Case Profile Series on
Land Trusts as Climate Change Solution Providers

Restoration of the Lower Havel River in Northeast Germany

Eva Vayhinger
Prepared for the Lincoln Institute of Land Policy
Cambridge, Massachusetts, USA

INTERNATIONAL LAND CONSERVATION NETWORK

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Cover photograph of Havel River in Brandenburg, Germany. Source: Getty Images/hsvr

For questions regarding or copies of this publication, please contact Robin Austin at raustin@lincolninst.edu.

CASE OVERVIEW FOR EDUCATORS

Topic: Landscape and Ecosystem Restoration

Subtopics: Land Restoration, Climate Mitigation, Flood Protection, Cross-sectoral partnerships

Timeframe: 2005-2022

Primary Learning Goals: (1) Better understand how a large ecosystem restoration project was implemented despite institutional barriers and budget constraints. (2) Move through a case analysis that considers, in sequence, situation, challenge, proposed solutions, implementation, and results.

Secondary Learning Goals: (1) Develop insights into how conflicting uses of one landscape can be resolved. (2) Gain an understanding of the large networks of public and private partners that can make projects successful in multiple dimensions.

Primary Audiences: (1) Land Conservation organizations and practitioners. (2) Public decision-makers and regulators. (3) Staff, directors and supporters of NGOs, community organizations, (4) municipal planners, and (5) interested members of the general public.

Prerequisite Knowledge: General knowledge regarding climate change and the conservation of land and biodiversity

Summary: The lower Havel River restoration project in northeast Germany demonstrates that restoring an industrialized river system can provide significant benefits, including enhanced biodiversity and habitat, augmented recreational value, natural flood protection, and increased water storage capacity in the landscape. In addition, the restoration measures will buffer the river system from climate change impacts, thereby reducing the need for expensive remediation measures to repair climate change-related damage. This study assists conservation organizations, planners, and government officials in understanding the development and execution of a large scale river restoration project. This project has taken place over the last two decades, and the learnings from this case can be applied in a variety of regulatory contexts globally.

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Executive Summary

The lower Havel River restoration project in northeast Germany demonstrates that restoring an industrialized river system can provide significant benefits, including enhanced biodiversity and habitat, augmented recreational value, natural flood protection, and increased water storage capacity in the landscape. In addition, the restoration measures will buffer the river system from climate change impacts, thereby reducing the need for expensive remediation measures to repair climate change-related damage.[1] The project serves as an example for other river restoration projects across Europe and beyond.

The lower Havel River and its adjacent wetlands form the largest expanse of non-coastal wetland in the western part of Central Europe. In the 19th and 20th centuries, river engineering measures destroyed most of the natural dynamics of the river ecosystem and the adjacent floodplains. Until today, only a small proportion of the habitats and species communities along the river were preserved. Due to its ecological importance, most parts of the lower Havel Lowland are now protected by European and German national law.

After several decades of preparatory work, a large-scale river restoration project[2] is now nearing completion. The project aims to restore the natural dynamics of the lower Havel River and its floodplains along 90 kilometers (about 56 miles) of the river course. The project area is located around 70 kilometers (43 miles) west of Berlin, and the total budget for all river restoration measures that are planned until 2033 amounts to about 80 million Euros. The restoration project is led by Naturschutzbund Deutschland e. V. (NABU), a German nature conservation association.[3] Having started with an intensive four-year planning phase in 2005, it is so far the largest river restoration project in Central Europe.

The vision of the project is to restore a near-natural watershed with a meandering river and adjacent wetlands that harbour rich biodiversity. In addition, the project is envisioned to positively contribute to:

- Natural flood prevention for downstream cities and infrastructure
- Improved water quality for residential, commercial, and industrial water users
- Better conditions for rewetting peatlands and the associated increased carbon storage potential, and
- Increased recreational value for the local population and tourists.

These goals are being achieved by removing riverbank stabilizations, connecting cut-off meanders to the main river, removing dikes, planting additional riparian forests, and creating additional flooding areas. Reduced dredging to maintain the riverbed, more dynamic management of water levels, and nature-compatible grassland management are also being promoted.

The lower Havel River restoration projection proves that river restoration is possible, while meeting the requirements for navigability and flood protection. Several challenges had to be overcome to implement the project, however, including institutional barriers, opposing

stakeholder interests and budget constraints. Project managers planned and implemented the project with a high degree of transparency and a sound stakeholder involvement strategy, which has been crucial for its success. The project will likely have a positive impact on future river restoration projects. Furthermore, the project managers aim to share their experience to a broader audience interested in river restoration, as there has been high interest in the project and the expertise of the project managers.

The protection and restoration of the Havel River would not have been possible without the long-term engagement of the conservationists who lobbied for the change in the river's legal status, and worked on the project planning, mostly on a voluntary basis. The project also shows that initiating river restoration projects can be resource and time-consuming, and that it's essential to plan for human resource and financial needs when developing such projects.

By improving the water and habitat quality of the river, the project is expected to positively contribute to the implementation of the Water Framework Directive of the European Union.[4] The project has also contributed to reducing administrative barriers for future river restoration, as authorities had to solve for many unprecedented administrative and legal challenges. The project has furthermore demonstrated that thorough planning is very costly, which could spur efforts to increase the future public funding budget.

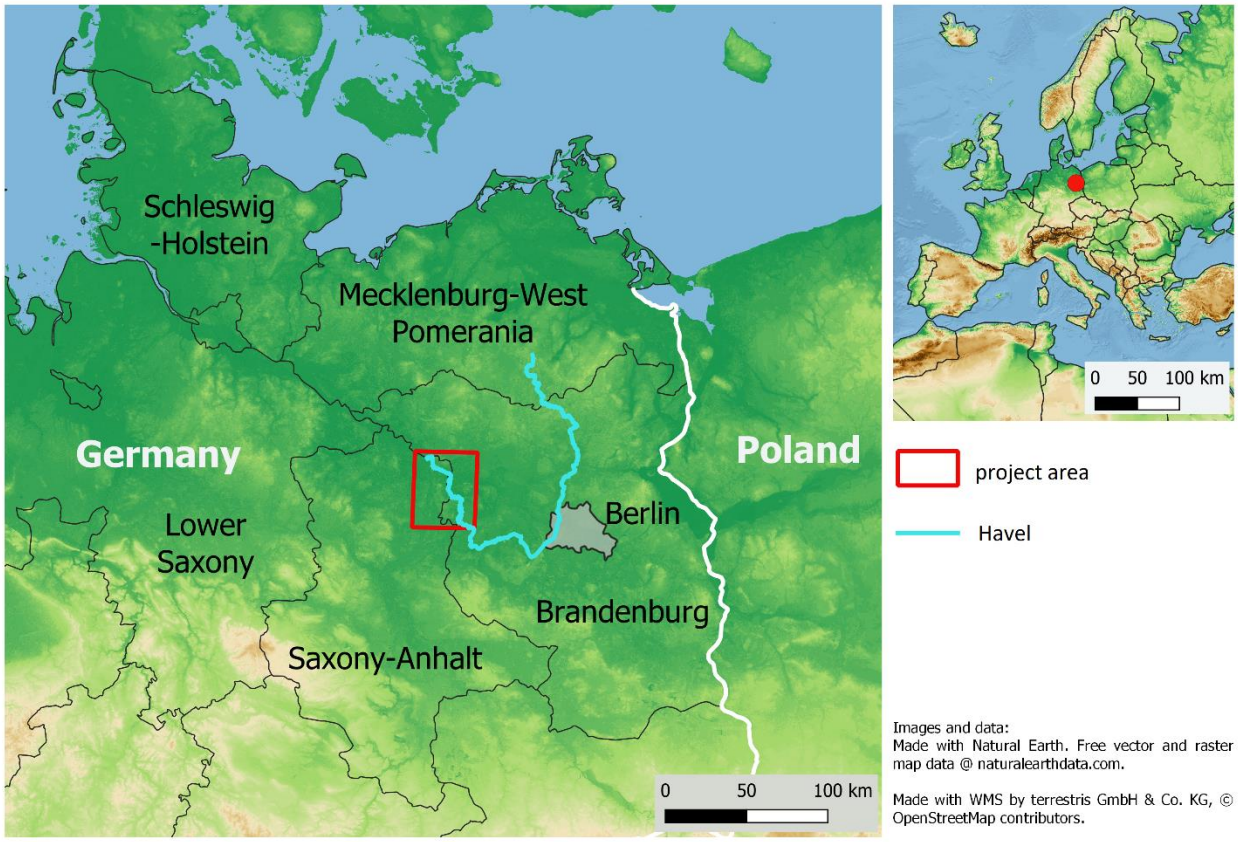

Figure 1: Geographic location of the project area. Credit: Elena Wenz

Introduction and Context

The Natural Landscape and History of the Lower Havel River

The Havel River flows through a former glacial melt-water drainage channel and supplies numerous lakes and wetlands in a mostly flat and sandy landscape.[5] In its 334-kilometer (approximately 208 mile) course, the Havel passes through Berlin into the lower Havel lowland.

Before human intervention, the Havel River formed a large and dynamic inland delta before flowing into the Elbe River.[6] The flood plains of the river were once characterized by vast mires (wetland areas dominated by peat-forming plants), numerous river bends, meanders and islands, sandbanks, siltation areas, tributary streams, lakes, and ponds. The dynamic water movement provided the base for a diverse habitat for many different plant and animal species and formed one of the most important non-coastal wetland areas in the western part of Central Europe.[7] The lower part of the Havel River has long been shaped by long-lasting spring flooding periods and regular summer flooding periods,[8] that endure for six months.[9] Before dams and dykes were built, Havel inundations were long feared by the local population because they frequently caused famine.[10]

Like many other rivers in Germany and Europe, the river and its adjacent wetlands have been heavily modified for shipping channel construction and maintenance, flood protection, and agricultural improvement measures. The first weirs to control the river's water levels were built in the 14th century.[11] From the mid-19th century onwards, the river was modified many times to maintain commercial river traffic.[12] Weirs, water gates, and summer barrages were installed to regulate the water level; parts of the river were straightened, the river cross-section was expanded, and stone bank reinforcements were installed, the last ones between 1965 and 1989.[13]

The Havel River has been intensively used for centuries for freight traffic between the city of Berlin and the sea.[14] To enable shipping, channels are, to this day, regularly maintained by dredging, which prevents natural development of the riverbed.[15] Since the beginning of the 18th century, the adjacent wetlands have been drained by pumping stations. Dikes were also erected to prevent flooding and to benefit agriculture.[16] From 1965 to 1989, the efforts increased to enable intensified grassland management.[17]

The river engineering measures resulted in major negative ecological impacts,[18] such as biodiversity loss and severe disturbance of the natural river dynamics. Nevertheless, complicated hydrological conditions made it difficult to completely tame the river and to drain all the adjacent land.[19] Hence, some parts of the wetland were placed under the protection of conservation regulations. That is why some parts of the lower Havel River's characteristic habitats and species communities remained in a relatively natural state until the 1990s and the river and its adjacent wetlands preserved their ecological importance.[20] Even before the restoration project began, the lower Havel lowland still provided habitat for more than 1,100 threatened and endangered plant and animal species.[21, 22]

People Engaged in the Restoration of the River

The restoration project began decades ago with a dream of a better future for a beloved natural site. An intergenerational group of people began working then to fulfill that dream. In the 1960s, nature conservationists successfully promoted the legal protection of some parts of the area. A Ramsar site for watershed protection was established in 1978. Additional sites within the watershed were protected within the framework of the Natura 2000 network of protected areas of the European Union, preventing some parts of the area from further degradation.[23]

Rocco Buchta, who in 2021 serves as the project coordinator of the river restoration project, is one of the engaged nature conservationists who has been very strongly committed to the restoration of the Havel River. Born in 1965, the nature conservationist was movitvated by his childhood memories of an intact riverscape to join the movement. Buchta recalls flooded meadows and extended morning fishing excursions with his father and grandfather, observing abundant birdlife.[24] When his grandfather stood stunned in front of the straightened river in the 1970s, Buchta made him a promise: "Grandpa, when I grow up, I'll fix it!"[25] Buchta's dream of his children's generation having the chance to swim in the Havel River's crystal-clear water and sit on sandy beaches, observing beavers, otters and kingfishers, is now coming true.

Problem Statement

By the beginning of the 1990s, most of the natural dynamics of the lower Havel River's ecosystem had been destroyed in the following ways:[26]

- Many former branches of the river were cut off from the main river course
- The flow velocity was significantly reduced, from 0.45 to 0.15 meters per second (17.7 to 5.9 inches per second), due to several barrages
- The average height of floods was reduced by 80 centimeters (31.5 inches), and the average annual duration of the flooding periods was shortened by four weeks
- The flooding areas were reduced to less than 15,000 hectares (about 37,066 acres; only about 10 per cent of the flooding areas of 1900)
- Further changes in the catchment areas of both the Elbe and Havel rivers led to a reduced flow volume in spring, the main reproduction period of aquatic and semi-aquatic biotic communities, and
- Most riparian forests had been cut down.

The possibilities to restore the Havel River were limited for several decades because of the river's intense use as a waterway. Legal restrictions associated with the river's waterway category, made it nearly impossible to implement any river restoration measures, especially those with the potential to reduce the navigability of the river. During that time, the natural river dynamics were further destroyed for the maintenance of the shipping channel and by agricultural improvement activities. It was therefore necessary to lobby for the re-categorization of the waterway into a less important category that would allow for more extensive river restoration measures. Furthermore, it was necessary to prove to authorities that the restoration

measures would not worsen flooding, which project managers were able to do because the river now has additional flow paths.[27]

Limited financial resources and changing eligibility criteria for public funding was an enduring obstacle for the planning and implementation of the restoration measures. The proposal for public funds that was approved in 2005 had to be refined eleven times before it was finally accepted.[28]

The project area lies within two different federal states with different planning authorities, which added further complications to the approval process. It is further characterized by a relatively small-scale ownership structure, a high number of adjacent municipalities, and many conflicting interests over the use and development of the lower Havel River. Farmers were concerned about reduced productivity and limited access to their land; hobby anglers were worried about their access to fishing spots, and shipping associations doubted the river would be navigable after the implementation of the restoration measures.

Strategy Options, Decision-Making, and Implementation

Strategies and Decision-Making Processes Before the Project Start

From the 1960s, when the first conservation efforts started, to the late 1990s, the main challenges with protecting and restoring the river ecosystem were the prevailing priority for cargo shipping and agricultural production. The lack of funding and public acceptance of the need for restoration measures, and an unfavourable legal situation added further challenges. While the natural dynamics of the river were destroyed between 1965 and 1989[29] to improve its navigability and drain the land for intensive grassland management, nature conservationists have subsequently focused on legally protecting parts of the river and its adjacent wetlands and on smaller restoration projects.[30]

The importance of lower Havel waterway as a freight shipping corridor began to decline in 1990, briefly after German reunification in 1989 and the establishment of unified road and highway networks.[31] A group of nature conservationists took this opportunity and started lobbying for a large-scale river restoration project. NABU Westhavelland e. V. (a regional group of NABU) founded the Association for the Lower Havel River[32] in 1991 and developed the first comprehensive concept to restore the riparian strips along the Lower Havel River. The association was one of the first to demand the shutdown of the lower Havel waterway for freight transport. Subsequently, the German Federal Ministry of Transport and Digital Infrastructure finally assigned a lower waterway category to the lower Havel waterway, which reduced requirements for shipping channel maintenance and benefited the development of natural structures.[33]

The German Federal Agency for Nature Conservation received the first grant application for a bigger restoration project of the lower Havel lowland in October 1991. From 1991 to 2005, the lower Havel River project developed from a wetland management project into a large-scale river restoration project, promoting the development of near-natural structures along the river and on its floodplains.[34]

Figure 2. Havel River in Brandenburg, Germany. Source: Getty Images/hsvr

Phase I – Development of the Maintenance and Development Plan

As is usual for river restoration projects in Germany, the project started with the creation of a Maintenance and Development Plan for the river, its riparian strips, and its adjacent wetlands.[35] The goal of this phase, running from 2005 to 2009, was to identify measures that would increase the ecological value of the site. Proposed restoration measures had to factor in that the lower Havel River was still a waterway, even though it had fewer official requirements than before. The potential negative impact of these measures on the navigational channel also had to be evaluated.[36]

NABU Westhavelland e. V. began the Maintenance and Development Plan with a thorough analysis of the conditions of the river and its flood plains before implementing the first river engineering measures. For this purpose, and especially for the reconstruction of the natural morphological conditions, involved agencies analyzed numerous documents from the 19th century, such as maps, longitudinal profiles of the watercourse, water level reports, memoranda, and hydrographic documents.[37]

The Maintenance and Development Plan included project goals Related to the restoration of a natural river system[38]:

- Ecological improvement of the lower Havel lowland for the protection and development of the floodplain's characteristic biological communities, as well as its physical features and functions
- Securing the retention capacity of the floodplains
- Near-natural development of the riverbed and of the recent floodplains through habitat management measures and through the dynamic processes of the running water; this was supposed to result in an improved structure of the water body, as well as a smaller discharge profile and more frequent and longer lasting floods
- Improved connectivity within the biotope network between the Elbe and Oder rivers, and
- Habitat development for biological communities that depend on wetlands as their habitats.

Furthermore, the Maintenance and Development Plan[39] has the following sub-goals[40]:

- Increased structural diversity and mosaic of habitats
- Increased and more diverse hydrodynamics
- Reduced barriers for animal species migrating along the river
- Improved regional water balance
- Increased share of floodplain forests/riparian forests, and
- Improved conditions of mires.

A feasibility study was conducted to examine and prioritize different measures and their impacts on the project goals. The measures that were rated best in terms of their balance between impact and cost were included in the plan (see Appendix 1).

Phase II – Detailed Planning and Implementation of the Restoration Measures

Implementation of a large proportion of the plan's measures began in Phase II of the project in 2009. Due to financial and legal restrictions, not all restoration measures developed in Phase I could be implemented in Phase II. The first measures to be implemented were selected according to budget constraints and costs, technical and legal feasibility, and with respect to the conditions set by the waterway and shipping authorities.[41,42]

The restoration project covers a project area of 18,700 hectares (~46,209 acres), with a core area of 9,000 hectares (~22,239 acres).[43] The core area of the project is identical to the area that is protected under the EU Natura 2000 framework.[44] Implementation of the following measures was planned through 2021:[45]

- Removal of 30 kilometers (~19 miles) of stone bank reinforcements
- Dismantling of two dykes to create around 500 hectares (~1,236 acres) of flooding area
- Removal of 17 smaller dams directly next to the river to facilitate the flooding of the natural flood plains
- Reconnecting 49 flooding channels and 15 oxbow lakes that were artificially separated from the main river course

- Planting 90 hectares (~222 acres) of floodplain forest
- Development of an adapted grassland management system, for instance with flexible dates for mowing
- Working towards reduced maintenance of the waterway
- Development of a dynamic water level management system, and
- Land purchase.

Financial and Budgetary Background

After several extensions and budget increases, the restoration project will cost roughly 80 million Euros; It will be completed by 2033, pending approval of a final follow-up application for 29 million Euros in 2022.[46] The German Environmental Ministry, the federal states of Saxony-Anhalt and Brandenburg, and NABU have financed the lion's share of the project costs. In addition to the large-scale restoration project, some smaller projects have been funded by other donors, such as riparian municipalities and private companies.

Results

River restoration measures, such as the removal of stone bank reinforcements, the connection of cut-off meanders to the main river, the replanting of riparian forests, and the reduction of river maintenance activities intended to improve navigability, are expected to positively impact the natural river dynamics, and increase plant and animal species diversity in the river and along its banks. Natural sandy riverbanks and other typical microhabitats of natural river ecosystems will form and provide enhanced habitat for various plant and animal species, following the removal of around 30 kilometers of embankment stabilization.[47] Reduced maintenance of the lower Havel waterway will restore the riverbed to a near-natural state with natural river vegetation (such as river reeds that provide nursery grounds for many fish species) and increased structural diversity. Similarly, little sand islands will serve as safe breeding sites for different bird species. Replanted riparian forests will contribute to the restoration of ecosystems that have almost disappeared in Germany.

As of today, most of the Management and Development Plan measures have been implemented. The first detailed ecological assessment of the project will be carried out from 2022 to 2025.[48] The restoration project is expected to have multiple measurable benefits in terms of biodiversity, water quality, flood protection, climate change mitigation, and landscape aesthetics.

Currently, some of the effects have already become visible, showing that the Havel is recovering. Project managers have observed the restoration project's impact on different plant and animal species, for instance, through sightings of certain bird or plant species and visible changes to the river environment. Furthermore, expert reports, such as one prepared by Monninkhoff *et al,* prove that river restoration is possible while meeting the requirements for navigability and flood protection.[49]

Removing two dikes and 17 smaller dams and reconnecting smaller flood channels to the river is intended to restore parts of the natural flooding dynamics between the river and its meadows.

Doing so will provide around 500 additional hectares of natural flood plains and increase the water retention capacity of the area. These measures are also expected to improve the conditions for species that depend on dynamically flooded wetlands as their habitats. Many fish species, for instance, depend on flood plains as their retreats during high water, as spawning grounds and as nurseries.[50]

Figure 3. Floodplain forests on the banks of the Havel River. Getty Images/Ina Hensel

Restoring natural flooding dynamics is further expected to facilitate the rewetting and conservation of mires and grassland, which is the aim of other conservation projects in the lower Havel Lowland. Since the 1990s, public authorities, mainly the administrative entities of the protected areas, have been purchasing pieces of land in the lower Havel Lowland to rewet or preserve them.[51] The restoration of these wetlands is likely to increase the soil carbon content of grasslands and mires, contributing to the mitigation of climate change.

The agricultural use of wetlands in the lower Havel lowland has already become more ecologically friendly: extensively used grasslands require less drainage and have the potential to provide valuable habitat for various plant and animal species. The implementation of an adapted grassland management system should improve the conditions for grassland birds.[52]

Connecting the river to its flood plains and planting riparian forests are also expected to increase the water quality of the river. It is also very likely that improving the river's natural features will improve the aesthetics of the landscape and enhance its recreational value.

Analysis and Implications of the Project

Several internal and external factors influenced the development of the project, including: jurisdictional and administrative circumstances; the availability of financial resources; the engagement of nature conservationists; and stakeholder interest on such issues as navigability of the river, land-use practices, and access to the river and its adjacent areas.

Jurisdictional and Administrative Circumstances

Even though the use of waterways for transportation has significantly decreased In Germany, most rivers are still treated largely as infrastructure for transportation. Waterways in Germany fall under many regulations that must be navigated when implementing nature conservation measures. Most of these regulations – especially for waterways belonging to higher categories considered as more important for cargo shipping – do not even take into account the possibility of river restoration measures. Therefore, it was crucial for the restoration project to change the jurisdictional status of the waterway. When freight shipping on the Havel River became less important in the early 1990s, dedicated nature conservationists managed to convince the relevant stakeholders of the benefits of the restoration project and to change the waterway category of the lower Havel waterway from Class III to Class I. Reclassifying the river abolished freight traffic, leading to reduced requirements for maintaining the shipping channel and stabilizing the riverbed.[53]

Dealing with public authorities was another major challenge, as the project area is located within two different federal states. In some cases, the cut-off meanders coincided with the borders of the federal states, resulting in time-consuming processes to identify the responsible authorities.[54] The small-scale ownership structures required a lot of bargaining and paperwork to successfully implement the planned measures.[55]

Stakeholder Involvement and Dialogues as a Key Success Factor

Due to the considerable size of the project area, the complicated ownership structure, and many conflicting interests concerning the use and development of the lower Havel River and its lowlands, intensive communication and discussions were essential for the project's successful implementation. Transparent, democratic, and laborious grassroots work, coupled with considerable care and diplomacy, helped address stakeholder concerns and win their acceptance of the project.[56]

Stakeholder Involvement Before the Project Start

Before the project start, the focus of local stakeholder engagement was on lobbying to abolish freight shipping and assign a lower waterway category to the river to enable the restoration measures. During the feasibility study,[57]which served as the basis for the final grant application, affected municipalities, user groups, and other stakeholders were integrated into the planning process.[58]

Simultaneously, the two district administrations that the lower Havel River flows through developed a joint Regional Development Concept,[59] to examine the economic and social impacts and define socio-economic framework conditions for the restoration measures.[60] In 2004, the German Federal Government, as well as representatives of the affected federal states and districts, consulted each other about the future project implementation.[61]

Stakeholder Involvement During the Planning Process

During the planning phase between 2005 and 2009, a project advisory group consisting of 130 institutional members was set up to create a high level of transparency and to include all stakeholders.[62] Project proponents also presented plans and updates to the broader public within the affected municipalities to provide general information, present intermediate results, and secure the municipal parliaments' official adoption of the restoration measures.[63, 64] The project advisory group and other stakeholders were given the opportunity to comment on the first draft of the Maintenance and Development Plan, which comprised a set of restoration methods. Project managers considered all 240 recommendations from 21 different written statements before reaching agreement on the plan.[65] According to Buchta,[66] this transparent and participatory approach was very useful for detecting problems and avoiding duplication of work.

Stakeholder Involvement in the Implementation Phase

Throughout the implementation of the restoration measures, project managers have regularly consulted with various stakeholders affected by the project.[67] Most of the time, these consultations are about finding reasonable compromises. The project managers also believed it was very important to build trust, show reliability, and highlight the importance of the project to the local population and public authorities.[68]

The project managers regularly engage in dialogue with the waterway and shipping office regarding solutions for reduced and less invasive dredging of the shipping channel; they also include them in the decision-making on which measures to implement to avoid reducing the navigability of the lower Havel River. The latter must be guaranteed, and public authorities worry that measures like the removal of stone bank reinforcements could lead to sand slides into the shipping channel. That is why NABU is obligated to provide costly preliminary assessments of the impacts of the restoration measures and to regularly survey the riverbed. One of the project's biggest challenges, especially at the beginning in 2010, was getting the restoration measures approved by both the waterway and shipping authorities and the federal states' authorities. Securing those approvals led to significant delays in the project implementation.[69]

Long-Term Engagement of Nature Conservationists

The long-term commitment of devoted nature conservationists, many of whom are characterized by their deep connection to the area, was a key success factor for the project coming to life. As described above, a considerable amount of time-consuming lobbying and stakeholder involvement activities were necessary to create the necessary legal conditions and general public acceptance that led to for the project implementation.[70]

Financial Resources

Financial resources have always been a crucial issue. The first restoration measures that were implemented before the large-scale conservation project was approved were especially limited by the lack of financial resources.[71, 72] As the available public funds provided after 2009 were not enough to implement all measures that were approved, the project staff had to be flexible in the implementation phase. The remaining restoration measures were implemented as soon as the budget became available.[73]

Lessons Learned

Many rivers in Germany and in other countries have lost most of their natural dynamics due to river engineering measures. River restoration can help to reestablish the ecosystem services provided by natural river landscapes. The Havel project now serves as a showcase for other river restoration projects, helping to accelerate the implementation of the European Water Framework Directive in Germany and in Europe.

It is already apparent that the restoration project has yielded multiple benefits for biodiversity, climate change mitigation, flood protection and an increased recreational value of the landscape**.** The project proves that the restoration of a healthy and vital river ecosystem is possible without disadvantaging the navigability of the river or flood protection. The restored river is becoming an increasingly attractive location for tourists and the local population, who are coming to understand that flood protection infrastructure such as stone bank reinforcements can be removed without adverse effects on surrounding settlements.

The stakeholder involvement and public transparency activities of the Havel restoration project during both project planning and implementation also offer important lessons that could help other river restoration projects in similar socioeconomic contexts to succeed. Unforeseen project costs can be kept low with high stakeholder involvement during and after the implementation phase. Informing and addressing in advance the concerns of relevant stakeholders, such as shipping associations, landowners, representatives of the tourism sector, and fishermen, reduces the likelihood of resistance to restoration measures, litigation, or other conflicts.

Figure 4. Banks of the Havel River. Getty Images/hsvrs

The project's experience could help future river restoration projects overcome regulatory and institutional boundaries faster, as public authorities play an important role for river restoration in Germany. Project managers can refer to best practices and solutions to various issues implemented by the lower Havel lowland restoration project, both in the field and with respect to administrative processes in public authorities. To address the increasing demand for expertise on river restoration, NABU has founded an institute[74] that others can consult; the institute will also initiate further river restoration projects in other regions of Germany.[75]

Policy Recommendations

Implementing the Havel River project demonstrated that various institutional barriers in Germany made river restoration difficult and time consuming. Waterway authorities were not allowed to implement river restoration measures themselves when the Havel project began. Hence, measures such as the connection of cut-off meanders to the river, or other river engineering measures with the potential to change the course of the river, had to be implemented by external nature conservation organizations such as NABU.

Furthermore, these measures could only be implemented after complicated and lengthy approval procedures. That is why several environmental organizations like NABU lobbied for the amendment of the German Waterways Act,[76] which recently came into force.[77] The amended legislation will allow the water authorities themselves to implement river restoration measures.

In practice, the implementation of these kinds of projects is still likely to happen in collaboration with environmental organizations, especially regarding the restoration of adjacent floodplains.

The lack of public funding to prepare applications for river restoration projects is another significant barrier. As these applications are complex and expensive, some organizations struggle with raising the necessary financial resources. Additional funding for the compilation of project outlines and grant applications, but also for the implementation itself, could help to accelerate river restoration. A more detailed publication on policy recommendations, based on the Havel River project's experiences, is being prepared by the current project coordinator, who was also one of the committed volunteers who helped make the project possible early on. It is expected to be published in 2023.

Finally, it is also important to consider that river restoration measures alone are not enough to create healthy river ecosystems. Other policy areas should also be addressed to achieve this goal. For instance, natural river dynamics in Europe are still threatened by smaller hydropower plants, as well as by pollutant discharges and eutrophication, especially from agricultural activities.[78]

Appendix 1: Measures of the Maintenance and Development Plan of 2009

The following measures were included in the Project and Development Plan:[79]

- Removal of 71 bank stabilizations with a total length of 29 kilometers (~18 miles)
- Connecting river and flood plains by reconnecting smaller watercourses to the river
- Removing 32 dams, and dismantling 2 dikes, thereby creating 500 hectares (~1,236 acres) of flooding area
- Reconnecting 23 cut-off meanders to the river
- Increasing the flood plain forest area by 200 hectares (~494 acres), and then increasing in the long run with an additional 700 hectares (~1,730 acres)[80]
- Using nature-compatible river maintenance methods in the entire core zone
- Developing a more dynamic water management system
- Adopting sustainable grassland management practices in the entire core zone
- Purchasing about 620 hectares (about 1,532 acres) of land to ensure the achievement of the goals of the Maintenance and Development Plan, and
- Building fish ladders.

Appendix 2: Study Group Questions

One of the several uses of this case profile is in an academic setting. Following are several questions that an instructor can pose to their study group to engage participants in the details of the narrative.

1. Is this a novel initiative? How have the protagonists addressed the issues of conflicting interests and multiple jurisdictions?

2. Is the solution profiled in this case measurably effective and strategically significant for the practice of land and biodiversity conservation and climate change adaptation and mitigation? Why and why not?

3. Is the solution emerging from this case transferable to other jurisdictions and will it endure?

4. Is this a large landscape solution that crosses sectors and political jurisdictions? Who are the key players from various sectors essential to the success of this initiative? What are the key technologies and organizational methodologies?

5. If you were a manager of this program at NABU, what would be your priorities for action in the next year? Over the next ten years?

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*Please note that most of these references are only available in German.

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ENDNOTES

[1] Palmer et al. 2009. In general, the implementation of river restoration projects can significantly contribute to the protection of existing resources and the minimization of expensive reactive restoration measures to repair damages associated with climate change.
[2] Title of the project: "Lower Havel Lowland between [the cities of] Pritzerbe and Gnevsdorf" (in German: "Untere Havelniederung zwischen Pritzerbe und Gnevsdorf")
[3] English-language information about NABU is available at https://en.nabu.de/
[4] European Union, 2000.
[5] NABU, 2021.
[6] Buchta, 2014.
[7] NABU, 2021.
[8] NABU, 2021.
[9] Buchta, 2014.
[10] Landesamt für Umwelt Brandenburg, 2019.
[11] Kirschey, 2005.
[12] The first continuous regulation of the water level along 60 kilometers was completed between 1882 and 1902.
[13] Uhlemann, 1987.
[14] Stork, 2018.
[15] Lengsfeld, 2019.
[16] Landesamt für Umwelt Brandenburg, 2019.
[17] Stork, 2018.
[18] Kirschey, 2005.
[19] Landesamt für Umwelt Brandenburg, 2019a.
[20] Landesamt für Umwelt Brandenburg, 2019a.
[21] NABU, 2021a.
[22] Landesamt für Umwelt Brandenburg 2019a; NABU 2021; May 2010. The river and the adjacent wetlands are inhabited by thriving populations of Eurasian beavers (*Castor fiber*) and Eurasian otters (*Lutra lutra*), as well as some fish species with distinctive site requirements The wetlands are important resting and wintering sites for northern European water and marsh birds). In total, 250 bird species have been documented so far, including 150 breeding species. The following bird species threatened by extinction are found in the lower Havel lowland: Eurasian bittern (*Botaurus stellaris*) with 25 breeding couples, 40 breeding couples of spotted crake (*Porzana porzana)*, little crake (*Porzana parva)* with two to five breeding couples, up to 10 breeding couples of black-tailed godwit (*Limosa limosa*), the common snipe (*Gallinago gallinago*) with 80 to 120 breeding couples, 160 to 200 breeding couples of black tern (*Chlidonias niger*), and up to 20 breeding couples of great grey shrike (*Lanius excubitor*)
[23] BMU 2009. That is one of the reasons why in 2009, before the restoration project started, the share of recent flood plains in the lower Havel lowland that were still preserved, including some longer sections that had only been slightly modified, was significantly above the average in Germany ().
[24] Weber, 2019.
[25] Stork, 2018.
[26] Buchta, 2014.
[27] NABU, 2020.
[28] Buchta, 2014.
[29] Uhlemann, 1987.
[30] Buchta, 2014. Due to the intensive use of the waterway and a lack of financial resources, these initial conservation efforts were relatively limited: some riparian forests were established on several hectares, a cut-off meander was

reconnected to the river, and a near-natural section of the shore with a length of 200 meters was prevented from being destroyed by bank stabilizations. Furthermore, there were some trials to reintroduce reeds.
[31] Buchta, 2014.
[32] German: "Förderverein Untere Havel"
[33] Kirschey, 2005.
[34] Buchta, 2014.
[35] In accordance with the funding procedures of the German Federal Agency of Nature Conservation, from which the project received the lion's share of funds, the river restoration project is divided into a planning phase (I) and an implementation phase (II). Each phase is based on an individual project proposal.
[36] Buchta, 2014.
[37] Buchta, 2014.
[38] Buchta, 2014.
[39] Arge Untere Havel, 2009.
[40] Buchta, 2014.
[41] Lengsfeld, 2019.
[42] Arge Untere Havel, 2009. Due to the limited available budget, the first project proposal for public funds for the implementation did not contain all the measures that were considered viable in the Maintenance and Development Plan that had been composed between 2005 and 2009. The project plan also included the purchase of certain areas, but one strategy to reduce the project costs was to avoid land purchase by involving the adjacent landowners to find solutions that did not necessarily require the acquisition of land.
[43] Buchta, 2014.
[44] NABU, 2019.
[45] NABU, 2019ª.
[46] Buchta, 2021.
[47] NABU, 2020.
[48] Buchta, 2021a.
[49] Monninkhoff et al, 2014.
[50] BfN, 2009.
[51] Buchta, 2014.
[52] NABU, 2019a.
[53] Kirschey, 2005.
[54] Lengsfeld, 2019.
[55] Buchta, 2014.
[56] Buchta, 2014.
[57] Ellman & Schulze GbR, 2004.
[58] Buchta, 2014a.
[59] ISW, 2004.
[60] Various expert discussions were conducted with relevant stakeholders, resulting in an implementation scenario and a demand list of socio-economic criteria. These demands mainly defined which sections of the waterway should remain accessible to what extent and stated that the Havel River should remain a waterway so that the river maintenance would still be financed by the federal government.
[61] Buchta, 2014a.
[62] Sub-working groups focused on (1) agriculture, fisheries and forest, (2) nature conservation, (3) sport and tourism and (4) water.
[63] Buchta, 2014.
[64] Buchta, 2014a. Within four years, 90 municipal events were organized in 30 different places (Buchta 2014). All participation procedures resulted in binding declarations – conversation transcripts of user group dialogues and resolutions of democratic bodies on the municipal level.
[65] Buchta, 2014a.
[66] Buchta, 2014a.

[67] Some of these stakeholders are, among others, public authorities, land users, residents, anglers, and the tourism industry. Concerns of these stakeholders were related to the accessibility of land, which can be reduced due to changed local water balance or the connection of cut-off meanders to the river. Others were concerned about the preservation or creation of swimming spots. In all cases, the project managers are keen to find solutions that satisfy these stakeholders' interests while making sure that the conservation goals are achieved.
[68] Buchta, 2014.
[69] Lengsfeld, 2019.
[70] Buchta, 2014.
[71] Buchta, 2014.
[72] Due to the intensive use of the waterway and a lack of financial resources, these initial conservation efforts were relatively limited: some riparian forests were established on several hectares, a cut-off meander was reconnected to the river, and a near-natural section of the shore with a length of 200 meters was prevented from being destroyed by bank stabilizations. Furthermore, there were some trials to reintroduce reeds.
[73] Buchta, 2014.
[74] Institut für Fluss- und Auenökologie (English: "River and Floodplain Ecology Institute")
[75] NABU, 2020ª.
[76] NABU, 2020b.
[77] GDWS, 2021.
[78] UBA, 2021.
[79] Buchta, 2014.
[80] Buchta, 2014.