Student Thesis Competition- Season 2

Re-imagining Urban Rivers
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1. INTRODUCTION

Sponsored Thesis Competition on 'Re-imagining Urban Rivers' is a joint initiative of the National Institute of Urban Affairs (NIUA) and the National Mission for Clean Ganga (NMCG), which aims at capacity building of the students towards river sensitive planning and development in the Indian cities. Under this initiative, 20 undergraduate and postgraduate students across the country are being supported through mentorship as well as financial assistance. These students were working on different urban river stretches across the country.

The purpose of this sponsored thesis competition was to invite students to take up their academic thesis projects on the five different themes of the competition i.e. river pollution, rejuvenating water bodies, creating a vibrant river zone, generating river related economy and engaging citizens in river management activities. The competition aspires to provide students with an opportunity to design blue sky and innovative solutions for re-imagining the outlook and management of rivers that flow through Indian cities.

The competition was open for all the students pursuing bachelors or Masters in any discipline. Following are the eligibility criteria applicable to both categories of participants.

(i) Students are undertaking or will undertake a mandatory thesis/research project as part of their academic curriculum.
(ii) The mandatory thesis/research project is atleast a semester-long (4-6 months) between January and June.
(iii) The topic of the thesis/research project fits the themes of the competition
(iv) The student has (or will have) a supervisor assigned by their Schools/Institutes for guiding the student during the duration of the thesis/project.
10 entries from each category (i.e., Undergraduate (UG) and Post Graduate (PG)) were selected. All selected students received a grant of INR 50,000 each to undertake the activities associated with the thesis/research project. All selected students received a special Certificate of Meritorious Achievement issued by NMCG and NIUA, subject to successful completion and submission of the thesis/research project. All selected students were invited to participate in a two-day workshop in Delhi before they started their thesis. During the workshop, they had an opportunity to interact with several experts in the domain to help them fine-tune their proposals. All selected students were invited to Varanasi for the final presentation in front of a panel of eminent jury members. The top three projects (in each category), as assessed by the jury panel were recognized and awarded. NIUA and NMCG will facilitate the development of projects that have a high potential for implementation.

2. GRAND FINALE AT IIT - BHU

NIUA in collaboration with IIt-BHU organised the STC season -2 finale in IIT -BHU, Varanasi on 28th and 29th July 2022. This two day event contained presentations by the students, IIT Faculties, NIUA Water and Environment team, launch of E-Gov Magazine and launch of STC-Season-3. Major focus of the event was the presentation by the students where they presented their thesis work in front of a panel of esteemed jury members. The students were given 15 minutes each, 10 minutes for the presentation and 5 minutes for the question-answer round. The students were then marked accordingly. 28th July was dedicated to the UG students and 29th July for the PG students of the respective fields.

The objective of this competition was to bring different minds of different fields together under one roof and expose them to different perspectives, thoughts and ideas which would help them grow professionally as well as personally.
<table>
<thead>
<tr>
<th>Sl.</th>
<th>Category</th>
<th>Student</th>
<th>Institute</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>UG</td>
<td>Akriti Jaiswal</td>
<td>SPA Bhopal</td>
</tr>
<tr>
<td>2</td>
<td>UG</td>
<td>Daman Dogra</td>
<td>SPA Bhopal</td>
</tr>
<tr>
<td>3</td>
<td>UG</td>
<td>Dhaval Mistry</td>
<td>Academy of Architecture, Mumbai</td>
</tr>
<tr>
<td>4</td>
<td>UG</td>
<td>Sanika Upasani</td>
<td>Dr. Bhanuben Nanavati College of Architecture, Pune</td>
</tr>
<tr>
<td>5</td>
<td>UG</td>
<td>Mohini Vikas Bhosekar</td>
<td>Dr. Bhanuben Nanavati College of Architecture, Pune</td>
</tr>
<tr>
<td>6</td>
<td>UG</td>
<td>Mubashir Arshid</td>
<td>NIT Srinagar</td>
</tr>
<tr>
<td>7</td>
<td>UG</td>
<td>Radhika Garg</td>
<td>Apeejay Institute of Technology</td>
</tr>
<tr>
<td>8</td>
<td>UG</td>
<td>Rupal Srivastava</td>
<td>SPA Delhi</td>
</tr>
<tr>
<td>9</td>
<td>UG</td>
<td>Sabnekar Sai Sharan</td>
<td>Vignana Bharathi Institute of Technology</td>
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<tr>
<td>10</td>
<td>UG</td>
<td>Ujjawal Singh</td>
<td>SPA Bhopal</td>
</tr>
<tr>
<td>11</td>
<td>PG</td>
<td>Abhishek Kailash Burkuley</td>
<td>IIT Kharagpur</td>
</tr>
<tr>
<td>12</td>
<td>PG</td>
<td>Arunima K T</td>
<td>NIT Calicut</td>
</tr>
<tr>
<td>13</td>
<td>PG</td>
<td>Karpagavalli S</td>
<td>IIT Kharagpur</td>
</tr>
<tr>
<td>14</td>
<td>PG</td>
<td>Madhavi Gajre</td>
<td>IIRS Dehradun</td>
</tr>
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</table>
### 3. KEY HIGHLIGHTS OF STUDENT PRESENTATIONS

<table>
<thead>
<tr>
<th>No.</th>
<th>Student ID</th>
<th>Name</th>
<th>Affiliation</th>
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</thead>
<tbody>
<tr>
<td>15</td>
<td>PG</td>
<td>Mrignayani Chandra</td>
<td>Amity University, Noida</td>
</tr>
<tr>
<td>16</td>
<td>PG</td>
<td>Pranav Varshney</td>
<td>SPA Delhi</td>
</tr>
<tr>
<td>17</td>
<td>PG</td>
<td>Preetikrishna Panda</td>
<td>XIM University, Bhubaneswar</td>
</tr>
<tr>
<td>18</td>
<td>PG</td>
<td>Rajarshi</td>
<td>Faculty of Architecture and Planning (FOAP), AKTU Lucknow</td>
</tr>
<tr>
<td>19</td>
<td>PG</td>
<td>Shakchi Singh</td>
<td>SPA Delhi</td>
</tr>
<tr>
<td>20</td>
<td>PG</td>
<td>Shivalika Arora</td>
<td>SVNIT Surat</td>
</tr>
</tbody>
</table>

**Planning for an Ephemeral city: A case of Prayagraj**

**Revitalisation of Urban Livelihood through WaTOD**

**Pragati Setu – linking the river Vinchurna, residents of Shinde Wasti and Sautada village**

**Cleaning rivers can start from Drains and Nallahs through a ‘modular’ waste to incentive system: A case of Mumbai**

**Engaging the tribal nomads and indigenous people of Pahalgam in managing river: A case of River Lidder**
Reconnecting with the river through riverfront development: A case of River Yamuna

Radhika Garg

Planning to mitigate wastewater flow effects on the river: A case of River Yamuna

Sabnekar Sai Sharan

METAMORPHOSIS: Ecological restoration of quarries for Adaptive Reuse: A case of ARAI stone quarry, Pune

Rupal Srivastava

River Engagement Credit System: Re-imagining citizen engagement, river economy and livelihood dependency: A case of Kanpur

Ujjawal Singh

Strategies for Riverfront Development: through Nature-based solutions: A case of River Kham, Aurangabad

Abhishek Burkuley

Spatio-Temporal flood dynamics and its impact on river morphological changes: A case of River Kosi

Madhavi Gajre

Strategic spatial planning based on Ecosystem Services: A case of Cauvery Basin

Arunima KT

Blue-Green Infrastructure planning for Sustainable Development: A case of Tirunelveli

Karpagavalli S

Integration of spatial technology and citizen participation for nature-based remediation of a river: A case of River Hooghly

Mrignayani Chandra
4. JURY


Prof Gaurav Raheja, Head of Architecture and Planning, IIT Roorkee.

Prof Amrita Dwivedi, Assistant Professor, Department of Humanistic Studies IIT (BHU).
Sh. S Vishwanath, **Founder and Director of Biome Environmental Solutions.**

5. **WINNERS (UG)**

![Image of winners](image-url)

**Congratulations Winners**

**STUDENT THESIS COMPETITION (SEASON 2)**

**UNDER GRADUATE CATEGORY**

1. Rupali Srivastava
2. Ujjwal Singh
3. Mohini Bhosekar and Mubashir Arshid
Under Undergraduate category Ms. Rupal was awarded the first prize. She presented her work with effective data while also considering the practical problems of Indian cities. Mr. Ujjawal was awarded the second position. His focus area was citizenship engagement and generating economy through the rivers. There was a tie for the third position. Ms. Mohini and Mr. Mubashir Arshid were placed third in the competition.

WINNERS (PG)

Under Post-Graduate category, Ms. Arunima KT was awarded the first prize. She presented her work on "Strategic spatial planning based on Ecosystem service assessment- a case of Cauvery Watershed region". Inspite of having a very wide study area, she did a tremendous job and finished first in her category. Ms. Karpagavalli S was awarded the second position. Her focus area was "Blue-Green Infrastructure Planning for a sustainable development – An opportunity for Tirunelveli". She was awarded the second position. Ms. Shakchi singh presented her work on "Water Quality Monitoring System Using Machine Learning Technique" and finished third in the competition.
Prof Rana P.B. Singh delivered a presentation titled ‘Benaras ki Kahaani’ where he talked about the rich cultural heritage of the ancient city of Varanasi. Much of his presentation focused on the influence of the holy river Ganga on the origin and evolution of the city, its riverfront, ghats, ancient kunds and waterbodies, temples etc and their intrinsic relationships. He stressed on the importance of utilizing and conserving the rich cultural heritage of the city.

Mr. Rahul Sachdeva an Dr. Uday Bhonde delivered a session on Managing Urban Rivers. Mr. Rahul Sachdeva set the context of the discussion with an interactive discussion based on mentimeter quiz. The questions were basically focused on water security related issues. Dr. Uday Bhonde then presented various works of the Water & Environment Vertical at NIUA. NIUA has prepared an Urban River Management Plan (URMP) Framework and conducted the pilot implementation of the framework in the city of Kanpur. Other cities like Auranbgabad, Ayodhya, Moradabad and Bareilley are being supported in preparing their Urban River Management Plans. Also, NIUA has developed a guideline for Mainstreaming River Management in a Master Plan. A framework for Comprehensive Water Management has been prepared by NIUA and the same is being applied for the cities of Udaipur and Varanasi. Apart from these, the team is also working on preparation of dashboards and digital tools (e.g. Digital Waterwall, Urban Waterbody Diagnostic Tool).
Shri Hitesh Vaidya, Director NIUA delivered his welcome remarks during which he highlighted the fact that NIUA is continuously working towards bridging the gap between academia and practice by nurturing young talents.

Prof Pramod Kumar Jain, Director Indian Institute of Technology Varanasi, in his remarks said that the competition on “Re-imagining Urban Rivers’ will help strengthening both urban as well as rural India.

Shri G. Asok Kumar, Director General National Mission for Clean Ganga congratulated the finalists through a video message. He also mentioned that a new theme on ‘Managing Riverine Biodiversity’ has been added to the season 3 of the competition. He also highlighted the importance of various emerging aspects such as the economic importance of the river, reuse of treated wastewater, Fecal Sludge Management etc and the need for action research on these aspects.
Ms. D. Thara, Additional Secretary, Ministry of Housing and Urban Affairs, Government of India, virtually delivered her motivational address in which she urged the students to study various innovative technologies for river management. She also stressed on the need of sensitization of people towards river related issues, reimagining the riverfront as a beautiful public space by incorporating recreational elements, naturalization of river edges though creation of green buffers, understanding the surface water groundwater interaction and aquifer recharge etc.

Shri Durga Shanker Mishra, Chief Secretary, Govt of Uttar Pradesh, in his inspirational address mentioned that the competition emerged as part of different activities taken up under the Hon’ble Prime Minister shared his vision for the river sensitive urban development during the Meeting of the National Ganga Council in Kanpur in 2019. He highlighted the importance of water conservation in totality, especially the conservation of waterbodies and also mentioned that as part of the Azadi ka Amrit Mahotsav, the whole country is working towards developing Amrit Sarovar and Amrit Van. He urged the students to address different scales of waterbodies (rivers, lakes, ponds, wetlands etc) in their research works. In this context he also mentioned that the recent initiatives of Ministry towards making the cities water plus is also helping them improving the quality of their rivers, citing the example of Indore.

Shri Mishra also announced the winners of this competition and felicitated them. Season 3 of the competition was also launched by him.
Annexures
**7. ANNEXURE - 1**  
**AGENDA OF THE COMPETITION**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Details</th>
<th>Moderator</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00-10:10</td>
<td>Welcome Address and Context Setting</td>
<td>Mr. Lovlesh Sharma, NIUA</td>
</tr>
<tr>
<td>10:10-10:25</td>
<td>Special Address</td>
<td>Prof. Rajesh Kumar, HoD, Department of Architecture, Planning and Design (DoAPD), IIT (BHU)</td>
</tr>
<tr>
<td>10:25-10:30</td>
<td>Structure and Rules for Finale</td>
<td>Mr. Anirudh Soni, NIUA</td>
</tr>
<tr>
<td>10:30-11:30</td>
<td>4 (Bachelors Students') Thesis Presentations (10+5 = 15 mins. each)</td>
<td>Jury</td>
</tr>
<tr>
<td>11:30-11:45</td>
<td>Tea-Break</td>
<td></td>
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<tr>
<td>11:45-13:15</td>
<td>6 (Bachelors Students') Thesis Presentations (10+5 = 15 mins. each)</td>
<td>Jury</td>
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<tr>
<td>13:15-14:15</td>
<td>Lunch</td>
<td>Ms. Ishleen Kaur &amp; Ms. Shilpi Chakraborty, NIUA</td>
</tr>
<tr>
<td>14:15-14:30</td>
<td>Energiser</td>
<td>Dr. Uday Bhonde &amp; Mr. Rahul Sachdeva, NIUA</td>
</tr>
<tr>
<td>14:30-15:30</td>
<td>Session by IIT BHU</td>
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<tr>
<td>15:30-15:45</td>
<td>Tea-Break</td>
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<tr>
<td>15:45-16:45</td>
<td>Session on Managing Urban Rivers</td>
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<tr>
<td>16:45-17:00</td>
<td>Reflections from Jury</td>
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</table>
**FINALE**

**RE-IMAGINING URBAN RIVERS**

**DAY 2**

28-29TH JULY, '22

**PROGRAMME AGENDA**

**VENUE: ANNE BESANT LECTURE THEATRE, IT (BHU), VARANASI**

<table>
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<th>TIME</th>
<th>SESSION DETAILS</th>
<th>MODERATOR</th>
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<tr>
<td>09:50-09:55</td>
<td>Instructions for Day 2</td>
<td>Ms. Manju R. Kanchan, NIUA</td>
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<tr>
<td>09:55-11:10</td>
<td>5 (Masters’ Students') Thesis Presentations (10+5 - 15 mins. each)</td>
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<td>11:10-11:25</td>
<td>Tea-Break</td>
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<tr>
<td>11:25-12:40</td>
<td>5 (Masters’ Students') Thesis Presentations (10+5 + 15 mins. each)</td>
<td>Jury</td>
</tr>
<tr>
<td>12:40-13:40</td>
<td>Lunch</td>
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<tr>
<td>13:55-14:30</td>
<td>Benaras ki Kahaani</td>
<td>Dr. Rana P.B. Singh, Retd. Prof. Geography (Cultural Heritage) BHU</td>
</tr>
<tr>
<td>14:30-14:45</td>
<td>Expert Comments</td>
<td>Jury</td>
</tr>
<tr>
<td>14:45-15:15</td>
<td>Words of Wisdom</td>
<td>Sh. Rajiv Ranjan Mishra, Chief Technical Advisor, NIUA</td>
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<tr>
<td>15:15-15:30</td>
<td>Prize Distribution</td>
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<td>15:30-15:45</td>
<td>Tea-Break</td>
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<tr>
<td>16:00-17:45</td>
<td>AWARD CEREMONY</td>
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</table>

**STUDENT THESIS COMPETITION SEASON 2**

**JULY 29, 2022**

Re-imagining Urban Rivers
8. ANNEXURE - 2
PRIZE DISTRIBUTION CEREMONY

FINALE
Student Thesis Competition, Season-2
‘RE-IMAGINING URBAN RIVERS’
Annie Bexant Lecture Theatre,
IIT (BHU), Varanasi

AWARD CEREMONY

Setting the context (5 minutes)
Sh. Lovesh Sharma, Senior Water and Infrastructure Specialist, National Institute of
Urban Affairs

Welcome remarks (5 minutes)
Sh. Hitendra Vaidya, Director, National Institute of Urban Affairs

Welcome remarks (5 minutes)
Prof. Pramod Kumar Jain, Director, IIT-BHU (tbc)

Remarks (5 minutes)
Sh. Deepak Agarwal, Divisional Commissioner, Varanasi (tbc)

Elevator pitch by thesis students (25 minutes)
One minute per student

Motivational address (5 minutes)
Sh. G. Asok Kumar, Director General, National Mission for Clean Ganga

Motivational address (5 minutes)
Ms. D. Thara, Additional Secretary, Ministry of Housing and Urban Affairs, Govt. of India

Felicitation of jury members (5 minutes)
Sh. Durga Shanker Mishra, Chief Secretary, UP Govt.

Launch of Urban India (special edition) (5 minutes)
All Dignitaries

Launch of eGov Magazine (5 minutes)
All Dignitaries

Launch of season-3 of the Student Thesis Competition on “Re-Imagining Urban
Rivers” (5 minutes)
Sh. Durga Shanker Mishra, Chief Secretary, UP Govt.

Inspirational address (20 minutes)
Sh. Durga Shanker Mishra, Chief Secretary, UP Govt.

Announcement of the winners of season 2 & awards distribution (10 minutes)
Sh. Durga Shanker Mishra, Sh. Hitendra Vaidya

Vote of Thanks (5 minutes)
Prof. Rajesh Kumar, Head, Dept. of Architecture, Planning and Design, IIT-BHU
9. ANNEXURE - 3
PROJECT POSTERS

SPONSORED THESIS PROJECT
COMPETITION ON
"RE-IMAGINING URBAN RIVERS"

January to February
March to June

Total GDP Contribution
2018
₹16.91 lakh crore

4.2673 million jobs
8.1% of its total employment.

Challenges

<table>
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<tr>
<th>Authorities</th>
<th>River</th>
<th>Human</th>
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<tr>
<td></td>
<td></td>
<td>• Loss of life for Preparation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Protection of ghats from fluctuating water level</td>
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<tr>
<td></td>
<td></td>
<td>• Covid-19</td>
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<tr>
<td></td>
<td></td>
<td>• Transmitted disease</td>
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<tr>
<td></td>
<td></td>
<td>• Disposal of Waste during the Main Bath</td>
</tr>
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<td></td>
<td></td>
<td>• Crowding Management during Main Bathing days</td>
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<tr>
<td></td>
<td></td>
<td>• Destructor Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Restoring the Floodplain</td>
</tr>
<tr>
<td></td>
<td>• Dumping of garbage in open places</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 500-1000 packets of milk are dumped into the river</td>
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<tr>
<td></td>
<td>• So many uncleaned bodies of course, add even more contaminants to the water</td>
<td></td>
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<tr>
<td></td>
<td>• People risk hepatitis, typhoid, cholera, amoebic dysentery, other waterborne diseases, and various skin afflictions</td>
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<tr>
<td></td>
<td>• Disobeying the covid protocols during mass gatherings can affect the health of vulnerable people</td>
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</table>

Proposal

Carrying Capacity Parameter

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<tr>
<th>Floodplain Carrying Capacity</th>
<th>Physical Carrying Capacity</th>
<th>Infrastructure Carrying Capacity</th>
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<tbody>
<tr>
<td>Floodplain Management Score</td>
<td>Citizen Engagement Score</td>
<td>Wastewater reuse Score</td>
</tr>
</tbody>
</table>

PLANNING FOR SUSTAINABLE RELIGIOUS TOURISM: A CASE OF PRAYAGRAJ

STUDENT NAME: AKRITI JAIWSAL
COURSE NAME: BACHELOR OF PLANNING (B.PLAN)

Re-imagining Urban Rivers
Citizen Engagement in River Management and Economy: A case study of Kanpur, India.

Student Name: Ujjawal Singh
Course Discipline: B.Plan.

Livelihood Mapping of riverine community

Area
260 Sq.Km.

Density
105 PPH

Literacy
79.66 %

Population
45,61,000

Worker Population
- Main
- Marginal
- Non-Worker

Site Analysis

Proposal

Source Data for River Credit System

Administrative
Personal
Activity Data
Municipal Monitoring

Physical verification by Local Boat
Verification by Visitors
App Based Verification

River Credit System

River management Activity verification

Executive Committee (River Credit Distribution)

Re-imagining Urban Rivers
LUNGS OF THE CITY RESTORED

Citizens overjoyed as an abandoned stone quarry site undergoes metamorphosis into a biodiversity park

This one of a kind project is a result of a joint initiative by National Institute of Urban Affairs - National Mission for Clean Ganga to revive, rejuvenate and beautify wetland eco-systems.

Citizens participated in an opinion survey citing the issues like lack of security and sanitation facilities on the nature trail, also suggesting interventions that would result in the metamorphosis.

Excerpt from the “Citizen Opinion Survey”

- Capital Expenses: Rs. 14.0 Cr
- Maintenance: Rs. 7.0 Cr for 10 years
- Expected Government Grant: Rs. 10.00 Cr
- Expected expenses over 10 years (including capital cost = grant) = Rs. 11.00 Cr
- Per year Revenue: 1.72 Cr

Assumption:
Operation and maintenance cost is expected at the rate of inflation.
Only fees shall be revised in proportion with rate of inflation.
Re-capture of open space shall be made.

Possible Funding –
Compensatory Afforestation Fund Management and Planning Authority (CAMPA) funds, also be used to rejuvenate wetland, and infrastructure development to support the rejuvenation.
Capital and Revenue Grants of urban local bodies (Entry Fees) Also, the BMC ensures conditions and provisions to collect entry fees that revenue to meet O&M costs of the facility created.
Planning for Yamuna to mitigate wastewater flow effects on the river

UNDERSTANDING THE NEED & ISSUES
CASE OF DELHI, YAMUNA

The Yamuna flows through Delhi for only 22 kilometers (or less than 1.6% of its total length). However, the wastes and toxins dumped into that narrow swatch account for roughly 80% of all pollution in the 1,376-kilometre-long river.

This is as a result of:
- 31% UAC have sewer laid only
- 20% wastewater discharged directly
- 70% STPs don’t discharge treated water as per standards
- 69% CETPs don’t discharge treated water as per standards

WAY-FORWARD

A combination of measures to tackle rising concerns on wastewater pollution.

Structural at Site Level + Soft at Floodplain Level

At Site Level to overcome the issue of connecting areas to centralised treatment plant
- Proposing DWWM

At Flood Plain to overcome the issue of changing floodplain Land Use & agricultural run-off through
- Nature Based Agriculture
- Reuse of treated wastewater from DWWM

LULC ANALYSIS

44% major negative change observed in terms of area of Yamuna

Ignoring the river-floodplain interactions which play significant roles in the ecology of a river, most of the floodplain has been encroached by constructing high levees.

Vision for Zone ‘O’

Making recognized long-standing ground realities i.e. agriculture on floodplain sustainable that will contribute to better water quality. Integrating Nature-based farming with proposed parks creating a strong visual & physical connection b/w water, park & the city and contributing to urban image.

ENVIRONMENTAL

Ecological restoration of the river and its surroundings, filtering runoff and fostering biodiversity richness

SOCIAL

Community engagement and river-people connect through integrated walkways within farmlands

ECONOMIC

Economy generated from riverine farming and supporting sustainable livelihood though green jobs
Introduction
Water plays a vital role in the daily life of human beings and other natural phenomena. Drinking water facilities are facing several problems such as:
- Due to the limited drinking water resources
- Overuse and wastage of water
- Growing population
- The excessive use of sea resources for salt extraction

The high use of chemicals in manufacturing, construction, and fertilizers in agriculture are directly leaving the pollutants into the nearby water bodies. About 80% of diseases in a developing country are caused by the consumption of polluted water.

Background
At present, water quality assessment involves the collection of random samples of water at various locations weekly or monthly and analyzing them in the laboratories.
This approach is not much efficient because of:
- long-time consumption,
- Water samples were taken from only a few areas.
In order to overcome the above drawbacks, we need a real-time water quality monitoring system.

Analysis
- Quality of water can be predicted using its own properties.
- In this model, we are using pH, turbidity, conductivity, temperature, and TDS as attributes.
- Using these properties, we are going to build a prediction model, through which we can forecast the water quality in the near future.

Key Issues
- Automatic monitoring and alerting will not be supported by the existing system.
- By tracking the water quality indicators using the sensors set up near the river basin, this system enables the end users to be automatically alerted via SMS.
- This system offers analytics and future forecasting utilizing historical water parameter values and machine learning techniques.

Proposals

Way Forward
- In the future, we use IoT concepts for water quality monitoring.
- More parameters, Merrier the results.
- Increase the attributes by using multiple sensors.
- System can be developed for mobile Applications.
- More forecasting methods can be implemented.
To resuscitate the relation between river and the city by socio-petal, ingenious and persuasive sustainable practices to transform the urban interface of the river and city with solicitude towards ecology and culture to revive the city’s identity on its water front.
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Student Name: MUBASHIR ARSHID
Course Discipline: BTECH IN CIVIL ENGINEERING

INTRODUCTION & BACKGROUND

Significance of River Ladder:
- Acts as a source of potable water for Yatris enroute Amarnath Cave.
- Provides livelihood to 2059 households.
- For Pujan and Visarjan ceremonies.
- As the camping sites for the migratory tribes.

CAUSES OF POLLUTION AND IMPROPER MANAGEMENT OF RIVER LADDER
- The hectic pace of urbanization among the indigenous people.
- Wallowing/bathing of animals in the river.
- Open defecation and urination into the river.
- Dumping of dead animals into the tributaries of the river.
- Household waste dumping along the riverside.
- Only 3% of general households are equipped with door to door water collection system.

KEY ISSUES AND ANALYSIS
- Educating and training the tribals about river management and water sampling and testing.
- Tribals as macro-plastic samplers.
- Preparation of a four-pillar engagement model.
- Assessing the reason for involuntary participation by tribals in river management practices.
- Sustaining the developed tribal framework.

OUTCOMES AND WAY FORWARD
- Improved tribal participation after progressive workshops.
- More thrust to be given on engaging younger people.
- Banning or restricted use of polythene and plastic bags.
- Learns between the tribals and organizations.
- Tribal knowledge to be given an equal standing.

River clean-up drive results for a selected stretch of river

Graphical representation of water quality tests

Solid waste % weight wise composition
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Revitalizing the Nullahs of Mumbai

Student Name: Dhaval Mistry
Course Discipline: B.Arch

What are Nullahs?
Nullahs were originally natural watercourses or rivers. Connected to the sea and thereby the tides, these water bodies regulated groundwater levels and assisted in dispersing water from the land in case of heavy rain.

Sadly, these watercourses or rivers have unfortunately been abused, making it an open sewage drain taking all the effluents out into the sea.

It's filled with:
Industrial waste, Domestic waste, House refuse, Seed, Wax & Naphtha

Who throws the garbage into the nullah?
Koli Settlements near nullahs for fishing was adopted by Informal Settlements in 1970s. As other parts of the city developed, they have become today's slums.

Sewage Disposal Analysis of Mumbai:

- 28.6% Connected to City's sewer lines
- 33.6% not Connected
- 92% Not Connected

Everyday ~ 100 Tones of waste gets directly thrown into the nullah.

Approach:
The intervention is designed to be MODULAR, so that the problem is solved with multiple layers throughout the city where the situation of Slums and Channelized Nullahs filled with Garbage and Sewage exists!

Just Cleaning not a solution:
Before Cleaning - After Cleaning - Now (in a week)

Change with Circular Economy:
The 3Ps of the system:
- People (Society)
- Planet (Environment)
- Profit (Economy)

A program where Environmental Problems gets solved, the people get facilities as well as the Gov earns.

Moreover, Mumbai's SWDS network, meant only to carry rainwater, is connected to illegal sewage lines.

107 Nullahs in the west directly open into Arabian Sea without any treatment.

As no space people resort to throwing garbage into the nullah.

This has end up as a floating sheet of garbage on the nullah.

Impact on ecology:

Everyday ~ 100 Tones of waste gets directly thrown into the nullah.

Impact on city:
Choking at one point, affecting the other parts.

According to the BMC survey, over 76,400 sewage lines have been illegally connected to SWDS, open nullahs and creeks.

Also, MODULAR for all types of widths.
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Revitalization of Urban Waterfronts through WaTOD
A case of Jhelum River in Srinagar

Daman Dogra
Bachelors of Planning

Characteristics of Ferry Riders
- Leisure Users: Less Concerned about time
- Value Uplift: 4% in Brisbane, 8% in New York
- Modal Share: 15% of all ferry journeys included another mode

How Ferries differ from Roads & Rails
- Ridership declined due to bridges & roads
- Feasibility depends on how much the route
- Congestion was the common factor for

Intra City Routes
- NW 49: Passage through 4 Districts, 110 Km

Quick Passage through Congestion
- 60 Water Buses by 2044
- Terminal I: 15 Min, 8 Min, 4.7 Km
- Terminal II: 60 Kms

Legend
- Water body
- Municipal Corporation
- Inland Waterways:
  - Dal Gate - Hazratbal Bell
  - Charar-e-Sharif
  - Dal Gate - Hazratbal Bell
  - Ring Road - Srinagar
  - Ring Road To Charar-e-Sharif
  - Park to Charar-e-Sharif
- Green Belt
- Waterfronts

Water Sports
Water Transit
Ferry Terminal
Recreational Activity
Bicycle Paths
High Density Mixed Use development

WaTOD
18 m Riparian Buffer
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Spatio-Temporal Flood Dynamics and its impact on Kosi River Morphological changes, Bihar

Student Name: Madhavi Gajre
Course Discipline: M.Tech. (RS&GIS)

River Restoration Strategies

- Scale of agricultural land should be strictly controlled
- Farmland and forest should be reclaimed to restore the natural community
- Avoid soil erosion and water pollution

Illegal buildings occupying the river should be retreated
- Transform single-channel to a multi-channel river
- Main channel should be used for flood discharge
- Tributary should be used to improve sediment transport capacity and the quality of habitat

Ecological restoration area
- Protect diverse habitats and increase biodiversity

Town Connection Area
Integrating spatial technology and citizen participation for nature-based remediation of river Hooghly.

**Analysis and Key Issues**
- Pollution quantification and framework proposal
- Feasibility studies of ferry service and solar powered boats
- Developing spatial technology for supported app-based solution

**Solar Powered Ferry Service**
- Initial cost is more than diesel powered boats
- Yearly energy cost Rs. 65000 (Diesel costs around Rs. 22,20,000 per annum)
- Solar Ferry: 274.4 kWh, Ferry 914.7 lakh in a 20-year lifecycle

**App for Citizen Participation**
- Specific for river
- Connecting people and monitoring the remediation of river and its bank
- Options for citizens volunteering for NBS
- Create event

**Proposal**
- Enables user to create events
- Select and event get details and rate it
- Check for created events to track status
- Volunteering for NBS
- Option to choose from NBS
- Donate for desired NBS to be the closest cost
- Including citizen in remediation processes
- Educational and direct involvement of citizens

**Student Name:** Mrignayan Chandra
**Course Discipline:** M. Tech Environmental Engineering
Sponsored Thesis Project Competition on "Re-imagining Urban Rivers"

Strategic spatial planning based on Ecosystem services (ES) - A case of Cauvery basin region

Student Name: ARUNIMA KT
Course Discipline: M.Plan (Urban Planning)

**INTRODUCTION**

- **Ecosystem services (ES)** refer to benefits people obtain from ecosystems.
- Such services have value to human communities, but this value is not always captured or monetized.

**DISTRICTS WITHIN CAUVERY BASIN**

- Length of the river: 802 km
- Catchment area: 3.1557 km²

Cauvery's Depletion

Cauvery has depleted over 40% in the last 70 years

- 82% of the basin's original tree cover has been lost
- During the summer, Cauvery is unable to reach the ocean

- 75% of Cauvery basin's soil suffers erosion

**ES INDICATOR ASSESSMENT**

1. **Relative Ecosystem Service Value**
2. **Ecological Status of Surface Water**
3. **Population Impact on River Quality**
4. **Relative Treatability Index**
5. **Largest Water Bodies in India**
6. **River Basin Policy Framework**
7. **Economic Valuation of ES**
8. **Water Resources Management**
9. **Population Impact on Water Quality**
10. **Sustainable Water Management**
11. **ES Indicators for Water Management**

**GOVERNANCE MECHANISMS**

- A strong institutional structure for better and holistic governance of Cauvery basin region

**PROPOSALS & WAY FORWARD**

- Result map for all assessment indicators
- Integrated analysis across indicators
- Comprehensive overview report
- Interactive data portal
- Contribution of relevant knowledge towards optimizing basin development

**CAUVERY BASIN THROUGH THE LENSES OF ECOSYSTEM SERVICES**
Sponsored Thesis Project Competition on "Re-imagining Urban Rivers"

Student Name: Shivalika Arora
Course Discipline: M. Tech., Urban Planning

PROJECT IDEA
To identify the Urban Drivers that are majorly responsible for river degradation and pollution.
To prioritize and rank the drivers through qualitative and quantitative analysis by applying Fuzzy Analytical Hierarchical Process (FAHP).
To frame the solutions, approach to tackle urban drivers and suggestions for unique planning approaches pertaining to Urban River Management Plan (URMP) for Ganga basin cities.
Inculcation of innovative techniques and strategies including designing of eco-sensitive River Ghats with active participation of stakeholders and community to overcome the limitations.

KEY ISSUES
- Anthropogenic activities the riverine ecosystem is at stake.
- This has led to river turning into drains.
- Due to pollution the river has lost its self-cleansing capacity.
- The environmental implications will result in extinction of bio-diversity and at later stage will impact human life in deleterious way.

WAY FORWARD
- Employment generation
- Boost in river economy
- Revenue generation through tourism
- Improvement in micro-climate
- Sensitized citizens for river centric activities

PROPOSALS
A policy framework to safeguard the Riparian Zones.
Streamside, Middle zone & Outer zone
Policy for their determined widths, activities permitted, restricted, type of vegetation & envisaged outcomes.
The proposals are with the domain of environment, economic & social cohesion.
Community engagement: Planned activities for different age group to participate in developing this site.
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Planning for River Sensitive Developments in Cities
-A Case of Varanasi

Student Name: SHAKCHI SINGH
Course Discipline: Master’s in Urban Planning

The aim of the study is to plan for river-sensitive development in Varanasi.

**VARUNA**

Why Varanasi??

- Lost its Value

**ASSI**

- Assi River (Nolih)
  - Assi has also been encroached by unauthorized constructions
  - Assi has lost all its characteristics
- Enrichment of water
- Shrinking of water
- Decrease in groundwater recharge

Varuna River

Varuna River was recognized as the Mother of Varanasi. Varuna River is facing the problem of flooding. Many people are affected because of unauthorized construction in flood plain areas. A significant portion of the original riverbed is under either cultivation or other land use, which has changed the natural land use and also the land cover of the area.

**3 LEVEL OF STUDY AREA**

*AT CITY LEVEL*
- Groundwater
- Sewage Discharge
- Water Supply
- River Regulations

*AT RIVER FRINGE LEVEL*
- Water Sensitive Planning
- Inclusive Urban Planning & Design
- River Ecosystem Assessment
- Water Quality Assessment
- Water Accessibility

*AT RIVER LEVEL*
- Water Quality Assessment
- Environmental Assessment through Integrated Water Cycle Management

**ISSUES AND CHALLENGES**

- Pollution - Untreated Discharge
- Loss of green
- Loss of area
- Over abstraction of water
- Encroachment
- Flooding
- Weak rivers
- City Connect

**PROPOSALS**

Parameters for Proposal of Planning River Sensitive Cities

**BIOPHILIA DESIGN**

Local Community

- Flood Resilience

**HABITAT**

- Water
- Mobility
- Community
- Utility

**ELEMENTS**

- Education
- Connection
- Accessibility
- Inclusive and Sustainable
- Water Body Total lakes

**CONCEPT**

- From Isolation to Integration with Nature and City
- Flooring Plan for Garbage Collection

**NALLAH GARDENS**

- River Theatre
- Viewing Deck

- Pedestrian Bridge
- Herbal Garden

**Flood Leveling Projection**

- Rain Garden
- Pavement

Social Inclusion
AIM
To create a sustainable eco-management plan (Ecological & Economical), for Gomti riverfront area in Lucknow with a focus on overall development.

Potential Interventions based on the Analysis and the site study:
1. Riparian Buffer
2. Enhancing Public Accessibility
3. Tourism Economics
4. New economy generation
5. Safeguarding indigenous Occupations

Student Name: Rajarshi
Course Discipline: Masters of Urban and Regional Planning (MURP)
Sponsored Thesis Project Competition on
"Re-imagining Urban Rivers"

INTEGRATING RIVERS IN THE CITY PLANNING PROCESS

VISION
Integrating Urban River Management with the City's Master Plan by designing a Policy based initiative to Plan and Manage Urban Rivers within the ambit of the City's Master Planning process.

BACKGROUND
- Cuttack is the former capital and second biggest city in the Indian state of Odisha. It is Odisha's commercial hub, with many trading and business establishments in and around the city.
- The city's historic and most significant section is situated on a strip of land between the Kathajodi and Mahanadi rivers. The city is traversed by four rivers, including the Mahanadi and its tributaries Kathajodi, Kuakhai, and Birupa.

OBJECTIVES
- To enliven the waterfront with a range of attractive uses
- To improve governmental regulation, coordination and oversight of the riverfront
- To expand public access to riverfronts and revive the people-river connect

KEY ISSUES
- Congestion
- Deterioration Of Rivers
- Lost People River Connect
- Illegal Sand Mining
- Lack of Enforcement

DIMENSIONS OF RIVER

PROPOSAL 1. ZONING REGULATIONS
- DELINEATION OF RIVER ZONE BY THE IRRIGATION DEPT
  - HIGH FLOOD LINE (FL)
  - LOW FLOOD LINE (LF)
  - MAPPING OF ALL THE PERMISSIBLE & NON-PERMISSIBLE ACTIVITIES

PROPOSAL 2. RIVER MANAGEMENT & GOVERNANCE
To scale up citizen involvement in river management activities
To identify resources for project implementation, management and funding
To establish a wholesome multi-disciplinary and inter-sectoral framework for river management in a city

PROPOSAL 3. ENHANCING THE PEOPLE-RIVER CONNECT
To design and develop a riverfront catering to the needs of the citizens in a sustainable manner
To make the riverfront accessible to the public To create a stronger economic value for the river

FEATURES OF THE GREEN TRAIL
- A bridge to access nearby islands
- Delineation of the water's barrier to enhance safety
- An open-air theatre for cultural evenings
- An iconic structure to reflect on our rich marine heritage
- Enhancing access to riverfronts by creating promenades

Localizing Policies & Sectoral Strategies
Assigning Land Use Categories
Dev. Control Regulations
Taking up Special Projects
Sponsored Thesis Project Competition on "Re-imagining Urban Rivers"

Topic: Blue-Green Infrastructure Planning for Sustainable Development - Trunalveli

Student Name: Karpagavalli S
Course Discipline: Master of City Planning, IITKGP

STUDY AREA DETAILS
Location: Trunalveli, Tamil Nadu
McCorm Population: 473637
Name of the River: Thamirabarani River
Origin of the river: Western Ghats - Pothigai Hills
Confluence Point: Bay of Bengal - Gulf of Mannar
River Basin: L. Thamirabarani River Basin
Site Study Area: 29.18 Sq km
River stretch studied: 4.66 km
Flood Plain: 1120 m to 250 m

CONCEPT:
The blue green infrastructure planning is a strategic planning approach that aims to develop networks of green and blue spaces in urban areas, designed and managed to deliver wide ranges of ecosystem services and benefits of environmental, economical, and social aspects.

AIM:
To contribute & protect hydrologic and ecological values of Trunalveli city, through resilient blue green infrastructure network, built in multiple scales.

RIVERBANK DESIGN GUIDELINES
Riparian Native species inventory for 150m active river section

RIPARIAN REGION DEVELOPMENT

INTRODUCTION 1: INFRASTRUCTURE IMPROVEMENT
Proposal of Road Improvement, Channel Improvement and Water Front Corridor in blue green infrastructure (Detail Implementation in Pilot project)

INTRODUCTION 2: CONSTRUCTED WETLANDS
Proposal of 6 units of Constructed Wetlands in L. Thamirabarani to treat daily sewage treatment plant of 27.77 MLID existing in AV Corp.

INTRODUCTION 3: RETENTION BASINS
Proposal of 3 Retention Basins are planned from the outflows of three disappears waterbodies using the HEC-HMS design analysis, Cost: Rs. 20 crores.

POLLUTION INTERVENTIONS:
1. Zero Tolerance Policy for combined sewer overflows
2. River bank protection Policy, from encroachment, foreign species, urbanization and pollution
3. River basin management, increasing of native species, enhancing biodiversity

500 m Nature Trail for educational and tourist campaigns, increased public awareness

OUTREACH DECKS
Green Corridors along the river bank for walking and cycling

ECOSYSTEM RESTORATION
By developing the wetlands and stabilizing it with afforestation of native species restoring the urban biodiversity

POLICY INTERVENTIONS:
1. Zero Tolerance Policy for combined sewer overflows
2. River bank protection Policy, from encroachment, foreign species, urbanization and pollution

3. Zero Tolerance Policy for combined sewer overflows
4. River bank protection Policy, from encroachment, foreign species, urbanization and pollution

5. River basin management, increasing the biodiversity of native species

6. Nature Trail for educational and tourist campaigns

7. Zero Tolerance Policy for combined sewer overflows
8. River bank protection Policy, from encroachment, foreign species, urbanization and pollution

9. River basin management, increasing the biodiversity of native species

10. Aligned with "Blue Green Policy of Delhi 2041"
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Planning Strategies for Riverfront Development of Kham River in Aurangabad

Objectives of Proposals:
- Low Cost and Low Maintenance
- High Performance
- Sustainable
- Unique Selling Proposition

Spatial Scale of Kham River Restoration

Range of Measures:
- Ecosystem Interactions
- Ecosystem Restoration
- Habitat Creation
- Water Management
- Flood Mitigation

What we value, we usually care for!