What's your relationship with the river?

**Please take a moment to fill out the survey.
Your input will help us better manage our rivers!**

Your Voice Matters

We are a research team from the laboratory Citeres - Umr 7324 Cnrs of the University of Tours in France.

This questionnaire is carried out under the auspice of UNESCO Chair River Culture – Fleuves et Patrimoine and coordinated by the Global Network of Water Museums.

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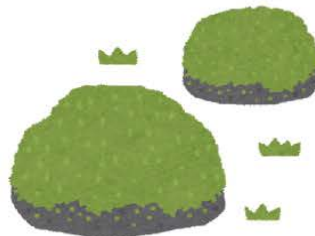
A Global Questionnaire Survey to Understand Human-River Relationships

Yixin Cao

Laboratoire d'Excellence – Intelligences des Mondes Urbains, University of Lyon, France
UMR 5600 "Environnement Ville Société" – Centre National De La Recherche Scientifique (CNRS)

Urbanization has altered natural waterways, leading to a growing disconnection between humans and rivers and the loss of river culture – the co-evolution of biocultural diversities in riverscapes. To combat this trend, efforts to restore rivers are reintegrating them into urban environments as green-blue infrastructure. Recognizing evolving human-river relationships, this article introduces a GIS-based survey aimed at exploring societal perspectives on the roles of urban rivers, particularly to counter the "extinction of experience" with nature. Drawing on previous studies of public interactions, perceptions and evaluations of urban rivers in France and China, this international survey, available in seven languages and in collaboration with a UNESCO-IHP flagship initiative, the Global Network of Water Museums (WAMU-NET), seeks to promote the development of Urban Human-River Encounter Sites (UHRES). Through comparative analysis, the goal is to foster a harmonious coexistence between humans and biota – an eco-social approach to revive river culture in contemporary cities.

KEY THEMES

⊲ Fig. 1 Graphical abstract (please scan the QR code to access the questionnaire) (Source: Yixin Cao, 2022).
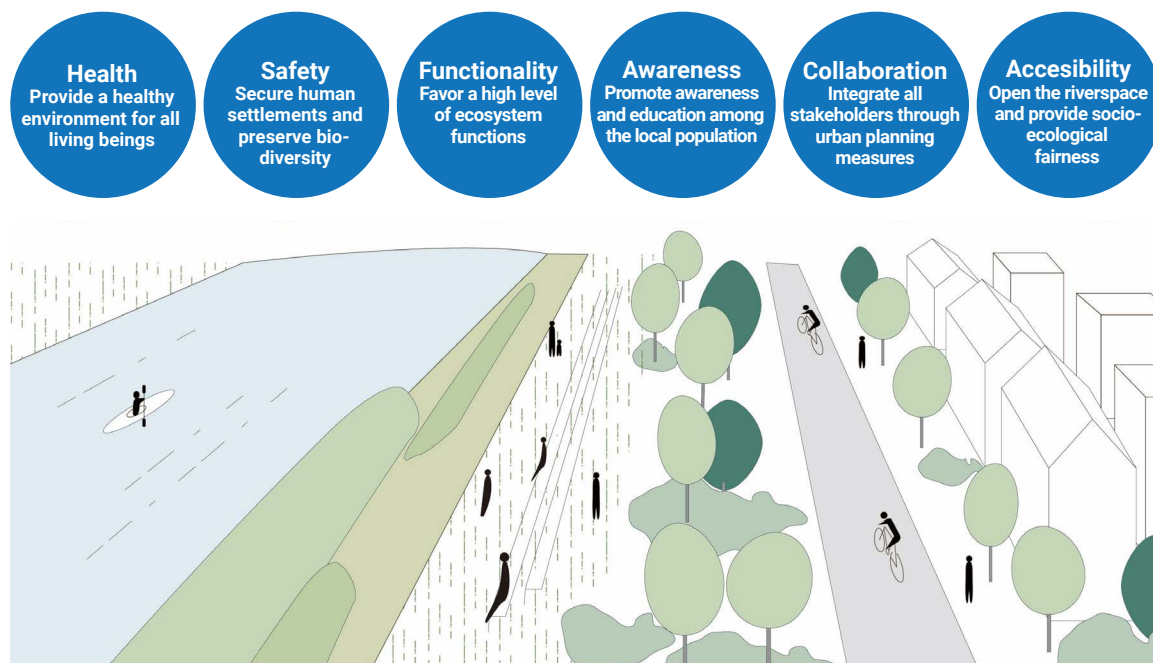
Introduction: Human-River Relationship

In the Anthropocene, with unprecedented pressures from global warming, industrialization and urbanization, rivers face numerous environmental challenges. These include pollution, devastating flooding, the loss of riparian vegetation and highly engineered morphological structures (Wantzen et al. 2019). Globally, monitored freshwater fauna and flora has declined 83 per cent since 1970 (WWF 2022). Only 37 per cent of rivers longer than 1,000 km remain entirely free-flowing worldwide (Grill et al. 2019). Human-nature experiences associated with rivers are also diminishing, leading to a loss of cultural diversity and practices and adaptation strategies involving river rhythms (Jackson et al. 2022). The decline of cultural heritage in river floodplains affects people's spiritual and cognitive connections to rivers (Hikuroa et al. 2021). Introduced by Wantzen and colleagues (2016), the concept of river culture suggests that rivers' pulsing hydrology nurtures both biological and cultural diversity in riverscapes. River culture is particularly endangered in modern cities where rivers and streams have been straightened, buried and channelized to protect against flooding and to facilitate dense urban living.

In recent decades, river restoration has emerged as a trend to re-establish human-river relationships, particularly in urban settings. The restoration of urban rivers to a state closer to their natural condition often coincides with a city's economic and social development (Brun 2015). Common goals include providing direct sensory (e.g., visual, auditory, olfactory) contact with nature (Soga and Gaston 2020; 2022). However, river restoration projects often make little attempt to understand how people interact with and perceive urban rivers and a disproportionate amount of attention is given to hydrological and ecological aspects (van den Born et al. 2021). The need for socially and culturally sensitive approaches is becoming more evident as river restoration increasingly concerns the wider society (Carré, Haghe and Vall-Casas 2021). Failure to involve the social aspect of river restoration can lead to project failure, as exemplified by the failure of a dam removal project in the Sélune River of France due to a lack of public support (Germaine and Lespez 2017).

Social surveys serve as a tool for investigating the public perspective of the multifaceted values of urban rivers and promoting the integration of societal aspects in river restoration (Le Calvez et al. 2021). The survey "Human-River Relationships" provides a comprehensive understanding of public perceptions and evaluations of the urban river environment, as well as their preferences and suggestions for ongoing or future river restoration projects in cities. This survey is timely, accompanying the rapid development of nature-based solutions while numerous urban rivers are being transformed into public open spaces (Durán Vian, Pons Izquierdo and Serrano Martínez 2021; Prominski et al. 2017), and it aims to simultaneously enhance rivers' ecological functions, improve flood mitigation capacity and provide recreational opportunities for local citizens. The goal of the survey is to help build a Urban Human-River Encounter Site (UHRES) (Zingraff-Hamed et al. 2021) by examining the dynamics of social-ecological interactions related to urban rivers. A UHRES introduces new materialist thinking (Greenway 2023) about human-river relationships that does not prioritize human development (Zingraff-Hamed et al. 2021). Comprising six tenets (fig. 2), the UHRES approach aids in revitalizing river culture in urban areas and shaping a new mindset compatible with a sustainable human-nature relationship. On a practical level, the survey results can help transform UHRES tenets – health, safety, functionality, aware-

Health	Safety	Functionality	Awareness	Collaboration	Accesibility
Provide a healthy environment for all living beings	Secure human settlements and preserve biodiversity	Favor a high level of ecosystem functions	Promote awareness and education among the local population	Integrate all stakeholders through urban planning measures	Open the riverspace and provide socio-ecological fairness

^ Fig. 2 The Urban Human-River Encounter Sites (UHRES) framework with its six tenets: health, safety, functionality, awareness, collaboration and accessibility (Source: Yixin Cao, 2022).

ness, collaboration, accessibility – into actionable suggestions for urban planning and aid policymakers in considering local needs. They also assist in guiding future initiatives aimed at raising environmental awareness, enhancing ecological education and promoting river stewardship among the population to reach the UHRES goal of the coexistence of humans and non-human beings within urban river corridors.

Measuring Human-River Relationships – A GIS-Based Public Survey

To understand evolving human-river relationships in various geographical and sociocultural contexts, I developed a public survey under the auspices of the UNESCO Chair River Culture – Fleuves et Patrimoine[1] and with assistance from the Department of Geography at Hong Kong University (HKU). The questionnaire was initially designed through discussions among researchers from the CITERES - UMR 7324 CNRS[2] laboratory at the University of Tours in France. It was later modified based on similar questionnaires used in a study conducted during the 2021 Science Festival in Tours, France (Cao and Wantzen 2023), as well as in PhD fieldwork in three Chinese cities (Wuhan, Hangzhou, Chongqing) in the summer of 2022. Following consultation with directors of water museums worldwide (WAMU-NET 2022), the survey is now being distributed in partnership with UNESCO's Global Network of Water Museums (WAMU-

1. https://www.unesco-chair-river-culture.eu/

2. http://citeres.univ-tours.fr/

^ Fig. 3 Urban river restoration scenarios 1-4 (from left to right, up to bottom) made using Adobe Photoshop CC (Source: Yixin Cao, 2022).

NET)[3] and is available in English, French, Italian, Spanish, German, Chinese and Croatian. Each language version has been proofread by a native speaker.

The questionnaire, developed from two empirical studies – one in Tours (Cao and Wantzen 2023) and another in three Chinese water museums (Cao, Chen and Wantzen 2024) – has been enhanced with detailed adaptations for international participants. It includes a variety of formats (i.e., single-choice, multiple-choice, five-point Likert scale, open-ended questions) to capture a comprehensive range of responses. It explores six topics: (1) the participant's closeness to the river, (2) recollections of childhood experiences interacting with rivers, (3) valuation and perceptions of the river in the participant's

city, (4) expectations of urban river restoration, (5) willingness to participate in river management and (6) the participant's socio-economic characteristics. Using a GIS platform, participants are requested to pinpoint their favorite riverside spot on a street map, which defaults to their GPS location. They are also encouraged to upload images (e.g., from their smartphones) of their favorite river site in their city. Both questions about locations are optional.

To examine topic 4, expectations of river restoration, we created four scenarios based on a simulated image using Adobe Photoshop CC (fig. 3) with added or removed individual restoration elements such as river meandering, concrete bank protection, revegetation, stone placement and recreational amenities – each

3. https://www.watermuseums.net/

Name of the museum	Location	Survey language
Yaku Water Museum Quito	Quito, Ecuador	Spanish
Le Musée de l'Eau et de la Fontaine	Ottignies-Louvain-la-Neuve, Belgium	French
Museum of River Navigation (Museo Civico della Navigazione Fluviale)	Battaglia Terme, Padua, Italy	Italian
National Water Museum of China	Hangzhou, Zhejiang Province, China	Chinese
AQUATICA Freshwater Aquarium	Karlovac, Croatia	Croatian

∧ Table 1. The water museums of the WAMU-NET network currently distributing the questionnaire survey (Source: Yixin Cao, 2022).

element depicted in the scenarios is linked to one or more urban river values. The water in each scenario was adjusted to the same shade of blue in all scenarios, signifying an overall enhancement in water quality. The four scenarios aim to address potential conflicts between recreational use and the conservation of natural habitats in restored urban riparian sites, as explored in previous studies (Zingraff-Hamed et al. 2018, 2022; Cao and Wantzen 2023; Cao, Chen and Wantzen 2024). To explore topic 5 about possible participation in river management, an optional open-ended question asked for participants' suggestions regarding future river management in their city. Potentially sensitive socio-demographic questions about education and income level were placed last to avoid any discomfort about those questions discouraging participants from completing the survey.

The questionnaire is expected to be completed online using the ArcGIS Survey123 platform (https://arcg.is/1OHDG00, which can be opened in a browser directly) and executed on-site. A poster, translated into the local language (see example in fig. 4), is displayed in the entrance hall of each participating water museum. The poster features a QR code linking to the questionnaire and provides information about the study while adhering to research ethics. Museum visitors are randomly invited to take part in the survey anonymously by scanning the QR code with their smartphones or tablets. Museum staff can offer instructions if needed. The questionnaire takes approximately 15 minutes to complete, and no incentives are provided for participation. The questionnaire survey is currently being distributed among several water museums within the WAMU-NET network (see table 1). Data collection for the survey is expected to proceed worldwide through the end of 2024. The data analysis phase will begin after all gathered information has been translated from local languages to English. In collaboration with HKU, I will employ both quantitative and qualitative analytical approaches. The study will utilize descriptive analysis and inferential statistics to uncover correlations between variables. One key aim is to explore the correlations between people's childhood experiences of rivers, their current perceptions and preferences regarding river restoration scenarios, as well as differences among various demographic groups. Additionally, qualitative coding will be applied
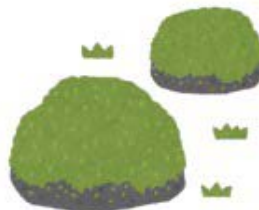
^ Fig. 4 Exemplary poster in Spanish utilized in museums for disseminating the questionnaire (Source: Yixin Cao, 2022).

to the visual content of respondents' submitted photographs of favorite river sites in their cities. This will help identify specific elements related to river systems that are preferred and the underlying cultural reasons for those preferences. Furthermore, an international comparison will be conducted to understand human-river relationships in different geographic, political and sociocultural contexts. For instance, I aim to examine differences between attitudes toward sacred rivers among Indigenous populations in Latin America and urban citizens' perceptions of restored European riverscapes as well as attitudes toward concreted river sites used as flood defenses in densely populated Asian cities. This comprehensive analysis will offer insights regarding how people interact with and perceive river systems in various global settings.

Expected Results and Conclusion

The survey is centered on the concept of river culture and UHRES and the primary objective of the research is to shed light on the long-standing, inseparable connections between humans and rivers that have been forgotten in today's industrialized and urbanized societies. The survey investigates the role of rivers in mitigating the "extinction of experience" (Soga and Gaston 2016), making it possible to analyze the variety and scope of human-nature interactions that rivers facilitate, including potential negative aspects. Specifically, inferential statistics will ascertain whether a river's role during an individual's upbringing influences their current perceptions of urban rivers. This outcome will contribute to ongoing research focused on cultivating biophilia and avoiding biophobia among children and examining their impact on pro-environmental behaviors in adulthood (Cho and Lee 2018; Hughes et al. 2019).

Secondly, understanding public perspectives of urban rivers can contribute to involving stakeholders and the public in the social-ecological restoration of rivers (Germaine et al. 2021). The public survey aims to integrate the "social sphere" with the "biophysical problem-sphere" and identify a "solution sphere" – such as a river's social-ecological restoration – that gains social acceptance and support (Wantzen 2023). The feedback collected through the citizen-science method in the survey will also provide practical recommendations for the successful implementation of UHRES. Specifically, this result will help identify the necessary trade-off between different ecosystem services (Turkelboom et al. 2018) of river systems and help identify strategies to mitigate potential conflicts while transforming urban rivers into multi-functioning nature-based solutions.

Finally, I plan to conduct an international comparative study by analyzing survey results from various geographic locations. This could potentially reveal significant disparities due to localized socio-economic contexts and provide site-specific suggestions for establishing UHRES in different areas. In conclusion, understanding human-river relationships allows us to encourage the harmonious coexistence between humans and biota within urban corridors (Zingraff-Hamed et al. 2021) and in the future contribute to an integrated river management scheme. By establishing sustainable human-river relationships that are grounded in ethical considerations (Strang 2020), we can ensure long-term benefits for future generations.

The use of social science methodology, particularly through a questionnaire targeting the public, represents an innovative approach to studying human-river relationships. This method is at the forefront of understanding rivers' social connectivity and river culture's influence on ur-

ban citizens, shifting the focus from the traditional emphasis on hydrological and ecological aspects to viewing rivers as complex social-ecological systems. Collaborating with WAMU-NET, a UNESCO-IHP flagship initiative (Resolution n°5 – 23rd Session of the Intergovernmental Council of IHP), to study museum visitors' perceptions and backgrounds will help explore the WAMU-NET's international impact and improve environmental education with more interactive initiatives for the public. The results will also be instrumental in reinforcing international communication among water museums. In terms of the results, the study's transnational and transcontinental comparison is unparalleled in its scope, aiming to understand the evolving dynamics of human-river interactions globally. A key objective is to uncover disparities in river restoration practices between the Global North and South, as well as the varied aspects of river culture across different cultures. Additionally, by incorporating transdisciplinary methods and formulating actionable suggestions for establishing UHRES for policymakers, the survey aims to foster a more collaborative approach to river governance by bridging the science-policy-society gap, effectively aligning the SDGs.

Policy Recommendations

- Social science methodology should play a crucial role in studying the evolving relationships between humans and rivers in modern cities.
- Urban river restoration should integrate societal needs and relations, rather than focusing solely on hydrological or ecological aspects.
- International comparison aids in analyzing the evolving human-river relationships across sociocultural contexts.

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Dr. Yixin Cao is Scientific Coordinator and Researcher of the "Baignades en rivières urbaines" studio of LabEx IMU (Laboratoire d'Excellence – Intelligences des Mondes Urbains) in University of Lyon, and also serves as a co-lecturer at Polytech Tours in France. She defended her thesis, "River Management and Human-River Relationships from Socio-Ecological System Perspectives – Case Studies in France, Mainland China, and Hong Kong," in November 2023, at the University of Tours. Holding a Master's degree in Sustainable Territorial Development and a Ph.D. in Environmental Science, Dr. Cao brings a global perspective to her work, enriched by her educational and professional experiences across Europe and Asia. Her research spans many topics, including transdisciplinary and interdisciplinary collaboration, social science methodologies, water management and governance, river restoration, human-nature relationships, Nature-Based Solutions and social-ecological system analysis.

Contact: yixin.cao@universite-lyon.fr