

CLIMATE SWITCH

Kimaya Keluskar* & Ajay Nayak**

* Educated Environments (EdEn)

** Educated Environments (EdEn)

Corresponding editor <kimayakeden@gmail.com>

Abstract

Urban river rejuvenation is often promoted as a way to address climate stress, ecological decline, and fragmented urban growth. Yet most programs focus primarily on technical engineering solutions such as flood control, riverfront beautification, and infrastructure upgrades. This approach often overlooks or undermines the livelihoods and institutions connected to river environments. This paper argues that building urban river resilience requires more than just ecological restoration. It also means rebuilding the social and institutional relationships that shape how rivers are managed, valued, and cared for. Using examples from Western Maharashtra, the study introduces a Livelihood-Centred Socio-Ecological River Governance (LCSERG) framework. This framework draws on political ecology, socio-ecological systems theory, commons-based governance, ecological justice, and institutional analysis. It sees river-dependent livelihoods not just as recipients of restoration, but as key advocates and long-term agents for fair and accountable actions. In this view, rivers are socio-ecological infrastructures, and their resilience depends on the connections between ecosystems, institutions, and livelihoods.

Keywords: urban river rejuvenation, livelihood, political ecology, socio-ecological systems, ecological justice, Western Maharashtra, climate resilience.

1. Introduction

Urban rivers, like other wetlands, now sit at the centre of debates on ecological restoration, climate resilience, and sustainable development in the Global South. For years, these rivers have supported agriculture, fisheries, transport, cultural practices, and local economies, but many have, over time, been converted into engineered channels for flood management, wastewater disposal, and the creation of land availability for future urban expansion. River restoration has therefore become an urgent policy concern, particularly in cities contending with floods, water scarcity, biodiversity loss, and ecological decline. Despite substantial funding and allocation of funds for river restoration, outcomes remain unplanned. Most projects concentrate on embankments, channelisation, riverfront beautification, dredging, sewerage networks, and treatment plants. Such works can showcase improvements in flood control or the restoration of riparian landscapes, but they rarely address the social, economic, and institutional drivers of river degradation. Restoration, in effect, is treated as a technical process rather than as an overarching effort to reconfigure and re-establish the relationships among rivers, state agencies, and local communities.

The gaps in planning and implementing policies often create contradictions in India. Urban rivers historically supported settlements, agriculture, trade, and cultural life, but post-independence, with industrialisation, urban sprawl, and infrastructure expansion have impacted these relationships. To create more land for real estate, floodplains and wetlands are reclaimed, drainage is engineered, and riverbanks are converted into high concrete walls and redesigned roads along the river length, allowing machinery to access the riverbed for dredging before every monsoon. Simultaneously, the untreated sewage, industrial effluents, and solid waste get emptied informally into the riverbed, and hydrological alterations further degrade the ecological health across many basins, even though the authorities are contributing to this degradation and to the loss of access to the rivers (Das et al., 2021, p. 1859; Simons et al., 2023, p. 27554).

Western Maharashtra offers an insight, offering a regional lens on this transformation. River Godavari, Krishna, Panchganga, Bhima, Ulhas, and Mula–Mutha link across the Western Ghats, the Deccan Plateau, the Konkan coast, urban centres, agricultural belts, and estuarine zones. These flows have supported and nurtured settlements that formed institutions along the banks, created resting and reaffirming purity for pilgrims who travelled, and supported livelihoods to diverse communities through fisheries, sand extraction, ritual economies, ferry services, craftsmanship, and the informal work of the riverbank (Dhumal & Shahane, 2016; Jalal & Jayanthi, 2018, p. 2). Moreover, these relationships have undergone many shifts and transitions. Economic growth, social restructuring, environmental degradation, and urban redevelopment have loosened the interdependencies that once linked communities to river ecosystems. In order to follow developed lifestyle one aspires for a good life and living, forcing or encouraging youth to move out of traditionally driven river-based economies into services, manufacturing, logistics, and information technology, the everyday rationale for stewardship weakens, and rivers become politically visible mainly at periods of crisis floods, pollution episodes, and infrastructure failure (Aktara & Bhuyan, 2025; Bhattacharya et al., 2023, p. 2).

This paper argues that the difficulties of contemporary river rejuvenation stem from ecological decline and from the weakening of the symbiotic relationship of river and society. Restoration strategies commonly assume that ecological improvement will translate, more or less automatically, into social and economic gains (Basak et al., 2021, p. 95). Without accompanying major shifts in institutions and livelihoods, ecological restoration itself is unlikely to generate durable stewardship (Fox & Cundill, 2018).

Livelihood transformation should therefore be treated not simply as an outcome of river restoration but as a precondition for its success, embedded from the project's inception. Urban rivers demand strong advocacy and governance that treat rivers as ecological commons, support adaptive livelihood transitions, strengthen local organisations, Urban Local Bodies (ULBs), and other governing institutions. These institutions or organisations can help link ecological restoration to economic robustness through a lot of groundwork carried out at the social level. To be environmentally just, the costs of degradation fall unequally on informal settlements, small-scale fishers, farmers, and other river-dependent communities (Grabowski et al., 2022, p. 1683; Hamel & Tan, 2021, p. 701), whose knowledge is routinely excluded from planning (Szalkiewicz et al., 2020).

The following section aims to establish the historical relationship between rivers and society in Western Maharashtra (Figure 1). Subsequently, the paper reviews how urbanisation and development planning have severed rivers from their socio-ecological roles. These form the basis for addressing livelihoods through the LCSESG framework, for examining governance fragmentation, and for comparing four restoration projects to support a conclusive statement.

2. Rivers: Socio-Ecological Commons

Godavari, Krishna, Bhima, Panchganga, Mula–Mutha, and Ulhas have, for centuries, been integrated into the region's socio, environmental, and economic life. They functioned as socio-ecological commons offering shared spaces for ecological processes, livelihoods, cultural practices, and everyday activities that celebrated life and well-being. Towns like Nashik, Pune, Kolhapur, Karad, Sangli, and Kalyan grew up along the river, ghats, floodplains, and trade routes. The rivers provided water for sustenance and agriculture, served as a means of transporting goods and people, supported pilgrimage and shaped urban form. However, this has changed over time, and under current conditions, urban rivers require a deep delve into past mapping, pollution indices, and engineering failures to define the crisis they face.

The environment plays a crucial role in river-dependent livelihoods. Agricultural farming is extensively dependent on seasonal flooding, groundwater recharge, and irrigation systems. Inland fishers, washer communities (dhobi ghat), ferry operators, potters, ritual specialists, small vendors, sand extractors, and riverbank cultivators were each dependent on particular ecological conditions. For these stakeholders, water

quality, fish stocks, seasonal flows, soil moisture, and riparian vegetation were integral environmental indicators, providing ecosystem services that support household survival and community well-being.



Figure 1: Rivers in Western Maharashtra

Rivers offer cultural landscapes, carrying social and spiritual meaning through sacred ghats, temples, cremation grounds, bathing places, festivals, and pilgrimage routes. One can also observe how caste, occupation, gender, and local power evolve or are layered across the river's spatial extent and its floodplains, especially in religious cities, towns, and regions. It is common to observe that local customs treat rivers as living elements of collective life rather than as neutral infrastructure administered by technical agencies. From a social perspective, a commons lens clarifies how these relationships were organised within a geographical setting. Activities like fishing, seasonal cultivation, grazing, irrigation, and resource extraction were typically carried out under local rules and customary practices. Such arrangements did not abolish conflict, but they gave communities ways to adjust to and become accustomed to social and environmental change. Colonial hydraulic management and post-independence development gradually unsettled this order, positioning rivers as objects of technical control; instruments of irrigation, drainage, flood protection, water supply, real estate, and waste disposal.

With floodplains reclaimed, wetlands occupied, the riparian edge concretised or encroached, and local institutions displaced by sectoral bureaucracies, communities lost both the authority and the incentive to act as local heroes or river saviours. Modern high-tech restoration, therefore, has to be forced to acknowledge its historical roots. River degradation is not only a story of declining water quality and loss of biodiversity; it is equally the erosion of reciprocal ties among ecosystems, institutions, and livelihoods.

3. Urbanisation, Development Planning and the Depoliticisation of Urban Rivers

The decline of an urban river is often attributed to extractive urbanisation, population growth, inadequate public infrastructure, such as sewage management systems, and industrial pollution. However, one fails to explain why rivers end up as neglected residual spaces within cities, turning front yard to backyard. Planning traditions frame rivers as technical problems rather than as complex socio-ecological systems or as living entities. This administrative approach to defining restoration gravitates toward the displacement of communities, concrete embankments, high retaining walls that form channels, treatment plants, landscaping, and riverfront development, while land governance, livelihood displacement, ecological justice, and accountability are largely unaddressed or overlooked under political pressure and bureaucratic processes.

This form of defining rivers as serving objects with a technocratic orientation has colonial roots. Colonial water management techniques revolved around highly engineered parameters of measurement, hydraulic control and revenue. Engineering authority and post-independence planning experts carried forward these logics through the construction of dams, reservoirs, flood-control works, and specialised bureaucracies. Post-economic liberalisation added further pressure by inflating the market value of riverfront land; floodplains and riparian corridors became prized sites for real estate, infrastructure, tourism, and urban beautification. However, in Indian cities, this is not the case; the rivers never form the front yard but the backyard, thus turning one's back on the river and denying its actual presence in people's everyday lives. Riverfront projects can improve access and aesthetics, yet they can also simplify river ecologies, replacing wetlands, floodplains, and vegetated edges with hard surfaces and impervious layers. The politics of visibility matters, as projects that photograph well can be inaugurated and presented quickly as progress, and are likely to attract more attention than technical fulfilment of catchment protection, groundwater recharge, habitat restoration, sewage-network repair, or institutional reform. A visually acclaimed and enjoyed riverfront is not the same as ecological recovery.

These river development interventions raise questions of ecological justice and socio-ecological cohesiveness. River-linked groups, residents of informal settlements, fishers, washerfolk, and small vendors are routinely labelled as encroachers, even though the dominant sources of pollution are untreated sewage, industrial effluents, and weak land-use regulation. Institutional fragmentation compounds the problem: municipal corporations, water departments, pollution control boards, development authorities, irrigation agencies, and disaster management bodies each govern the river under separate mandates, and the resulting patchwork produces inconsistent ecological outcomes. To add to the incompetence to govern rivers, a river falls under two jurisdictions. For example, the Mithi River is managed by MCGM and MMRDA, despite being free-flowing.

4. Livelihood-Centred Socio-Ecological River Governance (LCSERG), an idea/opportunity

The vocabulary of urban river renewal increasingly features ecosystem restoration, climate adaptation, and blue-green infrastructure. In practice, though, the work remains organised around engineering and project delivery. Sewage treatment, embankments, channel stabilisation, dredging, and riverfront beautification address the visible face of degradation without necessarily altering the institutions that produce it. The Livelihood-Centred Socio-Ecological River Governance (LCSERG) framework treats ecological restoration, livelihood security, institutional coordination, participatory stewardship, and adaptive planning as interdependent conditions for river resilience. It is not an argument against infrastructure; the point is that technical interventions endure only when they are embedded in social and institutional systems able to sustain them.

Political ecology anchors the framework by showing how environmental conditions are produced and reproduced through decisions on land use, infrastructure, capital, regulation, and authority. Policy amendments, GR (Government Resolution), are passed to relax environmental norms and jurisdiction. Rivers become sites where industrial growth, real estate, cultural identity, recreation, water security, and livelihoods intersect. Thus, from this position, river decline is not inevitable; it is produced by particular choices made under the pretext of urbanisation and governance. Socio-ecological systems focus on loops, resilience, adaptation, and the

interrelation of social and ecological processes. Refining water quality alone cannot revive a dynamic river in all its forms if the governance of land use, livelihoods, waste management, floodplain regulation, and public participation continues when it becomes very difficult to come to one *genius loci*, but to have multiple *genius loci* to be disjointed. Similarly, commons governance emphasises that rivers are shared ecosystems, necessitating well-defined rules for access, stewardship, conflict resolution, and joint responsibility. Ecological justice provides another foundation for the framework. It seeks answers to who benefits from riverfront redevelopment, who bears the costs of pollution and displacement, and whose knowledge counts in the act of planning and execution. Without this scrutiny, river renewal can reproduce inequality while claiming environmental success. Mitchell's (2002) account of expertise and infrastructure helps explain why restoration is so often depoliticised: political questions are translated into technical ones, pushing industrial regulation, floodplain urbanisation, housing inequality, livelihood displacement, and environmental rights out of view.

At its core, LCSEERG is built on a simple proposition: livelihoods are both outcomes of restoration and instruments of stewardship. Fisheries regeneration, restoration employment, wetland management, environmental monitoring, riparian edge, nature-based tourism, circular-economy enterprises, cultural economies, and the upkeep of blue-green infrastructure can give communities standing reasons to protect the river's health. This stewardship is not limited to traditional community-based livelihoods; it can also include custodianship of urban amenities and river maintenance. Historically, occupations such as well-digging and the management of hydraulic flows through culverts and indigenous dams often remained within the purview of communities rather than corporations. Taken together, these perspectives recast river rejuvenation as a problem of institutional change rather than a couple of discrete technical, ecological, or social fixes.

5. Fragmented Governance and Institutional Transformation, a gap:

If rivers function as socio-ecological or green-blue infrastructures, their governance cannot stop at departmental or municipal boundaries, as one cannot confine rivers within boundaries. River systems connect diverse geographies through forests, farmlands, peri-urban fringes, industrial zones, dense city cores, business districts, estuaries, and coastal ecosystems. Pollution, flooding, groundwater depletion, habitat loss, and sediment change move across these linked systems, yet the institutions responsible remain divided and controlled by mandate, administrative procedures and territory. River governance is shared across boards, among municipal corporations, water resource departments, pollution control boards, irrigation agencies, development authorities, district administrations, disaster management bodies, revenue departments, forest departments, and tourism or heritage agencies. Each has legitimate objectives; what they lack is coordination. Drainage works advance without regard for wetland protection, land-use plans overlook ecological flows, and riverfront developments advance with no provision for restoring livelihoods. Tender processing and project-based funding deepens the fragmentation. Consultants, master plans, engineering contracts, Requests for Proposals, and public-private partnerships favour outputs that are easy to specify and budget. The sewage treatment plants, embankments, promenades, drains, lighting, and landscaping are being completed quickly without any support from subject experts. Participatory stewardship, livelihood transition, institutional learning, and ecological recovery run on longer timescales and demand more flexible forms of evaluation.

LCSEERG identifies five interlocking governance priorities: ecological soundness, livelihood transformation, institutional integration, participatory stewardship, and adaptive planning.

1. The first is ecological soundness, aimed at improving water quality, restoring biodiversity, securing environmental flows, protecting floodplains, and reconnecting habitats.
2. The second is a shift in livelihood through work tied to river restoration, monitoring, fisheries, tourism, circular economies, and the upkeep of blue-green infrastructure.
3. The third is institutional integration across municipal, basin, environmental, and development authorities. The fourth is participatory stewardship, which takes local wisdom and community co-governance seriously. The fifth is adaptive planning, grounded in persistent monitoring and policy revision under climate uncertainty.

Rather than infrastructure metrics, riverfront kilometres developed, sewage capacity installed, projects completed, it foregrounds ecological robustness, community participation, and biodiversity recovery, and it evaluates restoration versus long-term socio-ecological resilience as opposed to short-term delivery.

6. Comparative Case Analysis

The paper uses four contrasting cases to demonstrate its argument: the Godavari at Nashik, the Ulhas in the Mumbai Metropolitan Region, the Grahamukteshwar project on the Ganga, and the Rangmati–Nagmati river rejuvenation initiative, which the authors have worked on in their practice. The author cites these examples to show how tools and frameworks like LCSERG can be integrated into planning to facilitate transformative change in our cities. Though they vary in scale and institutional context, they collectively showcase different permutations and combinations of scenarios on cultural ties, industrial influence, participatory management, watershed restoration, and livelihood support. This emphasises that there is no universal approach when working with urban rivers. Each case is unique, with its own history, evolution, urbanisation trajectory, and specific needs, which the LCSERG parameters can address.

The Godavari at Nashik shows both the strength and the limits of cultural attachment. The river is central to pilgrimage, life-and-death rituals, local commerce, and civic identity, creating real opportunities for public engagement. One of the findings notes that citizens of Nashik strongly believe their identity is closely tied to the identity of Godavari. Restoration, however, has focused on built heritage conservation, wastewater management, riverfront development, and aesthetic upgrading, with floodplain restoration, habitat recovery, and livelihood support largely left to one side. Thus, advocacy and governance are two crucial elements in the river estimation and rejuvenation process. The Ulhas follows a more fractured trajectory. Industrial estates, logistics corridors, dense settlements, municipal wastewater, effluent discharge, sand mining, land reclamation, and infrastructure expansion have eroded the fisheries and livelihoods tied to the river. Governance is dispersed across numerous agencies, and the river is increasingly treated as urban infrastructure rather than a shared ecological resource.

Grahamukteshwar shows what participatory stewardship can add even under resource restrictions. Religious institutions, local groups, volunteers, educational programmes, and river-based economies have all contributed to restoration and public awareness. Community involvement here functions as a genuine complement to formal institutions, not a box-ticking consultation. Water hyacinth or river weed was harvested to create various products by recycling the material. This is a classic example of not having a livelihood and accepting the shift in the livelihood owing to contemporary times. The Rangmati–Nagmati initiative comes closest to a comprehensive socio-ecological approach, combining watershed management, groundwater recharge, vegetation recovery, flood mitigation, community involvement, and livelihood development through ecological restoration, afforestation, watershed works, and nature-based employment.

The common ground across all four cases is that the objective is consistent: ecological restoration alone does not secure resilience, especially when governance is fragmented. Creating opportunities to build livelihoods into restoration strengthens stewardship by giving communities lasting reasons to stay connected and protect river health, and participatory, basin-scale institutions outperform isolated, project-bound efforts. Project Phool collects useless waste in the form of flowers into natural colours.

7. Towards Livelihood-Centred Futures - building resilience

The analysis shows that the main challenge of contemporary urban river rejuvenation is not about technical capability but institutional framing. Where rivers are cast as hydraulic infrastructure, restoration bends toward control, aesthetic improvement, and project completion. Where they are recognised as socio-ecological infrastructure, focus turns to the dense relationships among water, land, biodiversity, livelihoods, institutions, and public life.

LCSEER makes three contributions. It extends political ecology by showing how changes in livelihoods and enterprises mediate the link between urbanisation and ecological harm. It deepens socio-ecological systems theory by placing livelihoods at the core of adaptive governance. And it ties ecological justice to restoration practice by insisting that stakeholder communities be recognised as participants in governance rather than raising objections to it. In practice, this implies that planning should shift from riverfront development to whole-corridor management, encompassing floodplains, wetlands, groundwater, riparian habitat, and upstream catchments. Restoration itself should become a sustained undertaking of monitoring, institutional learning, adaptive management, and participatory stewardship rather than a sequence of standalone projects. Climate change sharpens the immediacy. More intense rainfall, shifting monsoons, droughts, heatwaves, sea-level rise, and mounting flood risk will all add stress to river systems. Engineering is still necessary, yet resilience must also be built into institutions, livelihoods, and ecological functions.

River rejuvenation is, ultimately, more than just an ecological repair. It is an institutional transformation that binds ecosystems to livelihoods, governance, and community stewardship, and rebuilds the relationships among cities and their waters, institutions and communities, and presents planning choices and future resilience. It is also a social reform, as it allows mankind to reestablish its relationship with natural forces and demands a change in social behaviour for cohesive living and the coexistence of built and natural environments.

8. Conclusion: Coexistence and Harmony

Urban river restoration and rejuvenation have become a priority for urban areas experiencing climate stress, ecological decline, and rapid growth, yet efforts confined to engineering or aesthetics tend to fall short of this imperative. Sewage treatment plants along the river length, concretised embankments, existing drainage upgrades, and riverfront redevelopment address symptoms; they do not restore the deeper socio-ecological relationships on which river health depends. Drawing on the regional experience of Western Maharashtra, the paper has argued that rivers are best understood as socio-ecological infrastructures. Their decline registers not only falling water quality or lost habitat; it marks the loss or shift of livelihoods, commons institutions, and everyday stewardship.

The study offers an alternative approach by integrating ecological soundness, livelihood transformation, institutional coordination, participatory stewardship, and adaptive planning. Livelihoods function as on-site governance mechanisms that monitor, care, and commit to long-term accountability. Hence, community participation is a prerequisite for building a resilient river governance system rather than an optional extra. The planning technique, data procurement, indicator mapping, and funding require a reorientation from an infrastructure-planning perspective toward socio-ecological outcomes, biodiversity recovery, livelihood security, and environmental justice. To restore a river is to re-establish the connections between cities and waters, institutions and communities, ecological processes and economic systems and future readiness.

9. Limitations

This paper develops a conceptual framework via comparative case analysis, and its limits should be acknowledged. The LCSEER framework has not yet been tested against ecological or socio-economic data. The four cases cover varied governance contexts yet cannot represent the full range of river restoration experience in India or the wider Global South. And while the paper identifies design and planning processes and institutional fragmentation as decisive influences on restoration outcomes, it does not examine project contracts, financing, or implementation performance in depth. Upcoming studies should pair governance analysis with ecosystem monitoring, spatial data, and socio-economic indicators to test the framework in practice.

References

- Aktara, A., & Bhuyan, M. J. (2025). Changing jobs, changing landscapes: Do land use patterns reflect occupational shifts? *Area*, 57(4). <https://doi.org/10.1111/area.70018>
- Basak, S. M., Hossain, M. S., Tusznio, J., & Grodzińska-Jurczak, M. (2021). Social benefits of river restoration from an ecosystem services perspective: A systematic review. *Environmental Science & Policy*, 124, 90–100. <https://doi.org/10.1016/j.envsci.2021.06.005>
- Bhattacharya, S., Mukherjee, J., Choudry, A., & Ghosh, R. (2023). Reifying “river”: Unpacking pluriversal possibilities in rejuvenation surrounding the Adi Ganga of Kolkata. *Frontiers in Water*, 5. <https://doi.org/10.3389/frwa.2023.1070644>
- Das, S., Bhunia, G. S., Bera, B., & Shit, P. K. (2021). Evaluation of wetland ecosystem health using geospatial technology: Evidence from the lower Gangetic flood plain in India. *Environmental Science and Pollution Research*, 29(2), 1858–1874. <https://doi.org/10.1007/s11356-021-15674-9>
- Dhumal, H. T., & Shahane, V. A. (2016). Inter-basin transfer of water: From Konkan to Krishna, Maharashtra, India. *International Journal on River Basin Management*, 5(1), 44–49. <http://www.indianjournals.com/ijor.aspx?target=ijor:incold&volume=5&issue=1&article=008>
- Fox, H., & Cundill, G. (2018). Towards increased community-engaged ecological restoration: A review of current practice and future directions. *Ecological Restoration*, 36(3), 208–218. <https://doi.org/10.3368/er.36.3.208>
- Grabowski, R., Vercruysse, K., Holman, I., Azhoni, A., Bala, B., Shankar, V., Beale, J., Mukate, S., Poddar, A., Peng, J., & Meersmans, J. (2022). The land–river interface: A conceptual framework of environmental process interactions to support sustainable development. *Sustainability Science*, 17(4), 1677–1693. <https://doi.org/10.1007/s11625-022-01150-x>
- Hamel, P., & Tan, L. Q. (2021). Blue–green infrastructure for flood and water quality management in Southeast Asia: Evidence and knowledge gaps. *Environmental Management*, 69(4), 699–718. <https://doi.org/10.1007/s00267-021-01467-w>
- Jalal, J. S., & Jayanthi, J. (2018). An updated checklist of the orchids of Maharashtra, India. *Lankesteriana*, 18(1). <https://doi.org/10.15517/lank.v18i1.32699>
- Mitchell, T. (2002). *Rule of experts*. University of California Press. <https://doi.org/10.1525/9780520928251>
- Simons, S., Kinjawadekar, A., & Kinjawadekar, T. A. (2023). Assessing the impacts of the ecological framework of Indian riverfront revitalisation projects. *Environment, Development and Sustainability*, 26(11), 27553–27583. <https://doi.org/10.1007/s10668-023-03771-3>
- Szalkiewicz, E., Sucholas, J., & Grygoruk, M. (2020). Feeding the future with the past: Incorporating local ecological knowledge in river restoration. *Resources*, 9(4), 47. <https://doi.org/10.3390/resources9040047>