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A Holistic Mapping Approach to the Seine River Basin and the Port City Territory of Paris: Developing Historically Informed Awareness for Future Designs

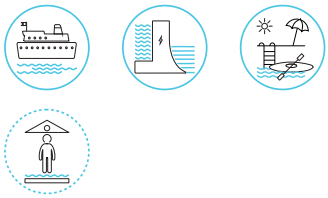
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Abstract
Rivers and ports have historically shaped European cities, yet their wider territorial and spatial relationships remain insufficiently understood. This article proposes a multi-scalar, holistic and historically informed mapping approach to examine river port city territories as interconnected systems linking hydrology, logistics, urban form, governance and heritage. Building on the methodology developed for the *Port City Atlas* and refined for the *River Port City Atlas*, it investigates the Seine basin between Paris and Le Havre, revealing how inherited infrastructures and institutional fragmentation shape contemporary spatial challenges. By visualizing relationships across basin and metropolitan scales, the study argues that integrated mapping can support more adaptive territorial governance, sustainable logistics, climate resilience and heritage preservation in Europe's changing river landscapes.

KEYWORDS

River Port Cities
GIS-mapping
river basins
river networks
planning

WATER ICONS



Policy Recommendations

- Academics/mapping specialists should provide research approaches and data that foreground the regional/territorial/water dimension of European spatial development.
- European institutions should establish water basin–scale policy guidance.
- European decision-makers should provide policy guidance that positions ports in their river systems across the continent.

< Fig. 1 *Fluctuat nec mergitur*, by Adolphe Martial Potémont (Source: Musée Carnavalet / Ville de Paris, 1871. CC0 1.0 Universal Public Domain, via Wikimedia Commons).

Reactivating River Ports

Rivers have shaped Europe's cities and landscapes for millennia. Most major European cities, including many capitals, are located on a river and many are home to ports that have served as places of transshipment, where goods and people are transferred between water and land, facilitating urban growth and regional development. Shipping has long linked the cities of Europe, and river port cities have emerged as critical interfaces between waterborne and land-based transport, connecting inland territories to regional and global networks of commerce far beyond administrative and political boundaries. The importance of rivers to Europe's historical development is reflected in Sebastian Münster's sixteenth-century depiction of *Europa Regina* (Europe as Queen), in which the continent's major rivers – notably the Danube – feature prominently. These historic developments have led to the emergence of some of Europe's most iconic tourist destinations, think of Budapest and Vienna on the Danube, London on the Thames or Paris on the Seine (EEA 2016).

Despite the historical importance of ports, their relation to cities and their heritage remains understudied. While port and infrastructure developments are well documented in economic and logistics studies, their spatial and morphological implications remain comparatively underexplored. As early as 1985, historian Frank Broeze (1985) observed that historians, geographers and planners rarely examined port cities as urban formations shaped by their distinctive maritime and fluvial functions. The historical role of rivers and ports in urban development – even in well-known European cities – has often been addressed through case studies of cities such as Budapest, Prague, London or Hamburg, rather than comparative or territorial perspectives. Collectively, these studies illuminate the historical evolution of individual rivers and cities, but rarely examine the wider territorial relationships linking rivers, ports, cities and hinterlands across European river basins.

Renewed attention to the role of river ports in shaping cities and landscapes is needed today to address several pressing challenges, particularly climate-change related ones that are concentrated in port cities and their territories. Changing societal values and environmental transformations are fundamentally altering the relationship between cities and their rivers, introducing new economic, social and environmental risks. In response, we need approaches that accommodate human activities while working with hydrological and ecological processes – approaches that can also help historic cities, infrastructures and heritage landscapes adapt to changing hydrological conditions, while fostering more sustainable logistics and circular practices. This shift bears particularly on (river) port city territories, which we conceptualize as a layered, interconnected system in which waterbodies, ports and cities evolved together across borders, scales and jurisdictions (Hein, van Mil and Ažman-Momirski 2023). Yet despite their shared hydrological systems, governance and planning of these territories remain fragmented across administrative boundaries and sectoral responsibilities.

In the summer of 2026, climate-related water extremes affected shipping on major European rivers through drought and flooding, highlighting the need for a comprehensive spatial approach. Low river water levels have had a major impact on inland shipping and ports. Some politicians argue for deepening some of the rivers; however, this will not solve the issue of an overall lack of water. In July, historically low



^ Fig. 2 *Europa Regina*, by Sebastian Münster (Source: Sebastian Münster, *Cosmographia*, 1598. Public Domain Mark 1.0, via Wikimedia Commons).

water levels forced the closure of the port of Deventer on the IJssel due to low water levels (NL Times 2026; Dutch News 2026). Meanwhile the construction of new canals continues, such as the Seine–Nord Europe Canal, designed to connect the Oise River to the Dunkirk-Scheldt Canal and which could ultimately connect the Rhine and Seine basins.[1]

We posit that greater recognition is needed of river port cities and other cities along waterways as interconnected, dynamic urban systems that extend far beyond their administrative boundaries. Such an understanding provides the foundation for research that acknowledges both the changing hydrological conditions of Europe's rivers and the impact on cities and landscapes, highlighting insights for the planning of future mobility, production and heritage. We argue that multiscalar mapping of geospatial data captures the current state of these territories and provides a framework for interscalar and multi-stakeholder analysis as the result of long-term processes. Such mapping also reveals the historic construction of the region's shipping network and ports, showing how past decisions on infrastructure, land use and connectivity continue to shape current spatial realities. Mapping thus offers a time-aware spatial tool for strengthening territorial governance and recognizing river systems as connective, living infrastructures.

Building on the methodology developed in the *Port City Atlas* and the *River Port City Atlas* (Hein et al. 2023; Hein, van Mil and Höller 2026), we argue that such a mapping approach provides integrated perspectives that offer novel insights on spatial conditions, starting with water flows and emphasizing the role of ports. Understanding and planning the complex spaces of port city territories as historically evolved can help reveal – and act on – the interdependencies between their spatial structures, functional systems and institutional arrangements and historic development. To demonstrate the analytical potential of this approach, we analyze the case of the Seine River basin between Paris and Le Havre and the river port city territory of the Paris metropolitan region.

1. "C'est l'empereur Napoléon qui l'a dit: Paris, Rouen, Le Havre sont une même ville dont la Seine est la grande rue." Jules Janin, *Voyage de Paris à la mer* (Paris, 1847), 13.

Mapping the Seine Basin: Understanding the Present as a Result of Historic Processes

The Seine River basin serves as a compelling case study for our mapping approach and for understanding the challenges and opportunities of the river port city territory[2] of Paris, based on its historic development. The city's role as a port, captured in the motto "*fluctuat nec mergitur*" (as shown in fig. 1), has long driven urban development and water management. However, both the historic and the contemporary port functions are underdeveloped in contemporary planning – even though Paris is the largest fluvial port in France, and not sufficiently recognized as a tool for sustainable development and heritage preservation. Infrastructures designed to facilitate port activities shape contemporary and future relationships between the river, the ports, the city and their wider territories.

Mapping of the Seine River basin and its port system exemplifies the complex links among hydrological features, urban structures, societal values, cultural heritage and port systems. The Seine basin covers a large area of northern France, with Paris as its center, and it extends westward to link the regional capital port city Rouen and the maritime port city of Le Havre, France's second-largest commercial port, creating a hierarchical polycentric port system. The national capital has always been linked to other cities along the river. As early as 1802, Napoléon Bonaparte characterized this spatial continuity when he said, "Paris, Rouen, Le Havre – a single city with the Seine as Main Street." The street metaphor, later echoed by historian Jules Michelet, underscores the historical perception of the Seine basin as a single, functional and cultural corridor, rather than three isolated cities – an image that still resonates with planners and policymakers today (Brennetot 2019). From source to sea, the Seine River is now managed to regulate water levels, facilitate shipping and prevent drought and flooding, with limited integration across these efforts.

Cities, regions, national bodies and other entities such as HAROPA (the authority established in 2021 that governs the ports of Le Havre, Rouen and Paris) and Voies Navigables de France (VNF, the national waterway authority) manage specific locations according to their distinct mandates. This fragmented system is the outcome of economic developments, especially over the past century. Multiple stakeholders have used the Seine for specific purposes – drinking, washing, energy generation, shipping and sewage disposal – hindering the development of more integrated approaches. Water constitutes a fundamental matrix of metropolitan organization, structuring spatial relationships across scales rather than functioning as a separate technical policy field (Secchi and Viganò 2011). As illustrated by the 2013 strategic plan for the Seine, which aimed to coordinate development across the Île-de-France and Normandy regions, achieving basin-wide integration remains an ongoing political and spatial challenge (Brennetot 2019), one that also affects the city of Paris and its heritage.

Renewed attention to ports and shipping, along with ongoing discussions of the role of inland ports in Europe's multimodal logistics networks, would benefit from a comprehensive spatial visualization. According to the European Environment Agency (EEA 2024), inland waterways (i.e., non-maritime freight) accounted

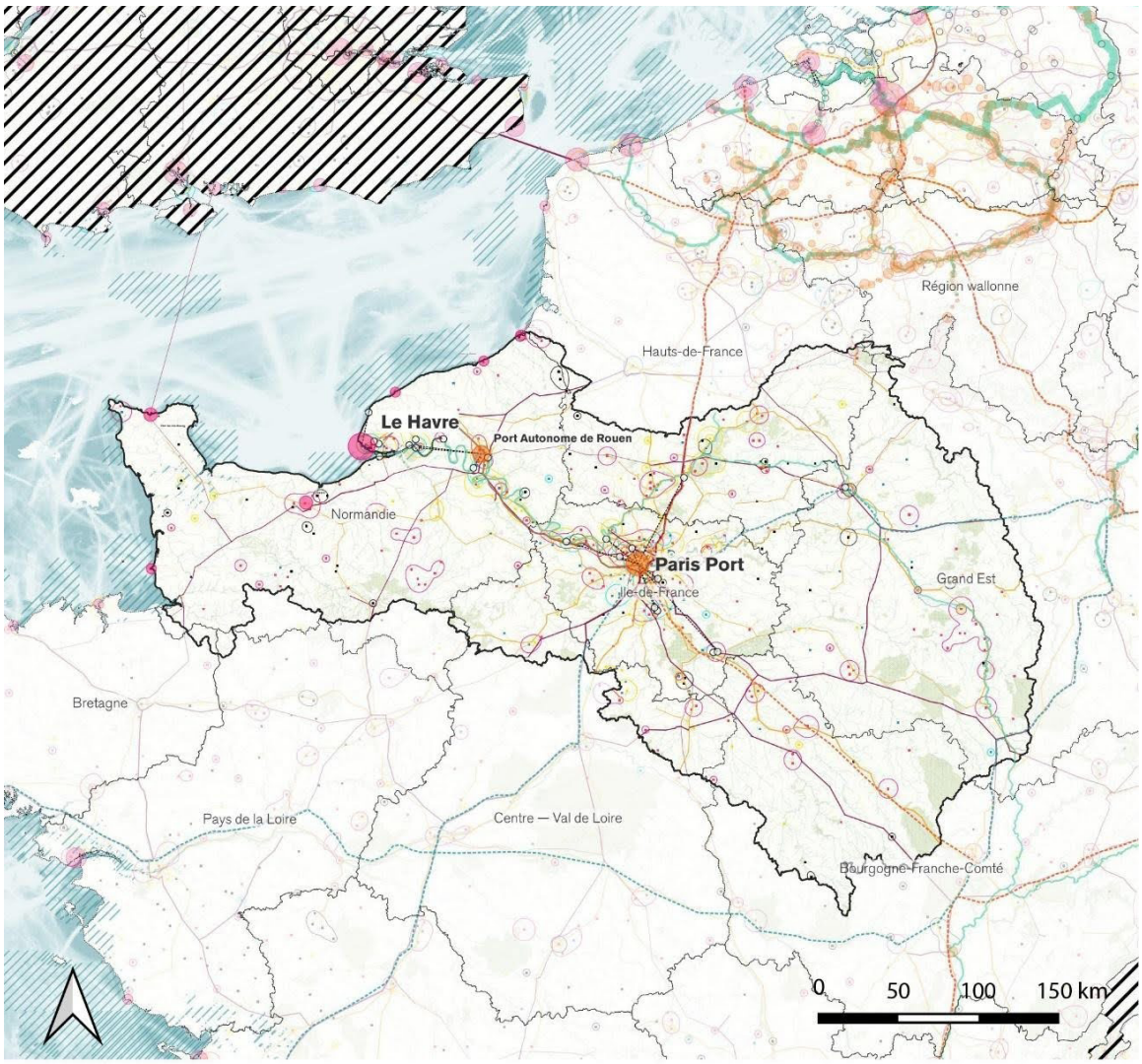
2. We have abbreviated this in the *River Port City Atlas* as RPCT (Hein et al. 2026).

for only 3.5 per cent of total freight transport (ton-kilometers) across all modes of transport in the EU-27 in 2022. In France, this figure is even lower, at 1.92 per cent. Despite these relatively low figures, inland waterway transport remains the most sustainable option compared with road and rail. It is therefore supported by multiple levels of government – EU, national, regional and municipal – as a strategic tool to advance a sustainable urban freight transport system (e.g., UNECE 2020; European Commission 2021).

Mapping inland port activities in the Seine basin, starting with flows of goods along the river, provides a foundation for renewed attention to the role of shipping. Infrastructural systems in France are traditionally oriented toward the capital, and this is also the case for water transport. The Seine, as a national river, has been governed by the capital city from source to sea. The City of Paris owns the river's sources and depends largely on the import of goods through Le Havre and via Rouen. The map (fig. 3) shows the Seine basin within Northwestern Europe and illustrates the importance of shipping on rivers and canals in serving the French capital, exposing a pattern that has evolved over centuries, as road, rail and canal infrastructure have been expanded to serve Paris. It also shows the role of Le Havre as the main maritime gateway to Paris, along with connections with the river network of the Scheldt to the north and the Meuse, Rhine and Rhône to the east.

The Seine basin spans multiple regional jurisdictions (NUTS 2), including the Île-de-France, Normandy and Grand Est Regions, forming a network of economic and ecological interdependencies. The map of the Seine basin (fig. 3) captures the hierarchical structure of the basin and the role of Paris as the dominant central urban node for trade and mobility, both by road and rail – along the north–south axis (linking Paris with Lille, Antwerp and Brussels and Bordeaux, Lyon and Marseille) and the east–west axis (from Le Havre to Strasbourg) – as part of the TEN-T Atlantic and North Sea–Mediterranean corridors. These motorways and railways run parallel to the inland waterways, particularly along the Paris–Le Havre river axis (the Seine), connecting the Port of Le Havre with the Port of Paris and extending from the Channel to the capital. This inland waterway network also links to Belgium's port cities via the Oise, the Canal du Nord and the Canal de la Somme. Both north–south and east–west connections are part of the same TEN-T corridors, a planned network of nine corridors, roads, railways, airports and water infrastructure, in the EU. The Seine–Nord Europe Canal will extend this network further, as it is designed to connect the Seine and Scheldt basins directly, and could ultimately link the Seine basin to the Rhine basin. The new canal can reinforce the Seine's position within a wider, cross-basin European inland waterway network, while potentially diminishing the role of Le Havre as entrance gate to Paris and the Île-de-France.

While the Seine basin's physical infrastructure forms an increasingly integrated cross-border network, its institutional landscape remains fragmented. For instance, the Seine-Normandy Water Agency is responsible for managing water resources across the basin. However, it must coordinate with numerous regional and local authorities, inter-municipal entities (EPTs) and independent port administrations – such as Haropa Port – but operates under distinct governance structures (OECD 2017). For example, flood risk management in the Paris region requires coordination not only among cities upstream and downstream but also between actors with differing priorities,



^ Fig. 3 Map of the Seine basin showing the overlapping functional, morphological and institutional dimensions within natural river basin boundaries (Source: Yvonne van Mil, Carola Hein and Lukas Höller, 2025).

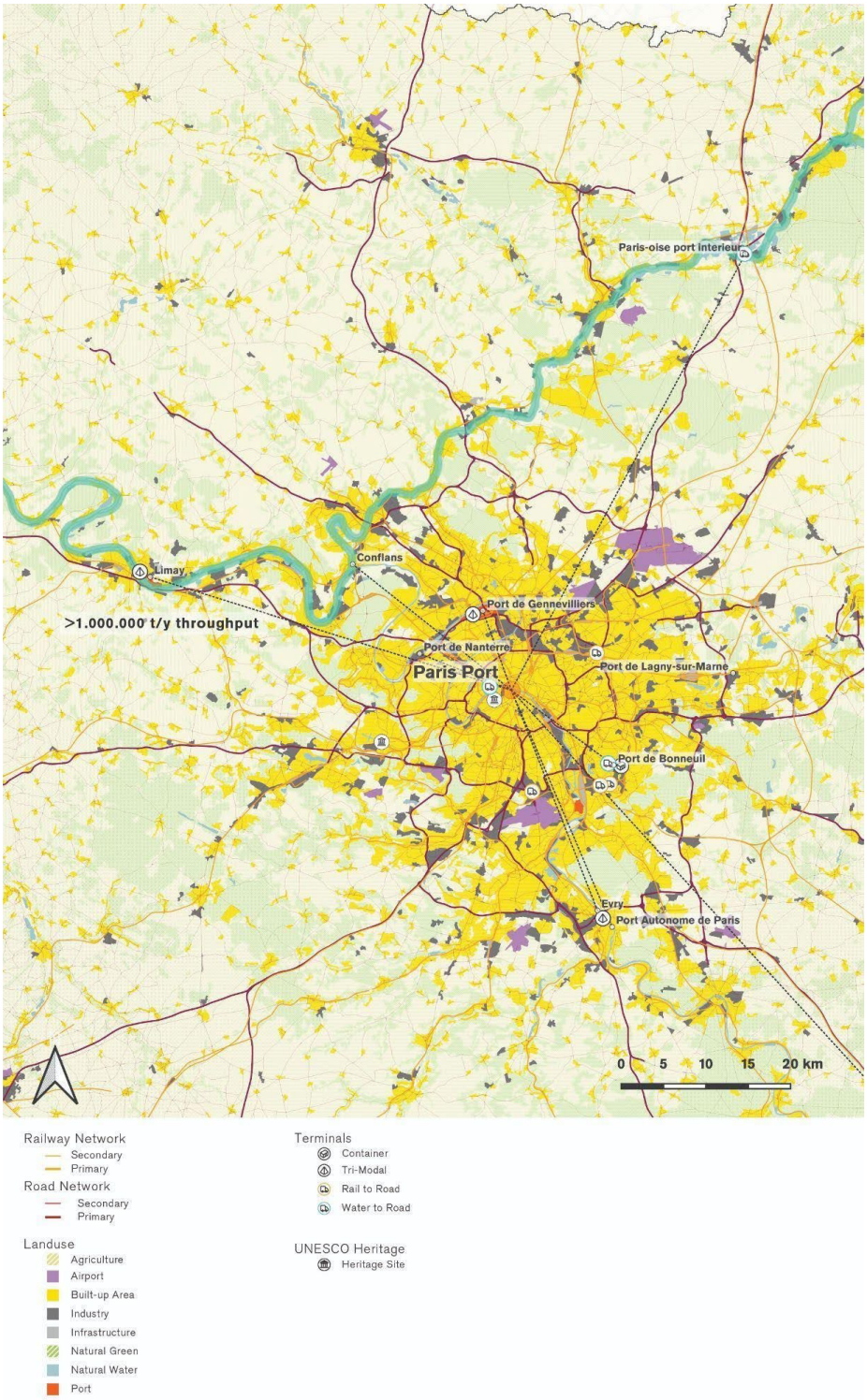
including urban planners in the Île-de-France, navigation authorities on the Seine and port operators in Le Havre. Efforts such as the Seine Grands Lacs reservoir system, designed to regulate water levels and reduce flood risk, illustrate how cooperation across administrative borders is both necessary and challenging to achieve in practice (European Commission 2021; PIREN-Seine Programme 2020). Balancing these competing priorities – economic, environmental and social – remains a constant challenge, particularly in densely regulated areas like Paris, including the city's World Heritage property.

Mapping for the River Port City Territory of Paris

Basin-scale mapping provides insights into comprehensive regional dimensions. Further zooming in is required to understand how these networks engage the scale of the river port city territory (fig. 4). Although the Seine remains navigable to the center of Paris, most long-distance traffic is not routed through the city; it passes through the major seaports of Le Havre and Rouen to Conflans-Sainte-Honorine, located at the confluence of the Seine and the Oise rivers, approximately 30 kilometers northwest of Paris. From there, most goods are shipped northward to smaller ports, such as Compiègne and Creil, via the Oise River, or they are transported through connecting canals, such as the Canal de Saint-Quentin and the Canal du Nord, toward key European ports, including Antwerp. As a result, shipping activity within Paris is predominantly local or regional. Peripheral cities around Paris are increasingly leveraging logistics to drive regional economic development, a trend especially pronounced in Le Havre, a major port competing with Antwerp and Rotterdam.

On the scale of the territory, the Parisian river port city appears as a single block within regional logistics flows; zooming into the river port city territory shows that the port system is distinctly polycentric (fig. 4). Ports de Paris comprises approximately 70 (smaller) port sites across the Île-de-France region, including the city center – where every area between two bridges is called a port – to larger sites further out, such as Gennevilliers and Bonneuil-sur-Marne. Together these sites form the second-largest inland port complex in Europe, after Duisburg. The spatial polycentricity, however, is not mirrored institutionally: HAROPA governs the entire network as a single authority, from Le Havre to Paris and in the Paris metropolitan area, concentrating decision-making power in a way the port system's physical distribution may not suggest. This tension between a polycentric territory and centralized governance raises a key question for further research: does institutional centralization under HAROPA constrain the advantages (smaller scale, locally embedded port sites) that polycentric organizations would otherwise offer? One such advantage worth investigating further is the potential for smaller, distributed port sites to integrate more readily into the urban fabric than a single large port complex, potentially generating less environmental and socio-economic impact per site and opening opportunities for local co-creation, public engagement and the protection of adjacent historic and heritage sites.

A historical example illustrates this potential for integrating smaller port functions into the urban fabric. In 2006, the Paris City Council took several initiatives to introduce a new freight transport policy, with the primary objectives being to reduce noise pollution and emissions, improve traffic flow in densely populated urban areas and strengthen the position of Paris within the trans-European freight corridors.



^ Fig. 4 Map of Greater Paris showing the overlapping functional and morphological dimensions at the territorial level (Source: Yvonne van Mil, Carola Hein and Lukas Höller, 2025).

To support these ambitions, several "part-time transit ports" (Dablanc and Frémont 2013) were designated along the Seine. These multifunctional sites allow goods to be unloaded directly from vessels onto trucks, after which the space returns to its usual urban use – e.g., as a promenade or plaza – for the remainder of the day. This approach supports sustainable distribution while minimizing urban disruption. These sites also provide opportunities for heritage preservation. However, the initiative's locally embedded, small-scale nature also exposes the underlying tension identified above: fragmented, site-specific solutions such as these still depend on coordination through a single, centralized authority, underscoring the need for closer collaboration between HAROPA, logistics companies and urban planners.

This tension between fragmented, site-specific coordination and the need for a more comprehensive governance framework extends beyond the scale of individual port sites to the Seine basin as a whole. The historical focus on Paris as the heart of the Seine basin and the Paris–Rouen–Le Havre shipping axis continues to shape projects. A notable example is Antoine Grumbach's vision in 2008 to extend Greater Paris along a unified metropolitan axis reaching Le Havre, building upon existing port and shipping structures and reflecting ongoing efforts to conceptualize the Seine basin as a coherent development corridor (Brennetot 2019) – however, one that is driven by the needs of Paris. Since 2022, under the name Entente Axe Seine, 16 institutions of various sizes and power – including the Métropole du Grand Paris, the City of Paris, the Métropole Rouen Normandie, the Community of Le Havre Seine Métropole and other Établissements Publics de Coopération Intercommunale (EPCI) – are collaborating to focus on comprehensive development and provoke a change in the discourse on spatial development, governance and the role of the watershed in the collective imagination, from the capital city to the coast (Eau de Paris n.d.; Métropole du Grand Paris n.d.). Together, these entities are undertaking projects relevant to the ecological, energy and industrial transitions. Paris and its partners are taking an innovative position in urban and territorial development and governance, focusing on common interests, new river strategies and urban logistics, sustainable agriculture, new forms of tourism, heritage and culture, energy and the governance of water spaces and flood protection and biodiversity. New interventions such as bike paths are being developed, but they do not appear to be part of a comprehensive approach. How to govern the current transition and what spatial and social tools and methods to use remains undecided. Meanwhile, similar attempts to create overarching governance systems in the context of the energy transition occur in other river basins, such as the Loire (Duval and Bahers 2023; Duval 2024).

Future Opportunities for Territorial Development from a Water and Port Perspective: Activating Heritage

Napoléon Bonaparte's 1802 description of Paris, Rouen and Le Havre as "one city, of which the Seine is the great street" reflects the historical, infrastructure-driven understanding of territorial unity that has long shaped the Seine basin. Our holistic, multi-scale mapping approach captures the current state of these territories and their function across scales. It makes the layered institutional fragmentation beneath this apparent unity visible, as well as the largely overlooked interdependencies across hydrology, logistics, governance and heritage that are shaped by inherited infrastructures today. It offers a comprehensive visualization of the

multiple flows and forces that are active in the Seine River basin and the Paris river port city territory.

River port cities are essentially networked: their character depends on their position on the river, or "street," its crossings and their position relative to other river port cities along the same network. This sets them fundamentally apart from seaports, which face the open ocean and can, in principle, function as an endpoint in themselves. Comprehensive management of the Seine River network as a single, integrated entity can enable the sustainable operation of shipping in Paris while also addressing ecological restoration, flood risk mitigation, recreational use, heritage preservation and improvements in water quality. Initiatives such as HAROPA and the Entente Axe Seine demonstrate the potential of coordinated, multi-temporal and multifunctional strategies. They also demonstrate the need to balance the interests and needs of the Paris metropolitan region with those of other port cities on the Seine and beyond. As spatial scales continue to expand while the urgency of climate and energy transitions grows, integrated mapping of this kind offers a tool for adaptive territorial governance – connecting local, place-based understanding with basin-wide coordination, not only along the Seine but in river territories elsewhere.

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