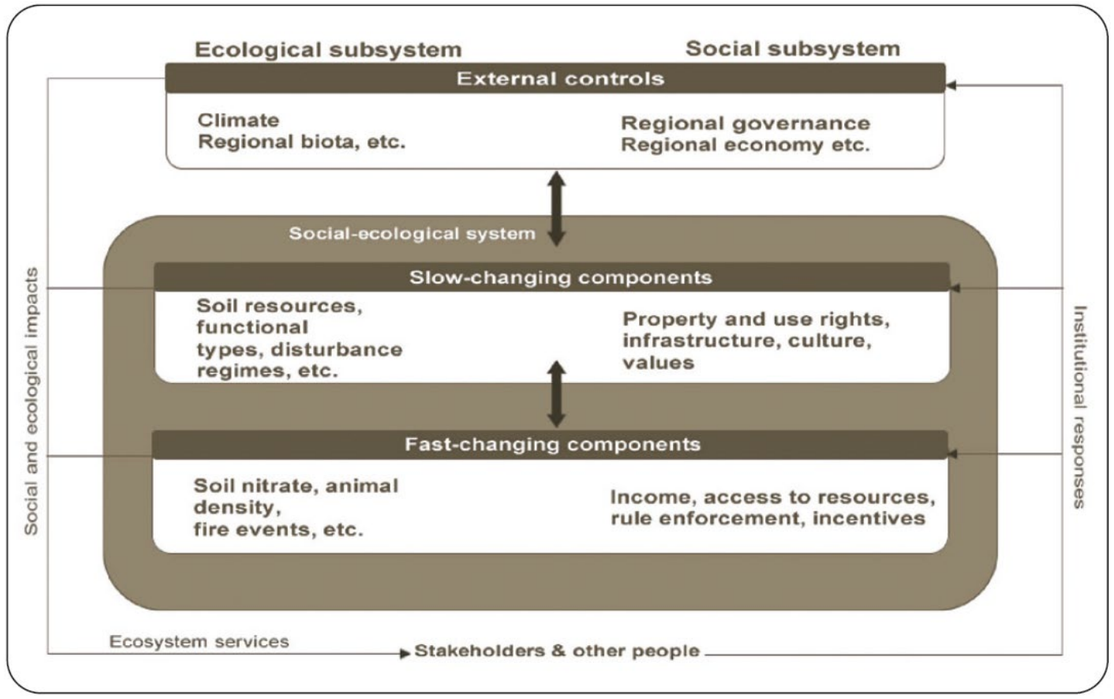


Fig Conceptual Model of the integrated socio-ecological system. Source: From Resilience Alliance - Practitioner’s Workbook)

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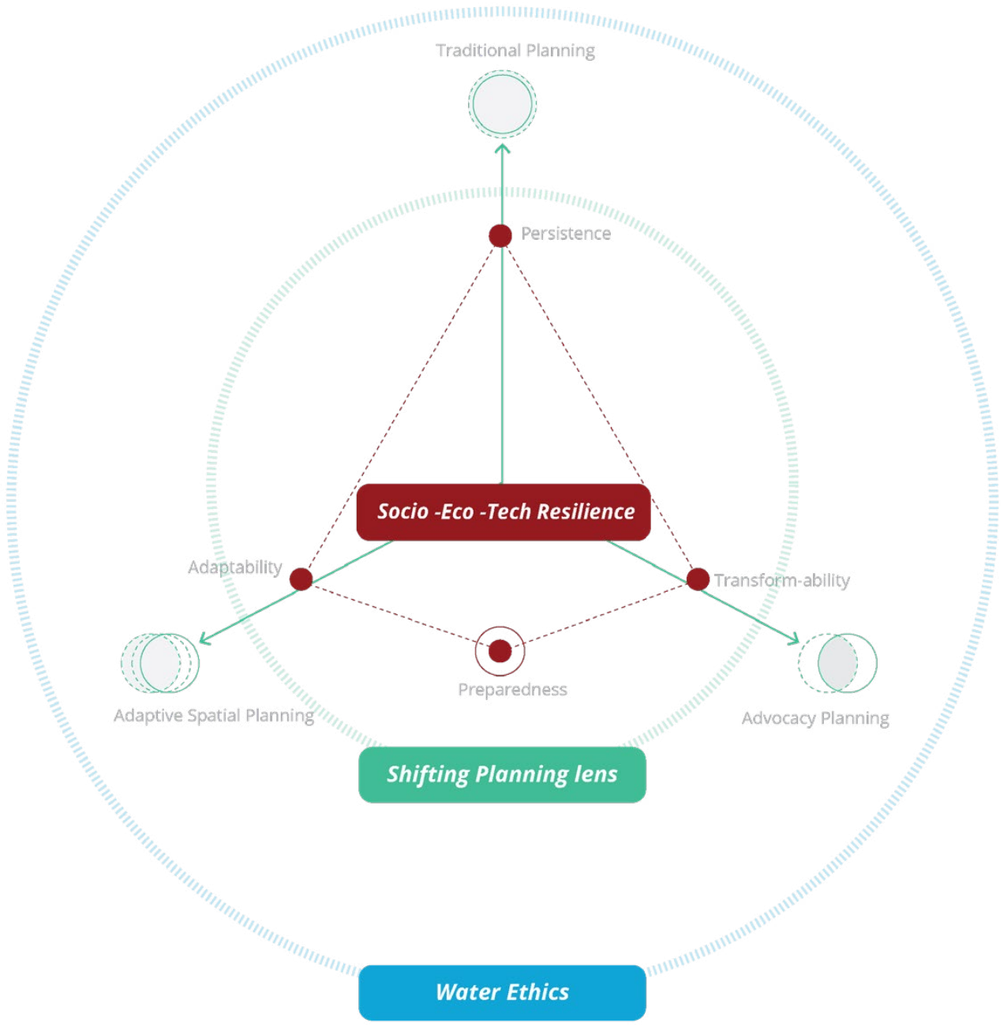
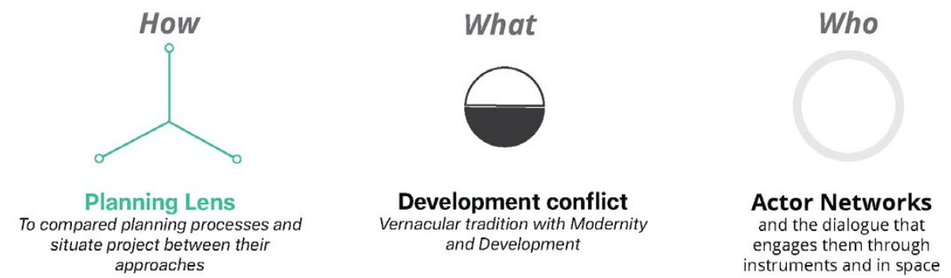
Neal, M. J., Lukasiewicz, A., Syme, G. J. (2014). Why justice matters in water governance: Some ideas for a “water justice framework.” Water Policy, 16, 1–18. https://doi.org/10.2166/wp.2014.109

From theory to Concepts to investigate:
The principles of Adaptive spatial planning, Water Ethics and Socio-Ecological Resilience were used to arrive at a theory model to refer to for design.

This theoretical model was juxtaposed with intentions of designing with vernacular practices and addressing the vernacular-development dichotomy to chart a conceptual framework



1.4 Conceptual Framework



1.5 Aim and Outcome

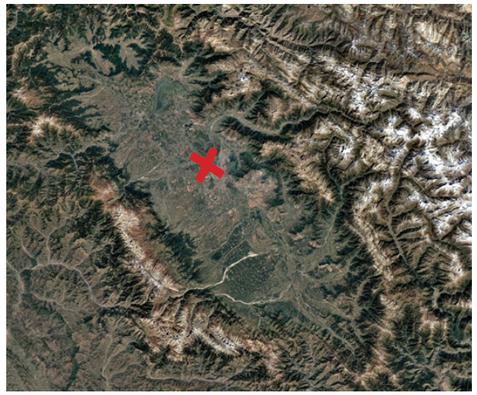
Project Aim is to involve traditional practices and networks while building the adaptation capacity of settlements in Jhelum Basin by employing nature based resilient flood management plans.

Some intended outcomes set at the start of thesis were:

Pilot Resilient Neighborhood
The aim of this thesis would be the design of a model resilient riverfront neighborhood that could serve as a restorative model of wetland shrinking and flood vulnerability with systems and processes to be replicated across scales. Finding the appropriate balance between organizational resilience and community–ecological resilience operationalized using strategies to supplement flood-proof plans The focus would be Community-based natural resource management.

Reflection on City scale
Resilience vision that is based on this vernacular centered approach. This would supplement the Masterplan 2035 of Srinagar City

Strategy Toolkit
A practical guide bridging resilience concepts from socio and ecology made after analysis of site and accommodating learnings specific to site.



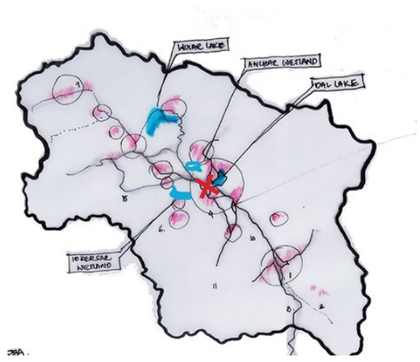


Fig: City and Jhelum Scale Process Maps

1.6 Research Question

How can vernacular practices of River Jhelum guide adaptive spatial planning for a flood resilient Kashmir?

The questions help to investigate the line of Inquiry called “Vernacular water Conflict”. This term specifically refers to the current vernacular practices that evolved over centuries and the conflict crisis of the contested state with its effect amidst a --- growing city.

The second main line of inquiry is termed as “The planning Gap”. This refers to the lack of mediation and community voice in a top down authoritative model of planning. It seeks to explore how adaptive spatial planning in this context would require flexibility from the current governance models.

1. What are the most urgent urbanization conflicts around water that aggravated the flooding? Why have these
emerged as urgent?

2. What are the vernacular water traditions and networks (who); Can resilience be interpreted in their nature-based solutions?

3. How can adaptive spatial planning better inform traditional sustainable living with water?

The first line of inquiry is the vernacular water conflict . These are the urbanization challenges on water systems and the conflict state’s effect s on River Jhelum water network. This step is explored with spatial assessment of Srinagar City with field visit to case study sites. The vernacular Practices Inventory was collected from Literature Study and supported with findings from Field Visit.

The second line of inquiry is the of planning gap and is explored by reading the Master-plan document and Interviews with planning experts .

Lines Of Inquiry

1.Vernacular Water Conflicts

2. Planning Gap

1.7 Methodology

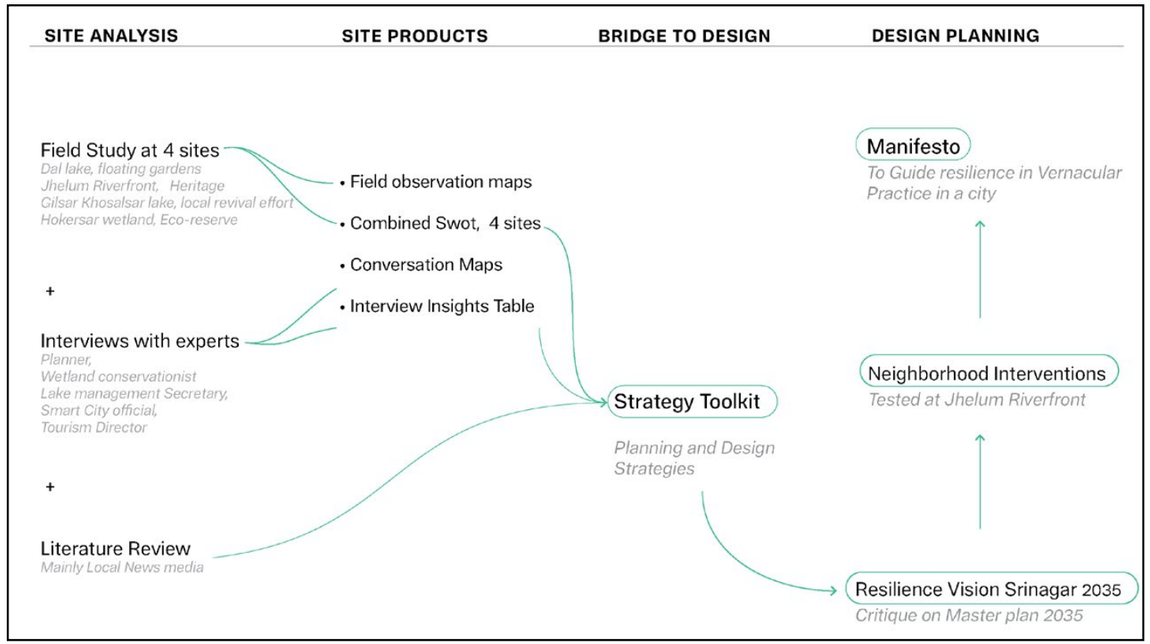


Fig: Methodology Chart

Addressing the Research Questions

1.Vernacular Water Conflicts

RQ1. What are the most urgent urbanization conflicts around water that aggravated the flooding? Why have these emerged as urgent?

RQ2. What are the vernacular water traditions and networks (who); can resilience be interpreted in their nature-based solutions?

2. Planning Gap

RQ3. How does traditional spatial planning tackle issues of flood resilience in Jhelum Basin and can adaptive spatial planning better inform such decisions?

Methods Used

Case study Research on 4 selected sites, Local Literature Study, Fieldwork
Outcome: Spatial Assessment – SWOT

Local Literature and Media Study
Outcome: Vernacular Practices and Networks Inventory

Planning Documents Review
Outcome: Catalogue/ Toolkit of Policy and strategies

Case Study Research: Two lakes one Urban - Dal Lake and one Semi-Urban or Rural - Wular Lake were considered to look at the vernacular practices around them. The significance of looking at these lakes is that their wetland ecosystems and marshes have had an interesting interdependent relationship with the urban settlements.
How: Conduct a socio-spatial analysis of the two lakes Wular and Dal using Geo-data available by the government and QGIS.

Planning Documents Review: Vision Documents like the Srinagar Master-plan2035 were reviewed as well as Jhelum flood management plans to understand key issues, interventions and actors involved.
How: Document outline of traditional planning framework and strategies and goals adopted relevant to flood-urban resilience and wetland encroachment, water dwellers.

Local Literature Study: This step involved looking at literature mainly produced by locals in academic situations located in Kashmir. The goal was to supplement socio-spatial analysis with scientific data and substantiate claims made during SWOT analysis.
How: By reviewing academic papers and articles on:• Wetlands of Jhelum Basin• Urban sprawl of Srinagar City• Status of Lakes and Wetlands• Social Relationship with River Jhelum• Jhelum Riverfront Heritage

Fieldwork: To gain a first-hand understanding of spatial and social issues connected to River Jhelum and Urbanization, a trip after P2 will be planned to supplement findings.
How: Observational sketches and expert interviews.

SWOT Analysis The final step to conclude Analysis would inform the strengths opportunities threats and weaknesses to inform the design. a catalogue of resilience strategies that list out the structural and non-structural measures in places or suggested would guide the first steps of design.

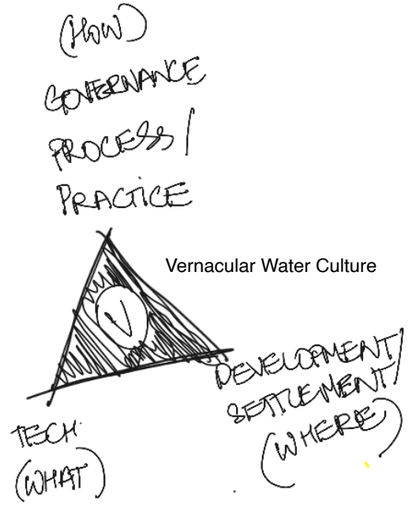


Fig: Analysis Lens, Conceptual Sketch

2

Analysis

2.1 Analysis Steps

This section looks at answering the research questions by going through the following steps

Step 1: Spatial Assessment- Water-Urban Conflicts
Aim: Using elementary maps to spatially assess the causes that aggravate wetland loss and flooding. Diving deeper into one case example investigates the vernacular- development dichotomy or dialogue around water
Intended Products: Places of Urgencies and opportunity I Synthesis Map to determine design intervention locations.

Step 2: Examining Vernacular - Planning gap
Aim: To identify Inequalities around Water caused by planning and Examine the traditional planning framework
Intended Products: Understanding Planning policy gaps

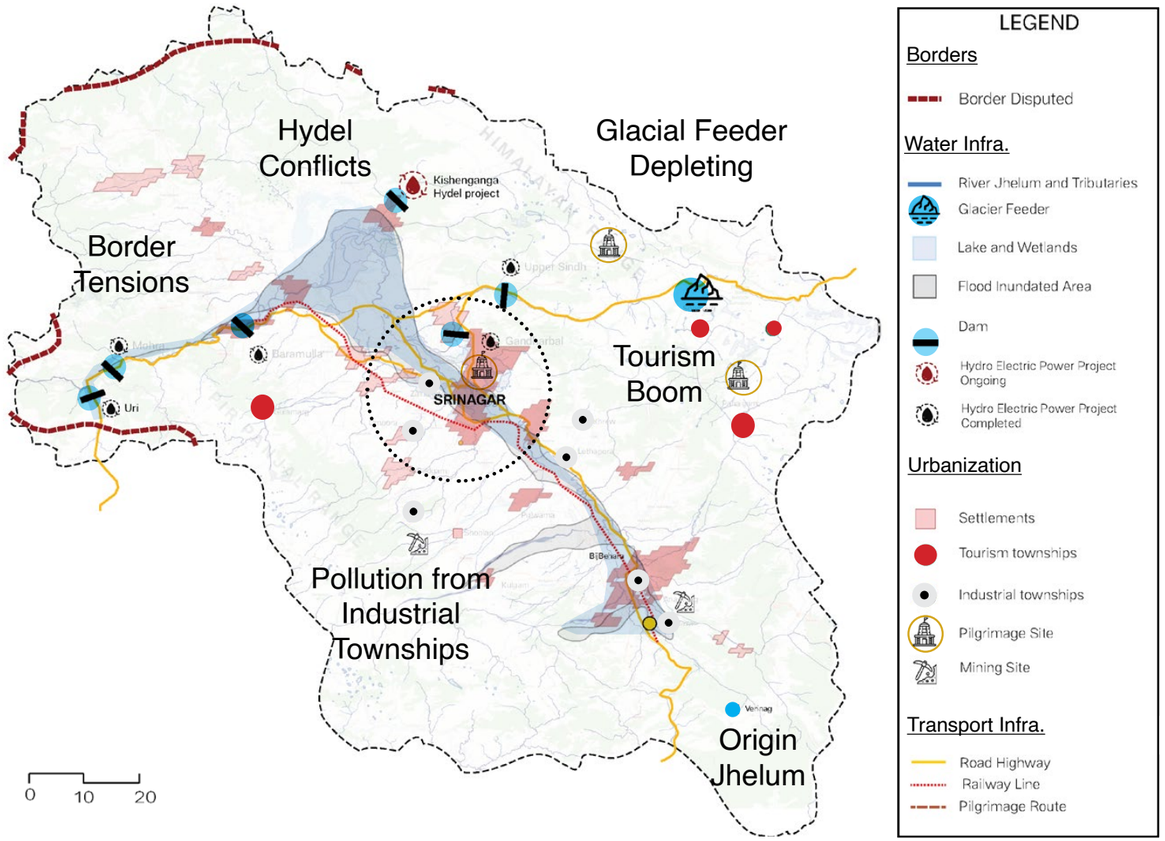
Step 3: Preliminary SWOT
Aim: Compare and determine the way to design key insights
Intended Products: SWOT

Step 4: Field Research
Aim: To gather and verify assumptions on actor advocates networks, defining local water narratives.
Intended Products: Individual swots for 4 case study sites

Step 5: Expert Interviews
Aim: To gather and verify assumptions
Intended Products: Questionnaire and Review Table

Step 6: Revised SWOT and Resilience Framework
Aim: Reflect on the Field visit and update the swot, an iterative process Design a resilience framework keeping the site in mind.
Intended Products: tools to supplement planners while devising resilience strategies

2.2 Jhelum Basin, Regional Assessment



Urgencies and Opportunities, Jhelum Basin

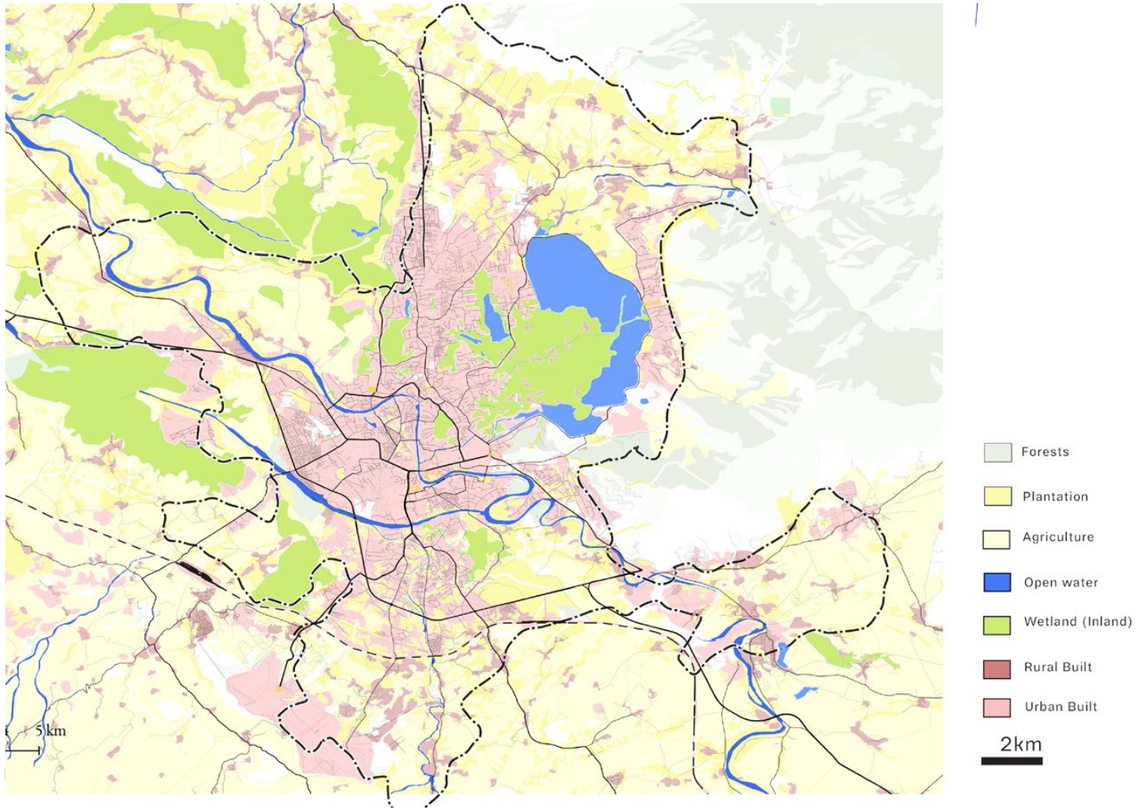
Starting from identifying the wider basin scale issues, some key findings from literature are:

• **Tourism Township :** The occurrence of Tourism Township is significant. This is rapid urbanization in secluded areas solely on the function of commercial tourism. Religious pilgrimage also plays a crucial role in the valley. Construction of hotels and restaurants and pilgrimage related constructions along the Lidder River at Pahalgam.

Glacial Melting and Deforestation has resulted in a massive loss of forests since 1992 is also associated with deforestation - at Pahalgam-Lidder valley. Deforestation and ecological imbalance. Kolahoi Glacier in West Lidder Valley, Kashmir has been declining at 7 per cent in terms of SCA. Timber smuggling is at its peak in basin.

• **Contested Hydro Power Projects: and Border Tensions**
Other factors significant at Jhelum scale are contested locations of water tech-infrastructure like hydro power plants and dams as this is a conflict zone at the border. The ongoing dam and hydel projects often face friction based on the cross country Indus Water Treaty.

2.3 Spatial Assessment - Srinagar City



Land Use Map of Srinagar City

This section covers the Investigation with elementary maps made for Srinagar City detailing the key findings for each theme. These maps were made referring to Key Planning documents and Government websites sharing informations on land use and floodplains.

The map on top represents the evolution of Srinagar in 2016 and the map on right traces what it was in the 1900s from a Historical map. As is evident from the maps the city grew along banks of Jhelum and floating gardens at Dal outwards along arterial roads.

The Peri-urban wetlands are now being surrounded by urban fabric and will witness a massive shift in land use with the current trend.

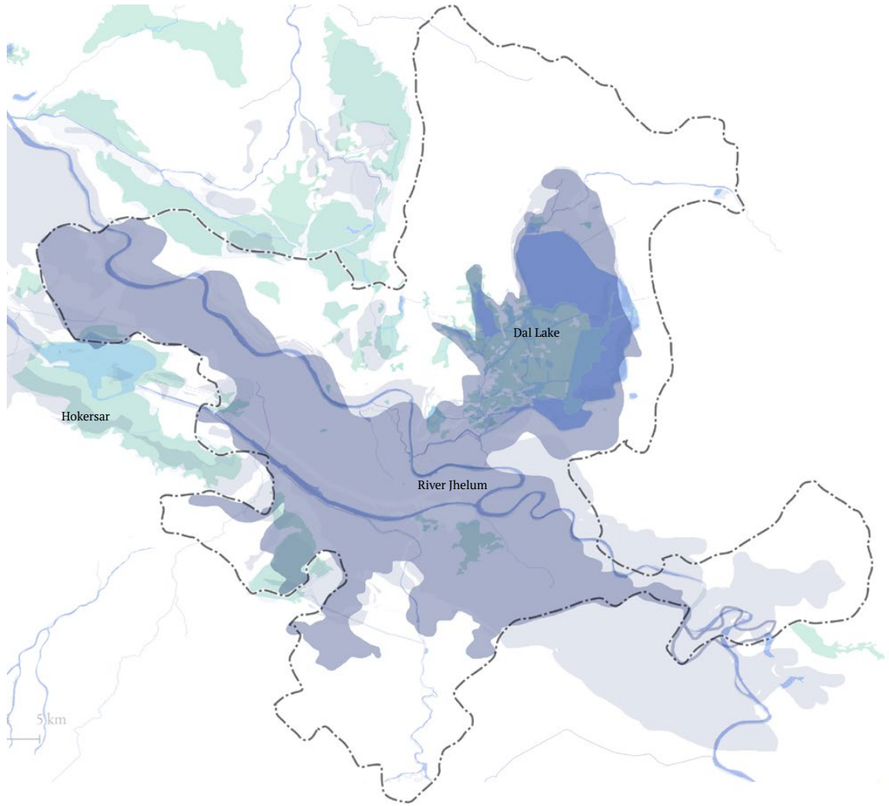


Fig: 2014 Jhelum Flood Map

2014 Catastrophic Flood Map

The flood saw the city submerged for 28 days. The worst impacted where the newer setllemnts built on the south of the Jhelum floodplain.

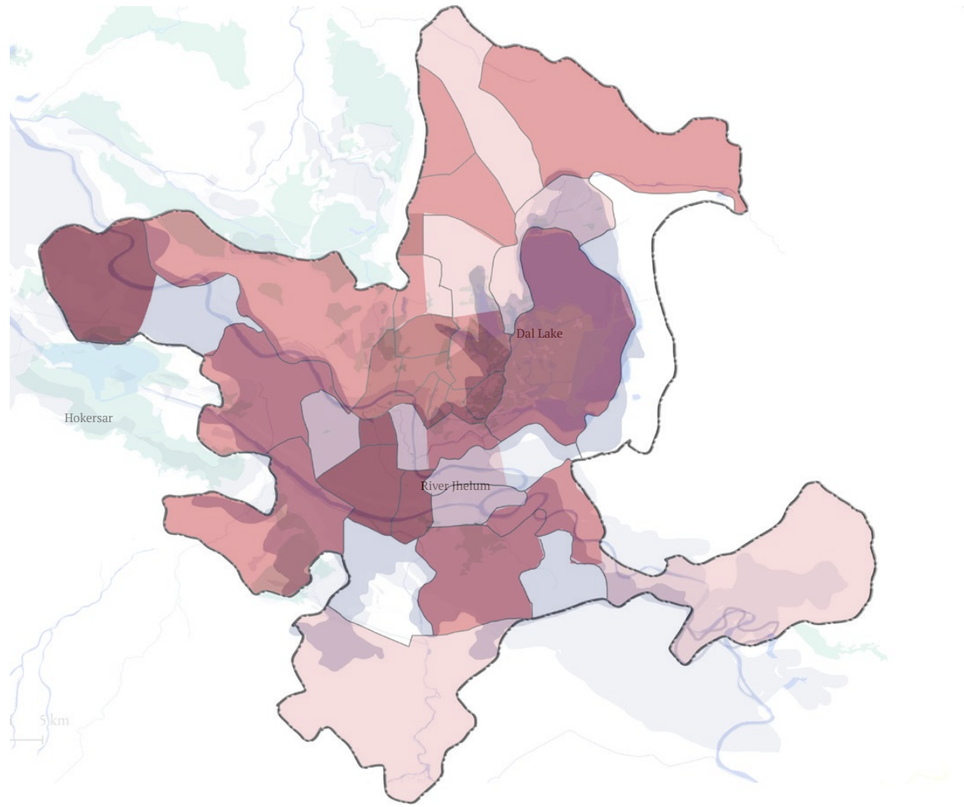


Fig: Flood Vulnerability Mapping

Flood Vulnerability Map

Flood Hazard, risk and Vulnerability were studied This map adapted from a literature study on vulnerability depicts Municipality wards and their vulnerability to floods considering , socio-economic factors like age, gender, poverty, and accessibility to institutional assistance with flood recovery.

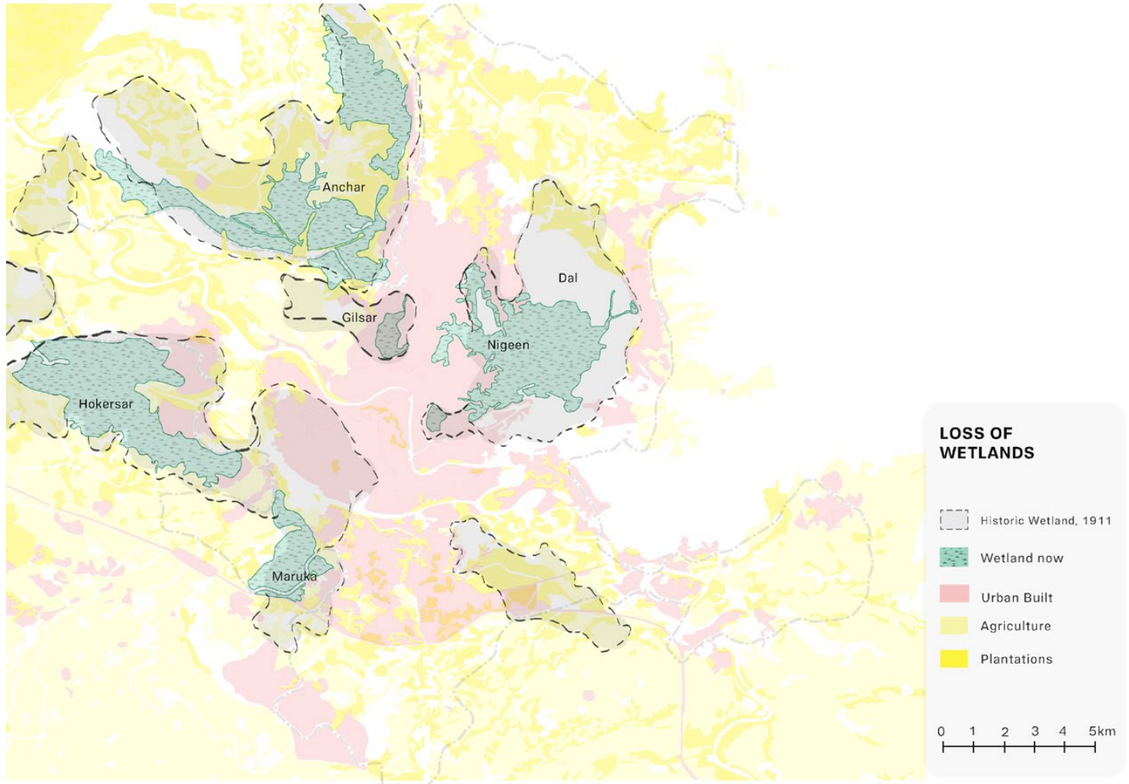


Fig: Wetland Past and Present boundaries in City

City sits on Marshes Map

The wetlands marshes are vital sponges for drainage. They hold and recharge groundwater.
From 1911 to 2011 the marshes reduced from 356.85 km2 to 158.54 km2 (DEERS, 2014) by 40 %. Urban sprawl and extensive agriculture – willow plantations are the key causes of the shrinkage of wetlands.

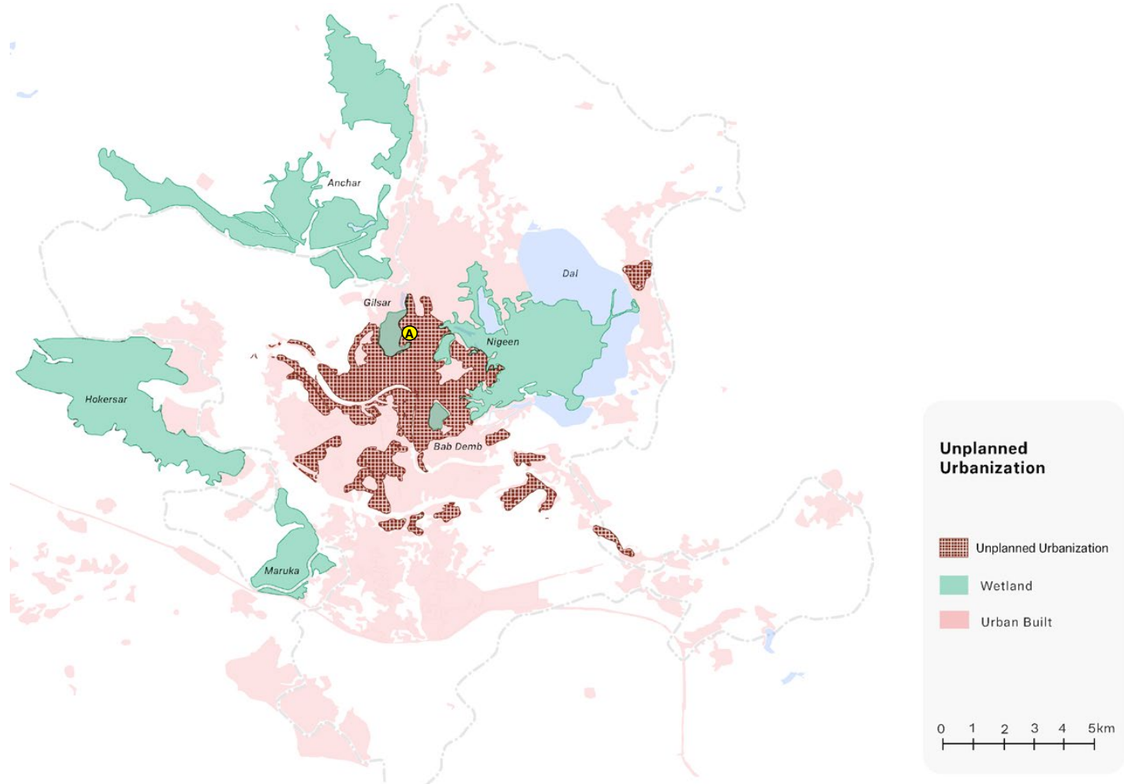


Fig: Demarcated areas as unplanned in LULC Plan 2016

Unplanned Urbanization

The loss of wetlands is aggravated by challenges at the core where the city began. The biggest challenge is unplanned urbanization, poor drainage causing excessive runoff and “congested Infrastructure”
Source: Srinagar, Land Use Land Cover Plan 2016

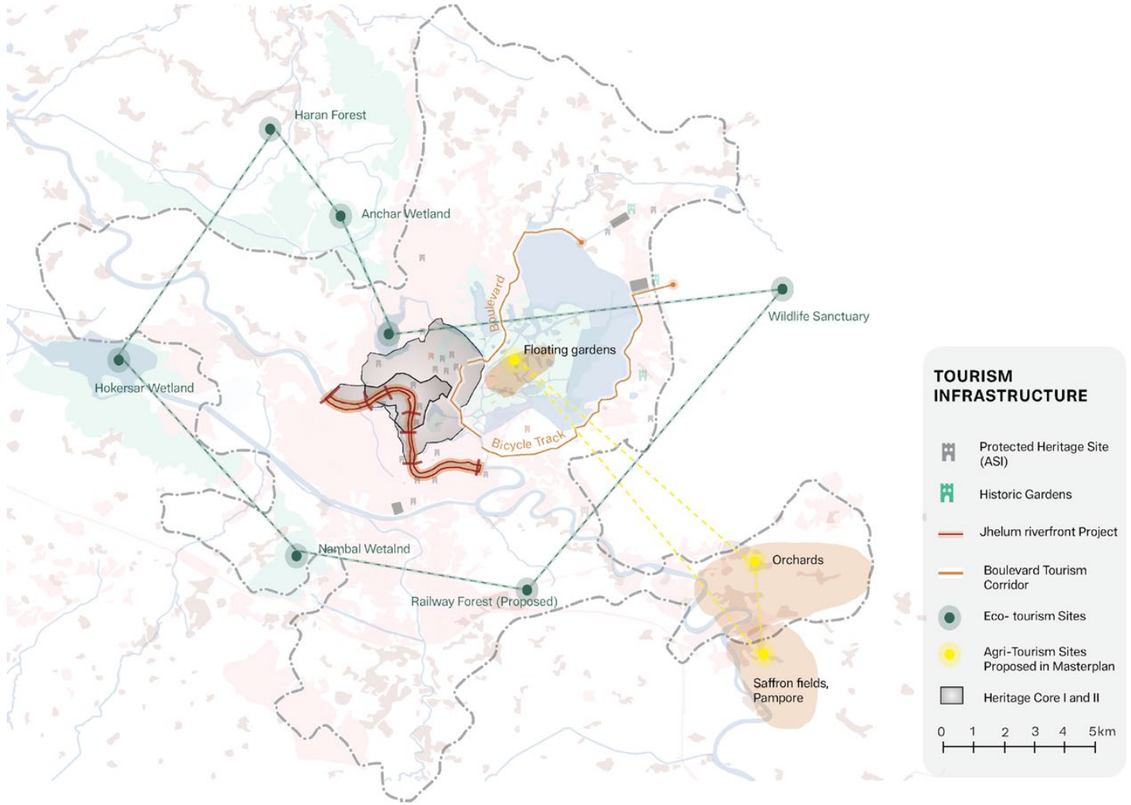


Fig: Tourism sites of relevance to understanding tourism pressure on Jhelum

Tourism Pressure

A key concern with pollution at wetlands is the proliferation of hotels along with water bodies and their waste disposal. Untreated sewage into the lake and from STPs at Dal and Brari Nambal for example is often blamed along with some 1200 houseboats that directly discharge their sewage into the lake
Possible Solutions could be management an administrative solution that connect the private (Hotels, Houseboats) and Government.

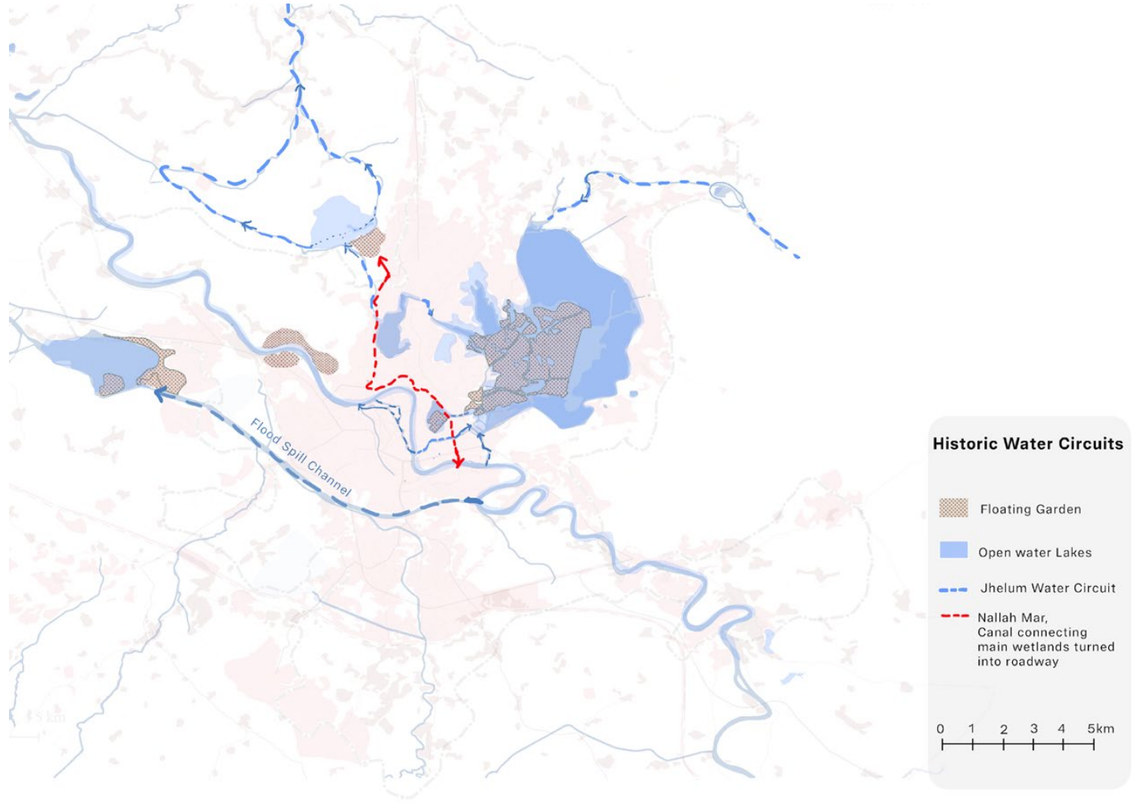


Fig: Jhelum Water Circuit map. In red marks the water Channel converted to Roads

Changes in Historic Water Circuits

“The vegetable demand of Srinagar has historically been met by the Dal, Anchar and Khushalsar lakes; hence the city owes its existence to these lakes and wetlands” cites the Srinagar Masterplan 2035 regarding the significance of the Jhelum water networks that flourished till thirty years back.
With traditional Water Circuits choked, Lakes and wetlands turn into garbage dumps.

Spatial Assessment - Srinagar City

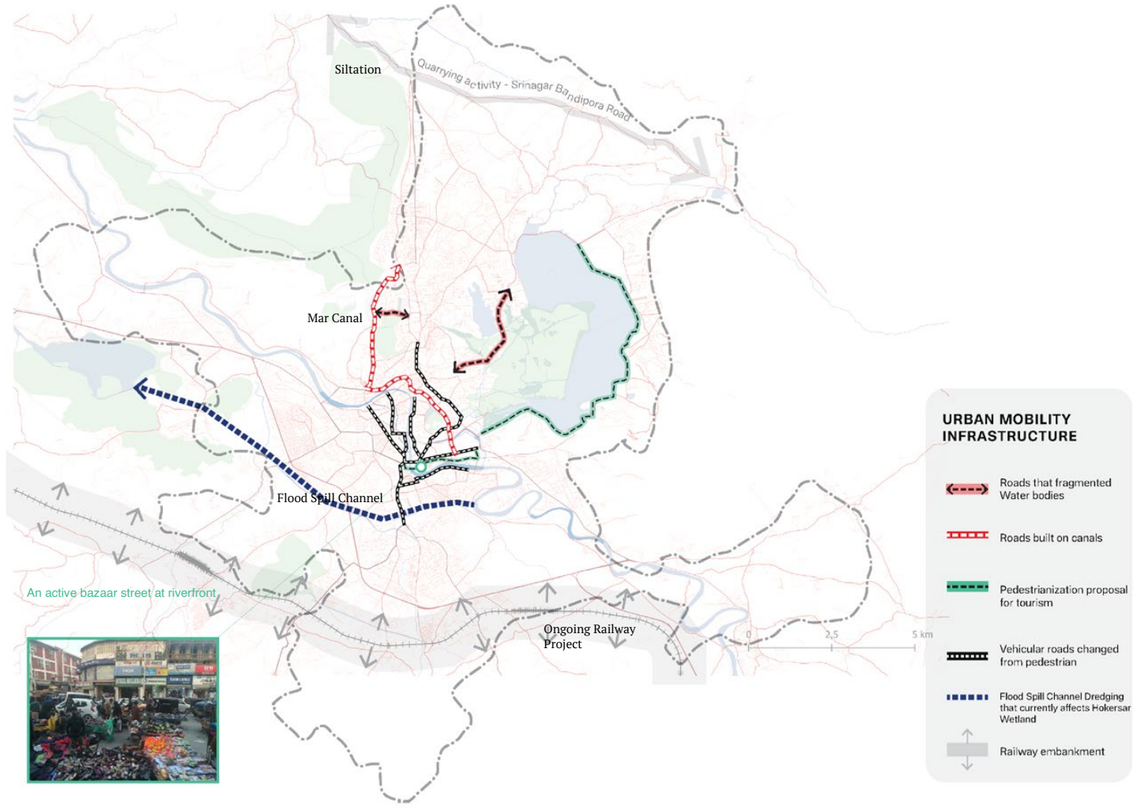


Fig Relevant Infrastructure shifts to study around Jhelum river

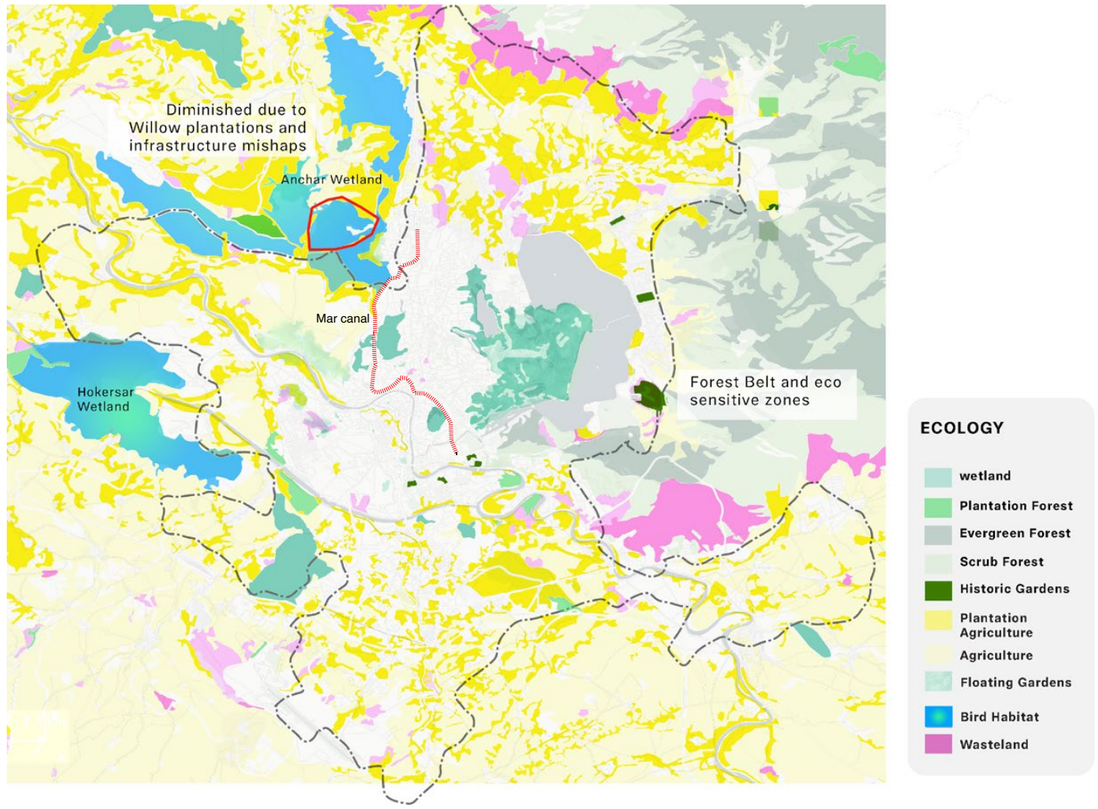


Fig Ecology Study Map Srinagar City

Infrastructure Shifts from Water to Road

Some key insights from analyzing the infrastructure are summed up as:
- Roadways cut through wetlands, sub-basins
- Railways embankment affected floods
- Flood channels converted to roads
- Quarrying in the direct catchment of Jhelum causes- siltation

Possible Solutions could be emphasizing Environmental Impact Assessments of these infra projects, Cross-sectoral collaboration and monitoring of impacts, Price to pay as polluter pays

Ecological Preservation Map

Siltation and erosion are caused by the loss of forests. This is mainly attributed to willow plantations, seen in yellow, which are not conducive to the environment and are blamed for choking wetlands. Basin scale Deforestation:

Some key concerns from an environmental perspective are Kolahoi Glacier melting which is Jhelum river's main feeder, timber smuggling in the context of geo-political conflict and pilgrimage tourism.

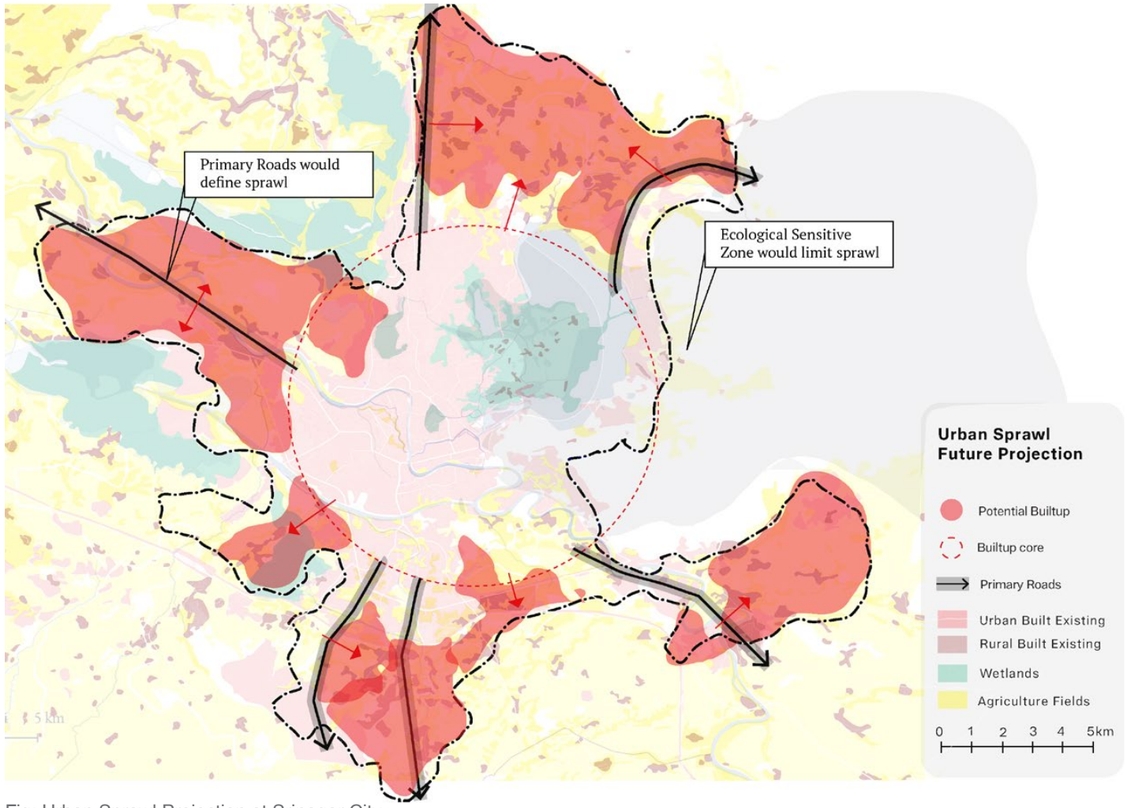


Fig: Urban Sprawl Projection at Srinagar City

Future Expansion of City I Projection Map

The author went through the master plan and academic literature of the region to draw a projection map for Urban sprawl along arterial roads and towards the west mostly as the east is a protected ecologically sensitive zone. This puts the wetlands in the west at urban periphery at risk .

From the Srinagar Master-plan 2035 the following themes were of relevance to the thesis.
- Re-Densification of core
- Integrated Townships
- Mini CBD clusters around the city extending into satellite townships
- Upgrading Peripheral Village settlements
- Self-sustained neighborhoods being a priority for the city vision

- Sub Urban Housing, City growth Additional 7500 Ha of greenfield to be added and Institutional rental Housing to supplement the plan

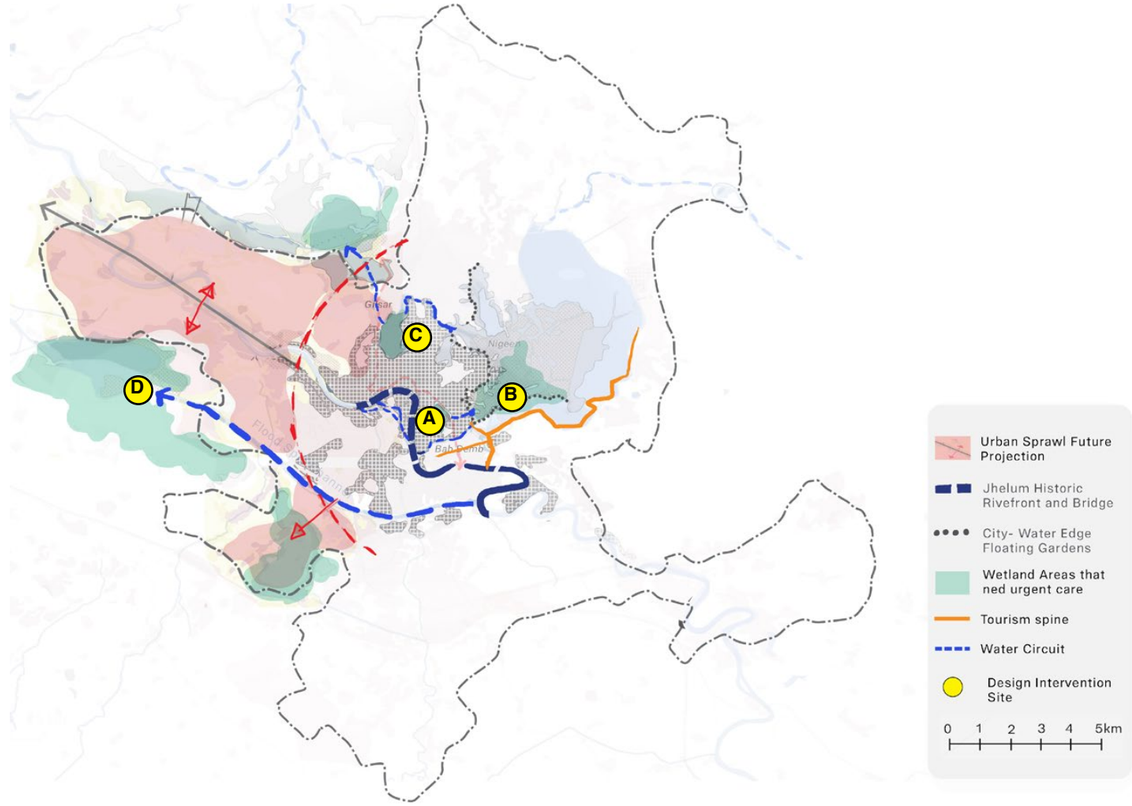


Fig: Spatial Synthesis Map Jhelum at Srinagar City

Urgencies and Opportunities of River Jhelum on a Srinagar City-scale

A synthesis map was used to condense the information collected during the spatial analysis. This helped identify four typical sites to investigate for field visit

Site A : Jhelum Riverfront. This is where the oldest settlement in the city around River Jhelum came up. Its architecture has a vernacular heritage but it has faced degradation due to the ongoing conflict crisis.

Site B: The Dal lake
With its floating garden this is the heart of city for the Boatmen community as they reside and play a pivotal role in tourism. They however are now regarded as wetland encroacher by the planning authorities.

Site C: Twin Lakes of Gilsar Khosalsar
These lakes have recently witnesses the valleys nascent attempts at citizen water governance when a local NGO, NCLO under the theme Mission Ehsas, a mission to raise awareness and responsibility of neighborhood residents o clean up lakes. Their efforts were rewarded with governments support and they have now expanded to taking stewardship of lakes elsewhere in the city.

Site D: Hokersar Wetland an eco reserve.
This peri-urban eco-reserve is the site Dal dwellers are being rehabilitated today in the ongoing program. It is also a migratory bird reserve of International Importance.

2.5 Fieldwork

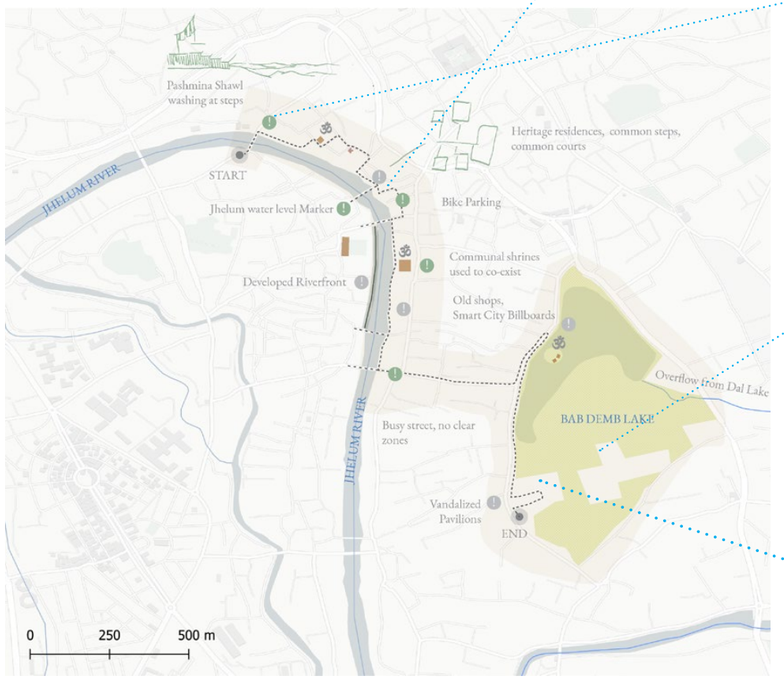
Site 1 I Jhelum Heritage Riverfront

At this site there was a sense of abandonment as a consequence of the conflict was seen with heritage homes in the vernacular style, crumbing wooden bridges and shrines of the displaced community no longer in use. There were still elements of riverfront activity which were more private in nature, like washing of shawls on the riverbanks or a group of residents sitting on the riverfront steps to catch up with the latest news.

The key learning from this site was that the oldest part of the city is stark in its abandoned heritage due to conflict displacement. The lack of social cohesion thus arising can serve as a starting point to strengthen vernacular water heritage of the boatmen and residents to build a strong water community. The lost water routes for navigation could be used for design to diversify the economy of this stretch.

Fig: Riverfront edge from one of the Bridges

Fig: Active but congest Bazaar not pedestrian Friendly because of the vehicular traffic



Figs: Field Notes Map and Photographs - Jhelum Riverfront

Fig: Abandoned Temple site, interior Bab Demb Lake

Fig: Vandalized Pavilions newly constructed for the Bab Demb Lake Revitalization Project

JHELUM RIVERFRONT
Heritage Architecture

+Mixed Use Active + Heritage, Identity + Well Proportioned Intimate Scale	- Conflict created abandonment - Traffic Congestion -Barricaded Riverfront,
S O	**W T**
* Scope to recover relationships with abandoned heritage and work at cohesion * Make walkable, De tangle Congestion *Local Tourism Sites Water navigation	! Gentrification Poorer Locality, Poor drainage,

Spatial Planning and Governance strategy
Spatial Design Strategy

Projecting from Swot

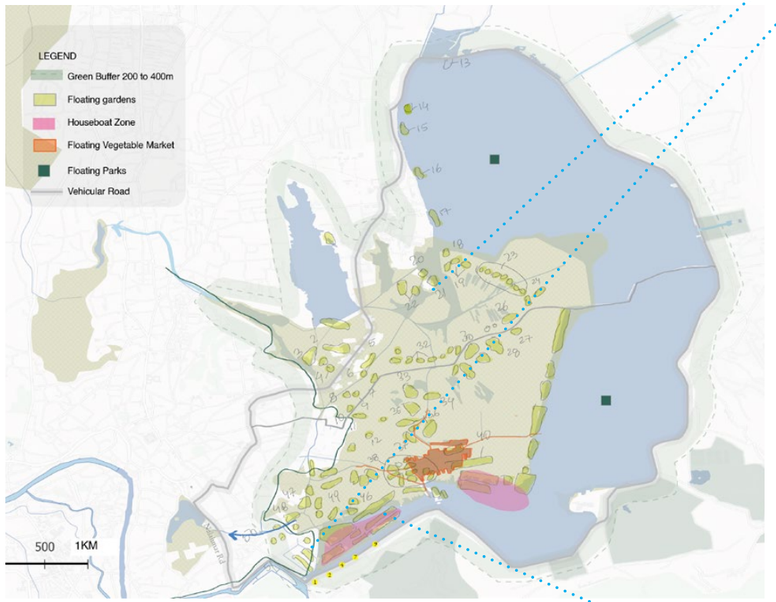
Resilience at this site comprised of the resourcefulness of the social networks of shrines, colleges, influential family homes and the boatmen community at Jhelum. Conflict created displacement but design could begin with looking at what remained robust through such disturbances.

Adaptation in design: Adjusting to challenges to give a positive outcome. Could be achieved from agency, diversity and making room for change and future needs. This could come in the form of identifying open and public spaces, overlapping uses by different stakeholders.

Site 2 I Floating Gardens, Dal Lake

At this site a microcosm of the Haenji Mohallas or the Boatmen community in floating islands within the lake was explored with its, schools, mosques, hotels for tourists and handicrafts bazaars. Although structures have an unplanned settlements (the organic white islands on the map in Dal) the mini city is self sufficient with all essential services located on the lake.

The key learning from this site was resilience through a diversity of functions a clear identified social structure and institutional support.



Figs: Field Notes Map and Photographs - Dal Lake

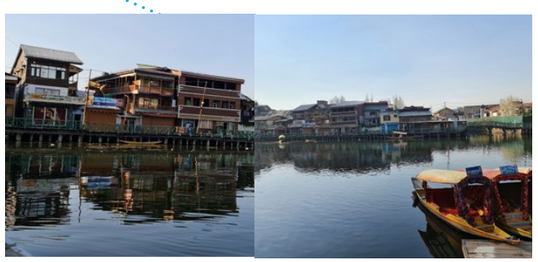


Fig Right Top:
Floating Microcosm of a city inside dall that grew organically but needs regulation

Fig middle:
Haenji Mohalla, Neighborhood

Fig Bottom:
Tourism Residence and a Floating Pavillion Neighborhood

DAL LAKE,
Floating Gardens

+Microcosm in Dal Self Sustaining Neighborhoods in Lake + Ancestral Occupations, strong vernacular water culture	- Unsustainable tourism boom - Distrust, Surveillance - Untreated Sewage Disposal
S	**W**
O	**T**
* Sustainable Tourism planning * Democratize the conservation of Dal by involving the community, develop trust * Nurture the potential symbiotic relationship between Boatmen and Dal aquatic life.	! Displaced boat-men community, Conservation measures fail to show results ! Eutrophication - aquatic weeds intensify ! Shrinkage of lake to possible dying

Spatial Planning and Governance strategy
Spatial Design Strategy

Projecting from Swot

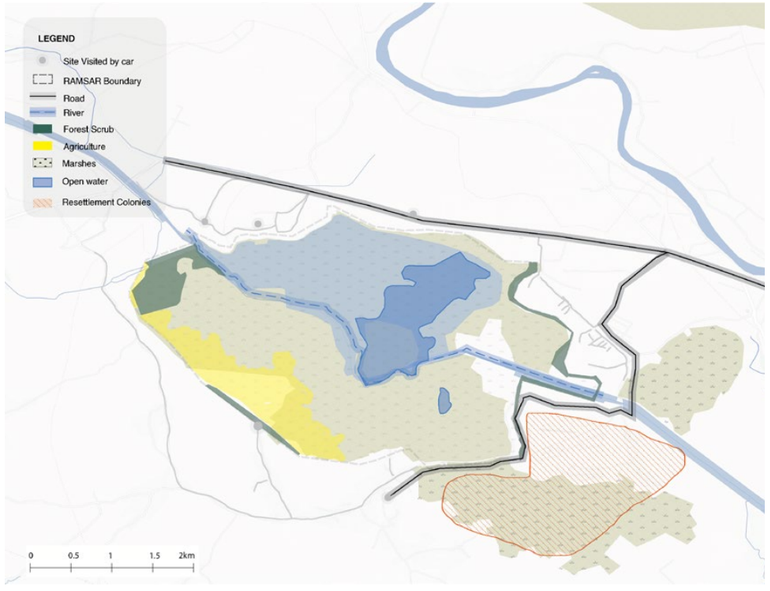
Adaptation in design: Adjusting to challenges to give a positive outcome. The overgrowth of tourism infrastructure poses a threat to the lake due to improper regulation around sewage disposal and urban farming. Adaption here could require planning principles that change as per tourist season in a year.

There is a need to create middle ground between planning authorities and the boatmen community to cater to conservation plans that are effective on ground as they are accepted by key stakeholders instead of the current top down planning and conservation plan that is contested by the dal dweller and creates a further gap between formal and informal institutions. International organizations for tourism can act as middle ground for peace.

Site 3 I Hokersar Wetland

At this site there is an important Bird Reserve identified as a RAMSAR site for its significance in international bird migration with birds visiting the wetland from Europe and Russia. The site holds value for recreation and scientific education of its biodiversity in the form of living labs.

It is a floodplain with Flood spill channel draining to it as a detention basin. The rehabilitation of Dal dwellers housing here called “Rakh-e-Arth” is a contested planning project as the locality lacks basic infrastructure and is not a proper compensation for the rich resilient lives of Haenji at Dal. This sensitive biodiversity hotspot faces threats from shrinking siltation and encroachment by the irresponsible planning measures.



Figs: Field Notes Map and Photographs - Hokersar Eco Reserve Wetland

Fig: Rural Character

Fig: Desolate, Periurban Wetland dispersed settlement

Fig: Haenji’s Floating Bed Practice found here too

HOKERSAR WETLAND,
Eco-reserve

+ Protected Bio Reserve + Stakeholders take part in protests	- *Vast Desolate,* -Flood Prone -Lack of proper Facilities
S	**W**
O	**T**
* Involve the stake-holders and address concerns * Middle Ground for concerned Depart-ments * Productive melting pots, Edges of city meets rural and wetland. Important Detention Basin for Jhelum Flood Control	! Dredging for Flood Spill Channel caused **shrinkage** cause by **adminis-trative collabora-tion Mishaps.** **!Rakh e Arth bad planning move**

Spatial Planning and Governance strategy
Spatial Design Strategy

Projecting from Swot

Resilience at this site could mean respecting the ecological resourcefulness while planning for social activities. It could mean from a mono- functional landscape creating options for multiple use with change time.

Adaptation in design: Planning shift in trying to asses ecological and social impact of the boatmen resettlement housing project.

Site 4 I Twin Lakes - Gilsar, Khosalsar

At this neighborhood called Zaidbal the 2 lakes are only accessed by a bridge between them. A strong boundary edge of residential homes creates any lack of puncture or public spaces on its periphery. However recently local efforts to clean up the river were met with governments recognition and institutional support.

The author learns that a few decades back these lakes had a vibrant life serving with children jumping from the bridge for a swim to boats both of Haenjis and residents charting its course. But a conversion of another channel that connected it to Jhelum to a road created a disturbance and the lakes had become dumping grounds with no maintenance.

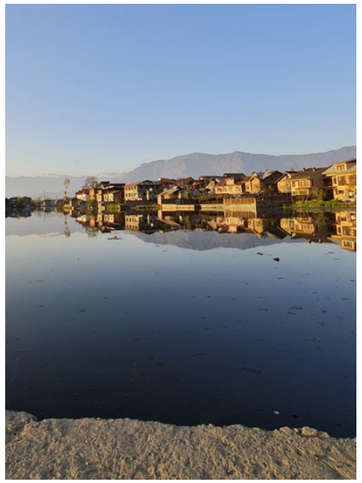


Fig: A cleaner lake from the twin lakes a a result of local efforts. A successful Pilot!

Fig: Cleaning efforts were initiated here by a Local NGO 'Mission Ehsas" comprising of elderly residents.. The government responded by strengthening clean up drives with machinery.

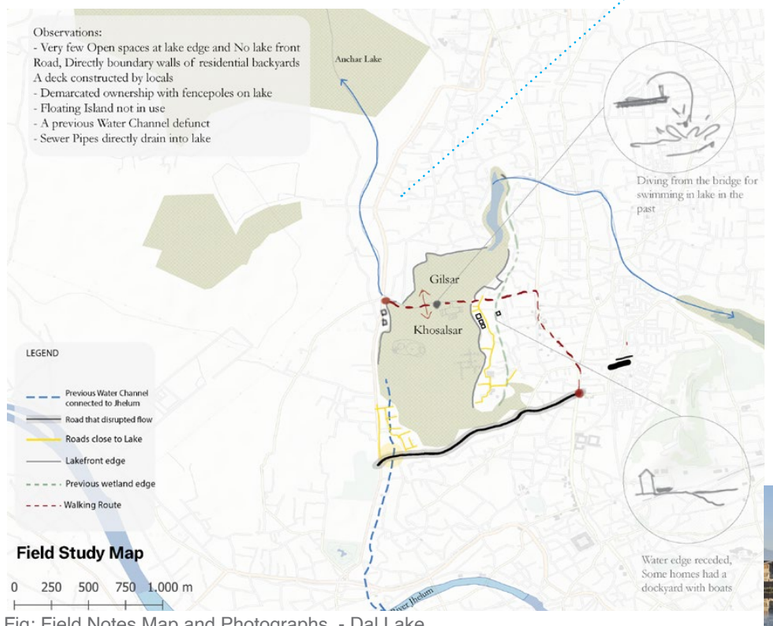


Fig: Field Notes Map and Photographs - Dal Lake

Fig: A residential Backyard Lake, Forgotten in purpose as seen with walls, barricades and garbage dumps.

TWIN LAKES
Local Revival

+Locals formed a committee to fund lake clean up and the government Recognizes and strengthens its power. A bottom up approach	- Dumping ground waste - "Backyard Lake"
S / **O**: *There is a need for an interaction zone between lake and neighborhood addressing the lack of public spaces * Garner more support and Stewardship through planning measures	**W** / **T**: ! No function, forgotten lake.

Spatial Planning and Governance strategy
Spatial Design Strategy

Projecting from Swot

Adaptation in design: Adjusting to challenges to give a positive outcome. Create Public spaces between Lake and the neighborhood. To redefine purpose of lake to residents for recreation. With parks, boulevards and cycle tracks.

+ Ancestral occupations are tied to Jhelum waters and shape its cultural identity. This could be the reason stakeholders participation is emerging.

+ Government's conservation measures recognize that Heritage, Water Preservation, Tourism are interlinked

STRENGTH

- "Backyard River, Forgotten Lake"
Strained Relationship with water with no Function or activity around water bodies

- **Conflict creates spaces of distrust,** surveillance, barricades, vandalism (Accessiblity Issues)

- **Planning neglect** worsens the issues of untreated sewage and unsustainable tourism boom

WEAKNESS

S W

O T

• The conflict state presents a scope to **use water based networks to recover relationships with abandoned heritage** and work at social cohesion.

• The planning gap can be bridged by **inclusive conservation process** of lake or riverfront revitalization by involving the community to develop ownership and trust.

• **A Middle Ground for planning Departments** would bring in the essential collaboration.
Two issues could first immediately be addressed by the planning- vernacular gap
1) Unsustainable tourism, unchecked growth of activities on water
2) Untreated sewage that has created dump-yards out of lakes

OPPORTUNITY

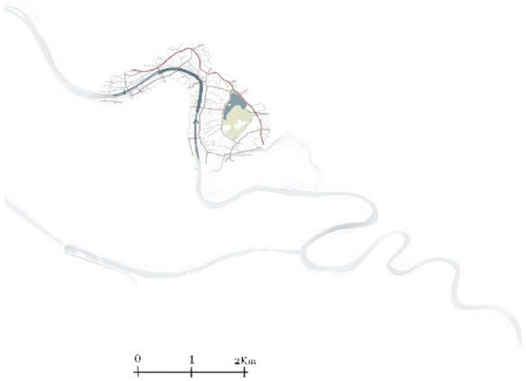
! Vicious cycle of Vulnerability
A threat is that planning measures aimed solely at conservation like Rehabilitation schemes displace water based communities from their source of livelihoods. This creates socio-economic distress further Escalating the vulnerability of these groups.

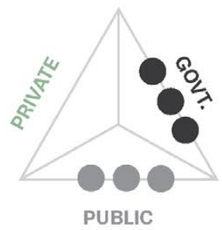
THREAT

Spatial Planning and Governance strategy
Spatial Design Strategy

This swot helped summarize key learnings from visiting the 4 selected sites. This was used to build on o a common set of principles as a starting point for resilience toolkit

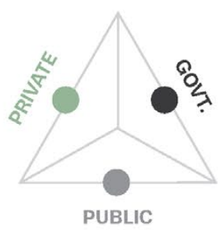
JHELUM AND BAB DEMB LAKE
(HERITAGE CASE)





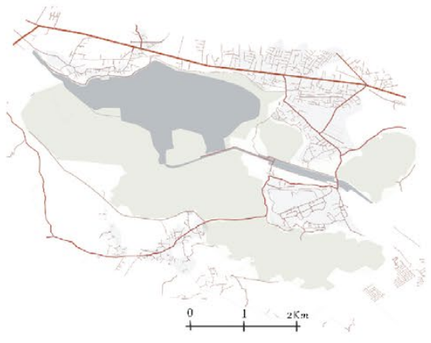
Srinagar Smart City
Srinagar Municipal Corporation
Flood Control Department
Religious Shrines and Mosques
Residents
Shopkeepers
-Nil-

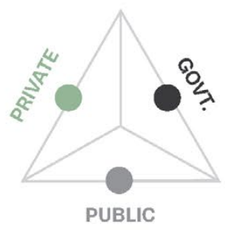
GILSAR KHOSALSAR LAKES
(LOCAL REVIVAL CASE)



Srinagar Municipal Corporation
Local NGO
News Media

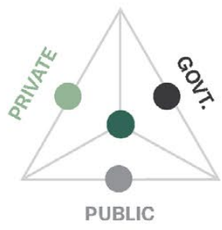
HOKERSAR WETLAND
(ECO-RESERVE)





Forests and Wildlife Department, Government of India
Urban Fringe illage dwellers
Eco Tourism Guides

DAL LAKE
(FLOATING GARDENS URBAN FARMING CASE)



Lake Conservation Management Authority
Haenji Community
Hotels and Houseboat Owners Associations, Tourism Guides
High Court

Fig: Governance Across 4 case study sites

After the fieldwork a comparison was done of the scale, key road network and stakeholders of each of the site. Only in one case, Dal was their a defined middle ground the High Court due to the disputed nature of the Lake dwellers- Rehabilitation drive for Lake Conservation.

Interview Insights - Conversation Map

The interviews were gathered from five officials in various planning spheres of which three are tabulated in depth. Table (AAA)
A sample of this Interview Questionnaire is as follows:

Name:
Designation:
Contact:
Location:
Date:

Topic: Wetland Encroachment, Vernacular Water Culture, Resilience Vision

1. What are the steps taken to tackle urbanization challenges faced by lakes and wetlands in the city?

o What success has the Land acquisition drive revealed? ...encroachment issue?

o How have flood recovery and resilience programs fared in the recent years, changes where?

o How has conflict affected the urban-water-management challenges?

Planning challenges

2. What are the next big goals for sustainable urban development and flood resilience? Master-plan 2035 current plans?

o How are nature-based solutions employed like detention basins? Where and what are the drawbacks, who manages them? (Vector breeding)

o Are they cases of co-planning and designing with public institutions and NGOs?

o How do we resolve issues of lack of cross-sectoral collaboration? (Given shifting planning regime and in the wake of new laws in a conflict-ridden state?)

Vernacular practice and water culture

3. How have they faced the consequences of a shrinking wetland affected water-based livelihoods?

o How do you think plans of new development can consider INCLUSIVE traditional livelihoods; local water communities (Haenj) connected to water practices?

Design

1. What do you imagine a developed neighborhood would look like that respects water? How can one begin designing that?

2. How can bottom-up participation of civil society help prevent the deterioration of lakes?

3. What do you think about schemes that could revive water-based transport and revive old water circuits with tourism?

Lastly, would you share your contact for future inquiries? Who is the best person to contact next about such questions?

INTERVIEWED OFFICIALS	QUESTIONNAIRE TOPICS		
	1. Water Urban Conflict	2. Planning Process	3. Vernacular roles
Consultant, Irrigation and Flood Control Department Jhelum River	"Most of Left bank of River Jhelum is a natural detention basin but rapid urbanization has compro-mised that" "Why did the old City developed where it is and hasn't faced flood trouble...Despite its unplanned nature" Topography kept in mind earlier. But due to conflict , in new settlements scrutiny was prioritized.	Technical, engineering aspects of mitigating a catastrophic flood are generally the key role here. Along with 1. Disseminating Information 2. Forecasting 3. Warning alarming Railway Line and Highway embankment against flood control policies, NOC's but no action "Urban floods not under our purview. " SMC responsible	"District administration looks at sociological response", (No such team common Disaster Management) SMC Handles urban flooding. Web based tracing app but no such flood mapping on neighborhood and street level tracing yet.
Secretary, Lake Conservation Management Authority Dal Lake	Organizations key role is to conduct Land acquisition drive and Rehabilitation of Dal lake dwellers under "Save the Dal Mission", maintaining a green buffer regulation and Mechanical Dredging of aquatic weeds. Research and Eng. Depart-ment wings work on study-ing aquatic weeds and species. **Engineering but not social aspects covered.**	- No Socio-Ecological Impact Assessments on the design move, "SDA would look into that" lack of middle ground with other depart-ments working on Jhelum and Wetlands -Legal disputes, Action Plans are not made Public	Regulation oriented, The department saw the Dal dwellers as encroachers and Dal conservation drive as a means to aquire land from them
Wildlife Warden, Department of Wildlife Protection Hokersar Wetland	Wetalnd water optimum level according to RAMSAR 3-4 feet of water is maintained at all times. No such issue with Eco reserve and peri-urban neighborhoods	- 9 Conservation Reserves of which 8 we care for with IWPA. - National Board for wildlife, Protected Area 2016. - Caretackers, Buid watchers Eco guides the key stake-holders - Beauracratic hurdles, Hokersar FSC should not have been constructed fragile site. But top down planning	- Livelihood patterns shifted. Weaving of reed bed-carpets a forgotten vernacular practice - Floating garden were there in the past not anymore.

* Had to spontaneously omit parts of the questionnaire to keep conversation relevant to expertise specialization.

2.6 Vernacular Water Practice Inventory

Defining Vernacular water Practices are local traditions and cultural norms, embedded in oral and written histories that define the specific relationships between people and water. From a planning context, vernacular development has been shaped by centuries of trial and error by a community and is part of their cultural knowledge passed down from one generation to the next through habits, customs, art and oral traditions. Vernacular was originally used to define native language- the common vocabulary shared by a similar group of people. The concept is often employed in Architecture for building practices not guided professionally but developed by a community over time.

Defining vernacular is often by using this non-definition by explaining what it is not –
1. Not professionally or academically produced,
2. Not sophisticated but simple and meets immediate local needs.
3. Not exotic; vernacular derives from the local palette in its building materials and construction. It blends with the context well and is often environment friendly because of frugality as well. These often have an informal nature, especially in Asia and are closely tied to the Water ethics principle of 'Religious Belief and sentiments/spirituality'.

Aim: Identifying actor-advocates defining local water narratives in Jhelum Basin.

A qualitative analysis of the discourse held between water governance and exploring the vernacular-development dichotomy through that. The result will be using case studies' first impressions of the actor-networks engaged in vernacular water practice and governance. This is necessary to identify who is current advocates/representatives to voice concerns and address these gaps. Engaging proposing. Vernacular building traditions of homes such as Kathi Bani', and Dhajji Dewari' are well-known and researched to withstand earthquakes as they are built for flexibility and learning across time. Learnings from vernacular are not just limited to local. On a settlement level, they instruct:

1. Site selection for development: based on weather patterns, Like in Hilly areas southern slopes are populated for sun exposure less hazardous ground stability and firmness looked. Ground water availability. (Ridge, Midland and valley)

2. Land use distribution – flat surfaces are often used for public buildings while sloping for residences

3. Settlements that merge with their natural environment: this could guide the concept of ecological urbanism

On the Area-Neighborhood level, the vernacular development instructs:
1. Clustering of buildings: keeping passive design principles
2. Character of area: Conformity and variance, Identity

On Building Level
1. Working with nature and along with it. Minimum Disturbance. Contextual appropriateness
2. Compact footprint

Vernacular wisdom is built on decades of lived experiences is often climate conducive, adaptable and centered around community collaboration. The traditional know-how of living with Wetland ecosystems

Vernacular Water culture can be summarized as:
• Nature-based
• Collaborative social structures sustained over time.

1. Floating Economies:

Urban Agriculture Water dwellers, 'Haenz' Communities, in Dal Lake: Generations of water-dwelling neighborhoods have been established in the Dal lake that raised beds and floating islands to farm lotus, lilies and other hydroponic crops. They are also engaged in tourism-based commerce. These are not restricted to Dal but along other water bodies in the Jhelum basin ecosystem. Planning initiatives: The water-dwelling communities and commerce have Reserved land and water rights but the current policy measures are attempting to change land use and rehabilitation plans in Srinagar city Master plan 2035 these rural based livelihoods elsewhere.

2. Fishing Community against Willow plantations:

According to a wetland international study 36000 people and2,300 households depend on the lake for income. Among other livelihood sources, fishing emerges as primary. Planning Challenges: The vernacular fishing community faces a tough fight since a planning measure in the 1980s to forest willow plantations in the marshy swamps for firewood and cricket bats. This resulted in heavy siltation, land competition for the lake area and declining fish stocks. Currently, the Forest Department and planning commissions debate the assessment of the environmental impact of deforestation plans of some 10,000 trees as these are often quoted to the declining health of Wular.

3. Riverfront Heritage at Srinagar City:

_These include old wooden bridges, vernacular homes, riverfront steps and Religious Shrines (See Fig XX) In the City of Srinagar along the Jhelum River, seven heritage bridges dot the course of the river. They defined the social life and stringed communities together. Each of the 7 bridges and 26 ghats (riverfront steps and courtyards) was defined by their community. Yarbal a term used for the riverfront steps colloquially referred to as a place for Friends Planning initiatives: Srinagar Municipal Corporation has floated tenders for revitalization and conservation plans- Jhelum Riverfront Project under the Smart City Mission

Floating Garden in Plan

Permanent static Floating Islands
I 'Radd'

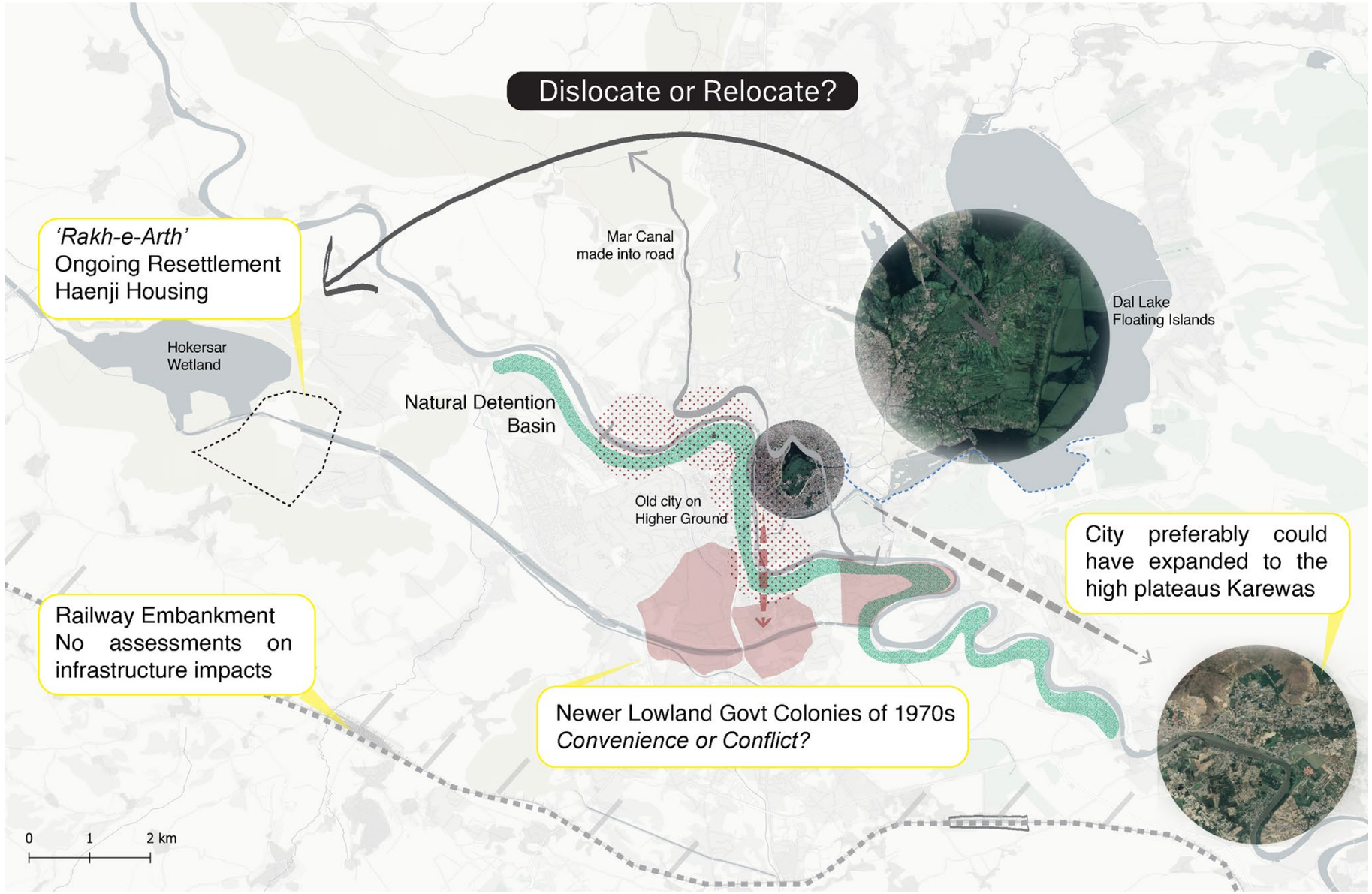


Fig: Conversation Map to summarize Key Learnings

A conversation map summarizes the key learning from conducting expert Interviews.

Conclusion

The reflection from analysis can be summarized as some key principles that define resilience for moving towards developing strategies for design. These are:

1. Diversity: biological, economic, and cultural

- Redefine the role of ancestral occupations connected to water. The livelihood shift can be an opportunity to diversify the economy to one that is sustainable

2. Creative renewal as an alternative to Preservation

- Renew functional diversity of degraded systems. Preserve biological hot-spots of diversity

3. Social learning through experimentation

- With dialogue and knowledge co-production, experiment, compare and test alternatives on a smaller scale (subsystem)

4. Adapt governance to change.

- Policy needs site-specific adaptation by the community. These alternate models can then be compared by community representatives leading their subsystems (lakes and riverfront)
- Amplify the rights of informal institutions. Assign responsibilities that build trust and accountability

Jhelum Riverfront with Abandoned Buildings

Design : Building Resilience with Vernacular

3.1 Defining Resilience Framework

Defining the focal system to design:
Identifying direct indirect issues, stakeholders In this case for design the main focal system identified is the network of water bodies of River Jhelum along the city of Srinagar. The smaller scale systems are hence each of these typical water bodies and a larger scale of focal system if the Jhelum River Basin in the Kashmir Valley of Himalayas.

The key issues are identified along with a valued attribute of the system and its concerned stakeholders. A timeline across which assessing change in the focal system is needed to analyze shocks an stresses it witnessed in the past.

Resilience to what: defining disturbances, uncertainties
To assess Focal system disturbances key threats, their frequencies magnitude was identified. Also attempt to manage these disturbances so far, my planning authorities was assessed.

Summing Up,
Ecological Impacts - •Shrinking lakes • Vulnerable water system • Cattle, Aquatic Life affected
Social Impacts-• Politics of conflict • Water based livelihoods • Heritage-Identity Crisis
“Dying water culture

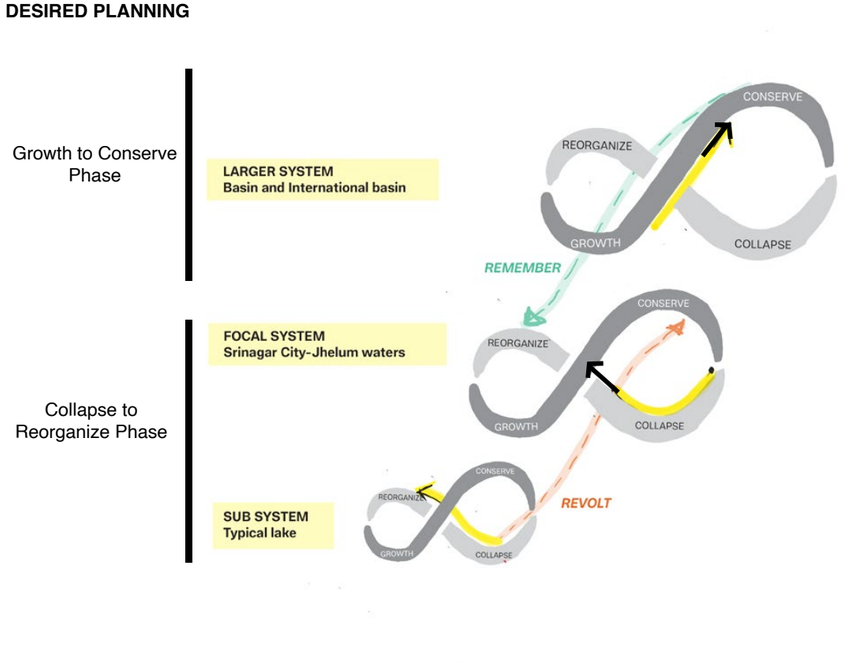


Fig: Panarchy, Jhelum Water Network
The arrows mark the phase the particular system is in with respect to the Adaptive Cycle model

Resilience Framework - Process

	Focal system(s)	Central Issue	Valued Attribute of system	Valued to whom? Key Stakeholders	Timeline to examine the focal system
1.	Jhelum Riverfront	Conflict created abandonment	Heritage Conservation planning and architecture	-Local Residences -City people at large	50-100 years, Conflict pre and post
2.	Dal Lake	Wetland encroachment, Haenji water agriculturists	Natural produce and ecosystem quality	-Haenji Community -Tourism Industry-Hotels	Planning Cycles
3.	Hokersar Wetland	Floodplain planning mismanagement	Bird reserve peri urban undisturbed	-Residences Rural, Peri-urban -Biodiversity	Planning Cycles
4.	Gilsar Khosalsar Lakes	Rapid unplanned Urbanization	Recreation, fishing boats	-Residences Urban	50 years, Post Urbanization

Table: Resilience of what, defining Focal systems to work on adaptation capacity

Natural resource uses	Stakeholders
Direct uses in city	**Inside focal system**
Heritage conservation	Heritage homes
Residential use	Planners,
Worship and religious activities	Conservationists
Transportation accessibility	Boatmen - Haenji
Transportation economic spine	Construction industry
Agriculture and water livelihoods	Religious sects
Cultural-Folklore Art	Artists
Recreational- swimming	School children
Indirect uses, beyond city	**Outside focal system**
Hydroelectric power	Centre and adjacent states
Tourism Sightseeing	Tourists
Pilgrimage	Religious tourists
Irrigation	Farmers
Dams flood protection	Disaster relief
Fish farming	Local businesses
Medicinal Plants	
Floodplain management Disaster protection	
Sand and Boulder Mining	
Neighboring nations	
International Organizations World Bank and RAMSAR	
Academic Researchers, Scientists	

Table : Resilience of whom, stakeholders key to the focal system

KEY DISTURBANCES		SHOCK / STRESS	FREQUENCY	MOST AFFECTED COMPONENTS	MAGNITUDE	MANAGEMENT RESPONSE
SOCIAL	Severe Flooding	Shock	50 years	Homes, soil, biodiversity	Severe	Monitoring, Alarming
	Conflict caused Displacement	Shock	50 years	Residents, Governance	Medium	-
	Infrastructure and technology shifts	Shock/ Stress	10-25 years	Boatmen Community, Transport sector	Severe	-
	Floodplain Land Use Change	Stress	25-50 years	Water Ecosystem	Severe	Buffer zones, Regulations
	Extensive Urban Agriculture, Tourism	Stress	25-50 Years	Water Ecosystem	Severe	Land Acquisition Drives
	Livelihood pattern shifting	Stress	25-50 Years	Agro Economy	Medium	-
	Waterborne Diseases	Shock	5-10 Years	Aquatic Life, City Residents, Crops	Low	Regulation
	Invasive Species	Stress	10 Years	Aquatic Life	Severe	Caused by lack of collaboration

Table : Resilience to what, defining key disturbances to adapt to and current management response

The table on top left defines the focal system conflicts around each of the case study sites to gather key disturbances and common valued attributes.

The table on bottom left enumerates the direct and indirect users of one of these focal systems Jhelum Riverfront. This would be the focus for design.

The Table on top right identifies the key disturbances in terms of shocks and stresses and the relevant management response for each.
It is evident the the current governance model is one of regulation and seeks conservation and preservation of bodies. It does not consider the social aspects of resilience and sees tries to provide hard infrastructure and technology solutions to technical aspects of water, like water quality, size. There is a need to shift to adaptive advocacy led planning that considers the social impact of ecological and tech solutions.

Threshold Model

The model identifies key disturbances that affect the identified focal system of Jhelum water network in Srinagar. These are under shocks, sudden like disaster or displacement caused by conflict and stresses. These are long term like economic distress, political instability The set of disturbances to define under social and ecological are the main problem fields to design for at various wetlands lakes and riverfront of the city.

This model can be used as a starting point to frame the challenges of vulnerability, resilience and change for a design brief that the community could build themselves.

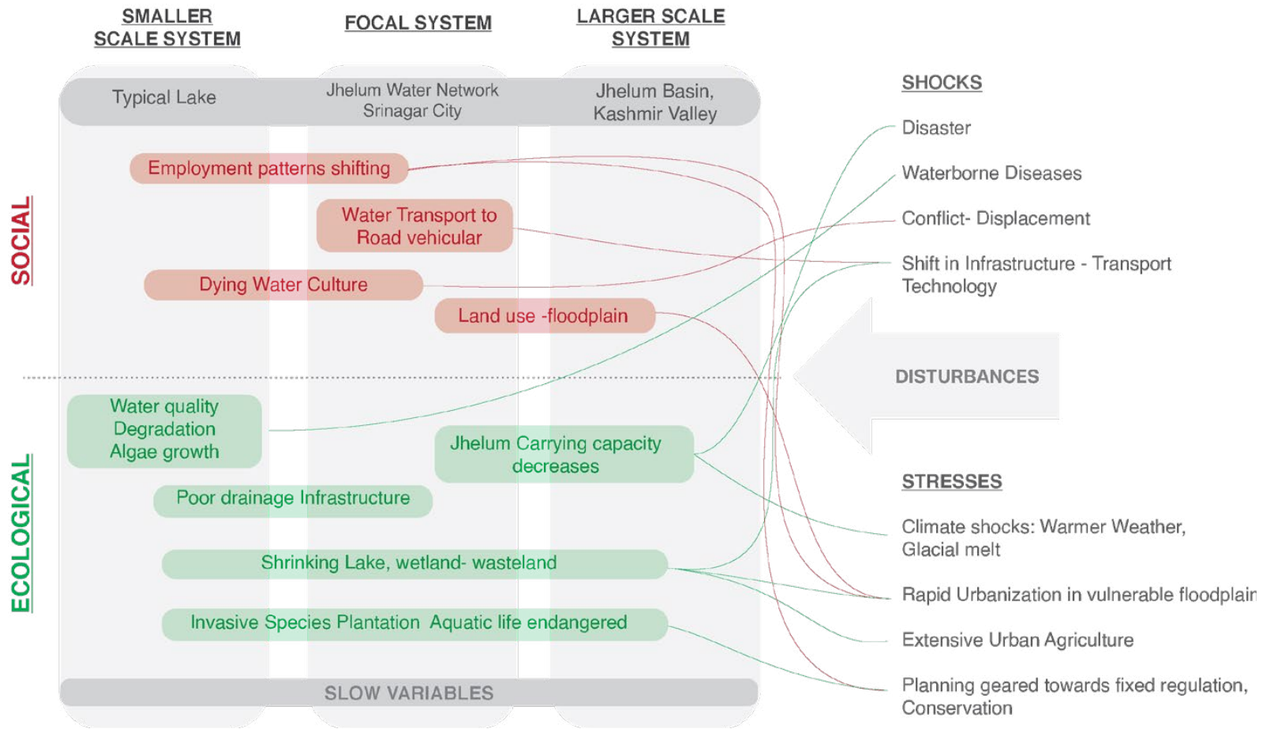


Fig: Threshold Model identifying Key Disturbances

SES Model

This Model of socio-ecological system resilience was adapted from theoretical research on socio-ecological resilience to identify key disturbances affecting the Jhelum water network in Srinagar under social and ecological fields as key design elements to map the relevant institutional response. This conceptual model would be later tested with the result of design as a form of assessment.

Here water based livelihoods of Jhelum are the middle ground at trying to achieve social and ecological resilience given their close ties and reliability on Jhelum and its wetlands.

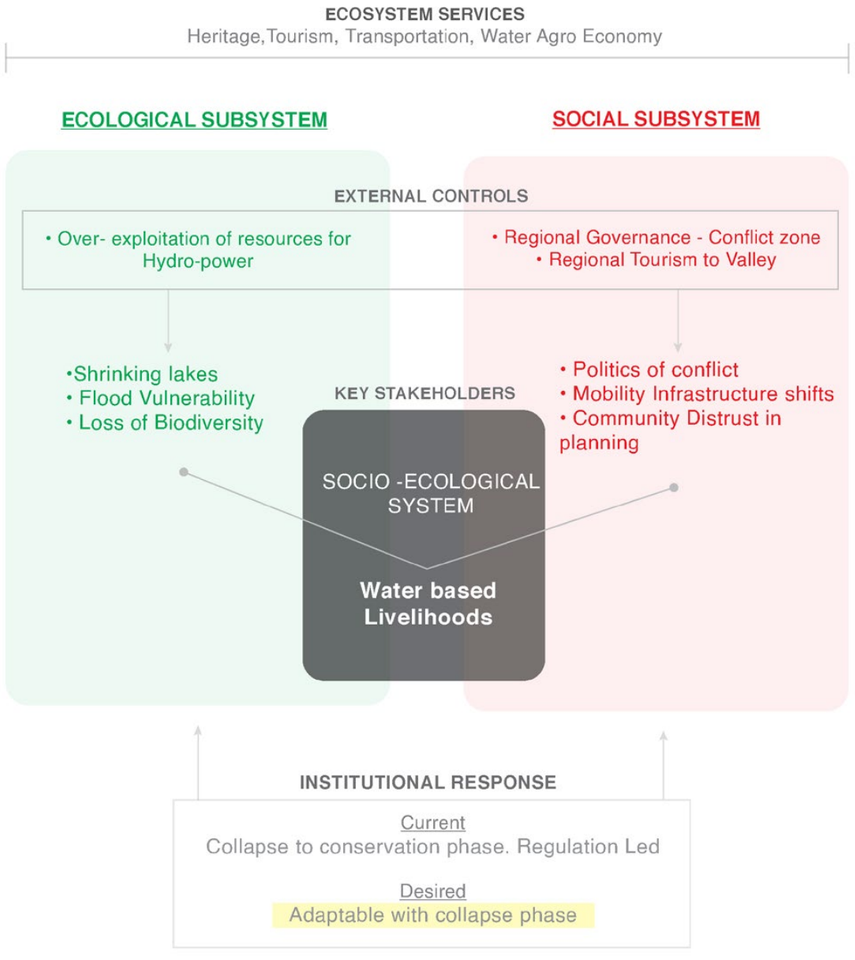


Fig: Socio Ecological Resilience Model identifying water- based livelihoods as middle ground to resolve key ecological and social disturbances

3.2 Strategy Toolkit

PRINCIPLES

Design

- **Resourceful**
  Inventory of social memory reserves
- **Adaptation**
  General policies, specific case
- **Diversity**
  Function . Economy . Biology
- **Modularity**
  Balanced systems
- **Openness**
  Permeability

Process

- **Creative renewal**
  Alternate to preservation
- **Policy feedback loops**
- **Experimental learning**
  Breaking policies fixation
- **Create stewardship**
  Roles and responsibility to informal institutions.

TOOLS

Social

Reclaim Vernacular Claims
With water based heritage and livelihoods

Adaptable
Making Room for change with time

Modular Systems
Interconnect subsystems loosely connected to other parts

Ecological

Permeable River
Softening River edges with green infrastructure and open spaces

Re-purpose Water
Diversify degraded ecosystems with a new function

Process

Co Map Vulnerability
Form a Neighborhood Water Board with community advocates

Policy-experiment-pilot
Experiment feedback loop

Conflict Resolution Board
Middle Ground of Academicians, Scientific community and international organizations

The strategy toolkit summarizes findings from analysis and bridges to design. The tools are social ecological and process based. These are informed from learnings from vernacular at Jhelum Srinagar but can be applicable elsewhere in a similar context addressing similar issues.

The strategy tools will be employed at tested at the pilot local scale and develop strategic themes for the city scale
The tools are subdivided as key social and ecological tools and design and process tools. The usage of these tools need not cover all but a mix of what suits the site best.

3.3 City Vision for Resilience

For preparing for city resilience vision for Srinagar the author draws certain key design themes: These are:
1) Haenji Water Loop, 2) Research and Recreation Corridor, 3) Permeable Left Bank of Jhelum. The concept diagram to arrive at these themes from principles and strategy tools established in previous chapter is shown below.

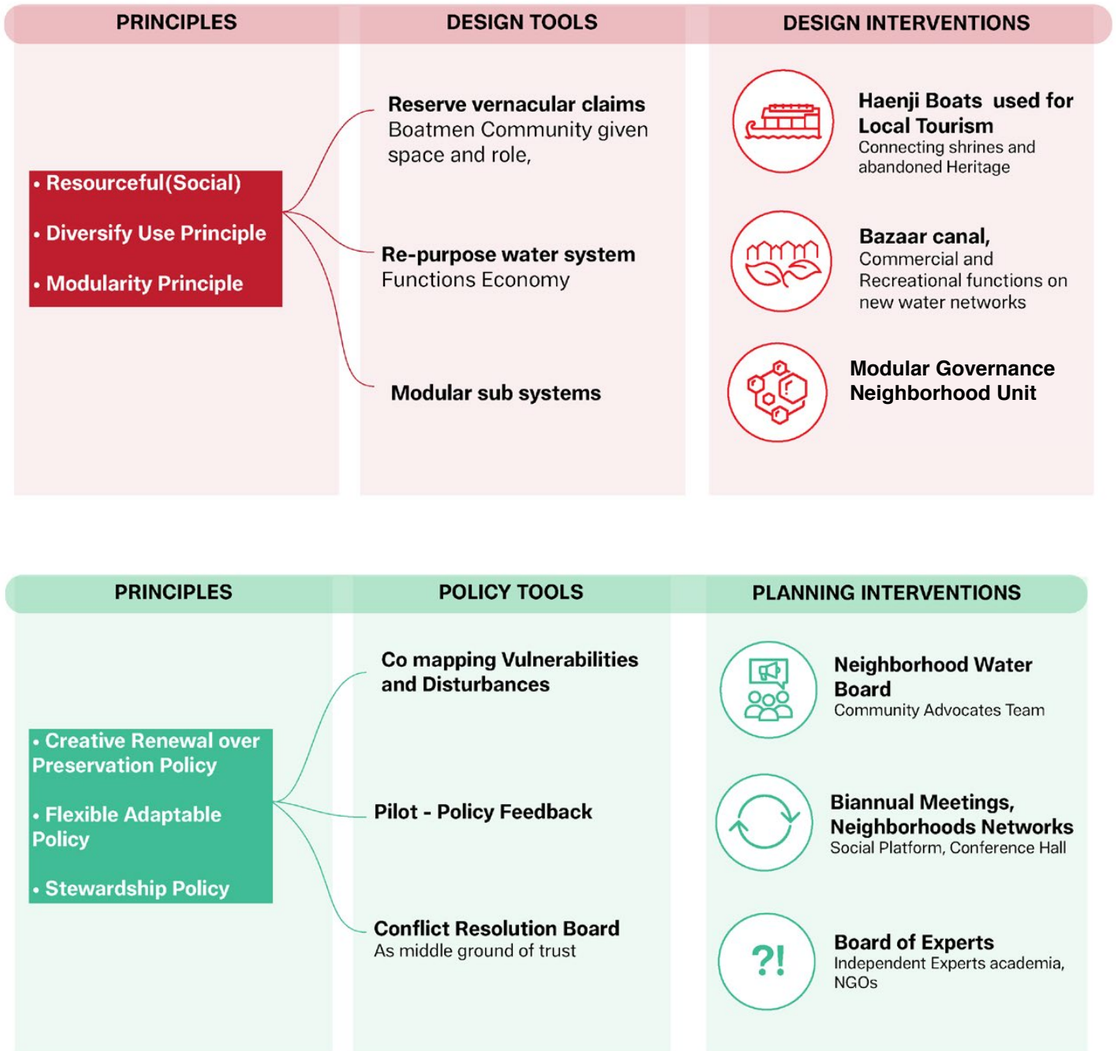


Fig: A process map to trace principles to strategies and design Interventions.

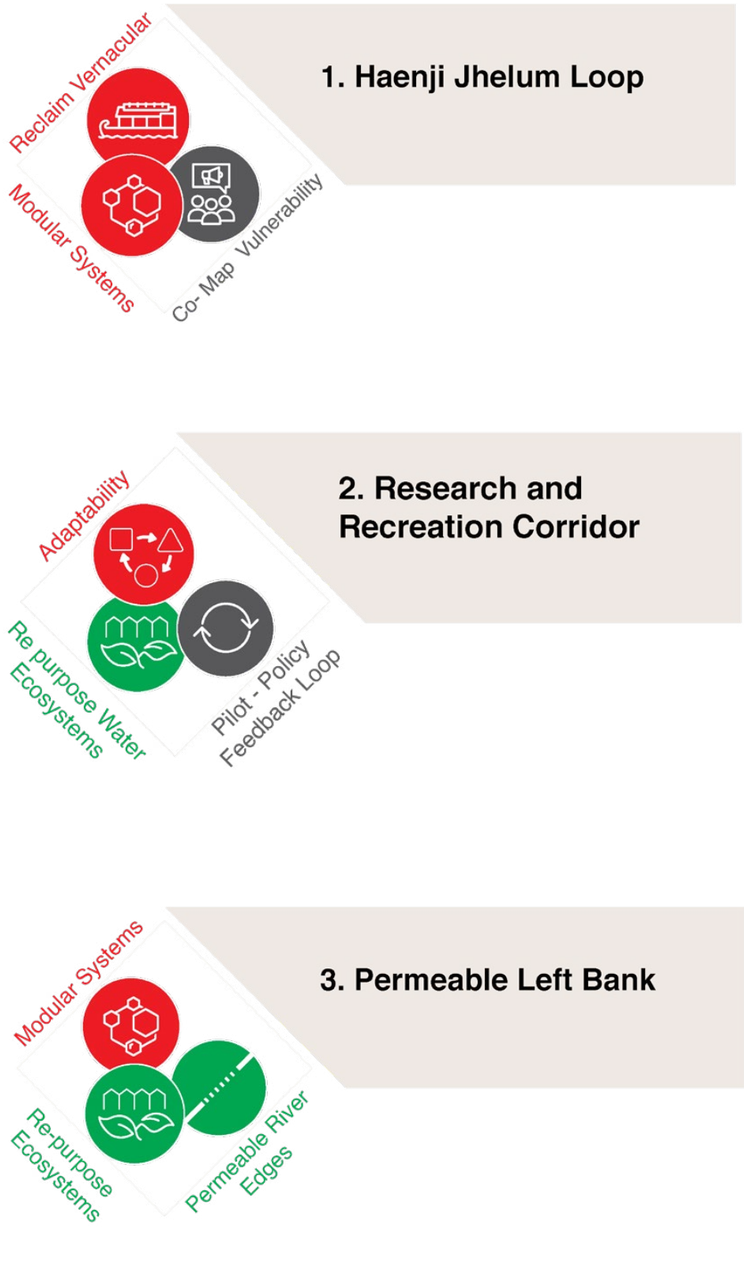
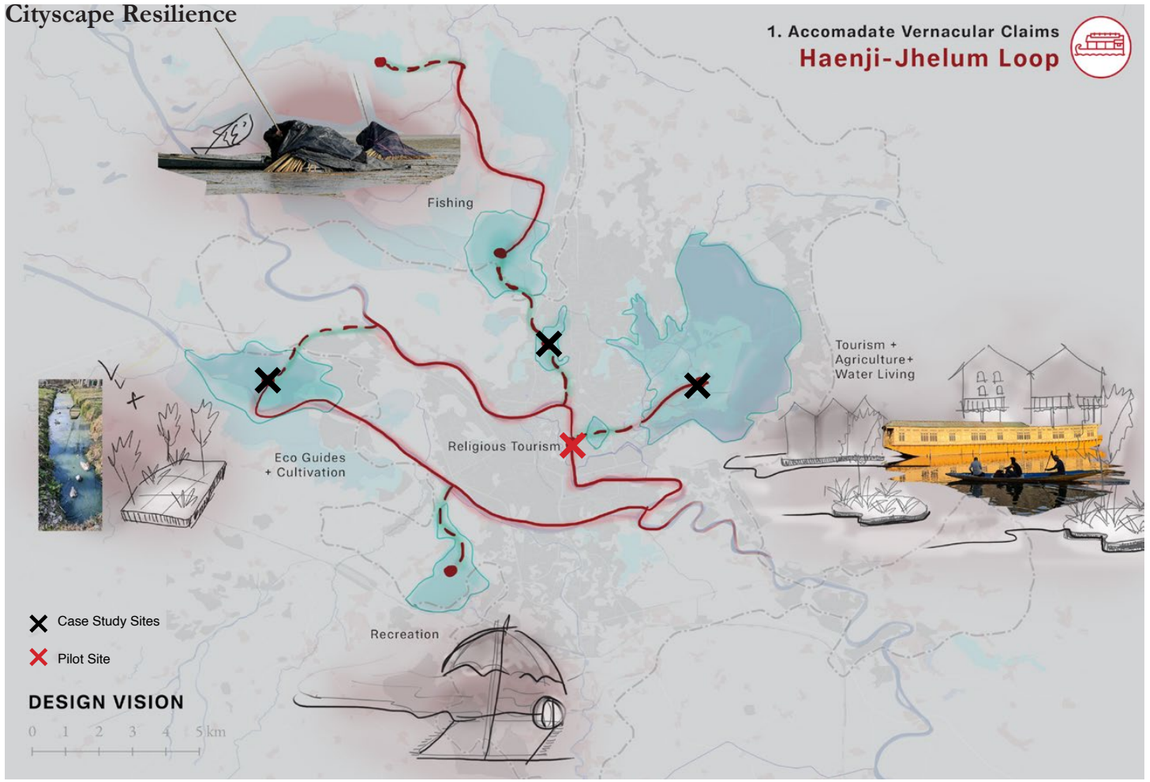


Fig: Concept Diagrams for Strategy Themes for City Vision



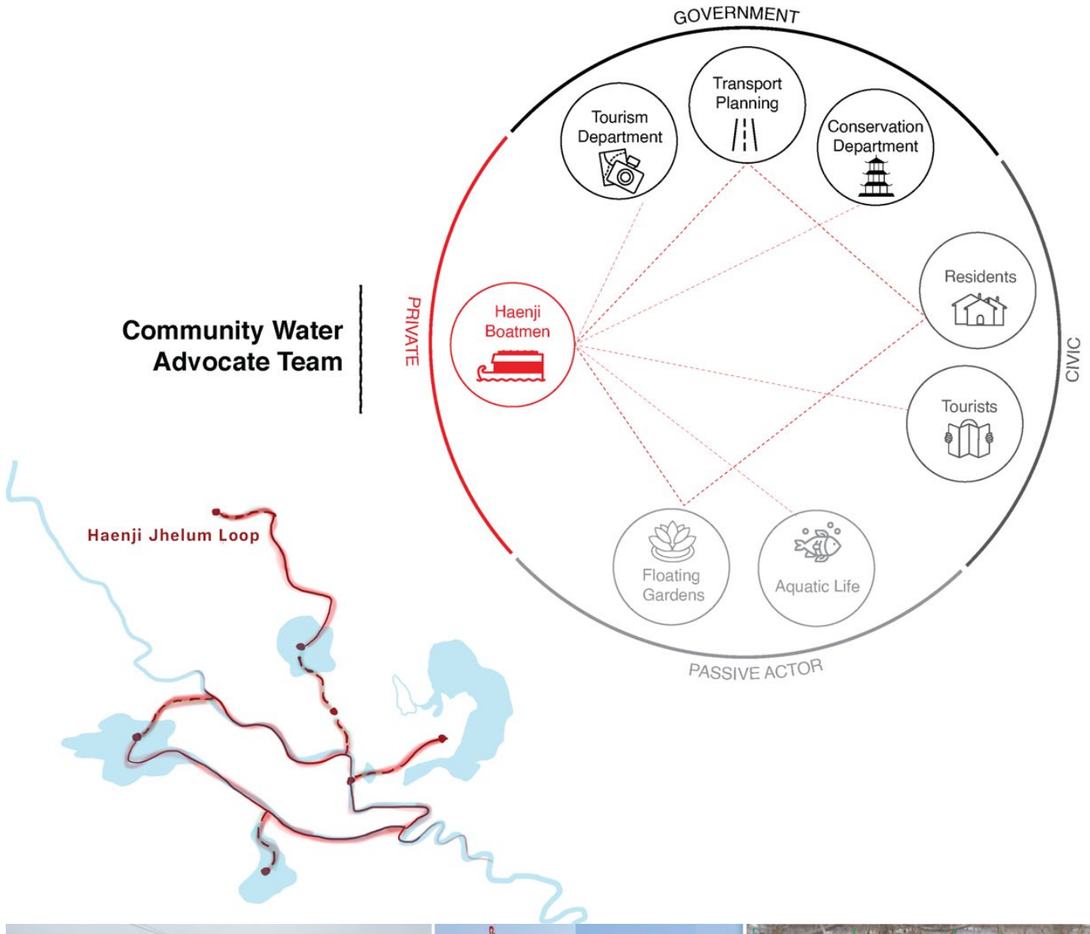


Fig: Key sites for the Haenji, Boatmen Community's Jhelum Loop

Theme 1: Haenji City Loop

Spatial Design: A sustainable zone on Jhelum water circuits where social and ecological functions meet with the efforts of the Haenji's or boatmen communities. These include Haenji resettlement housing, tourist and recreation spots, heritage riverfront, urban and rural wetland agriculture, and transport infrastructure. The loop connects local water governance units spatially and socially.

The Haenji loop takes on a different spatial character in each site of the Jhelum Water network. The boatmen housing and livelihoods are allocated along this loop with special reserved areas

Planning Process: Form a community water advocate team. To create stewardship with Haenji Boatmen and two key identified community advocates typical of each site. Local design Interventions are formed with continuous consultation and feedback between community water advocate team and planners and researcher team.

The structure of this hydro-social network of Boatmen loop must be rigid to be robust supported by fixed regulations to protect this vital spine. However, as the city evolves the roles and responsibility can adapt with experimental learning in the form of pilots at local sites.

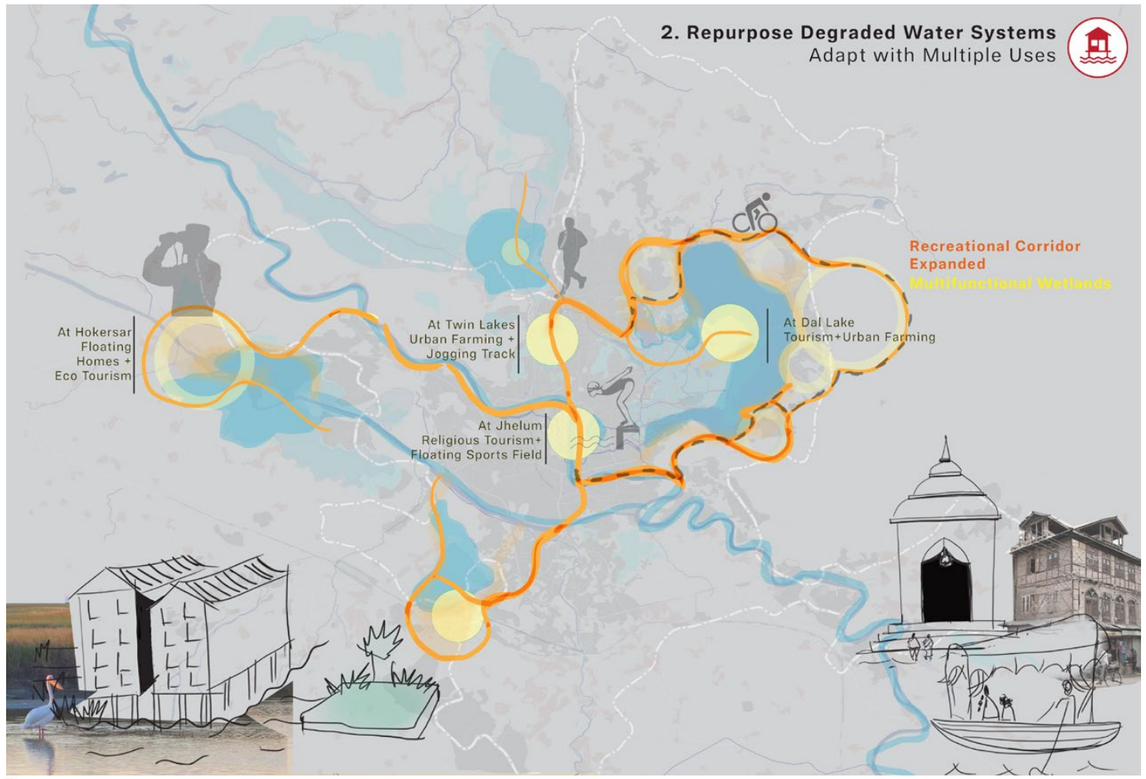


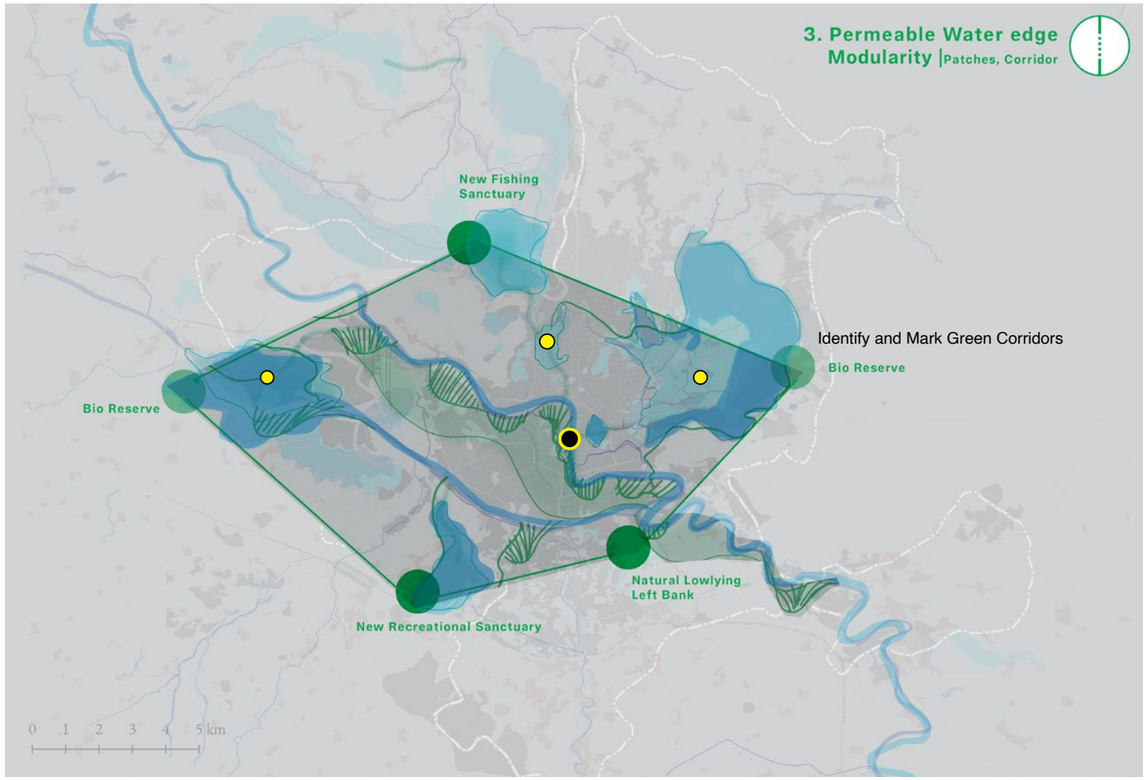
Fig:

Theme 2: Recreation and Research Corridor

Spatial Design: For resilience it is vital to re-purpose degraded wetlands and diversify their land use. A recreation corridor is at present only located at Dal lake as the Tourist Dal Boulevard connecting lakefront with Hotels, Mughal gardens, wildlife sanctuary and other social functions. This spine could be expanded over the city connecting important research and recreation sites along water. The green corridor could have cycling tracts, birdwatching sites, urban farming living labs and floating homes. It could combine research and recreation with college campuses. The attempt here is to diversify lakes with a defined purpose that serves both local and floating population.

Planning Process: Research bodies and schools can identify sites of scientific interest to investigate into. Sport fields can be maintained by college campuses that have a close relation to water sports and recreation activities.

The academic community can serve as an important conflict resolution board advising community water advocate teams on challenges, trade-offs and synergies of their local design interventions. The academic conflict resolution board serves as middle ground between planners and community advocate teams by providing on ground researched feedback on government master plan policies based on resilience assessments.



Theme 3: Permeable Left Bank, Jhelum

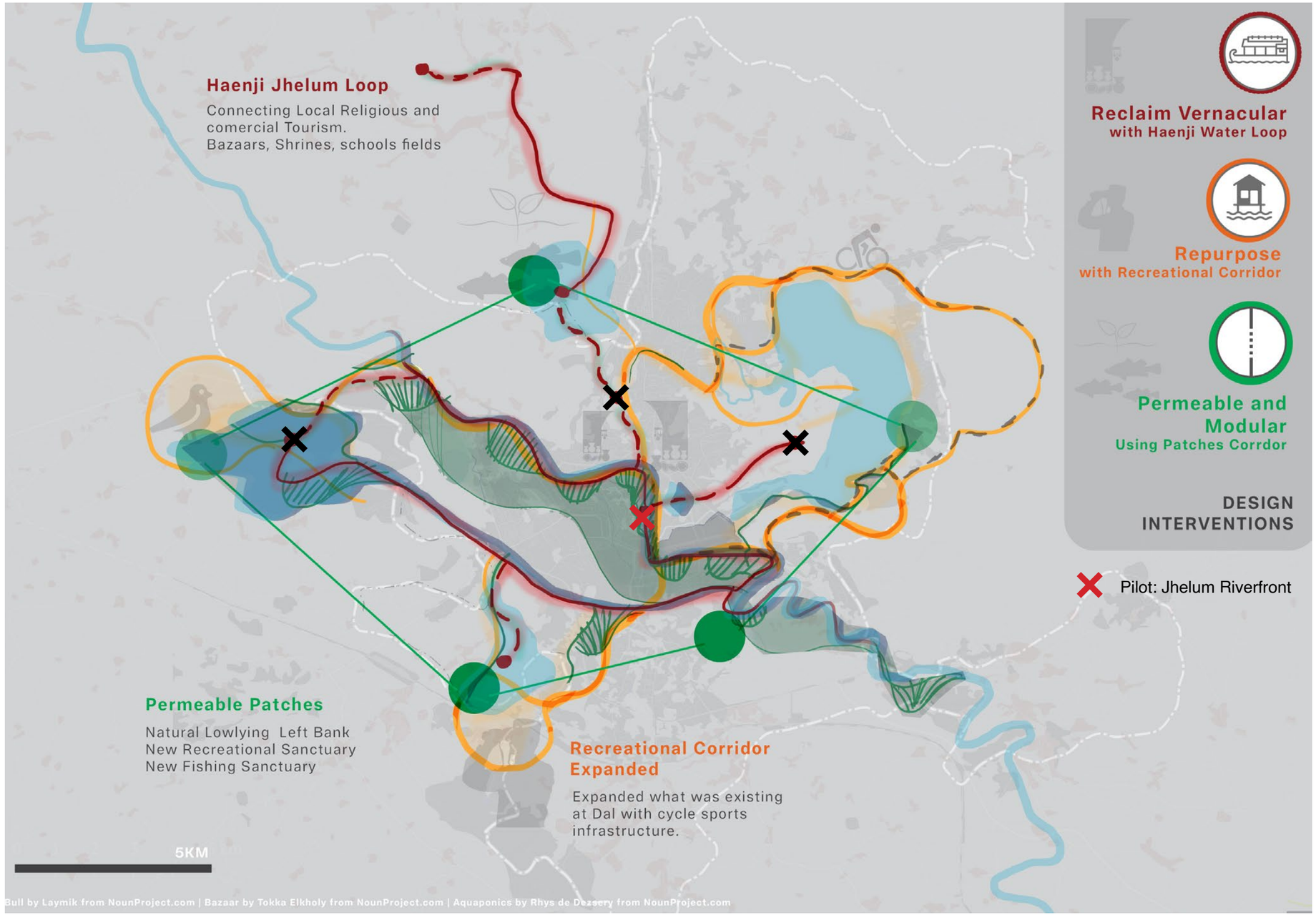
Spatial Design: Create a hierarchy of public private semi-private green space as retention basins on the left low-lying bank of Jhelum as this is already a densely developed bank at most areas this requires urban redevelopment policies.

Planning Process: Governed with Haenji loop. Connected to research recreation corridor spatially socially.

Green Parking Lots

Vernacular Urban Farms

Image Source: https://frenchly.us/seven-picturesque-paris-pools:
https://www.danabrownassociates.com/tri-centennial-place-parking-lot/



City Vision I 3 Themes

Spatial Design: Combining these 3 themes key sites emerge as potential pilots to elaborate for strategy. The Jhelum riverfront is selected for this study.

Planning Process: Combining the planning process from each theme arises a city level engagement strategy.

Pilot Testing and Scaling

The first step was envisioning three resilience themes on the city scale, next these will be tested at Jhelum riverfront the pilot for this research to trace how they manifest locally in space and in governance.

The learnings from pilot would then be used to project how other sites may work to operationalize the vision in an upscaling plan.

Lastly the author would reflect back to policy making and planning principles in the form of a manifesto to present reflections from pilot testing experiment.

3.4 Pilot | Jhelum Riverfront Neighborhood

Strategy Overview:
The first stage of strategy was to locate the different themes on city scale to understand key stakeholders and activities under each theme.

This step is to test pilot for vulnerabilities under the three themes, elaborated earlier. The design manifestations are explored when each of these themes are applied to the Jhelum Riverfront Neighborhood.

Insights from this pilot are used to upscale to other design Interventions. For the case of this proposal Hokersar Peri-urban wetland is chosen to test findings from pilot.

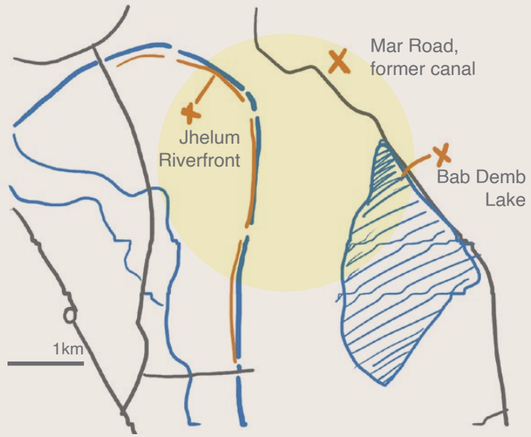


Fig: Pilot Neighborhood Selected

Fig: Mar Canal that was later made into a primary road, Collage

Pilot | What It was

This section looks at how the strategy toolkit can suggest design interventions on a local scale and how it can be operationalized.

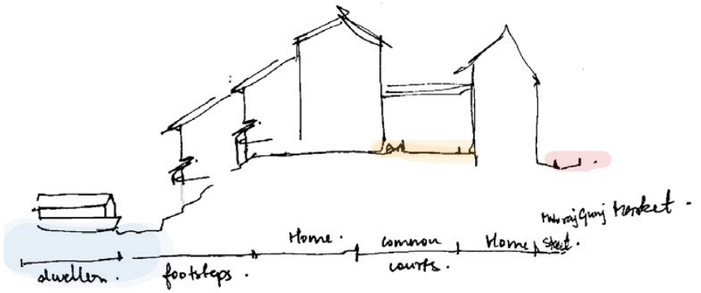
Why Here? | A Downtown Neighborhood

This site is a hotbed of the issues the author wishes to look into. These are the Vernacular bonds with water that are centuries evolved and well-cultivated here. Facing conflict in terms of traffic congestion, negligence of care and sewage issues from rapid urbanization and planning gap.

The 'Downtown' neighborhoods that developed along the banks of Jhelum characterized certain features making them more conducive to the environment. Their adaptation to surrounding ecology and climate built their resilience through time.

The vernacular architecture, of traditional homes, developed to the survival of cold and water built on high stony embankments and forming a closed knit in the plan. Brick stone and wood constructions were proven to be earthquake resistant from their flexibility achieved by timber bracing and dry rubble. While raised embankments and stilts made them flood-proof.

In terms of traditional planning, a group of houses snuggled together to form one compact structure sharing a courtyard that led to a common riverfront step section called 'Ghat.' These ghats colloquially were called 'Yarbal', or the place of friends. Thus each segment of the riverfront step was a certain block's characteristic identity.



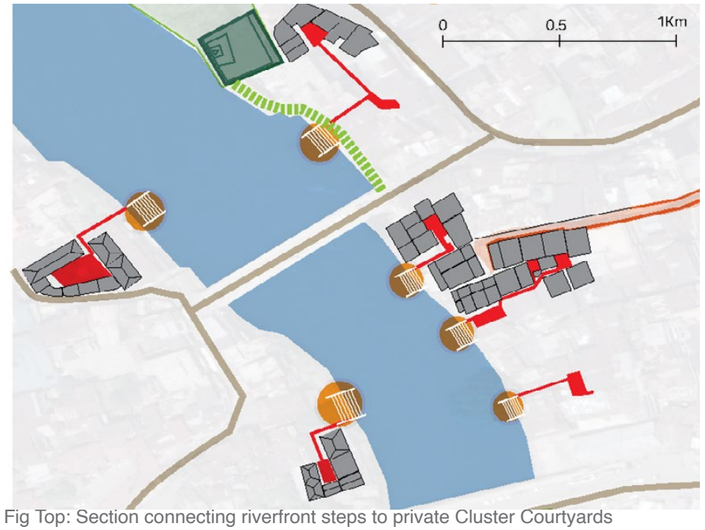


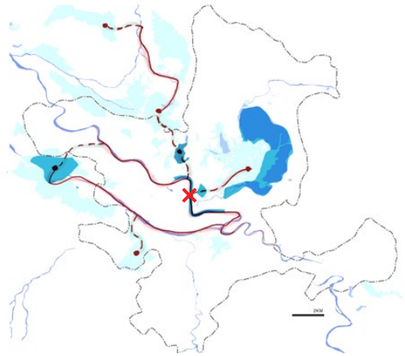
Fig Top: Section connecting riverfront steps to private Cluster Courtyards
Fig Bottom: Cluster- Courtyards of Old River Jhelum Riverfront Neighborhoods

Co-map with Haenji Jhelum Loop

The first step is to form a governance unit that is tied to the Haenji loop. In this case it is the shrine and heritage network along the old parts of the city. Some of the heritage is abandoned due to conflict and needs redevelopment and re-interpretation. For this the shrine network manages and maintains the crumbling structures and the Boatmen could help with the accessibility through water routes part of Heritage tours.

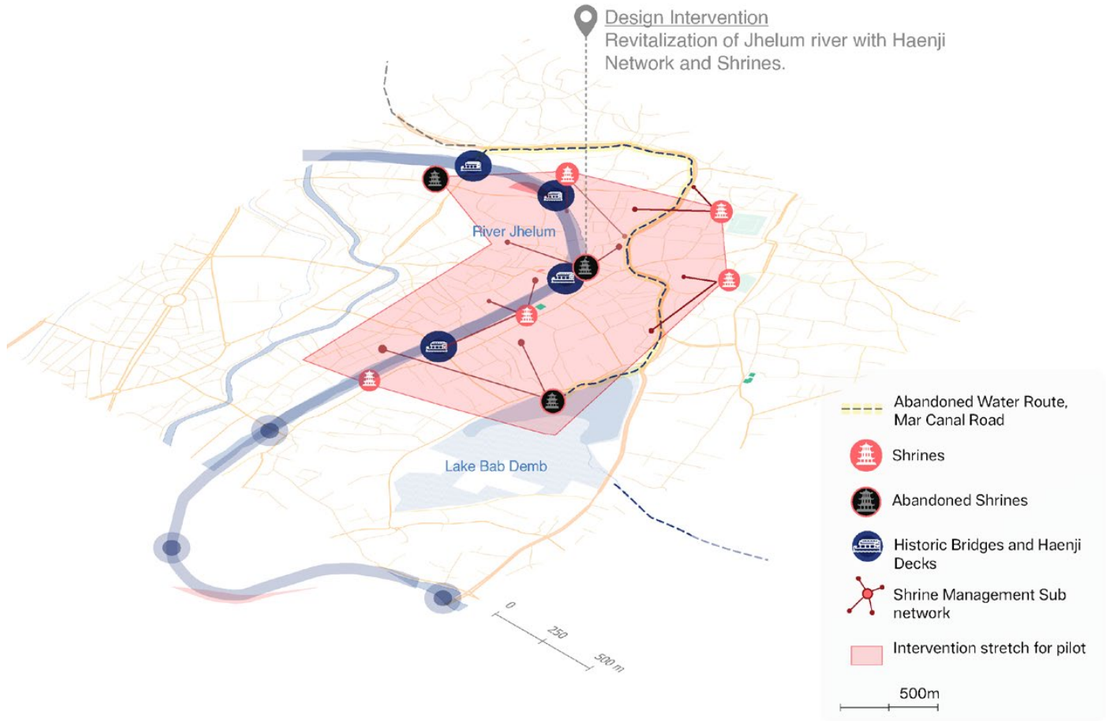
Spatial Design: The Haenji Boatman takes a worshiper and some tourists to an iconic city shrine. Heritage water tour boats takes visitors along the riverfront doted with cafes bookstores and art exhibitions. Use existing strong social networks in the neighborhood, in this case - shrines, Religious infrastructure along with Haenji can form a modular governing unit responsible for a stretch of the Jhelum water system.

Planning Process: Community water advocates team comprises of shrine priests, college lecturers, student board, Haenji representative, resident welfare board member and a municipality officer. Workshops are conducted with a planner and an academic researcher to co-map vulnerabilities, key disturbances and design possibilities for a Neighborhood scale intervention



The Haenji Jhelum loop connects the Vernacular Water culture spatially and socially. It forms a common thread tying local governance units. In this Case they are the shrine abandoned Heritage group

Neighborhood Water Team



A network model of governance with boatmen and shrines playing the central role and re purposing abandoned heritage homes, bazaar stores. The focus at other sites needs to be specific but due to displacement from the conflict redefinition of the core meant looking at the resourcefullness of the vernacular

The boatmen community act as the key actors negotiating between the various civic and government bodies and engaging with the passive actors who may be dormant. This is illustrated in the adjacent diagram.

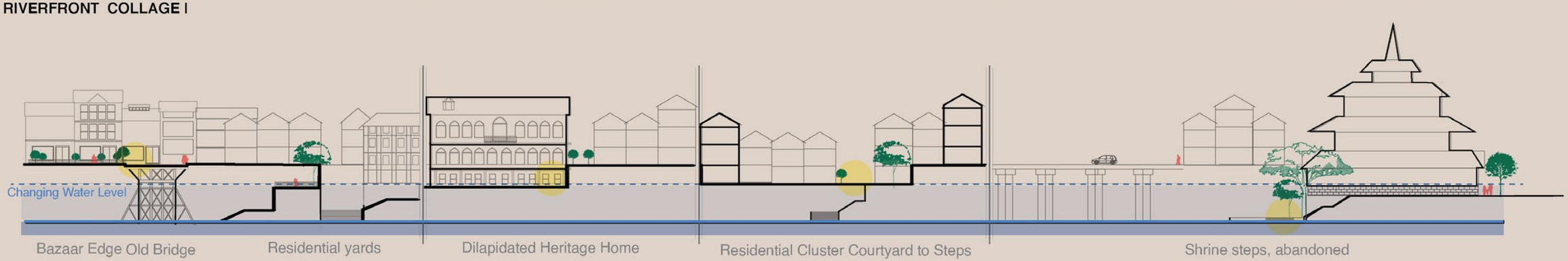
BEFORE

Bazaar at Bridge

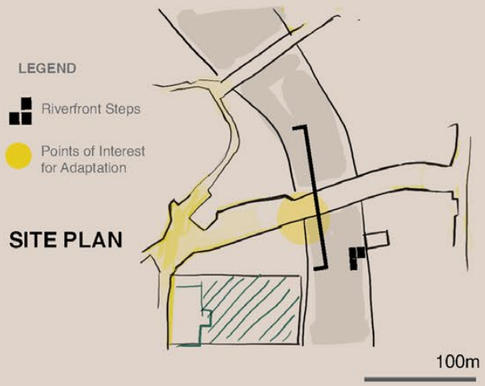
Riverfront Vernacular Homes

Abandoned shrine segment

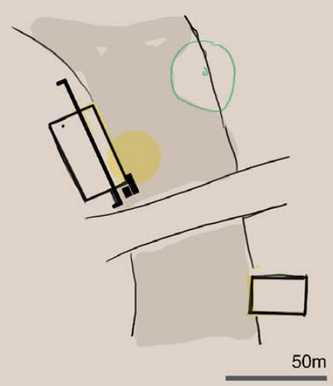
RIVERFRONT COLLAGE I



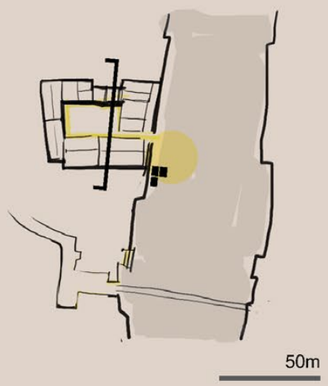
PART SITE SECTION - STITCHED



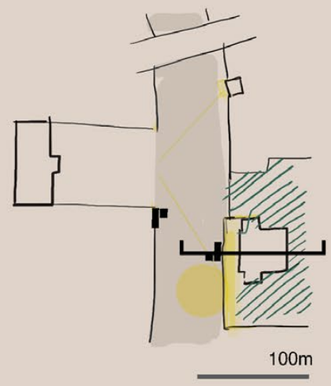
Historic bazaar junctions at old bridges but not much at rivers plane



Abandoned Heritage at riverfront disconnected. A temple and a dilapidated home.



Only a few traditional Courtyard clusters that connect to riverfront steps.



Shrines with the biggest public grounds carry potential of retaining basins.

KEY PLAN

JHELUM RIVERFRONT

Haenji Jhelum Loop

- *Adaptable design adjusts to changing river level*
- *Boatmen network used to diversify and permeate edge*

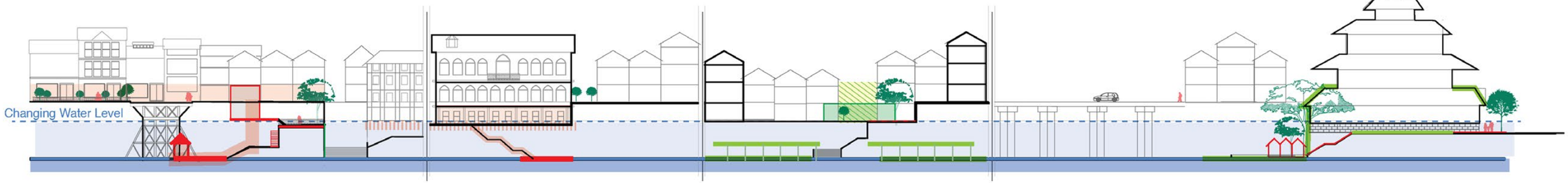
AFTER

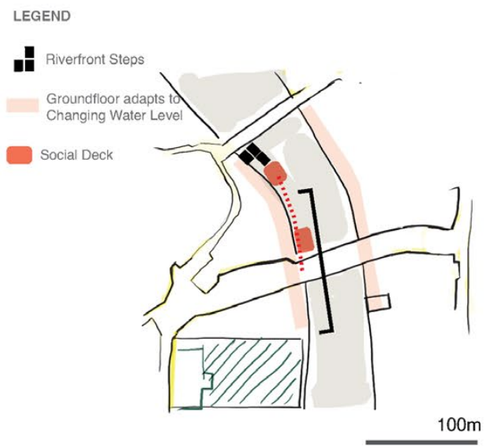
1. UNDER THE BRIDGE SOCIAL DECK

2. HERITAGE EDGE SOFTENED

3. HIERARCHY IN OWNERSHIP OF GREENS

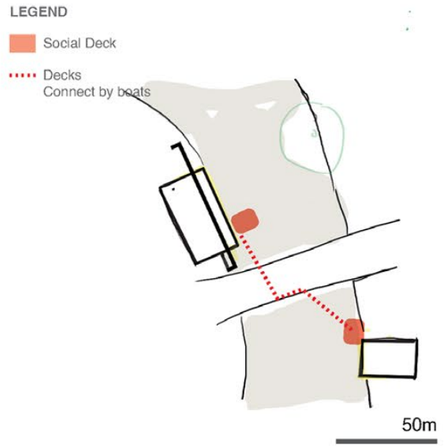
4. HOLY WATERS





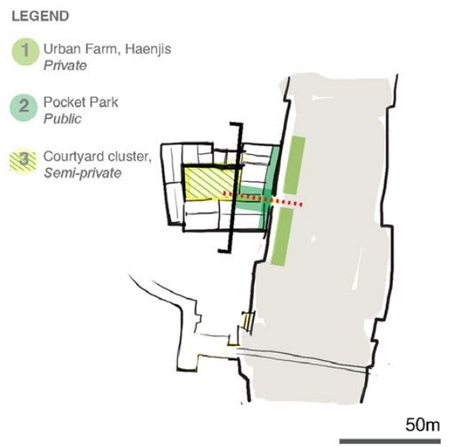
1. Under Bridge Social Deck

Connect Ground floor bazaar tto Social deck for Heritage boat tours, Floors that meet the 'Changing water level' made permeable.



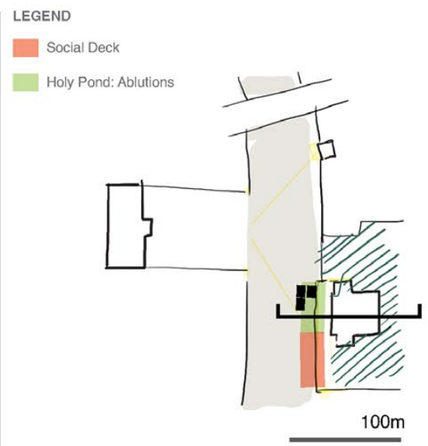
2. Heritage Edge Softened

Redevelop Old heritage as Art museum and connect to water tours with a Social Deck.-



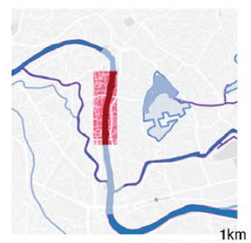
3. Hierarchy In Ownership Of Greens

A modular set of Green network from urban farms at embankment private cluster courtyards



4. Holy Waters

Revive abandoned shrine edge with floating shops, ablution pond, contemplation garden



KEY PLAN

JHELUM RIVERFRONT

Research and Recreation Corridor

Spatial Design: Degraded wetlands and river must be re purposed with a clear defined role for the community. This step requires to connect the academic institutions and the youth to River Jhelum network to bring vibrancy, ownership to it instead of vandalism. These interventions shape in this pilot as Bazaar Canal, Floating Sports Field, Living Labs (College Research)

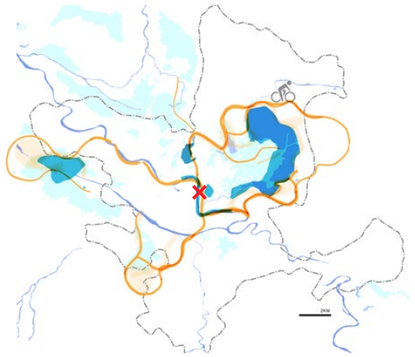
Bazaar Canal: An adaptable canal/ Road bazaar that connects river Jhelum to Bab Demb that merges the existing concept on Historic bazaar at landmark bridges and roads and places it on water to highlight the role of water as a connector. A former connection existed with the Mar canal that was converted to a primary road in the 1970. Through this relinking the water circuit the attempt is show how water systems can be a part of rapid development bustling with commerce.

Floating Cricket Field: An existing Island at Bab Demb Lake is extended to form a mini cricket field. The idea here is to give the adjacent school a function that ties it to wetland and generate sense of ownership and responsibility in maintaining it. The school could also conduct Living Labs, research on floodplain wetlands, river and lake to further extend their research and experimentation onto the water systems

Planning Process: The Bazaar canal requires representatives of the heritage bazaar to agree to such a proposal. They can form as a key member tied to the Haenji Governance Unit.

Academic Institutions identify sites of scientific interest to investigate into. Sport fields can be maintained by college campuses that have a close relation to water sports and recreation activities.

The academic community as discussed earlier under city vision forms part of the conflict resolution board.



Research and Recreation Corridor on the city connects boulevards for tourists and Eco and Agro tourist sites as well as major academic institutions.

The Historic Bazaars are away from the river along primary roads and the meet the river at historic bridges. The attempt is to engage with water transport to the bazaar

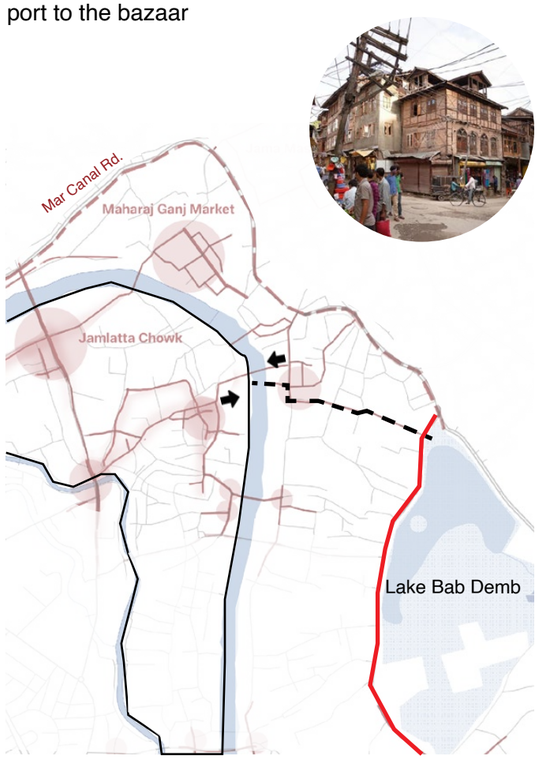
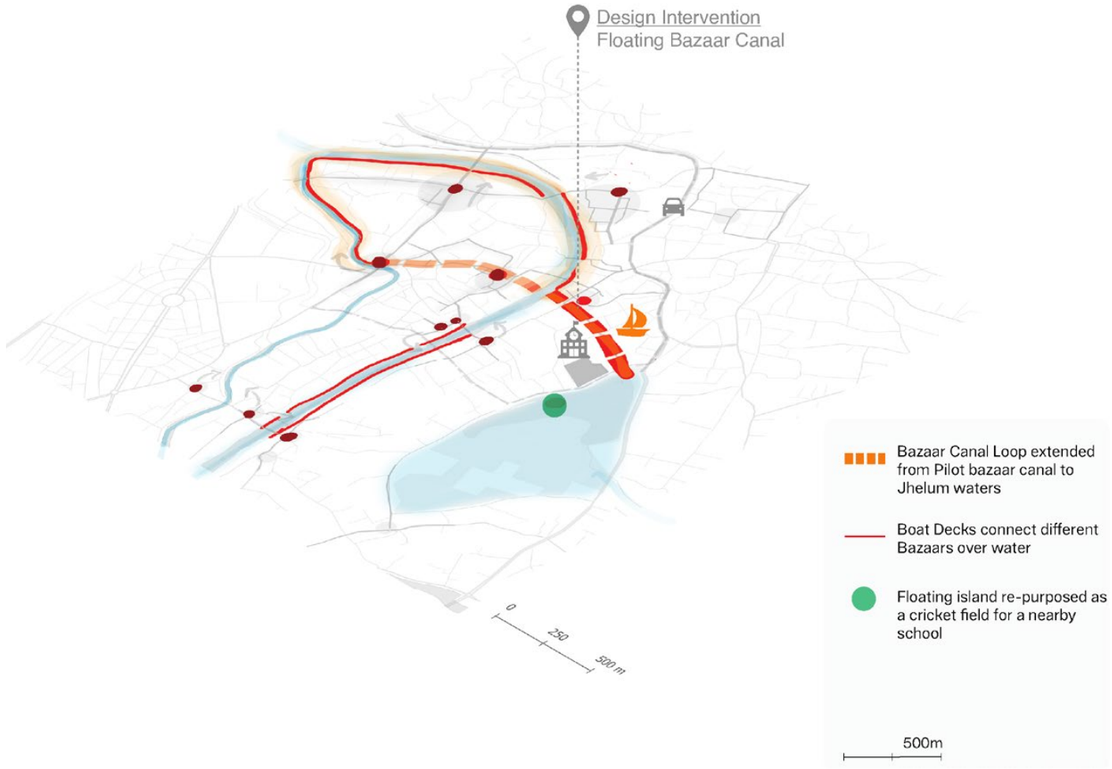
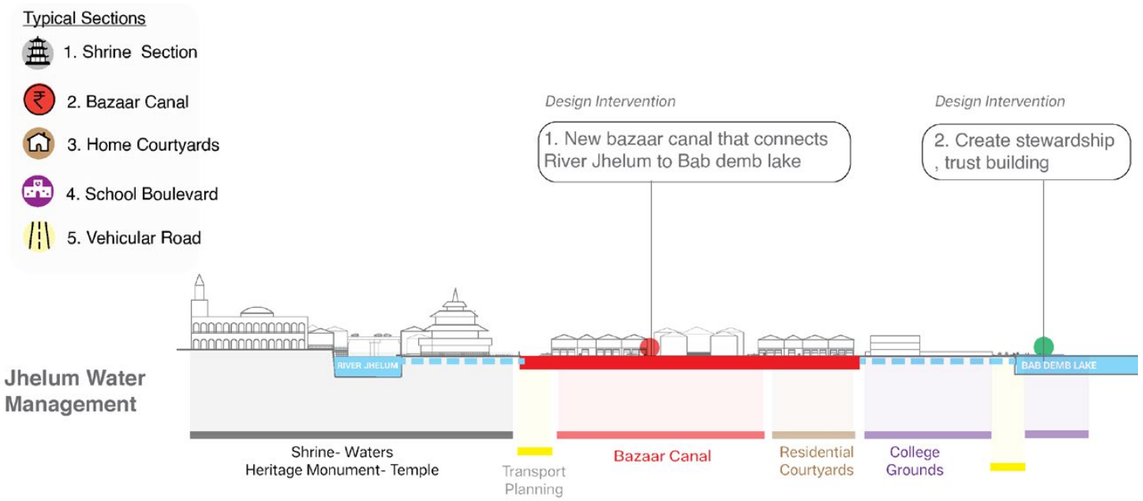


Fig: Historic Bazaars at Jhelum Old Riverfront Neighborhoods





BEFORE

Shrine Bazaar Junction

Shrine Bazaar, Temporary Stalls

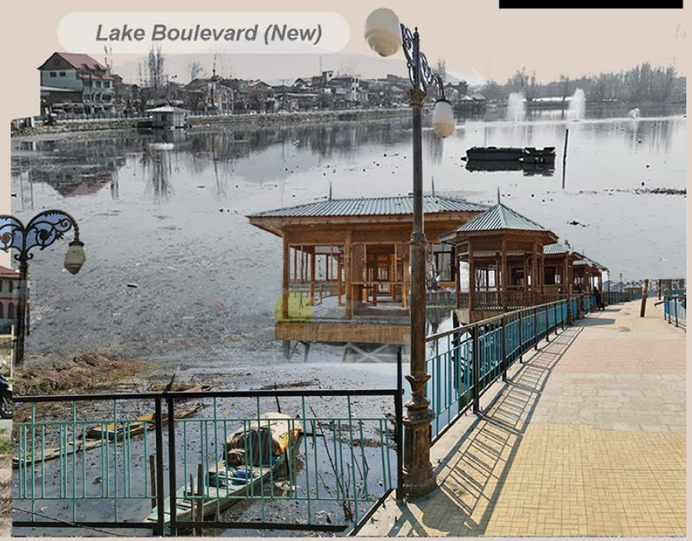
Heritage Bazaar

Heritage Bazaar that a smart city project is trying to revitalize

Government School

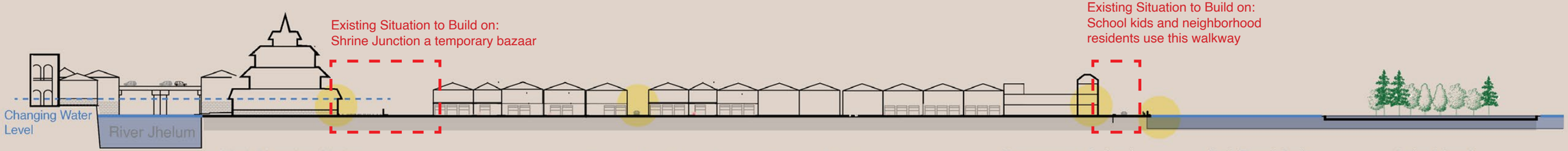
Lakefront School

Lake Boulevard (New)



Vandalized Pavillions on the new lake boulevard

COLLAGE



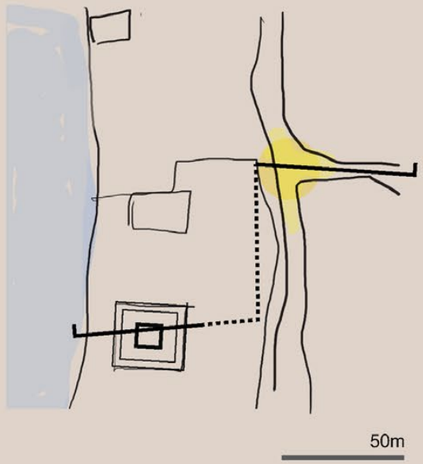
Shah Hamdan Shrine | Bazaar Road from River to Primary Road | Government School | Bab Demb Lake | Lake Island

SITE SECTIONS, STITCHED

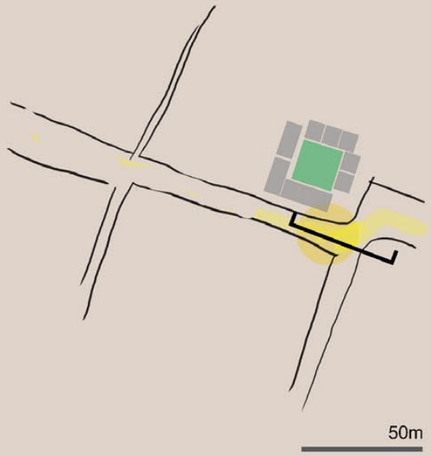
LEGEND

Points of Interest for Adaptation

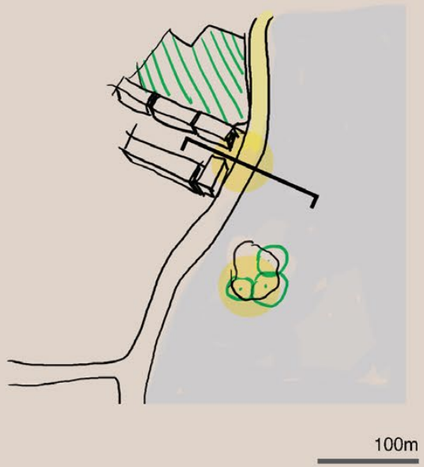
SITE PLAN



A Bazaar junction behind shrine



Bazaar road with neighbood lanes and few junctions



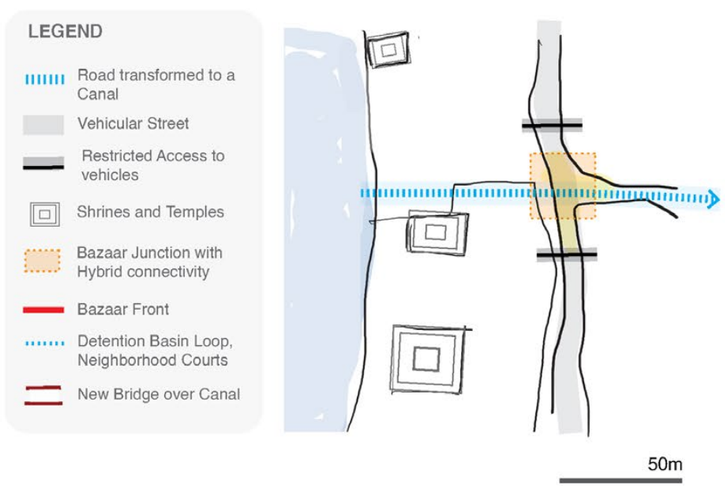
A school at the end of the street and a floating island at on Lake.

Bazaar Canal
(JHELUM TO BAB DEMB LAKE)

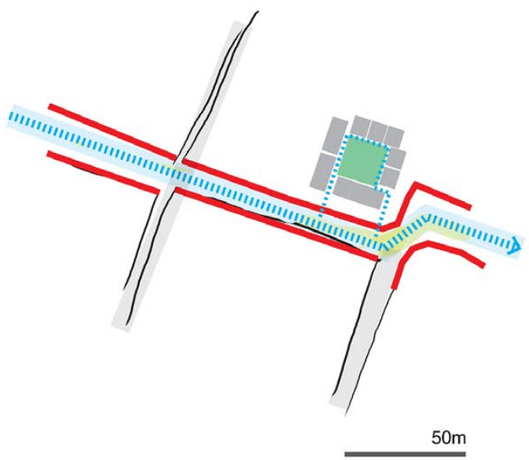
Recreation Corridor

- *A floating bazaar that adapts to a canal*
- *Diversify function of Lake*

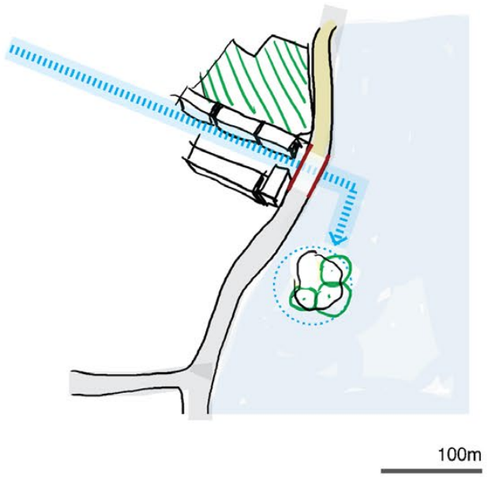
AFTER



1. Floating Vegetable Market
A vegetable Market at shrine and its junction could be organized by the boatmen community to leave their mark at this place.

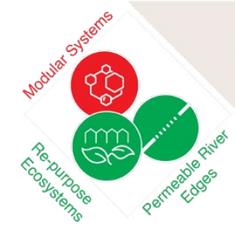


2. Bazaar Canal
Redevelop as floating on Decks so it can rise with water Cluster Courtyards serve as Detention Basin..



3. Floating Field
Existing Island in the lake could be extended to a small field size to serve as a floating cricket field for after school play.

Bazaar Canal
(JHELUM TO BAB DEMB LAKE)



Permeable Left Bank of Jhelum

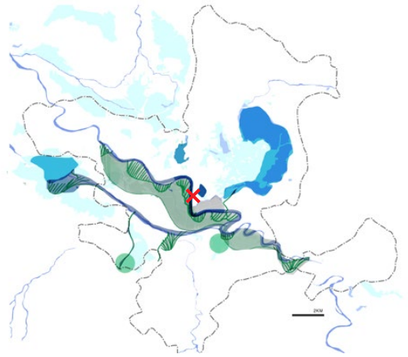
Spatial Design: A network of public, private and semi-private green infrastructure acting as detention basins is set up along the west bank of Jhelum.

The hierarchy is based on stewardship of the green potential detention or retention basins along the left bank of Jhelum. At some existing places open spaces are re purposed at other they are expanded like the embankment walls with floating urban farms.

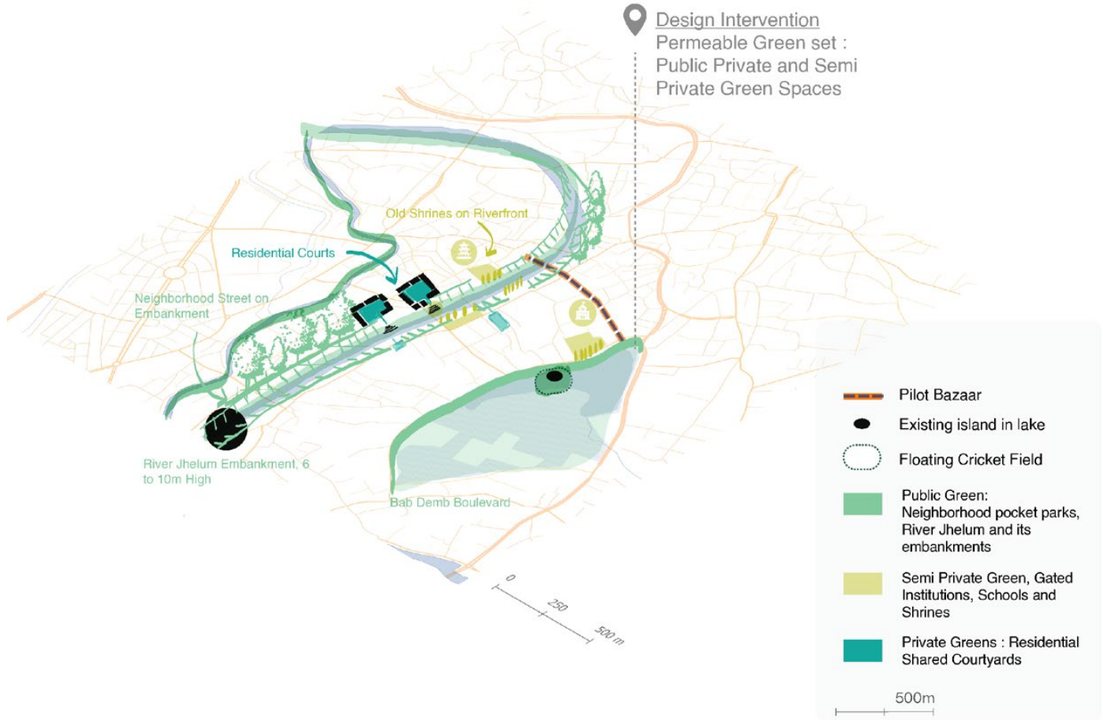
This set of Public private and semi private green becomes a modular unit easy to replicate along the Jhelum at Srinagar with explained typologies. Since cluster courtyard is a feature specific to old city at the core in newer neighborhoods these can take the form of pocket parks or green residential avenues .

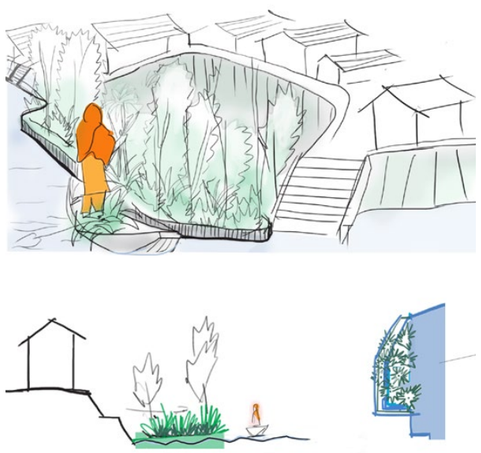
The public greens would be first the River Jhelum itself as a common good, its historic bridges and the greens around it that are accessible without fences. The semi private spaces are the institutions that even though for the public like shrines and schools guard the property along with introducing the vernacular water agriculture practices of floating gardens of Dal Lake along Jhelum network. The private greens the residential cluster courtyards.

Planning Process: The ownership of such green is varying from private house-cluster courtyards to semi private swimming pools and public neighborhood pocket parks and green parking lots.

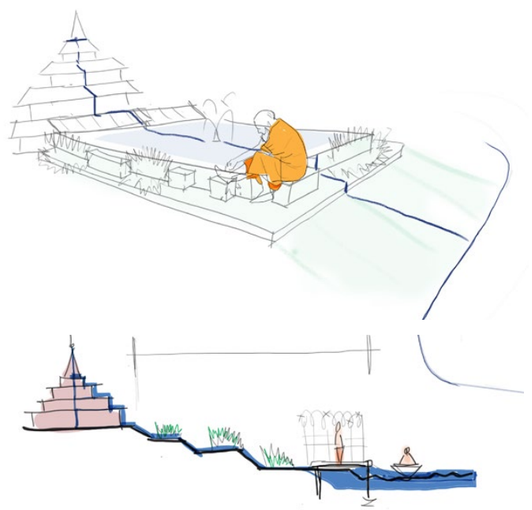


Permeable Left Bank of Jhelum on Srinagar City with Case study wetlands highlighted





1. Urban Farming by Haenji Boatmen community, proposed



2. Shrine Holy Waters

Softening the Riverfront- Concept Plan

CONCEPT OF PERMEABLE GREEN SET FOR JHELUM LEFT BANK

Permeable Left Jhelum

- *A modular set of Green spaces*
- *Ownership Stewardship of Water*

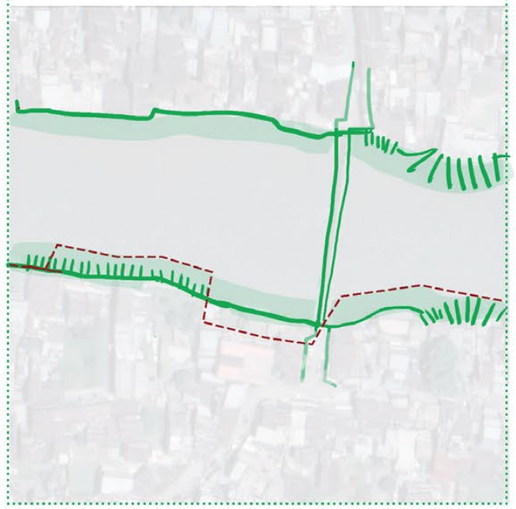
River Jhelum
Left Bank

1. PUBLIC

Bridge and Decks

Embankment Trees on River Boulevard at places not continuous

Parks serve as Water Retention Basins



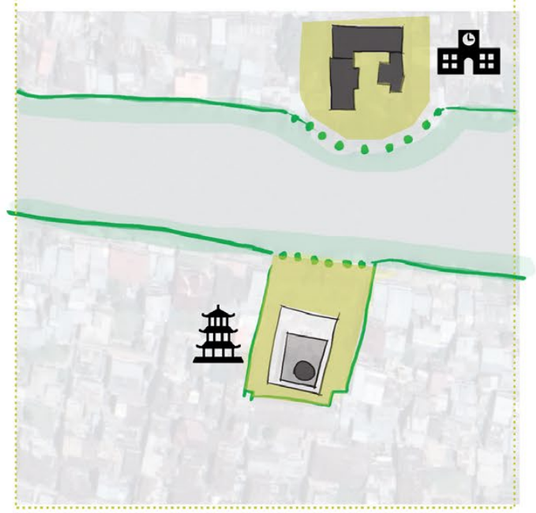
River Jhelum Embankment green, Bridges and the river itself. These edges could be used by urban farming, adabtable bazaar canals

2. SEMI PRIVATE

Floating Island, Haenji's

Urban Farms at embankment wall
Boat men's Vernacular Water Agriculture

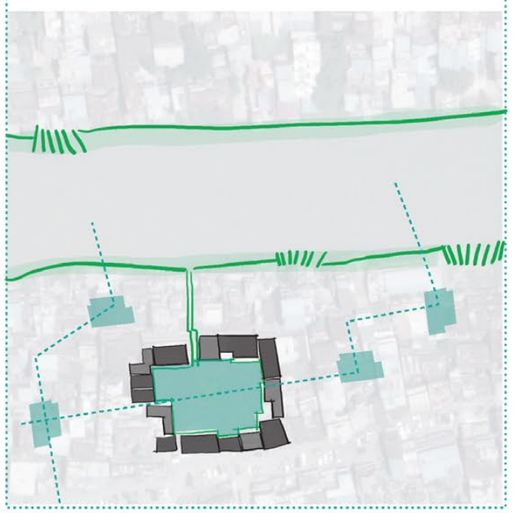
Gated Institutions can serve as Detention Basins



Temples and School, Public Institutions but gated

3. PRIVATE

Residential Cluster Courtyards, Privacy with access to river steps through intimate lanes.



Cluster Courtyards connected well with proper drainage could act as detention basins holding the water temporarily

N
50m

PUBLIC :
River Jhelum,
Embankment Boulevard,
Pocket parks

SEMI PRIVATE
Gated Institutions like
Schools, Temples
Maybe even the Bazaar
Canal

PRIVATE
Residential shared spaces,
At this stretch these are
the cluster courtyards and
their linked riverfront steps

Adaptable river edge ,Detention Basins, Floating Islands and Decks

KEY PLAN 2KM

N

LEFT JHELUM BANK

3.5 Strategy Phasing

PHASE 1 I Riverfront Redevelopment with the Haenji Jhelum Loop

The strategy starts with pilot located at core to suggest changes with water governance at the historic neighborhood level with the addition of the boatmen loop and its impact spatially on the downtown neighborhoods. The resilience begins with strengthening the hydro social bonds and expanding new social connections along shrines and college institutions. Thus a robust network of socio- ecology is created at the core of city center along Jhelum.

Institutional Response should direct Haenji agriculturists towards sustainable practices of water transport and water agricultures.

Phase 2 I Left bank Redeveloped and Water networks well connected

Expanding from this core to establishing strong connections with other wetlands and lakes in the city. This is done with the theme Research and 'Research and Recreation Corridor' and 'Permeable Left Bank 'to create natural detention basins along this edge.

Institutional Response : Incentivize sustainable commercial, recreation and academic use of wetlands that matches resilience principles. Stimulate design that supports adaptability, of left bank retention basins. Within a neighborhood area the percentage of retention basins can take an adaptable form with time.

PHASE 3 I Regulation of Peri-urban Retention basins: Eco reserve- Hokersar

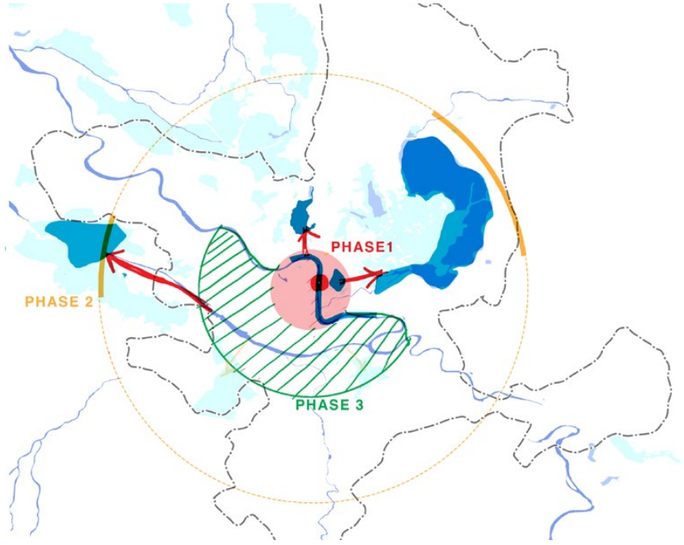
This step looks at rehabilitation of Dal dwellers at Hokersar, an Eco-sensitive site. The process is currently ongoing since a decade this step suggests looking at the resilience of such a policy measure and alternative uses of peri-urban wetlands of ecological importance in the wake of rapid urbanization to suggest for adaptable land use policy that protects the permeability of site

Institutional response here should assess the socio-economic and environment impacts and move towards hybrid living working solutions for Dal dwellers that respects the permeability of this important retention basin.

Pilot - A social learning experiment that informs policy.

The neighborhood pilot informs other interventions no form of governance model. The design interventions could vary at different site but key learning from pilot is well integrated into policy making and a feedback loop exists between policymakers and community water advocates team at pilot.

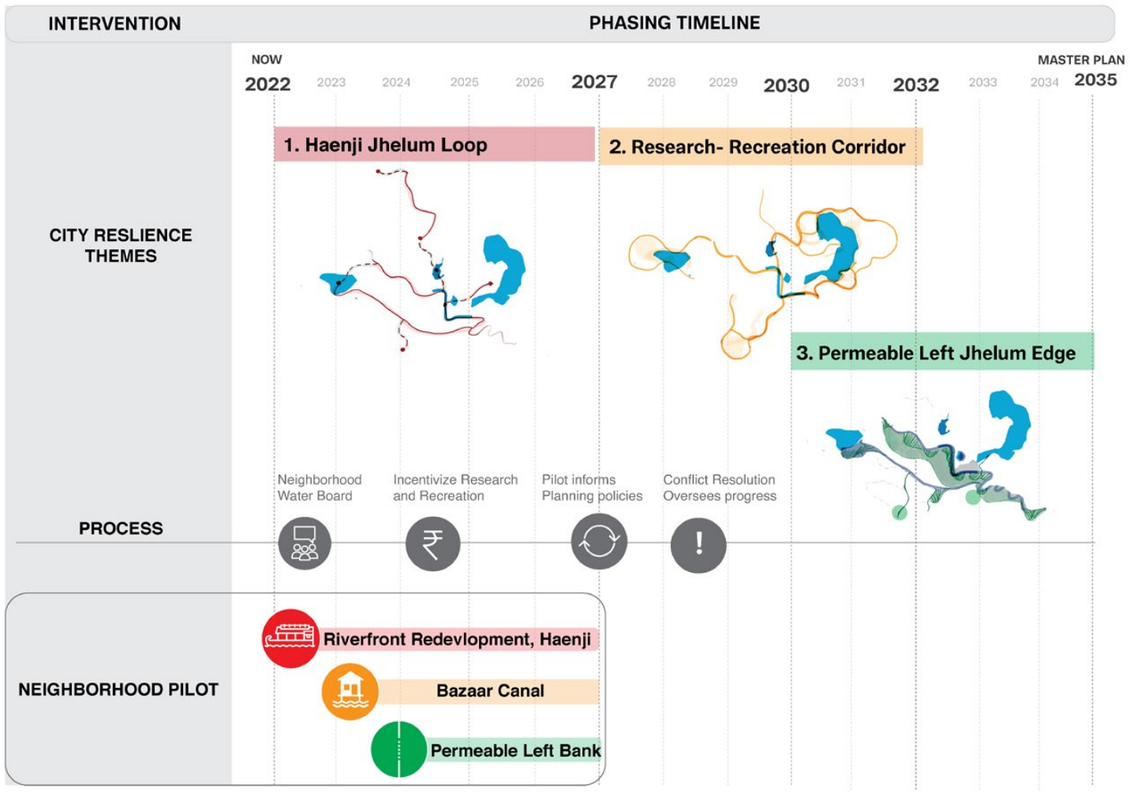
Fig: Process Vision: Neighborhood Water Board that Manages the Modular Unit of Typical Sections



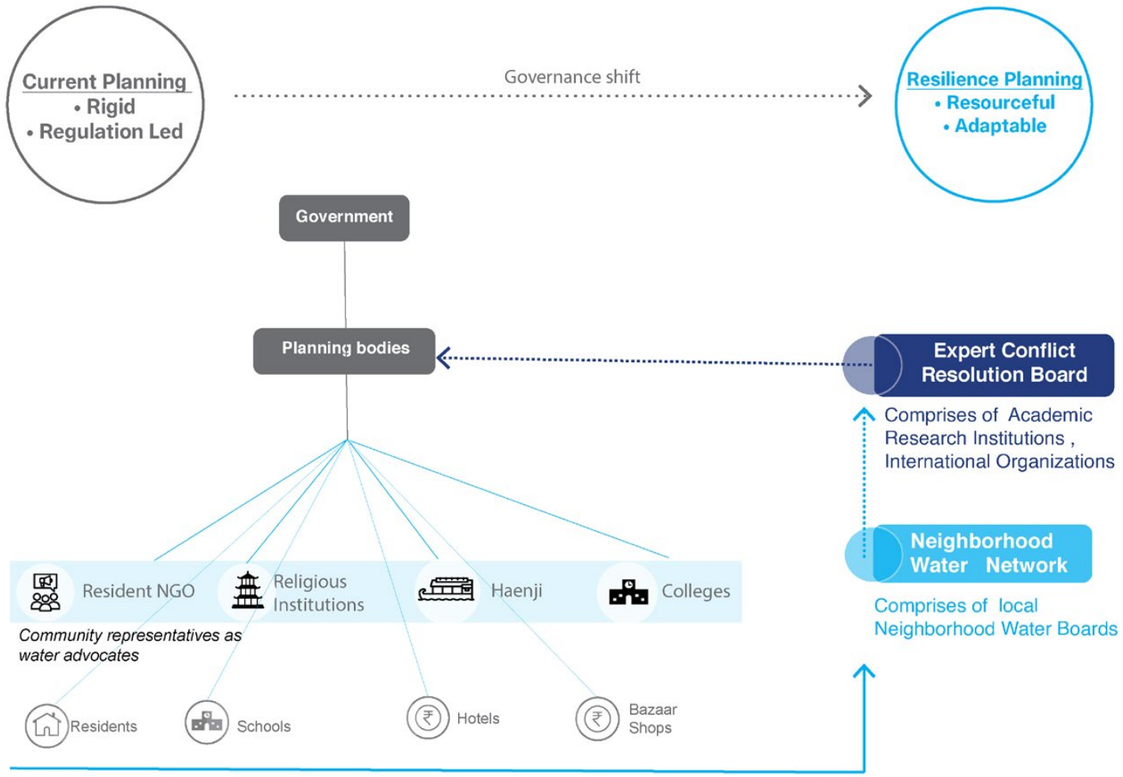
Phase 1 : Resilience at Riverfront Connecting to Boatmen community with adaptation and fucntion

Phase 2 : Rehabilitation of Boatmen Housing

Phase 3 : Treatment of Left Jhelum Bank and water network - River to Lakes



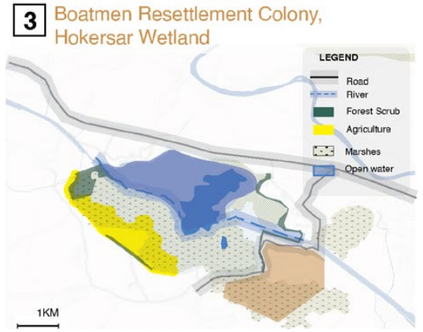
3.6 Upscaling from Pilot

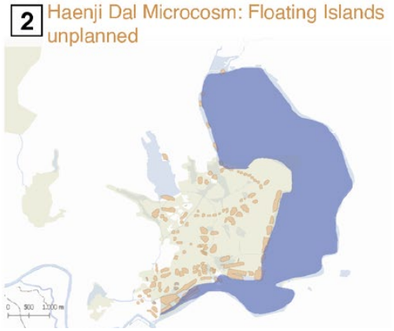


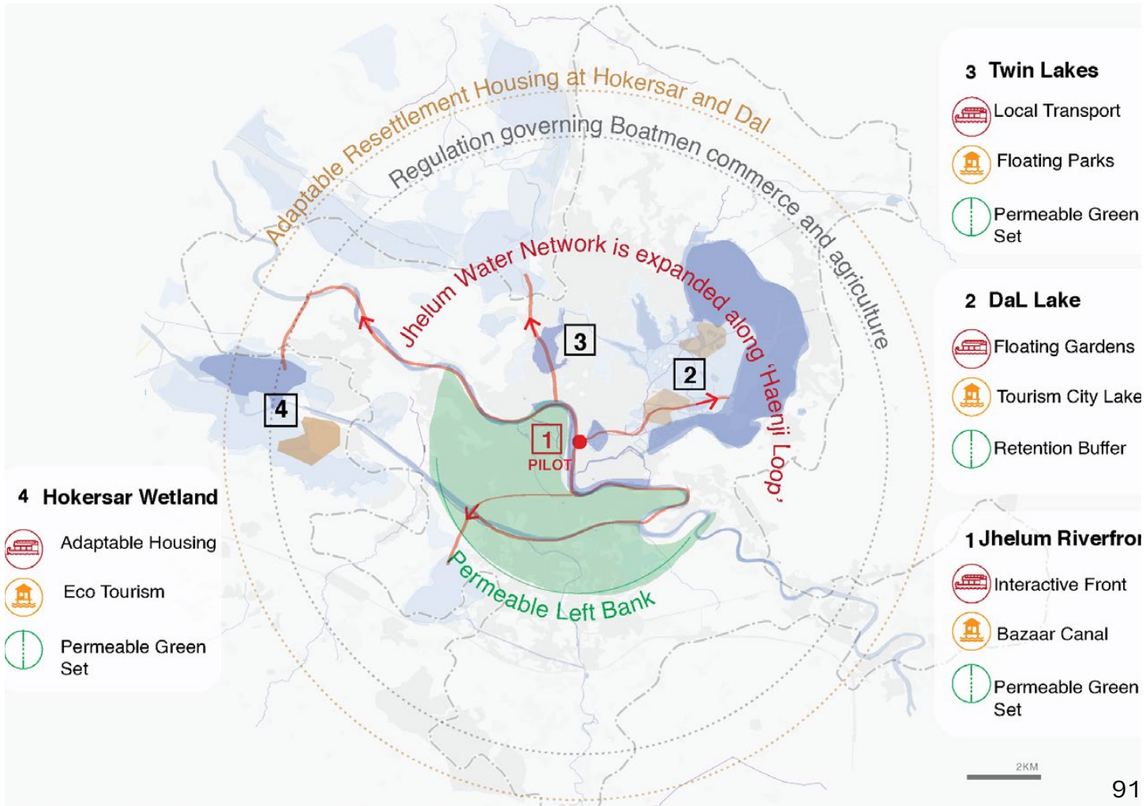
Governance Vision:

Lessons from resilience tools and themes developed at Pilot are tested to reflect at a city scale. At Jhelum river front resilience takes the shape of: At Dal lake with its floating gardens resilience is expressed through: At the twin lakes in the local rapidly growing neighborhood resilience can come from. Finally at Hokersar wetland resilience is expressed in the form of and design impressions at the peri-urban Eco reserve wetland - Hokersar and explored.

Rehabilitation plan for boatmen community from Dal to Hokersar could be supplemented with resilience measures accommodating their roles all along jhelum and its water network, spreading the community out along Jhelum under regulation to guide their agriculture and water inhabitation practices towards sustainability. The upscaling looks at how each of the 3 Themes developed in City Vision affect the case study sites







3.7 Design Assessment On Resilience

Strategy Evaluation and Conclusion

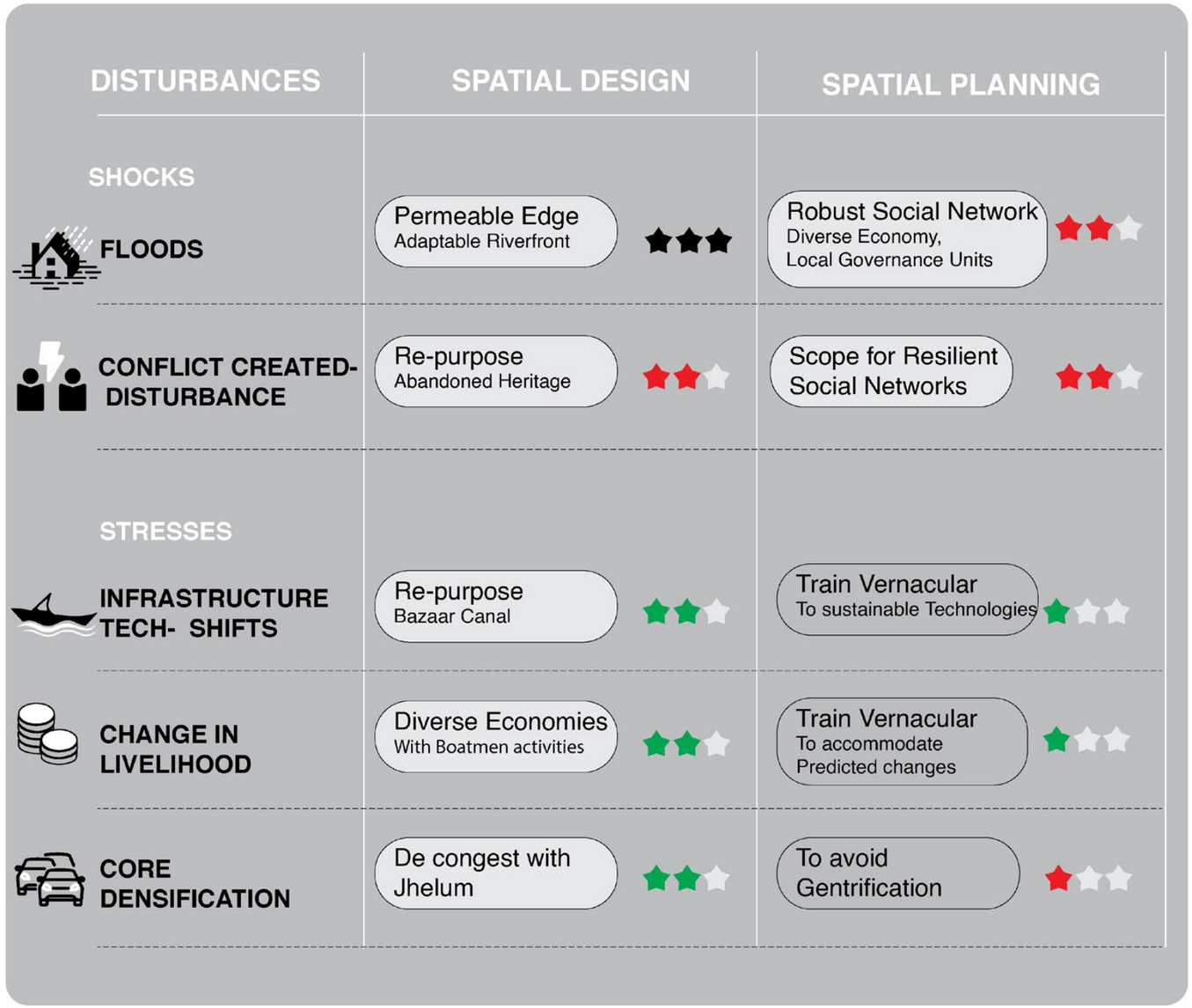
The design could be evaluated on the lines of its vulnerability, sustainability with maintenance along time and its resilience to shocks and stresses. Each of the three themes of Haenji-Jhelum Loop, Recreational Research Corridor and Permeable left bank caters to these set of disturbances to prepare for in terms of either robustness of design and planning measures or flexibility.

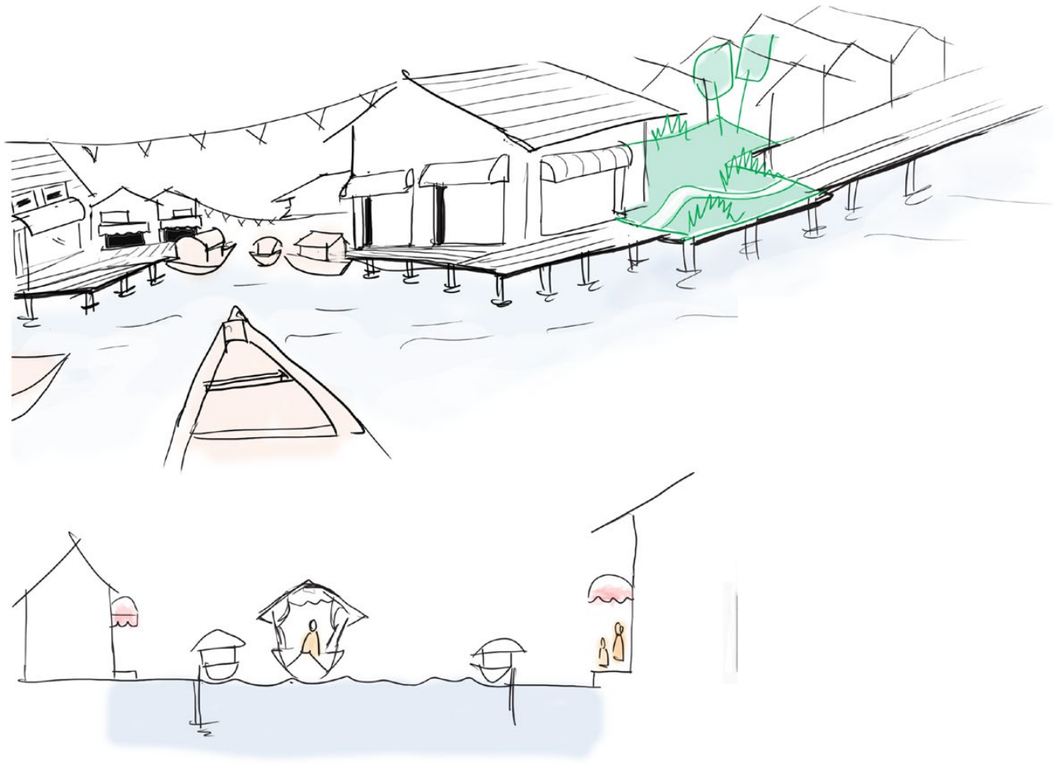
Resilience Stress Test

The stress test is based on certain identified shocks and stresses. It measures resilience based on vulnerability that is catered with either robustness or adaptability. If a balance of both exists then resilience is said to be achieved.

With the interventions at pilot for each disturbance it was assessed whether it fared resilience under spatial design and planning. Some field were not touched in detail for this thesis like the planning aspects of infrastructure shifts, core Densification, so they were identified as work to be developed on later.

Resilience Stress Test





“Frugal Solutions to Climate adaptation: Resilience with socio ecology”

A floating bazaar canal made from a road connecting Jhelum to an adjacent lake,

4

Reflection

4.1 Conclusion

Answering the research question

How can vernacular practices of River Jhelum guide adaptive spatial planning for a flood resilient Srinagar in Kashmir?

This can be achieved by guiding the vernacular water practices towards sustainability with a collaborative model of governance learning through experimentation. Hybrid solutions that combine the science of resilience in terms of resilience principles should be merges with practical vernacular tools to operationalize a shift towards better social ecological resilience.

The planning regulation inclined to strict conservation laws, whilst still necessary, should make room for dialogue and buffer spaces should be flexible to accommodate diverse economies.

Diversification of River in terms of purpose it serves to the local and city population could ensure resilient water ecosystems. In this case Urban Farming practices are combines with residential and commercial use.

Lastly resettlement should be the last option as separating livelihoods from their centuries of habitat would lose on principle of adaptation, social memory, but if it must be done then a rebuilding of similar socio-ecological bonds must be ensured by the government.

The findings of the research proposal have been summarized in a Manifesto of principles to guide projects on similar investigation lines.

Thus the two main lines of inquiry , 'Vernacular Water Conflicts' and 'Planning gap' can be resolved through a network form of governance that follows principles of adaptive spatial planning to achieve socio-ecological resilience with vernacular.

A set of general principles derived from pilot design and city resilience vision can be summarized and direct similar projects to build resilience with vernacular.

MANIFESTO I BUILDING RESILIENCE WITH VERNACULAR PRACTICE

1 Vernacular Water based Livelihoods should be geared towards sustainability

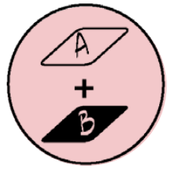
- Locate traditional hydro-social networks in Land use master-plan.
- Revive nature based solutions that could serve as tools to transition to sustainability.

2 Wetland Conservation Plans should make room for uncertainty

Mapping resilience scored on robustness and flexibility in design as well as water governance.

3 Incentivize diversification of river and lakefronts

Allow for heterogeneous composition in land use and even flexible land use policies.



4 Combine Urban agriculture practices with commercial and residential uses

Intensify value of land with other uses to work against mono-cultures.

5 Resettlement of water based livelihoods Compensated with advocate led rebuilding

Planners with community advocate re imagine the role of vernacular practices in newly resettled habitats.

4.2 Academic Reflection

Overview
The thesis investigation began with exploring the water conflicts in the wake of climate crisis. Here as the conceptual framework summarizes at the heart of the research question was the goal to bridge the planning and vernacular gaps around water governance. In a practical world these render as terms wetland encroacher and Dal Lake dwellers, the boatmen community that resides and earns its livelihoods from the Jhelum waters.

The thesis borrowed ideas from the theoretical field of adaptive spatial planning to resilience. It looked at water governance in wake of climate crisis by referring to water Ethics and the role of socio-ecological evolutionary resilience'. (Davoudi 2013) It uses these ideas to define lenses to identify key challenges and stakeholder roles and assist in designing the strategy toolkit that can be used to increase adaptive capacity both socially and spatially.

In a social realm resilience of local networks and planning bodies is achieved through network governance of immediate actors around wetlands and middle grounds with planning authorities for collaboration. It tries to address the planning gap through an advocacy planning approach while combining principles of adaptive spatial planning.

Spatially it renders as a modular set of design on a local level that makes room for flexibility while having a rigid structure in this case it was the Haenji Jhelum Loop in tourism, commerce and transport that becomes the main backbone to build on with adaptation tools.

What the thesis adds to the theoretical concepts of resilience and adaptive spatial planning is addressing the gap between planning and vernacular for these concepts to trickle down to the most immediate stakeholders of wetlands. It attempts at engaging them in the discussion suggesting their practices are often nature based and can be part of discussions to resilience to inform the planning authorities before policy making around lake or water conversation laws. Currently the approach is the opposite, an planning models for resilience are first developed by academia and planners and then the vernacular needs to adjust its practices to it. This thesis highlights the need on leaning on the knowledge and social resourcefulness of vernacular water cultures in developing models of resilience early in our studies.

A critique on the Method used
At the analysis stage I was open to gathering information that would require re-editing and changing the research questions. The fieldwork revealed the challenges tangibly in terms of abandoned heritage at core due to the political conflict and its impact on the riverfront. I often found myself diverging off and broadening the scope of thesis and was duly reminded by my mentors of the key concepts to focus on. After the analysis stage, much editing, and refining Initially, I aimed at designing for all four case study sites selected for analysis but for the scope of this thesis, I had to narrow down to one pilot site and its relationship with the city. The analysis was c summarized in a strategy toolkit with principles for building resilience with vernacular both in terms of design and process.

From the theoretical body of research considered I used certain practitioners tools for resilience specifically the 'Socio-Ecological System and Disturbances Threshold Model' to organize the data collected and create a resilience framework for design. This helped form a narrative and connect the dots after fieldwork to link data back to the theoretical lens before moving towards design.

The design first conceptualized city vision themes of resilience and further detailed them on a Neighborhood Pilot. The upscaling process on other site locations was to reflect on findings from the pilot. This design and strategy step was iterative and moving between the scales. As a final product of design a Resilience manifesto was produced for guidance towards similar projects on the thesis investigation.

A design assessment to test the resilience for the design scheme I realized that there are many other uncertainties apart from encroachment of floodplain or climate change induced flooding like Infra structure Technology shifts, changing livelihoods. These were briefly touched with design but need more elaboration. Lastly, I realized that using a scenario based approach with three key uncertainties early to be resilient to would have been a more insightful and an efficient during analysis and design.

Alternative Approaches
These could have been a scenario-based approach or testing a theory out but the approach I took was more expanding on existing resilience principles and basing a socio-ecological model specific to site. With the manifesto and stress test in the end it suggest ways inform the theoretical spheres of adaptive spatial planning and resilience.

Where can the scheme be transferred to?

The thesis scheme can be transferred to sites with a strong vernacular water culture that has a informal, centuries evolved culture around water that sees a dilemma with the strictly planned regulation led approach. These could be authoritarian regimes with a strict top down planning that have a populace tied to the wetlands for centuries. I would project this onto similar Indus basin cities in India and Pakistan given the similarities in water culture and planning models. Cities with water conflicts due to being at a shared basin or other geo-political factors could also look at how a middle ground between top don planning and bottom up approaches

The thesis conceptually began by considering the geo-political situation of the Indus basin shared between two countries often in conflict. So these border states that suffer locally from International disputes and planning methods aimed at strict preservation are the key sites for transferability of design.

In the book Lo-Tek, Design by radical Indigenism, Watson discusses how places in the Global South could rely on indigenous approaches to adapting with climate change. These solutions are low cost and nature based as opposed to the hard technology and infrastructure that might be necessary for increasing resilience. The societies that have found frugal ways to live with changing tide of nature are the best suited for the thesis' approach.


Floods and landslides kill 10 in northeast India after heavy rain
By Reuters and Esha Mitra, CNN
Updated 0550 GMT (1350 HKT) May 20, 2022
Train coaches toppled over after mudslides triggered by heavy rains at the New Haflong railway station in Assam, India, on May 16.

The case of Assam - Brahmaputra basin.
Transferability of design to border states with a strong vernacular water culture that have faced the effects of climate crisis.
Image Source: https://edition.cnn.com/2022/05/18/india/assam-india-rain-flooding-intl-hnk/index.html


Assam Heritage Shrine
https://www.re-thinkingthefuture.com/rtf-fresh-perspectives/a1342-the-heritage-architecture-of-assam/

Performance of Spatial Planning

The current system is very top-down with the center having ultimate authority over a public good: water. A need for a network of non-statutory bodies to govern the realm can be achieved by using spatial planning to function as an equalizer. The aim would be to give representation to the voiceless – Nature and marginalized communities.

The study touches upon academic fields of Conservation Architecture and Wetland Management against Climate Adaptation. It highlights the value of participatory planning, or as the author terms its Advocacy planning, in bridging the gap between planning and informal practices. So relevant trajectory to explore is to further research on the vernacular practices and bridging the gap with planning principles to achieve resilience with

• Vernacular Resilience and Planning gap
• Advocacy and Adaptive Spatial Planning

The research touched on trying to merge these spheres by finding a middle ground at a local scale. It would be insightful for further research trajectory to trace its impacts on the regional basin scale shared by two countries.

The manifesto and stress test are an addition to the theoretical discussions as practical tools to employ for adaptive spatial planning. The intersection of advocacy and adaptive spatial planning with vernacular low tech practices that could be nature based and geared towards sustainability was the contribution of my work.

The project was also developed to inform the Srinagar Master Pan 2035, on resilience tools so it would be a critique on the current planning document with suggestions on improvement from inclusive planning practices with vernacular.

Limitations of Research:

As I reflect on the thesis journey the importance of regularly revising a project pitch surfaces. The challenges to address were spread out to various spheres of transport, tourism, ecology, planning and design and giving an in depth study while looking at the inter relationships between these spheres meant simplifying certain variable. Like sticking to the issue of Haenji at Jhelum and not touching Dal Lake that is their main site.

While the project highlights the importance of collaboration, it is ironic that such work often happens as a product of one person's mind. I testify that practical field visits where I heard narratives forged by the locals and planners added a much-needed layer to the project with insights from ground realities and shaping the thesis scope.

The proposal is to be viewed as a suggestion for approaches to resilience in the wake of climate adaptation and the effects of geo-political conflict due to water tensions. For this reason design was kept at conceptual stage to be elaborated in detail in reality only after stakeholder workshops and interaction. The lack of follow up interviews with the design proposal would also affect the quality of the work.

Data accessibility and trust in the context of a highly militarized territory posed specific challenges related to transparency and reliability. Data in this context is often used to set narratives that are controlled by the authorities in power. One way in which the author tackled these challenges was to read between the lines in interviews with officials have informal conversations with both the locals and planners after the interviews.

4.2 Ethical Reflection

The limitations of cross border politics and resultant complexities of a disputed terrain could render the proposals too ambitious or Utopian for the real world. Hence the thesis conceptually paints what a sustainable model would look like for a local riverfront and lake in an urbanized settlement of the Jhelum basin. The ethical barriers that did arise during the project were:

Inherent Bias toward the oppressed in authoritative, high surveillance poorly democratic states. This resulted in looking at the after-effects of conflict on the built environment and not dealing too much with the governance and political issues. The author is aware of this limitation to digress from key political and social challenges and hopes the project can emphasize the relationships between conflict and the socio-ecological relationship with water, River Jhelum.

Sense of fear and distrust from the local community whose voices have been marginalized by the ones in power. From the field, visit attempts were made to protect the identities of professionals and locals spoken to in interviews and photographs. I was mindful to keep the tone of the thesis suggestive towards a shift in resilience oriented planning that comes from an advocate led approach.

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Logos References

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List Of Abbreviations

CBD: Central Business District
GLOF: Glacier Lake Outburst Flow
HKR: Himalayan Kush Region
IBIS: Indus Basin irrigation System
IPCC: Intergovernmental Panel on Climate Change
IWRM: Integrated Water Resource Management

SCA: Snow Area Cover
STP: Sewage Treatment Plant
NLCO: NIgeen Lake Conservation Organization
UIBN: Upper Indus Basin Network

A1 : Threats To wetlands

Source: Dar, Shahid & Bhat, Sami & Rashid, Irfan & Dar, Sajad. (2020). Current Status of Wetlands in Srinagar City: Threats, Management Strategies, and Future Perspectives. 7. 1-11. 10.3389/fenvs.2019.00199.

S. No.	Threats	Perceived impacts
1.	Floating gardens	Construction of floating gardens is a major threat to the lakes and wetlands of Srinagar city. This practice has resulted in conversion of large areas of open water into floating islands. The impact of these floating gardens is very grave, and unless this practice is stopped, the wetlands would be under a severe threat.
1.	Willow plantations	The creation of a network of willow plantations and populus trees within the wetlands (Anchar, Brari Nambal, Dal, Hokersar, Gilsar, and Khushalsar) is a serious threat to wetland ecology. These plantations have obstructed natural flow of drainage, causing deleterious morphological, hydrological, and ecological changes to wetlands.
2.	Houseboats	The direct discharge of untreated sewage from some 1,200 houseboats located in Dal lake is a growing threat to the lake ecosystem. This has resulted into deterioration of water quality, prolific growth of aquatic macrophytes, and pollution of the lake (Parvez and Bhat, 2014).
3.	Mechanical machines/harvestors	The mechanical dredgers and de-wedeers used in wetlands of Srinagar City (Dal lake, Brari Nambal) for removal of sediments and aquatic macrophytes has resulted into loss of species of fish, macro-invertebrates, zooplankton, and other biologically important organisms from the wetlands (Ali, 2014).
4.	Sewage treatment plants (STPs)	Pollutant loads from point sources (STPs) constructed along the banks of Dal lake and Brari Nambal has become the main source of pollution for these water bodies. The STPs have failed to operate as per prescribed norms resulting into increased nutrient loadings mostly nitrogen and phosphorus, organic matter, metals, pathogen, nutrients, and supplementary water pollutants to the wetlands (Mukhtar et al., 2014).
5.	Hospital effluents	The effluents discharged from SKIMS into Anchar lake has resulted into increased nutrient concentrations and toxic compounds into lake ecosystem that are very harmful for lake ecology and sometimes very toxic for fish and other aquatic biodiversity (Bashir et al., 2017; Gudoo et al., 2017).
6.	Red tide	The unprecedented occurrence and frequent seasonal recurrence of red tide in lakes and wetlands of Srinagar city constitutes a new environmental threat to the aesthetics and biological diversity of wetlands. The occurrence of red tide is due to ingress of untreated sewage from nearby residential areas to lakes and wetlands of Kashmir valley (Khan, 2000).
7.	Urban sprawl	Unplanned urbanization in the vicinity of wetlands in Srinagar is the biggest threat and an important cause for the reduction of wetland extent (Kuchay and Bhat, 2014; Romshoo and Rashid, 2014).
8.	Hydrological alterations	Hydrological changes including alterations in inflows and hydrological makeup by surface water extraction, water diversions, and stream channelization for a variety of human uses.
9.	Climate change in Himalayas	Recession of glaciers in Himalayas and changes in precipitation have a significant impact on wetlands and their associated species. Anticipated changes in regional climate could be one of the main drivers besides anthropogenic factors for loss of wetlands in Kashmir region given the depleting streamflow scenario as observed across Kashmir valley (Rashid et al., 2015; Zaz et al., 2019).
10.	Exotic species	Introduction of exotic species either deliberately or naturally into lakes and wetlands of Srinagar city has resulted into changes in wetland ecology, biodiversity, land uses, and water quality. For example, exotic fish species *Cyprinus carpio* introduced in Dal lake have eliminated the native *Schizothorax* sp. from Dal lake.
11.	Siltation and erosion	Siltation and erosion of sediments from the catchment areas is a major threat to the wetlands of the city. These result in loss in water spread area of wetlands.
12.	Roads	Constructions of roads within Dal and Khushalsar have not only fragmented these water bodies into sub-basins but also impacted the hydrology.

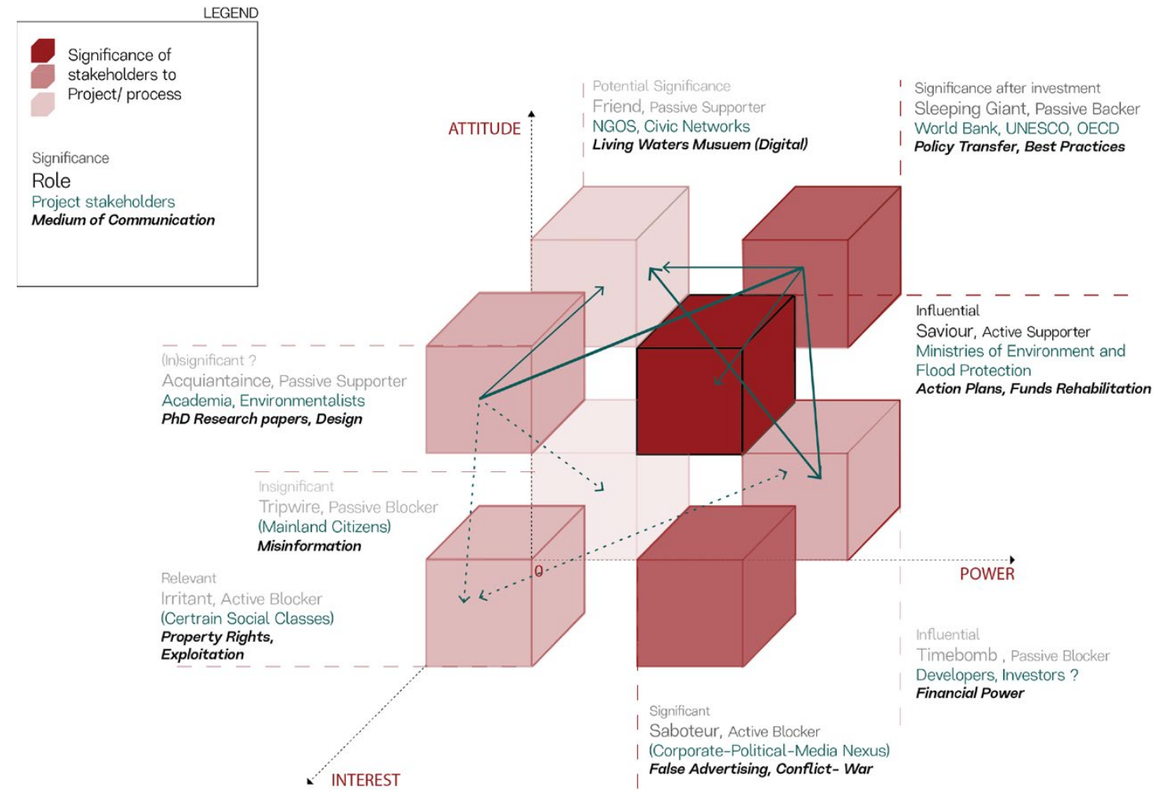
THREATS TO WETLANDS **MANAGEMENT OF WETLANDS**

A2 : A working Contact Wish-list developed before Field Research

NAME OF ORGANIZATION	WHY?	CONTACT	INTERVIEW METHOD	STATUS
Government				
Irrigation and Flood Control Department	Flood management		In person Interview	
Lake and Waterways Development Authority	Wetland Management			To Begin
Srinagar Development Authority,	Town Planning, Masterplan 2035,	Munir ,Deputy Director and Town planner		Ongoing
Tourism Department	Tourism plans, Dal Development Authority	Ittu Sahab		To begin
Heritage Consrvation Department	Riverfront Development	Saima Iqbal	-	
Forest Department			-	
Civic Society				
Residents of 4 sites	Local Interviews	Locals	Site Interviews	
Tourist – (Floating Population)				
Agriculturalists	Rural-urban and land use	Locals at 2nd site		
NGO, Environmentalists	concerns and collaborated efforts	Mission Ehsaas	-	
religious bodies	Shrines, values			
Private and international				
Jhelum & Tawi Flood Recovery Project (with World Bank>	Flood recovery Multi Hazard Risk Assessment of J&K	-	Online Interview	2nd Floor, ERA Commercial Complex, Rambagh Srinagar-190009 Tel : 0194-2437320, 0194-2437324
RAMSAR-WETLAND (Delhi)	Smart Kashmir Mission- Consultancy		Online Interview	

A3 : Stakeholder Analysis, Intensive 1

Developed as Intensive it was referenced to but not used as the chart became too confusing. A simplified version was kept as part of the report



Building Resilience With Vernacular Practice

Master Thesis Urbanism, A. Irfan

TU Delft Delft University of Technology
Faculty of Architecture
and the Built Environment