

RE-IMAGINING URBAN RIVERS

through young minds

STUDENT THESIS COMPETITION (SEASON 3)

A competition for the students of Bachelor's and Master's degree programs for their academic thesis/research projects

The purpose of this sponsored thesis competition is to invite students to take up their academic thesis projects on the themes of the competition, which revolve around Urban Water Management.

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 is organized by the National Mission for Clean Ganga (NMCG) and the National Institute for Urban Affairs (NIUA).

The competition spans across six distinct thematic realms:

THEMATIC AREA 1



Reducing River Pollution

Pollution is perhaps the greatest challenge for urban rivers today. This is in the form of untreated domestic and industrial wastewater; pesticides from agricultural runoff; solid waste; oil spills; and accidental dumping of hazardous material; among others. In many cities, rivers become the ultimate recipients of the pollution, even though it may be generated elsewhere. Therefore, controlling river pollution is the primary thrust area for any long-term rejuvenation strategy of a river.

For this theme, students will identify a polluted stretch of the river (or drain) in any of the Indian city and design an innovative solution to address the problem.

Examples of possible projects include (but are not limited to) state-of-the-art technologies for pollution control; leveraging on nature-based solutions; adopting advanced engineering avenues; developing innovative regulatory frameworks; designing unique planning approaches; among others.



1

**Student: Chaitanya Joshi, Masters in Urban Planning,
CEPT University, Ahmedabad**

River: Nag River, Nagpur

PROJECT: Rethinking River-centric Micro-Planning Approach Along With Rejuvenation of Freshwater Ecosystem: A Case of Nag River, Nagpur

The project aims to "Recreate the symbiotic relationship of Nag River with citizens to create a thriving ecosystem. The key focus area includes providing strategies for reducing pollution levels by restoring Nag River through nature-based solutions, not limiting to identifying key strategies for promoting homogeneous river-centric planned development using micro planning tools and rethinking the river as an urban asset to generate economy using the bottom-to-top mechanism.

2

**Student: Jalli Radhika, Electrical and Electronic Engineering,
Vignana Bharati Institute of Technology, Hyderabad**

Water Body: Hussain Sagar Lake, Hyderabad

PROJECT: IoT Based trash collecting boat

The main objective of this project is to collect trash over the certain area of the Musi river. This will be executed with IoT Based technology . The IoT-based trash collecting boat is an innovative solution that combines Internet of Things (IoT) technology with marine waste management. This boat is designed to autonomously collect and remove trash and debris from water bodies, such as rivers, lakes, and oceans, thereby addressing the growing problem of water pollution caused by litter and garbage. The IoT-based trash collecting boat represents a significant step forward in the fight against water pollution, offering an efficient and sustainable solution to help keep our oceans and waterways clean.

3

**Student: Kriti Mada, Bachelors in Geology,
Fergusson College, Pune**

River: Pawna River, Pune

PROJECT: Device for Removal of Microplastic pollution from river, Pawna

This project investigates the separation of microplastic from riverine systems using iron oxide filings and electromagnets. For the study of the effects, microplastics were first defined and categorised. Then the creation of microplastics were done for each type of microplastic that was identified, keeping in mind the required size that fit the definition. For the purpose of analyzing the efficiency, a crude photo-spectrometer was made, which was used to analyze spectrums of the solutions with microplastic and after treatment to compare and understand the separation efficiencies for different microplastic particles. It has been shown that this method to remove microplastics is efficient for fragmented and irregular shaped particles more than film or rounded particles.

4

**Student: Akanksha Bhardwaj, Master's in Urban Planning,
Indira Gandhi Delhi Technical University for women, New Delhi**

River: Rapti River, Gorakhpur

PROJECT: Restoration of riverine through nature-based solution towards disaster risk reduction for sustainable urban future: A case of Rapti river

With an understanding that wetlands are exceptional ecosystems with such diverse functions, the research aims to utilise urban wetlands ecosystems to reduce urban flooding risk. The research focuses on a case-based approach to study the management of Rapti riverine wetlands using nature-based solutions in the city of Gorakhpur to mitigate the risk of urban flooding. Further, the research uses primary survey, GIS analysis, expert survey, various reports, case studies as a basis to provide policy as well infrastructure-based solutions to reduce urban flooding in Gorakhpur. The research will assist urban planners, policymakers, and other stakeholders in developing flood strategies.

THEMATIC AREA 2



Rejuvenating Water Bodies

Water bodies and wetlands are intrinsically linked to rivers. Well-maintained water bodies are an excellent avenue for groundwater recharge, which can complement the water supply in a city and reduce the stress on the river. Likewise, most wetlands act as a natural buffer to protect the river from pollution. However, in most cities water bodies and wetlands are in a sorry state. The first step to reversing this trend is to create value for these features because we usually care for what we value.

For this theme, students will select an actual water body/wetland in any of the Indian city for the project, and demonstrate how its value can be enhanced to make it more attractive for the city's residents. This could be recreational value, social value, aesthetic value, and others, or a combination of all. The student has all the flexibility to imagine.

Examples of possible projects include (but are not limited to) reviving a water body using nature-based solutions; developing a water body as a recreational avenue for residents; rejuvenating a water body to serve as a groundwater recharge zone; developing a constructed wetland; and creating artificial water bodies; among others.



5

**Student: Shahul Hameed, Bachelors in IT,
St. Xavier's Catholic College of Engineering**

River: Pazhayar River, Kanyakumari

PROJECT: Intelligent Water Quality Detection tool for rejuvenating water body

This suggested water quality detection tool detects water quality at any location by providing the longitude and latitude of a single site. The proposed water quality detection tool is a low-cost method that yields high data capacities, low error rates, and high data quality. Water quality data can be collected and transferred from previously inaccessible places using low-cost IoT devices using cellular or satellite connectivity, contributing to a more comprehensive understanding of global water resources.

6

**Student: Monali Biswal, Masters in City Planning,
IIT Kharagpur**

Water Body: Gangua Nala, Bhubaneswar

PROJECT: Unpacking the catalyzing potential of geographical urban voids around the natural drains in the fabric of Bhubaneswar

The study aims to identify the causes and consequences of urban voids specifically around the natural drains and to develop strategies to revitalize these spaces using nature-based solutions and placemaking strategies thereby fostering a dialogue between nature people and events. The transformation will involve the natural drain as well as the voids surrounding the drain. The urban voids have a huge potential to be reshaped and redefined as per the needs of the users. Activating these lost spaces can benefit the community. This thesis focuses on transforming these urban voids or the negative spaces specifically around natural drains, making them a functioning part of the city. These spaces are also known as terrain vague, lost spaces, in-between spaces, urban voids, derelict spaces, leftover space, anti-spaces and many more.

7

**Student: Vidhisha Bhargava, Masters in Urban Planning,
SVNIT Surat**

River: Yamuna, Delhi & Mathura

PROJECT: Leveraging River-Centric Planning for Rejuvenation of Eutrophicated Segment of Yamuna River in Mathura City through Citizen Engagement and Self-Financing Model of Urban Planning

Following a thorough assessment of the current conditions and an evaluation of existing design patterns along Mathura's Yamuna River, a sustainable preservation strategy is proposed. This strategy revolves around a river-centric, multi-purpose riverside development that incorporates nature-based solutions to address the various challenges endangering the cultural heritage of the Yamuna.

The proposed design includes diverse amenities such as recreational spaces, a pontoon bridge, ghat development, boating facilities, and a captivating light and sound show. Complemented by relevant policies and guidelines, the design aims to achieve ecological restoration, enhance water quality, preserve the cultural and historical significance of the area, provide public access and recreational opportunities, and foster economic development.

8

**Student: Yash Dhawade, Masters in City Planning,
IIT Kharagpur**

Water Body: Lakes of Udaipur

PROJECT: Udaipur, the City of Lakes: Traversing through City's Titular Sobriquet to Anthology of Lakes and People

Udaipur, the City of Lakes which is an example of an urban identity with its very unique and specific topographic conditions, is under great threat. The city, though known to be the city of lakes, has acute water shortage, that indicates a need for deeper research and planning intervention. With this thesis, it is this problem of water shortage and urban identity that is intended to be tackled using Urban Planning and Urban Design. For this, firstly the ancient lake system which was unique to Udaipur was understood, and is explained in this book. Next, identification, understanding and enlisting of the various reasons resulting in the problems of the water system of the city was done. Finally, appropriate proposals relating to urban planning and urban design, using suitable analysis was done using modern tools and techniques in GIS to restore Udaipur's urban problem of water systems and reinforce its identity as the 'City of Lakes'.

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**Student: M Divya, Master's in Urban Planning,
SPA Bhopal**

Water Body: Pulicat Lake, Tamil Nadu

PROJECT: Reviving 'Poramboke': A case of Pulicat Lagoon

The thesis is an inquiry into the interdependence of the community and the wetlands. Through community engagement and literature review, it has been established that the community's aspirations and their socio ecological vulnerabilities i.e., the social exclusion of the inhabitants from the basic facilities and several other economic and livelihood threats posed on them and their ecosystem due to its secluded geography and lack of sensitive resource management. Intending to design and strategize how the built environment may intervene to enable the communities to coexist with the environment. The project's goal is to intervene through an architectural design for the community that embraces local traditions while conceptualizing a new design that uplifts the communities and rethink how we perceive the wetland and their inhabitants.



THEMATIC AREA 3



Creating a Vibrant River Zone

River Zone is an area immediately adjacent to the river. Ideally, the width of the river zone should coincide with the extent of the floodplain in the city. However, in many cities, the river zone width is dictated by existing development in the floodplain and can vary from 100 m to 1 km. Creating vibrant river zones serve as an effective avenue to reconnect the city with the river while enhancing the recreational quotient of the river.

For this theme, students will select a particular stretch of the river zone in any of the Indian city and design it to make it more vibrant and appealing. It is crucial that design elements are environmentally friendly and do not disturb the riverine ecology.

Examples of possible projects include (but are not limited to) biodiversity parks; ecofriendly ghats; herbal gardens; nature trails; amphitheater; or a mixture of different elements; among others.

10

**Student: Akshansh Mishra, Bachelors in Architecture,
Apeejay Institute of Technology, Noida**

River: Ganga, Kanpur

PROJECT: Reworking Water Connect With Urbanization: Heritage Riverfront of Kanpur

The main concept of this thesis is to revitalize the river path's public realm on the Heritage River connections (HRC) with River Ganga and provides a better infrastructure (landscape) for its users. The main theme is Heritage conservation, thereby reinforcing the age old value systems. It involves the selection of the HRCs through studies and exploration method. The key objectives are to understanding associations and sense of place and the built heritage structures along the river patch, lined with temples. Understanding association of heritage structure and there conservation with the ghat to help rebuilt the HRCs. The conclusion of the study comprises the master plan and demonstrating the design interventions development to ensuring and sustaining the river front limit.

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**Student: Puja Das, Masters in Landscape Architecture,
SPA Vijayawada**

River: Hoogly, Kolkata

PROJECT: Re-establishment of socio-cultural association between the city and river by creating dynamic riverine zone with Eco-sensitive Riverfront Design - A case of Hooghly River, North precinct of Kolkata

The main concept of this thesis is to revitalize the river path's public realm on the Heritage River connections (HRC) with River Ganga and provides a better infrastructure (landscape) for its users. The main theme is Heritage conservation, thereby reinforcing the age old value systems. It involves the selection of the HRCs through studies and exploration method. The key objectives are to understanding associations and sense of place and the built heritage structures along the river patch, lined with temples. Understanding association of heritage structure and there conservation with the ghat to help rebuilt the HRCs. The conclusion of the study comprises the master plan and demonstrating the design interventions development to ensuring and sustaining the river front limit.

12**Student: Debjyoti Saha, Masters in Urban Design,
Sushant School of Art and Architecture**

River: Hoogly, Kakdwip

PROJECT: Re-establishment of socio-cultural association between the city and river by creating dynamic riverine zone with Eco-sensitive Riverfront Design – A case of Hooghly River, North precinct of Kolkata

The Purpose of the project is reinventing the riverfront and canal front as a socio-economic interface by maximising its potential at the neighbourhood, city, and regional level. The Kalnagini Canal is one of numerous streams and canals that characterise the city's fabric, history, and future direction. However, modern building patterns, as well as the strong pressures of expanding population and development, undermine the connections between forests, water bodies, and the hydrogeological features that are prevalent in this river system. The plan will decide all of the previously described aspects, and it will aid in the implementation of a sensitive and nature-based solution system to construct the social, economic, and ecological balance.

THEMATIC AREA 4



**Generating
River
Related
Economy**

Rivers have a tremendous economic value through the ecosystem services it provides and the livelihoods it can support. Already cities across the globe have boosted their economies through river-centric activities. Rivers can help cities progress up the economic ladder, which every city aspires. Needless to say, the scale and extent of such actions must account for the river's carrying capacity.

For this theme, students will plan and design a river-friendly intervention to augment the river-related economy in any of the Indian city. The scale and scope of the project can be decided based on the context of the selected city.

Examples of possible projects include (but are not limited to) developing river markets; river cruises; water sports; floating restaurants; promenades; recreational plazas; boating clubs; and cultural theme parks; among others.

13**Student: Shishir Verma, Masters in Urban & Regional Planning,
Babu Banarasi Das University**

River: Ramganga, Gangan & Dhela, Moradabad

PROJECT: Reinstating The Riparian Corridors for Boosting The Urban Economics:
A Case Of Moradabad, U.P.

This study highlights the potential benefits of rehabilitating riparian corridors in Moradabad and provides recommendations for implementing such measures. These corridors have been encroached upon and degraded due to unplanned urbanization, industrial pollution, and inadequate waste management practices. Based on the findings of the evaluation of reinstatement efforts for riparian corridors in Moradabad, the project provides insights on how implementing strategies of Integrated Water Management Approach, Stakeholder Collaboration, Public Awareness & Education, Land Use Planning & Regulation, Innovative financing mechanisms, Monitoring & Evaluation framework and Knowledge Exchange & Capacity Building can further enhance the reinstatement efforts to foster socio-economic development in a way that benefits both the environment and the local community.

14**Student: Vishrut Goswami, Bachelors in Architecture,
NIT Calicut**

Rivers: Ganga, Yamuna, Saraswati Sangam

PROJECT: Ephemeral Conurbation of Urban Forms: Re-imagining an Impermanent City, Kumbh Mela 2025

Kumbh Mela is one of the largest religious gatherings in the world, and its design and planning have a crucial role in its success. The Navagraha Planning System is a new design principle that can be used to improve the planning and management of the festival. By adopting this system, the festival can be organized in a way that is more efficient, sustainable, and user-friendly. This thesis is an investigation of various possibilities in temporary architecture and urban spaces. It aims to question and challenge the accepted assumptions of architecture in terms of time and permanence, in the context of urban landscapes. It inspects how much potential ephemeral architecture has to become a state-of-the-art model in developing cities but also will formulate and understand current models to scrutinize their capability to give contemporary remedies to changing urban dynamics and urban processes alongside conventional architectural approaches.

THEMATIC AREA 5



Engaging Citizens in River Management Activities

Engaging citizens in river management activities is essential to make a shift from 'citizens as spectators' to 'citizens as actors'. This also sends out the message that river management cannot be the government's mandate alone. Residents will need to step in and share the onus of responsibility. Most progressive societies have some or the other form of this governance model. In the long run, it will help create a transformation in the mindset of people towards the ecological assets of the city.

For this theme, students will design a model/strategy for engaging citizens for a specific river management activity. The engagement can be a one-time effort, periodic, or continuous.

Examples of possible projects include (but are not limited to) developing a model/strategy for engaging communities for river clean-up drives; monitoring river water quality; larger sensitization on river-related issues; and action research for river challenges; among others.

15**Student: Saeed Desai, Bachelors in Geology,
Modern Education Society's Nowrosjee Wadia College, Pune**

River: Mutha River, Pune

PROJECT: Jalval2.0: INFORM-ing citizens about river pollution by PERFORM-ing ideas in activities for reducing it and TRANSFORM-ing into the pollution free river

In the world with so many social problems, citizens think it's not their responsibility to act on social issues and to lessen this gap between their thoughts and impending reality, a community, Jalval has been created in Pune with the motto of connecting citizens with river emotionally, by informing them about river pollution and performing activities like river cleanup drives with help of them and transforming river banks into pollution free zones. Public interaction was the essence of this research. Youth engagement has also contributed to this research.

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**Student: Gadem Sairam, Electronics & Communication Engineering,
Vignana Bharati Institute of Technology, Hyderabad**

River: Muchukunda River, Hyderabad

PROJECT: Extricate profanation of the River Muchukunda and save our relic Muchukunda River

This thesis presents the development of a website dedicated to raising awareness about the Musi River, its history, and the urgent need to address pollution issues. The website aims to serve as an educational platform, providing information on the river's past, and present condition, and potential solutions to restore its ecological balance. The website consists of various sections, including Home, About Us, History of Musi River, Pollution Data from IoT Devices, Team, Eco-Friendly Products, Volunteer Opportunities, Volunteer Login, Sign Up, and Donations. It is designed to be accessed through a Raspberry Pi device, enabling a kiosk mode that directly boots into a full-screen web page without requiring the use of a desktop environment.

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**Student: Bhumika Batra, Bachelors in Architecture,
Amity School of Architecture & Planning, Noida**

Water-body: Dal Lake, Srinagar

PROJECT: Extricate profanation of the River Muchukunda and save our relic Muchukunda River

Dal Lake, situated in Srinagar, is not only renowned for its natural beauty but also serves as the main source of livelihood for over 50,000 individuals known as the Dal Dwellers. These dwellers reside in floating villages called 'Rah' or 'Raz, which have deep cultural and historical significance, being an integral part of the lake's ecosystem. The focus of this study is on the architectural component of a floating community and its sustainability. The thesis not only demonstrates the importance of preserving and developing traditional architectural values, but it also demonstrates the flaws of this architecture that need to be addressed in the design of future floating communities. The goal of the thesis is to understand the current situation of villages on this lake and then further propose ideas that result to revitalize and promote floating communities as a unique cultural heritage and tourism attraction while also considering the lives of the people living there.



THEMATIC AREA 6



Managing Riverine Biodiversity

The complexity and severity of biodiversity challenges have grown exponentially over time, far beyond human vision. Although the rivers were redesigned with the best of intentions, the consequences of the changes resulted in the loss of biodiversity, river bio-corridors, and inherent traits.

For this theme, students will design a model/strategy for managing riverine biodiversity. The engagement can be a one-time effort, periodic, or continuous.

Examples of potential initiatives include (but are not limited to) developing a model/strategy for biodiversity mapping, monitoring protection, and including communities in the process, among others.

18

**Student: M. Veena, Electronics & Communication Engineering,
Vignana Bharati Institute of Technology**

River: Musi River, Hyderabad

PROJECT: Nadhi to Jeeva Nadhi- The rise of aquatic life

The proposed project aims to develop a comprehensive monitoring system for Musi River to assess the concentration of pollution and population of aquatic species. By integrating advanced water quality testing equipment and innovative data collection techniques, the project will enable real-time monitoring of various pollutants, including industrial and domestic waste, and their impacts on the river's ecosystem. Additionally, the project will employ advanced biodiversity survey methods to track and analyse the population trends of aquatic species in the river. The data collected through this project will not only provide valuable insights into the current environmental health of Musi River but also serve as a foundation for informed decision-making and the implementation of targeted conservation efforts to restore the river's ecological balance and ensure the preservation of its aquatic life for future generations.

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**Student: Sara Afzal, Bachelors in Geology,
Aligarh Muslim University**

River: Ganga, Yamuna, East Kali Nadi, Kannauj

PROJECT: Comparison of Anti-microbial Resistance in Three River Ecosystems and Assessment for Behaviour Change Interventions

Behaviour change interventions are strategies and techniques aimed at promoting positive changes in individuals' actions, habits, and behaviors. These interventions are commonly used in various fields, including healthcare, psychology, education, and public policy, to address issues such as health promotion, disease prevention, environmental conservation, and more. This study picks first-hand information from the microbiological and geochemical data for a confirmation of presence of contamination and from behavioural data confirms the presence of higher level AMR behavior. Subsequently, evidence-based research provided the information about availability of behavior change interventions that could be used to mitigate the situation. Use of behavior change interventions to address AMR should prioritize a multi-faceted approach encompassing healthcare professionals, patients, caregivers, and the general public.