

Enhancing Riverfront Social Connectivity in Brownfield Redevelopment Projects in Germany

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ABSTRACT

Recent riverfront redevelopment initiatives in Germany are focused on enhancing the urban landscape and the connection between the city rivers and the citizens. Various strategies have been implemented in order to succeed in this endeavor over the past three decades. This paper focuses on the concept of social connectivity along the newly redeveloped riverfronts, and it examines the patterns of use of those riverfronts, the activities happening along them, and the extent to which the people are truly connected with the river. The research was done through a thorough examination of two riverfront redevelopment projects situated in Germany. The aim was to provide insights into the elements of public space design and its impact on the social fabric of the local communities. By understanding the roles of these public space elements, valuable knowledge for urban planning, development, and design can be gained which will be useful not only for Germany but also for other cities in the world that aim to redevelop areas along their waterways and enhance the connectivity between cities and the people. The methods utilized are extensive field visits, along with mapping exercises, and photo documentation. The findings indicate that the focus has been mainly put on longitudinal and lateral connectivity and vertical connectivity to the water has not been fully established due to pollution of the rivers.

KEYWORDS

Social connectivity, urban rivers, river redevelopment projects, public spaces

1 Introduction

In the industrial era, rivers were canalized to improve their navigability. Riverbanks integrated industry and infrastructures such as railroads and ports. These industrial zones were mostly placed in natural floodplains. The fluvial floods that occurred in those areas resulted in riverbanks being turned into rigid flood infrastructure and rivers being frequently turned into channels full of waste [1]. The primary role of these city riverfronts as industrial zones has diminished due to deindustrialization, leading to the deterioration of these areas into brownfields and their attractive location near a water-body eventually made them attractive grounds for new urban redevelopments [2]. Many European cities, particularly those in Germany, France, Spain, the UK, and the Netherlands, have undergone a remarkable transformation of their riverfronts. Their main goal was to reuse the brownfields along the rivers, to enhance flood resilience and to improve the connection between the river and the people [1], [3]. A famous example is the Seine in Paris which was visually but not physically accessible. Initiatives like the Paris-Plages, that places beach sand on the quays used as roadways, have successfully generated attractive public spaces [4]. The initiatives to clean the river for the upcoming Olympic Games in Paris even more ambitiously contribute to making a stronger connection between the river and the people allowing for contact with the water [5].

One of the first examples of riverfront redevelopments in Germany is Duisburg Innenhafen, located in the Ruhr Valley, where a transformation of an inland harbor followed the decline of heavy industries. The project aimed to revitalize the waterfront, blending refurbished buildings with new housing, offices, and cultural amenities. The Inner Harbor now features a promenade as well as housing along the canals. More river and riverfront redevelopments followed in the last decades – in Hamburg, Munich, Cologne, Berlin, Leipzig etc. and all with the goal of improving the connections of people with the water.

2 Theoretical Framework

Kondolf and Pinto [6] borrow a framework of longitudinal, lateral, and vertical connectivity from the field of environmental sciences, and discuss the social connectivity of rivers dividing it into longitudinal, lateral, and vertical social connectivity. By 'social connectivity' they refer to the communication and movement of people, goods, ideas, and culture along and across rivers. Longitudinal connectivity is mainly achieved by navigable rivers and transport routes along the river, whereas lateral and vertical connectivity represents the everyday utilization of riverbanks by people. There are many examples of initiatives in Europe that aim to bring rivers closer to the citizens. Improving urban connectivity involves integrating circulation networks, especially for pedestrians and cyclists, to enhance lateral connectivity between the city and the waterfront [6]. This may include removing barriers like highways or introducing safe crossing points, which means sacrificing of longitudinal connectivity for the creation of lateral connectivity [1]. In re-designing waterfront spaces, there is an opportunity to address vertical connectivity, extending from upper street levels to embankments, terraces, and eventually down to the water.

This paper borrows Kondolf and Pinto's [6] concept of "social connectivity" to analyze newly constructed cases of river and riverfront redevelopments in a German context. In Germany, these initiatives go beyond simple aesthetic improvements; their aim is also to improve the social interactions and activities along the river, to contribute to the well-being of people, and to re-establish a sense of community and urban identity, catering to a multitude of activities, from leisure and recreation to cultural events and economic ventures.

3 Purpose of Study and Methods

The case studies of interest are mixed-use and residential areas that are built onto former brownfields. This research does not investigate the extent to which these areas are integrated into the city fabric in terms of distance or the extent to which the riverfronts are being utilized at a given moment. Instead, the research investigates if and how urban planning and design for these areas allows access to the urban rivers and if it enhances longitudinal, lateral, and vertical social connectivity. The research is conducted with a qualitative case study methodology [7], [8]. Qualitative data collection methods include extensive field visits, mapping, and photo documentation. After the data collection, qualitative and comparative data analysis was done to find reoccurring patterns in both projects. The study seeks to offer lessons and recommendations for urban planners, policymakers, and city developers not only in Germany but also in other cities in Europe.

4 Case Studies

This paper explores two riverfront redevelopment projects that are situated on a former industrial site – the Neckar riverfront in Heilbronn and Main riverfront in Offenbach.

4.1 Neckarbogen, Heilbronn

In the city of Heilbronn at the turn of the last millennium, an area north of the train station had lost its once vital role as a handling, storage, and industrial zone. The ground in the area was full of remnants of its industrial past. In 2019 the Federal Garden Show took place, transforming the industrial hub into a contemporary and attractive district. The "Modellquartier Neckarbogen" is a housing project that is a part of the exhibition. The transformation of Neckarbogen's urban fabric is founded in landscape architecture, which played a central role in connecting fragmented riverscapes, eliminating spatial obstacles, and reclaiming previously inaccessible plots. Over two kilometers of open space have been reclaimed from unused land along urban riversides. The new developments integrate crucial landscape functions like noise reduction, stormwater management, and protection of urban wildlife, which are all integrated into the so-called "smart" multifunctional landscapes [9].



Figure 1: Heilbronn BUGA 2019 project plan, adapted from: Sinai Gesellschaft von Landschaftsarchitekten mbH

Neckarufer embankment park offers recreational space, while its terraces also serve as flood retention areas. With Felsenufer, Hafenberg Park features embankments of earth and stone rising to 12 meters. The walls and gorges double as climbing walls and vertical playgrounds, respectively. Rock fragments and gravel fields on Hafenberg hill slopes provide biotopes for lizards and thermophile insects. Karlssee Lake serves as a recreational area with a beach and wooden decks while doubling as a stormwater retention pond connected to the river Neckar via water steps. The lake is connected to the river Neckar via water steps. Furthermore, there is a “floating” wooden footbridge 500 meters long that serves as a pedestrian connection but also has resting spots along the river. Floßhafen is the second basin or artificial lake in the project area that includes stairs and seating steps around the lakeshore. There is also an artificial island featuring a water playground. Both Karlssee and Floßhafen water basins are a reminiscence of the port formerly located on the site [9].

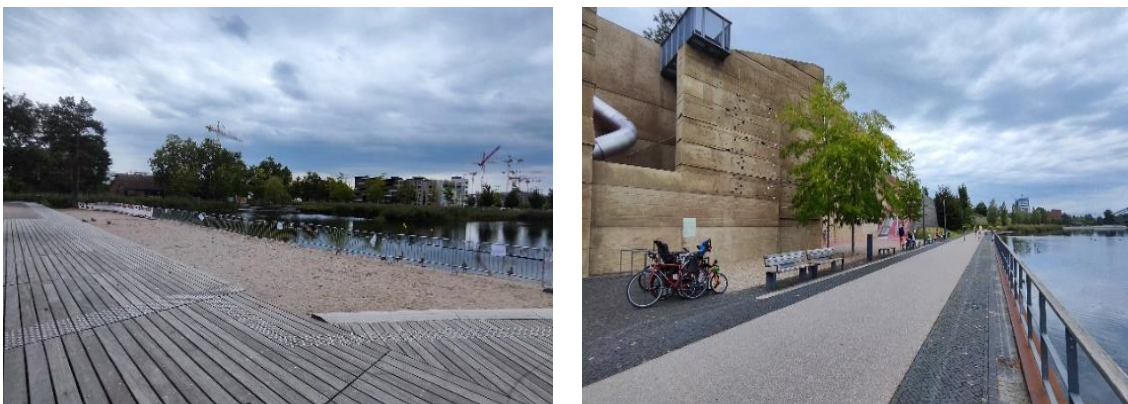


Figure 2: Heilbronn BUGA 2019 project, source: authors

4.2 Offenbach New Harbor

Offenbach am Main is an independent city in Hesse and is located near Frankfurt am Main. Historically, it was known for its strong presence in the leather goods, metal processing, and chemistry industries. Offenbach's port, situated on the northwest side of the Main River, was primarily an industrial goods storage and transshipment. Over time, the port became obsolete and remained dormant until the 1990s when redevelopment efforts began.



Figure 3: Offenbach New Harbor plan, source: Ramboll Studio Dreiseitl

The port area that also includes the small industrial peninsular is being revitalized into a mixed-use space that combines living, working, education, gastronomy, shopping, and culture. Well-known architects are contributing to this project [10]. The area offers diverse mix of uses, including rental and owner-occupied apartments, with most units completed by autumn 2016. A significant portion of the project area is designated for education, housing the Offenbach University of Design (HfG) and forming the "Design Port" in the Nordend district. Office spaces will occupy another substantial part of the area, with green spaces created at the tip of the harbor island and to the north [11].



Figure 4: Offenbach New Harbor public spaces along the water, source: authors

5 Findings and Results

The river's size relative to the city shapes its social function and urban layout. River width influences proximity, bridging ease, street patterns, and waterfront activities. Widths of up to 15 meters allow direct communication, from 50 to 200 meters create vibrancy, beyond 200 meters, individuals may seem distant and in very wide rivers, the opposite city often becomes a distant skyline, symbolizing regional identity [6]. Both examined case studies of riverfront redevelopments are located on rivers whose width fluctuates between 50 to 200 meters and involve artificially created basins as an expansion of the riverbed that are remnants of previous ports. In both cases, the basins visually connect residential buildings with the water [12], [13]. Both projects leverage these basins as an extension of the riverbed or as artificial lakes, providing a more secure and better-controlled water area that is separated from the river and that can be enjoyed by residents in the surrounding areas. The investigation into these redevelopments revealed that both cases have made significant steps in establishing longitudinal, lateral, and vertical social connectivity in the riverfront, encouraging social interactions, and revitalizing the urban landscape.

5.1 Neckarbogen, Heilbronn

The analyzed project area now is better connected through multimodal transport routes, with the newly established promenades facilitating better pedestrian interactions. The Neckar canal continues to serve as a longitudinal link. Lateral social connectivity has a significant improvement as there are many connecting routes that lead from the district to the river. The distance from one bank of the river to the other is approximately 84m which allows for good visual contact between both banks. The addition of pedestrian bridges allows for multiple crossing points across the newly constructed basins. The artificial lakes that are the heart of the new residential neighborhoods provide good visual contact with the water bodies for the new buildings.

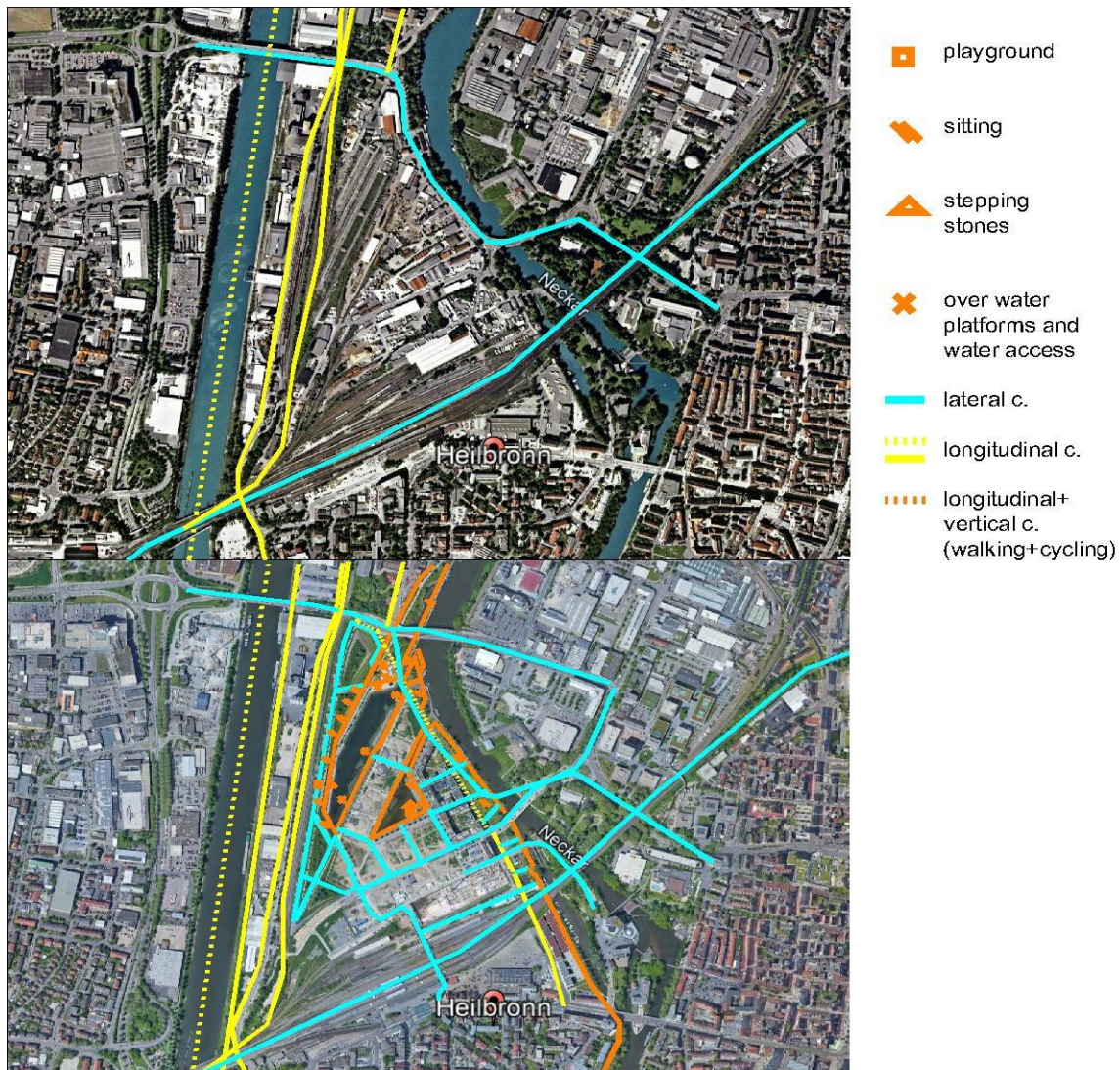


Figure 5: Heilbronn social connectivity map 2012-2022, source: authors

There are numerous access points that now offer direct contact with the water, incorporating design elements such as walkways over the water, steppingstones, and an artificial beach. However, most of these design elements are placed alongside the artificial lakes. To fill the lakes, a feasibility study led Heilbronn waste disposal companies to clean storm drains in the new "Neckarbogen" district. The separation system in this district channels wastewater and rainwater separately, with rainwater partially retained through green roofs and private property use. The rainwater is collected, treated in a multifunctional structure, and then distributed between the two lakes [14].

5.2 Offenbach New Harbor

The Main River maintains its longitudinal connectivity as it remains navigable. Moreover, the new residential district now enjoys enhanced longitudinal connectivity along the riverbank due to the integration of new public transport lines. Pedestrian connectivity is improved through the creation of promenades along the river and the harbor waterfront. Pedestrian bridges connect both banks of the harbor, facilitating easy crossing, although the connection to the opposite side of the river in that specific area is absent. Visually, lateral social connectivity is well established, with the harbor basin measuring a maximum of 64m in width and Main River spanning 123m. Vertical connectivity is made possible in a few spots around the basin, allowing access points for activities such as stand-up paddleboarding (sup boarding) and kayaking. To manage water pollution in the basin, an innovative drainage system that alleviates pressure on sewage systems is employed. This system ensures the separate treatment of rainwater and contaminated water. Moreover, strategically planted cleansing biotopes featuring grasses and perennials serve as natural filters for rainwater, contributing to the supply of fresh water in the harbor basin.[11].

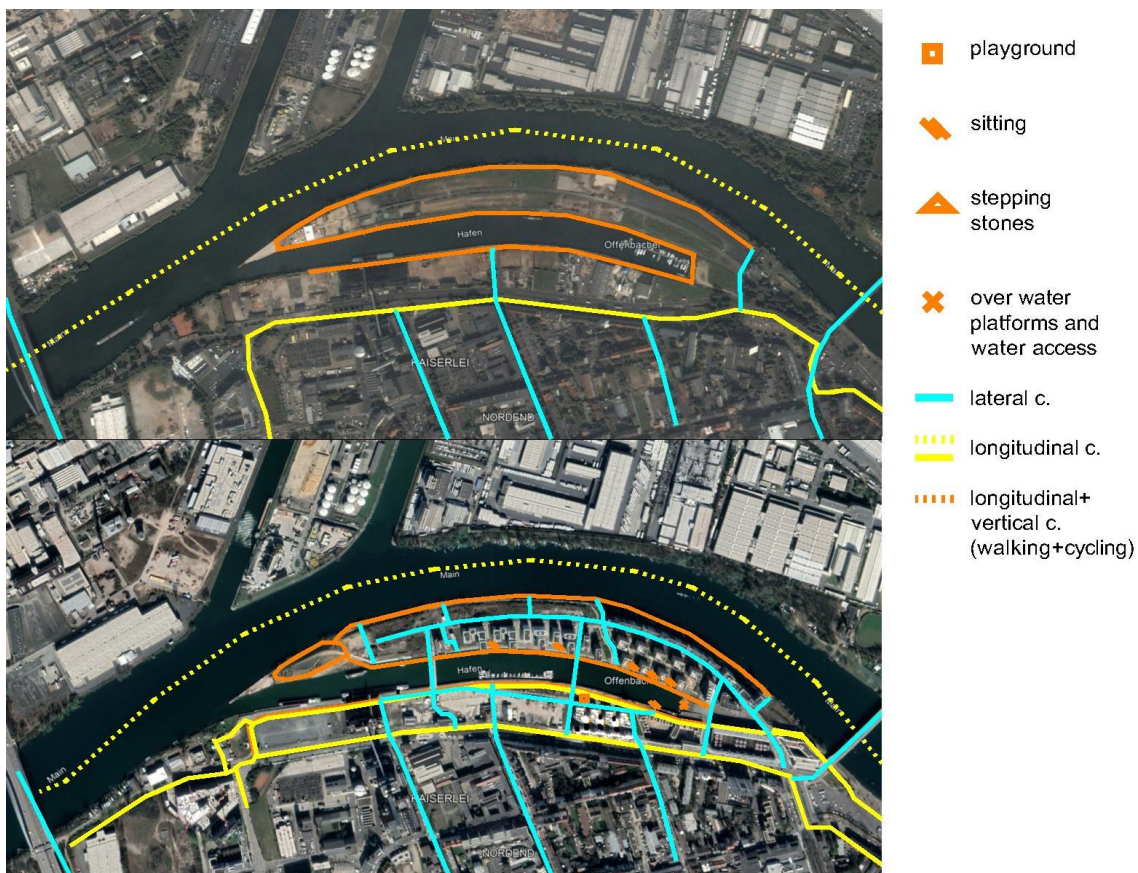


Figure 6: Offenbach social connectivity map 2004-2023, source: authors

Visitors and residents in both case studies are enabled to utilize the newly designed riverfront promenades for leisure activities and communal gatherings. The crossability of the artificial water basins located within the project area has been enhanced by the construction of pedestrian bridges in both instances, but crossability of the rivers has not changed. However, the distance between the banks of the basins ensures good visual connectivity. The residential buildings have been set back from the water, prioritizing the development of longitudinal promenades along the water. The primary linkage to the water has been established by optimizing views from nearby buildings.

The design elements that offer contact with the water are placed mainly alongside the basins in the two cases. The design of public spaces with stairs and steps that go into the water allows users to sit and do leisure activities there [15]. However, there are no access points that would allow activities on the side of the river. That is mainly because of the pollution of the waters and for safety reasons. Both case studies

showcase efforts to contribute to the water pollution of the areas particularly in the basins, however, swimming, and direct river access are still not feasible.

6 Discussion and Conclusions

The design of the examined banks, coupled with the presence of the artificial water basins as an “extension” to the river, significantly impacts the efficient layout of the built areas. The basins are particularly utilized to enhance the vertical connection to the water. In both case studies, the connection to the water has been instrumental in altering the perception of these areas, shifting them from being previously industrial or neglected spaces into vibrant hubs that cater to a multitude of activities.

In Offenbach, the port redevelopment project has effectively transformed the former brownfield into an attractive mixed-use area that overlooks the water and whose residents can enjoy a vibrant public space that allows the establishment of a vertical connectivity to the river. The reconfigured port area now accommodates a diverse range of activities, including promenades, and children’s playgrounds, enabling residents and visitors to engage with the area close to the water. Similarly, the BUGA 2019 Project in Heilbronn has successfully created a good longitudinal, lateral and partial vertical connectivity to the river within the new residential urban area. What is specific about the Heilbronn project is that the flood infrastructure is very well incorporated with the public space design. Namely, the flood walls serve as climbing walls, and the dikes are turned into steps and promenades that can be used for sitting and enjoying the view of the water.

The focus has been given to establishing visual connections to the water and with that to make the locations more attractive. The design elements employed in both projects, such as riverside promenades, green spaces, playgrounds, and amenities, have successfully transformed these riverfront areas into attractive and accessible public spaces. The assessment of social connectivity brought by both projects indicates that the longitudinal pedestrian connections within the redeveloped areas are well-established. However, because of the configuration of the basins, there is not a significant enhancement of longitudinal connectivity within the broader urban fabric. These new residential areas are being integrated with the introduction of new public transport routes. Lateral connectivity has been achieved through the construction of new bridges that cross over the basins, improving access to the newly developed residential buildings, but also through the implementation of more access points to the waterfront in general. Furthermore, significant efforts have been undertaken to establish vertical connections to the water. However, pollution issues have restrained with full contact and utilization of the water. Managing river pollution is a complex task that necessitates advanced measures, such as the deployment of sensors for early warning systems to notify the public about suitable times for river bathing. It is noteworthy that European cities aspire to attain relatively clean rivers, and the incorporation of European Green Deal and Digital Water Management strategies is expected to contribute to this goal in the coming decades. Having that in mind, the design of the riverfront should facilitate more access points that enhance the vertical connectivity to the river through direct contact with the water. To draw more comprehensive conclusions, an exploration of additional case studies is needed.

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