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Socio-ecological Transformation in Brandenburg

Enablers and barriers in seven innovative projects and initiatives

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Summary

The socio-ecological transformation of Brandenburg is in full swing.

Alongside the coal phase-out and the expansion of renewable energy generation, new challenges are emerging in areas such as land use, water management, mobility, digitalisation, and culture. The RIFS research project "Socio-ecological Transformation in Brandenburg" investigates how this transformation is unfolding in communities, towns and regions. Drawing on seven case studies, we analyse lines of conflict, recurring patterns, and possible solutions. To this end, we interviewed key stakeholders from politics, public administration, business, culture, and civil society, as well as members of the public.

Our research is guided by three central questions:

- Under what conditions does sustainable development succeed with the backing of committed change agents?
- How is sustainability discussed in locales where it is not a central concern?
- What conflicting positions exist, and how effective have current solution strategies been?

Our exploratory approach allows us to identify initial insights and hypotheses about Brandenburg's socio-ecological transformation. We use the Multi-Level Perspective (MLP) as an analytical framework to examine the interplay between stable regimes, innovative niches, and external influences.

Key findings of our study include:

- A willingness to experiment has often proved more effective than rigid targets. For instance, strict material requirements for sustainable theatre productions can provoke resistance and limit the creative exploration of new solutions.
- Terms and concepts such as sustainability, self-sufficiency, and autonomy are interpreted and applied in widely varying ways.
- Individual, committed actors are frequently key to the success of transformation processes. In contrast, the absence of strong stakeholder networks can impede progress. These "change agents" require targeted support.
- Sustainable projects tend to be more successful when they also deliver economic benefits – for example, through community investment in wind energy or the profitable use of peatlands. A central challenge lies in reconciling economic incentives with social justice.
- Resolving conflicts between competing goals (trade-offs) is often complex and time-consuming. Nonetheless, our case studies demonstrate that compromise and creative solutions are possible, provided participants engage in open dialogue and commit to long-term planning.

With this RIFS Discussion Paper, we aim to contribute to the scientific and political debate and to highlight open research questions.

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RELEVANT TRANSFORMATION PROJECTS AND INTERVIEW PARTNERS IN BRANDENBURG

1 Introduction

David Löw-Beer

In Brandenburg the transformation towards sustainability is in full swing. The coal exit is progressing step by step, Tesla's Gigafactory in Grünheide has emerged as an important hub for electromobility in Germany, and renewables continue to expand across the state. But this shift extends beyond energy. From soil conservation, water management, and heating to mobility, digitalisation and culture – Brandenburg must develop and embrace new solutions to overcome its environmental and social challenges.

These transformations are multi-layered processes that entail both systemic upheavals and gradual change. In the academic debate, Kollmorgen, Merkel and Wagener (2015) distinguish between five key axes of transformation: "The first axis distinguishes between substantial, system-breaking upheavals and accidental, more reformative changes to the system. The second differentiates transformations with a clear subject and object from those where, in Hegelian terms, the system itself becomes the subject: a whole transforms itself. Related, but not identical, is the third dimension of controlled versus uncontrolled transformation. Fourth, a distinction is made between revolutionary, short-term, radical transformations and evolutionary transformations that unfold gradually over long periods. Finally, the fifth axis contrasts innovative transformations with imitative ones" (p. 11) (own translation).

Such transformations are inevitably attended by conflicts. As financial and economic interests collide, differing personal, situational, and disciplinary perspectives fuel value-based disputes and ownership conflicts (Bos 2020). Questions of social justice loom large in public debates around these transformations: Who bears the cost of change and who reaps the benefits? In some cases, resistance is so strong that processes of adaptation slow or stall and social tensions worsen.

In our project "**Socio-ecological Transformation in Brandenburg**", we explored how these conflicts unfold at the local level across seven case studies, identifying emerging patterns and possible solutions. To this end, we interviewed key players from politics, administration, business, culture, civil society and citizens. This research centred on the following questions:

- What factors contribute to the success of sustainable development in areas where stakeholders actively support change?
- How is sustainability discussed in places where it is not the focus of attention?
- What positions have proved controversial in Brandenburg and how effective are existing strategies?

We examined both the policy contexts **(see the overview of current sustainability policy in Brandenburg in box XY)** as well as local perspectives. The seven case studies presented here cover a wide range of topics – from digitalisation and community-supported agriculture to moor conservation and theatre projects, financial citizen participation, the heat transition and low-traffic inner cities.

Our approach is exploratory: In this discussion paper we present our initial findings, sketch out hypotheses and highlight areas for further research. We apply the **multi-level perspective (MLP)** as our analytical framework, which enables us to identify overarching patterns across the case studies. Using this approach, we identify five key themes that connect case studies and offer fresh insights into Brandenburg's socio-ecological transformation.

Substantially developed by Geels (2002), the MLP is a heuristic research framework designed to explain why some innovations succeed while others fail. It hones in on the interdependencies between technological, economic, political and cultural change processes (Schrape 2014). Originally developed to analyse technological disruptions – such as the transition from horse-drawn carriages to automobiles – MLP is now widely used to examine socio-ecological transformations, for example in the energy sector (Jayaraj, Klarin, & Ananthram 2024; Geels 2024; Geels, Kern et al. 2016).

A central assumption of MLP is that transformations are influenced by interactions across three analytical levels (Geels 2019):

1. **Socio-technical regime**: This level includes established technologies, regulations, market mechanisms and cultural norms. Lock-in mechanisms such as institutional dependencies, irreversible investments (sunk costs) and specialised skills stabilise the regime. As a consequence, change here is usually only incremental.
2. **Niches**: Radical innovations – new technologies, business models or practices – emerge in these protected spaces and can gain a foothold in individual market segments or regions as well as through targeted funding.
3. **Landscape**: This macro level includes long-term trends such as demographic change or climate change as well as sudden shocks such as political crises. These trends can destabilise existing systems and enable niche innovations to break through.

Socio-technical transformations are long-term processes that unfold across several decades. They typically progress through four phases: In the **experimental phase**, niche innovations are tested and refined. The **stabilisation phase** that follows is characterised by the emergence of a dominant design, technical standards and/or the marketability of the innovation. During the **diffusion and disruption phase**, innovations gain traction, destabilising existing regimes and competing successfully with established technologies or practices. In the final phase, **institutionalisation**, the new system is anchored in standards, regulations and routines (Geels 2019).

MLP enables researchers to take a comparative approach to transformation processes and analyse the interactions between stable regimes and dynamic developments in niches (Schrape 2014). However, it is important that researchers remain attentive to the defining characteristics of individual cases throughout this analysis.

Application of the MLP to the case studies
Our case studies primarily examine niches and transformation processes that are in the experimental phase, such as *climate-friendly cultural events, the use of peatlands for climate protection, and sustainable approaches to digitalisation*. These projects are still being trialled and it remains unclear whether and how their innovations will scale. Moreover, the research has revealed lock-in mechanisms that make it difficult to achieve change at the regime level. For example, theatre operators frequently lack the authority to implement sustainability measures in the buildings they use. Peatland restoration possibly presents the most promising avenue for regime-level change, as rewetting drained peatlands can provide economic benefits to farmers while also addressing the impacts of climate change on landscapes.

Some innovations are already transitioning into the stabilisation phase:

- Community-supported agriculture: Mergers between various companies and regulatory developments point to a growing institutionalisation.
- A low-traffic city centre for Potsdam: The proliferation of low-traffic city centres across Europe and the emergence of associated networks at the national and international level are indicative of a consolidation.

The case study "Renewable heating for all?" is in the diffusion and disruption phase. The geopolitical situation – in particular the cessation of Russian gas imports – and new legal environment have increased pressure on the existing regime and favour change. Nevertheless, policy changes and their long-term consequences remain uncertain.

Local government participation in wind power projects has reached an advanced level of institutionalization, with new regulations establishing the principle of financial involvement. However, it remains to be seen which model will prevail and whether this will translate into increased acceptance of wind power.

Six central themes of the socio-ecological transformation
While the cases presented here are diverse, several questions can be derived that are relevant for future research and practice:

1. **Experimentation vs. control**: Openness to experimentation has repeatedly proved to be more successful than rigid targets. For example, imposing strict specifications for materials used in sustainable theatre productions can elicit opposition and discourage experimentation with new solutions. Context-specific solutions are also preferable to blanket regulations when restoring peatlands.
2. **Framings and concepts**: Terms such as sustainability and self-sufficiency are used in very different ways. Some farmers consider their practices to be sustainable, for example, because they produce feed for their animals locally and sell meat in regional supermarkets, reducing feed imports and dependencies. In contrast, proponents of community-supported agriculture point out that in Brandenburg far more

agricultural land is used to grow animal feed than for the cultivation of fruit and vegetables – despite the fact that meat production is significantly more resource-intensive than fruit and vegetable cultivation. In other words: Food security and regional food supply chains could be equally well served by producing more vegetarian foodstuffs in Brandenburg on less land. Likewise, terms like “low-traffic” and “climate neutral” often dominate discussions, but are frequently questioned by practitioners whose motivations do not always align with these concepts.

3. **Change agents**: As many studies show (e.g. Heucher et al. 2024), change is often driven by a small number of dedicated individuals. Their resources, networks and ability to mobilise support are crucial to the success of sustainable change. The case studies presented here highlight both the importance of proactive local actors in making ambitious projects reality and how a lack of support can slow efforts to bring about change. These findings underscore the need for targeted support mechanisms to strengthen such change agents.
4. **Economic and social factors**: Economic and social aspects play a central role – be it in the growth of wind power, the heating transition, or the development of low-traffic city centres. Environmentally favourable innovations are more likely to be successful if they deliver economic benefits such as unlocking new revenue streams for communities or local government. Nevertheless, questions of social justice and around the sharing of economic benefits are hotly debated. Local authorities that have invested heavily in the build-out of renewable energy infrastructure often face dissatisfaction within the communities they serve over electricity prices. Ensuring that economic incentives do not undermine social justice remains a key challenge.
5. **Trade-offs**: Efforts to pursue sustainable development inherently involve conflicting goals, such as balancing the use of land for agriculture, renewable energy generation, or biodiversity conservation. Our case studies show how difficult it can be to find fair solutions that enjoy broad support across stakeholders and communities. But we also show that open dialogue and long-term planning can pave the way for compromises and creative solutions.
6. **Exchange and learning**: As frontrunner cities and towns continue to inspire each other in the energy and heating transitions, intensive learning processes are unfolding in community-supported agriculture, where strong networks have emerged. In the field of digital transformation, knowledge transfer and open-source solutions play a key role in scaling successful practices – as shown by the Smart City initiative.

These themes illustrate that socio-ecological transformations are conflictual and dynamic processes that are characterised by policy and regulatory environments, economic incentives, and stakeholder constellations. With this RIFS Discussion Paper, we would like to contribute to further discussion and highlight issues for future research.

2 Sustainability Policy in Brandenburg

Ira Matuschke

Brandenburg State is grappling with a range of sustainability challenges. These include the planned phase-out of coal-fired power generation by 2038, a broader shift to climate-neutral manufacturing and industrial production, and the ongoing expansion of renewables. Other key issues in Brandenburg are soil conservation, water management, mobility and social justice – particularly in rural areas.

The state government is committed to pursuing a path towards sustainable development that addresses the ecological, economic and social dimensions of sustainability to safeguard the quality of life for current and future generations. The State Sustainability Strategy is the centrepiece of sustainability policy in Brandenburg. In March 2024, the state government adopted a new iteration of the strategy aimed at further embedding the principles of sustainability and resilience in Brandenburg. The strategy builds on previous strategies from 2014 and 2019 and was developed under the leadership of the State Chancellery and with the support of the Sustainability Advisory Board. The strategy is based on the 17 UN Sustainable Development Goals and addresses five key priorities: i) natural resources, environment and nature, ii) economy, labour and innovation, iii) social justice, communities, and inclusion, iv) education and lifelong learning and v) health, care, and prevention. The strategy also includes an internal component that is aimed at improving the sustainability performance of public administration entities across the state. This includes, for example, measures addressing procurement and financing, as well as training and further education for sustainable development.

Another important strategy for sustainability in Brandenburg is the Climate Plan, which aims to achieve climate neutrality in Brandenburg by 2045 at the latest. The plan was adopted by the state government in March 2024 and comprises 103 measures across diverse fields of action, such as energy and industry, transportation, municipal climate protection and the circular economy. The Climate Plan and the Climate Adaptation Strategy are the two central pillars of the state government's sustainability policy. While the Climate Plan aims to reduce greenhouse gas emissions, the Climate Adaptation Strategy focusses on measures to mitigate unavoidable climate change impacts. These include, for example, peatland conservation in forest areas, the development of a soil de-sealing strategy and a heat action plan.

In its 2024 coalition agreement, the new state government committed to implementing the state's Sustainability Strategy and Climate Plan with the aim of fostering sustainable development in Brandenburg. The Climate Advisory Board is tasked with supporting the implementation of the Sustainability Strategy and Climate Plan.

Numerous initiatives and networks support efforts to promote and facilitate sustainable development in Brandenburg. Brandenburg Sustainability Platform, for example, provides a forum for communication and networking among the diverse sustainability initiatives throughout the state. The initiative "Brandenburg 21" has established a platform for projects and activities that promote socio-ecological transformations aligned with the 2030 Agenda. The ILB state investment bank supports the transformation towards sustainability through various funding programmes that support social and economic development. Overall, the broader picture is promising: Brandenburg is taking action on multiple fronts to lay the foundations for a sustainable and thriving future for the generations of today and tomorrow.

3 Digitalisation: Balancing Progress and Sustainability in Brandenburg

Silke Niehoff and Grischa Beier

Digitalisation promises efficiency and innovation but also presents environmental and social challenges – in other words, it does not necessarily lead to gains in sustainability (Renn et al., 2021). Nevertheless, the question remains: can digitalisation serve as a driver of socio-ecological transformation? To explore this, we examine two projects in Brandenburg: the Smart City initiative in Bad Belzig/Wiesenburg (Mark) and the digital farm Agrarbetrieb Rehfeld. In both cases, digital technologies are being employed to support sustainability, yet challenges persist – particularly in securing acceptance for digital approaches.

Alongside fascinating technical innovations and significant efficiency gains, digitalisation also entails socio-ecological drawbacks, such as the enormous demand for resources and the risk of excluding certain populations from the digital transformation. The question of whether digitalisation supports or hinders socio-ecological transformation therefore cannot be answered unequivocally. What is clear, however, is that the digital transformation must be actively shaped: by policymakers, who must establish a legal framework; by economic actors, who must integrate sustainability as a core principle in the digital transformation of their business processes; and by civil society, which should draw attention to shortcomings and help shape new digital solutions wherever possible.

How can concrete projects that combine socio-ecological and digital transformation be implemented in a state like Brandenburg, given this ambivalence? Our two case studies – the intermunicipal Smart City Bad Belzig/Wiesenburg (Mark) and Agrarbetrieb Rehfeld (Kyritz) – reflect the complexity and breadth of the fields of application of digitalisation for socio-ecological transformation. For instance, when climate data such as soil moisture and tree dryness are captured by sensors in the Smart City Bad Belzig/Wiesenburg (Mark), collated, and analysed in a climate database, or when citizen participation is facilitated through the Bad Belzig app. Or when digitalisation advances agriculture – improving soil health and helping to protect fawns from combine harvesters – while also raising important questions about how agricultural workers can be meaningfully included in this transformation. Our case studies are based on interviews with the project leads for Smart City Bad Belzig/Wiesenburg (Mark) and senior staff at Agrarbetrieb Rehfeld. The Bad Belzig and Wiesenburg/Mark Smart City Strategy was also a valuable source of information (Stadt Bad Belzig und Gemeinde Wiesenburg/Mark, 2023).

Case study 1: Smart Cities Bad Belzig/Wiesenburg (Mark)
The Smart City cooperation between Bad Belzig and Wiesenburg (Mark) was launched in 2020 under the federal Smart City programme and is one of 73 initiatives funded across Germany. In Bad Belzig, changemakers have adopted a strategic perspective to assess where digital solutions can add value and support the socio-ecological transformation effectively. Citizen participation plays a key role and is actively supported through digital tools such as the Bad Belzig app.

Digital environmental monitoring is an important aspect of this initiative. In the drought-prone Hoher Fläming region, sensors are used to measure climate-relevant indicators like soil moisture. This data is compiled and analysed to support planning and decision-making, particularly in the areas of environment, energy, and mobility. Other planned initiatives include a future-focused mobility campus, envisioned as a hub where service providers and start-ups can collaborate on developing alternatives to reduce car dependency. At their core, both the Smart City model and the socio-ecological transformation aim to enhance quality of life by addressing ecological issues and promoting social inclusion.

Case Study 2: Agrarbetrieb Rehfeld
Our second case study is the digital farm Agrarbetrieb Rehfeld. Located near Kyritz in the Ostprignitz region, the farm is committed to "producing regional, high-quality food in harmony with nature, animals, and people." Modern agriculture presents numerous challenges, and the specific climatic conditions of the region also call for water-efficient cultivation. Moreover, the land is managed with a view to maintaining soil health, preserving biodiversity, and promoting species protection.

To achieve these goals, Rehfeld employs advanced smart farming methods and a range of digital innovations. The effects of digitalisation are most evident in agricultural machinery. Digital route guidance systems can minimize overlaps during field operations and ensure that machines do not violate field/land boundaries. By improving tillage efficiency, smart farming reduces water loss and can increase yields. According to the farm's management, the operators of these machines also feel less stressed due to digital support, allowing them to concentrate more effectively on other tasks.

Employees were reportedly not concerned about being replaced by machines, though they initially approached the new technologies with some caution. Younger staff members, more comfortable with digital tools, took on the more technically demanding tasks at first – effectively lowering the barrier to adoption. This informal mentorship role is a well-known and effective phenomenon in innovation management, often referred to as that of the "informal promoter."

Agrarbetrieb Rehfeld also uses remote sensing and drones for digital field mapping, fertiliser optimisation, and to determine the optimal harvest time. In addition, thermal imaging cameras are used to check fields for fawns seeking shelter before the first mowing – a common occurrence at this time of year. If any are detected, staff carefully remove the animals from the mowing area.

Opportunities and risks of digitalisation for the socio-ecological transformation
Many of the known opportunities and risks of digitalisation for the socio-ecological transformation also apply in this regional context. Our case studies address the following aspects in particular:

- **Transparency regarding environmental impacts:**
  Digital technologies can enhance the monitoring and analysis of environmental conditions.
- **Efficiency and consistency:**
  Digital technologies can support more efficient use of resources and energy (for example, through intelligent power grids or smart farming). They can also promote consistency by enabling the use of renewable energy sources and facilitating circular economy practices. It is essential, however, to consider the resource consumption of the digital technologies themselves.
- **Participation:**
  Digital tools and communication platforms can be used to involve people more actively in political decision-making or to foster dialogue on socio-ecological issues. While digitalisation can strengthen participation, it also carries the risk of a digital divide, meaning that certain groups may be left behind.

To link digitalisation and sustainability, the Brandenburg Sustainability Strategy focuses primarily on social dimensions – such as social justice, cohesion, and inclusion – as well as on issues of education and lifelong learning, particularly digital competence among different target groups (Staatskanzlei des Landes Brandenburg, 2024). The Brandenburg Digital Programme 2025 also prominently addresses aspects of socio-ecological transformation. It acknowledges the ambivalence of digitalisation and emphasises the need for political steering and efforts to align digitalisation with the Sustainable Development Goals (Staatskanzlei des Landes Brandenburg, 2022).

Experimentation, Steering, and the Role of Change Agents
The proponents of Smart City Bad Belzig/Wiesenburg (Mark) describe the digital transformation as an experimental process, in which numerous small-scale measures are first trialled and subsequently scaled up based on their success. Another key insight that emerged from discussions was the importance of engaging with other stakeholders who contribute specific expertise. The early stages of regional digital transformation in Bad

Belzig/Wiesenburg (Mark) are closely tied to the founding of Coconat, a “workation retreat” that brought digitally-savvy individuals and fresh momentum to the region.

The successful adoption of these ideas can be attributed to the active involvement of local actors, a forward-thinking administration, and decision-makers who demonstrated a willingness to embrace change. In Bad Belzig, for example, the position of Digitalisation Officer was created as early as 2019 and was filled by a highly dedicated change agent who played a key part in advancing the region’s digital transformation. The establishment of this position and the presence of a dedicated individual who coordinated critical elements – such as securing funding, implementing measures, and identifying subsequent steps – were identified as key factors contributing to the success of the initiative.

In the agricultural sector, Brandenburg is also actively supporting digitalisation through targeted funding and a strong research infrastructure that fosters innovation and encourages its practical application. In our case study, however, excessive bureaucracy and outdated documentation requirements were seen as the main obstacles to digital innovation in agriculture. As with the Smart City example, it was the farmer herself who drove the digital transformation in her business—drawing on her own academic research experience. Younger employees, in particular, supported this shift, helping to gradually build acceptance of new digital measures within the workforce.

A Tool for Enhancing Quality of Life

The Smart City approach addresses regional challenges with the aim of enhancing the quality of life in the community. This focus resonates strongly with local residents. In this context, digitalisation is seen as a tool, not an end in itself. A key factor in its success was the early launch of the Bad Belzig app, which soon proved itself as a useful tool for informing and engaging citizens. The app was widely promoted, in collaboration with an adult education centre, and a dedicated support service was established to help individuals with limited digital skills become familiar with the platform.

Another success story is the region's emergence as a digitally progressive area, which has fostered a positive public image. The early success of winning the Smart Village Brandenburg competition, organised the state’s media agency, attracted attention and secured additional funding for Bad Belzig.

Digital agriculture offers significant potential for resource conservation and environmentally friendly farming practices. While frames such as "working in harmony with nature," "regaining society's trust," and "preserving biodiversity" were discussed, they were not explicitly framed as central to the digital transformation process. Instead, the primary drivers appear to be economic factors, including the modernisation of agriculture and the pursuit of increased efficiency and higher yields.

Economic Aspects, Exchange, and Learning

Implementing digital measures often requires investments that are challenging for local authorities to finance. The Bad Belzig/Wiesenburg (Mark) Smart City project serves not only as a best-practice example with significant impact but also as a model for other municipalities. Many of its outputs, such as the Bad Belzig app, have been designed as open-source solutions that other municipalities can adopt. A development fund has been established specifically to provide financial support for the introduction of these measures. In Brandenburg, more than 30 municipalities are already using such an app. From the outset, learning and knowledge transfer have been key components of the Smart City project, and the development of expertise is further supported by financial assistance from the state of Brandenburg.

The transition to digital farming entails investment costs, which can be partially mitigated through available funding programmes. However, the integration of various digital innovations remains a challenge, and knowledge transfer to the agricultural sector is still inadequate. Despite this, digital innovations hold significant potential to enhance efficiency and reduce costs. There is a clear need for more targeted training programmes for farmers. Although empirical evidence on the economic benefits is still limited, practices such as route control, soil management, and fertiliser optimisation are already resulting in perceived savings, according to those involved. "Field days" focussing on various issues around digital farming have proved effective in facilitating dialogue among farmers.

Social Justice
By emphasising social inclusion and digitalisation, Brandenburg's Sustainability Strategy underscores the importance of closely linking digitalisation with social justice. In the Smart City context, this means promoting citizen participation through digital tools and strengthening digital skills across the population. In agriculture, the key issues include how job roles are changing, how workers can be supported during this transition, and how the sector can retain its social acceptance.

Summary
The two case studies illustrate how digitalisation and socio-ecological transformation can be meaningfully combined at the regional level. Examples such as citizen participation or digital fertiliser optimisation show that digital measures are also compatible with the goals of socio-ecological transformation. Nonetheless, the cases do not offer a universal blueprint for socio-ecological digitalisation, and several open questions remain:

- How can digitalisation be tailored to regional contexts, and how can local needs be identified?
- How can ecological benefits and drawbacks be weighed, and how can unintended side effects be avoided?
- How can socio-ecological goals be placed at the heart of digitalisation, shaping its direction rather than remaining a by-product?

The examples from Brandenburg also demonstrate that these questions can be effectively addressed at the regional level, precisely because they help make the otherwise abstract connection between socio-ecological and digital transformation more concrete and tangible. To support this, sustainability impacts should be monitored more systematically on-site to enable reliable assessments.

4 Renewable heating for all? Learnings from pioneering municipalities

Germán Bersalli, Yves Périllard and Franziska Mey

THE ENTRANCE TO THE THERMAL ENERGY STORAGE FACILITY IN NECHLIN.
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Heating is a crucial component of the energy transition: around one third of Germany's total final energy consumption is used for space heating and warm water in buildings. However, unlike electricity—where renewable energy sources account for more than 50% of the mix—the share of renewable energy in heating was less than 18% in 2023. Oil, coal, and especially gas remain widely used for heating. At the same time, energy prices have risen sharply in recent years, leaving many people concerned about managing their heating costs. The heating transition must not only support climate goals but also ensure stable and fair energy prices in the long term.

Brandenburg and the rest of Germany urgently needs a rapid transition to renewable and affordable heating sources. But how can this be achieved at the local level? How can municipalities lead the way in transitioning to clean, affordable heating? Here we explore these questions through two case studies in Brandenburg: Prenzlau and Henningsdorf. While the challenges are undeniable, these cases demonstrate that diverse decarbonization pathways are both feasible and inspiring.

Research on the socio-economic, institutional, and political aspects of the heat transition in Brandenburg—and in Germany in general—remains limited. This section contributes to the socio-technical transitions literature on legitimacy, public support, and participation in local energy transitions and highlights the role of municipalities and their utilities as central actors. Given the localized nature of heating needs, municipalities have been identified as key actors in driving building heat decarbonization and implementing national policy at the local level (Martínez et al., 2022). This decentralized municipality-based approach is also prevalent in neighboring countries like the Netherlands, where municipalities lead in creating strategies and visions for gas-free districts nationwide. This approach is particularly relevant because reducing emissions from residential heating often requires a high degree

of direct engagement with households, and local governments are generally seen as the level of governance closest to people (Devenish & Lockwood, 2024).

In Germany, research also highlights historically evolved structural differences between the federal states in the East and West, which continue to shape their respective energy transition pathways. A recent study (Krikser et al., 2024) suggests that municipal officers in Eastern Germany tend to be less open to low-carbon heating options while remaining highly price-sensitive. However, past positive experiences with district heating in many Eastern German communities may facilitate the further deployment of these technologies in certain areas. In Brandenburg, most municipalities have yet to begin their local heat transitions but some have already made notable progress in this direction.

Prenzlau

Prenzlau (20,000 inhabitants) has set a goal of achieving at least an 80% share of renewable energy in its heating mix by 2030, focusing on geothermal energy. Located in the North German Basin, the city benefits from favorable hydrogeological conditions (Lang et al., 2024). Currently, around 80% of the heat delivered by its district heating network comes from natural gas.

Technologies for decarbonizing heating
Prenzlau's transformation plan, emphasizing the decarbonization and expansion of its district heating network, positions it as a pioneer. The plan, developed before the 2023 German Heat Planning Act, prioritizes renewable heat production, grid expansion, and household connections.

In 2025, the municipal utilities plan to complete the installation of a large-scale heat pump that will use geothermal water sourced from 1,000 meters below ground. This renewable heat will supply 5,500 residents, with geothermal energy projected to account for 60% of total heat generation, supplemented by industrial waste heat. Power-to-Heat technologies will also harness surplus electricity from wind and solar resources, further supporting the transition. Additionally, the city will connect its currently separate heating grids and extend coverage to new areas, enabling rapid expansion and decarbonization (Interview 1).

Enablers and barriers
The choice to prioritize geothermal energy was driven by its local availability, ensuring lower costs. Prenzlau's experience with geothermal energy in the 1980s and 1990s, though abandoned due to cheaper Russian gas, provided valuable expertise and existing infrastructure. Rising fossil fuel prices under the Fuel Emissions Trading Act (2019) further incentivized the transition, with government programs like Bundesförderung effizienter Wärmenetze contributing over €8 million to the geothermal project (Interview 1).

Collaboration between the municipality, the local utility, and the municipal housing company has been key. Regular discussions among these actors have facilitated planning and decision-making (Interview 2). However, challenges persist. Expanding district heating to low-density areas is unfeasible due to high costs, which would limit public acceptance. High electricity prices, currently exceeding gas prices, further complicate affordability.

National policy inconsistencies also hinder progress. Municipalities and utilities require stable long-term financial support, yet changing policies and restrictive regulations like the Renewable Energy Sources Act (EEG) discourage innovative solutions. For instance, utilities cannot profitably redirect surplus electricity from wind power to local heat supply due to the EEG's compensation structure (Interview 2).

Another challenge lies in securing external services from planning offices, construction companies, and hydrogeological experts, as high demand and labor shortages delay projects (Interview 1).

Public and stakeholder participation
Stakeholder engagement has been integral to Prenzlau's transformation. Municipal utilities developed a heat cadaster based on input from homeowners and housing companies, identifying demand and willingness to connect to the grid. To avoid negative perceptions, mandatory connections to district heating were canceled in favor of voluntary participation, encouraged through information events (Interview 1).

The creation of a district heating advisory board, including two external experts and a municipal officer, demonstrates a commitment to transparency. The board calculates heat prices every one or two years and provides price recommendations, ensuring objective,

scientifically backed pricing decisions. Rising heating costs, especially if unjustified, are seen as a threat to public acceptance, emphasizing the importance of transparent communication (Interview 2).

In sum, even if the results still have to be seen, Prenzlau is a pioneering municipality in the heat transition, having anticipated the need for a network transformation early on. The municipal utility recognizes the critical role of final heating prices in public acceptance and plan the grid extension with affordability in mind. It also prioritizes open communication and information-sharing to encourage homeowners to connect to the district heating network.

Hennigsdorf

Hennigsdorf (30,000 inhabitants) exemplifies a progressive heat transition strategy, aiming for a CO_2-neutral district heating supply by maximizing regional resources. Currently, 80% of households are connected to its district heating network, with renewable energy contributing 60% of the supply. The municipality's goal is to increase this share to 80% in the coming years.

Technologies for decarbonizing heating
The local utility harnesses waste heat from a steel plant alongside energy from a solar thermal facility, a bio-natural gas plant, and a biomass power station. Together, these sources generate 110 GWh annually. A multifunctional heat storage system balances energy fluctuations and enables the integration of intermittent sources, like solar and waste heat (Interview 3).

Plans are underway to build a second storage facility, five times larger than the first, with a capacity of 5 million liters. This facility will store an additional 13,400 MWh of heat annually, providing significant flexibility for future energy sources Hennigsdorf's heating system, which integrates diverse energy sources, is recognized by the Ministry of Economy and Climate Change as a transferable model for similar municipalities (Bundesministerium für Wirtschaft und Klimaschutz, 2024). Since 2010, the city's heating grid has expanded rapidly, growing from 59% to 80% household coverage. This growth, combined with diverse energy sourcing, supports the municipality's renewable energy target for heating.

Enablers and barriers
Collaboration between the municipal utilities and the planning office has been pivotal in driving Hennigsdorf's decarbonization. A strong political commitment, such as the adoption of a climate protection concept in 2015 by the municipal assembly, further supported the utilities' efforts. Earlier investments in biomass and solar thermal plants during the 2000s—despite limited government support at the time—laid the groundwork for today's renewable heating strategy.

However, these early investments led to rising heating prices, reducing public acceptance in the past. To address this, the municipality now emphasizes transparency about price developments and grid expansion costs. Changes to policy frameworks and the discontinuation of support schemes also threaten the municipality's long-term heating plans. For example, changes as the Heat Planning Act's cap on biomass usage at 15% of district heating after 2035. This shift creates uncertainty for Hennigsdorf, where biomass is a relevant renewable energy source. The restrictive conditions of the Renewable Energy Sources Act (EEG) further complicate matters. For example, using surplus electricity for heating disqualifies operators from compensation, making Power-to-Heat systems financially unviable. These limitations necessitate innovative solutions, such as connecting wind turbines directly to storage systems (Interview 3).

Public and stakeholder participation
Public acceptance is closely tied to transparent communication, particularly regarding heating costs. The municipal utilities actively explain the district heating pricing structure, highlighting its higher base price but lower consumption-based costs compared to gas. This approach is critical, as perceptions of rising prices often outweigh climate concerns in public opinion (Interview 3).

There is a mandatory connection clause to the heating grid, making clear communication essential to foster trust and acceptance. Crowdfunding has also proven successful: for the second heat storage facility, residents could invest and earn returns. This initiative raised €1 million, half from local residents, and bolstered public support. Connection demand to the district heating network has now outpaced the utility's capacity, reflecting increased public acceptance (Interview 3).

Hennigsdorf's comprehensive approach—integrating diverse energy sources, expanding its heating grid, and prioritizing transparent communication and financial participation—demonstrates how municipalities can lead in heat transitions. While challenges persist, including policy uncertainties and pricing concerns, Hennigsdorf serves as a model for sustainable, community-supported heating solutions.

The search for tailored solutions

The cases of Prenzlau and Hennigsdorf illustrate how municipalities, in collaboration with their local utilities and using district heating networks, can effectively drive forward the heat transition, even in the face of prevailing challenges and negative narratives about the feasibility of renewable heating in Germany. Both municipalities demonstrate that combining innovative technologies, strategic planning, and local resources can make significant progress toward decarbonized heating systems. Factors such as local political support, open communication with the public (for example regarding the current and future costs of heating), and engagement with stakeholders appear to be critical.

However, many municipalities in Brandenburg have small populations, others are widely dispersed, which may prevent them from developing a district heating network. In such cases, alternative solutions need to be implemented. For instance, the community of Nechlin in Uckerland harnesses the excess electricity generated by local wind turbines. The community developed a small network that uses wind electricity to heat water, which is then stored and used to heat around 40 households. Other rural areas rely on biogas or biomass as alternative energy sources.

There is no one-size-fits-all solution. Some municipalities may benefit from utilizing waste heat from local industries, while others can take advantage of favourable hydrogeological conditions for geothermal energy or harness solar or biomass energy. Each community, in collaboration with its citizens and stakeholders, must identify the optimal combination of technologies and practices to suit its specific circumstances.

The implementation of the 2023 Building Energy Act and Heat Planning Act – which require municipalities to develop a heat transition plan – gives rise to several further research questions: What mechanisms and strategies are municipalities using to conduct participation processes and engage relevant stakeholders in heat planning? To what extent do these approaches accelerate the transition? And how can smaller municipalities with limited resources and personnel capacity effectively advance heat planning and the heating transition?

5 A Year-Round Produce Supply from Brandenburg? Community-Supported Agriculture Can Do That and More!

Katharina Beyerl, Armin-Laszlo Halbach and Kristina Steinmar

Community-supported agriculture (CSA) farms show that a year-round supply of regionally and sustainably produced vegetables is feasible in Brandenburg. However, only a fraction of Brandenburg's farmland is currently used for vegetable cultivation, and the vegetable supply consists largely of imports. A resilient supply and regional value creation could be facilitated by supporting the delivery of services for the common good, switching to regional products in community catering, and placing an interdisciplinary focus on sustainability in schools and vocational training.

According to research released by the German Federal Ministry of Food and Agriculture, people asked about their food choices in Germany say that they attach importance not only to flavour but also to regional, fair and environmentally friendly food production (Deutschland, wie es isst: Der BMEL-Ernährungsreport 2024). But glancing at the shelves of the supermarkets where over 90 per cent of people buy most of their food shows that what is offered hardly fulfils these aspirations. It becomes clear before we even make it out of the fruit and vegetable aisle that much of what is available is neither regional nor seasonal nor from certified organic and ethically responsible agriculture. We urgently need a transformation of the food system.

Brandenburg: 1.3 million hectares of agricultural land – but only 0.5 per cent of it is used to grow vegetables

Around 1.3 million hectares of land is in use for agriculture in Brandenburg, but only around 6,200 hectares – a mere 0.5 per cent of this total figure– was used for growing strawberries and vegetables in Brandenburg in 2024 (Amt für Statistik Berlin-Brandenburg, 2024). Breaking this down further shows that the main crops by area are asparagus (3,517 ha), gherkins for pickling (466 ha), carrots (365 ha), and squashes and pumpkins (280 ha). The statistics for vegetables do not include potatoes, which are grown on an area of 10,700 hectares in Brandenburg. Most of the agricultural land in Brandenburg is devoted to cereals (470,000 ha), plants harvested green such as silage maize (264,800 ha), and meadows and pastures (305,200 ha). In light of these figures, it is unsurprising that Germany is dependent on imports for around two thirds of its vegetable supply. The country is, however, adequately self-reliant in potatoes and cereals (Federal Information Centre for Agriculture (BZL), 2024).

Community-supported agriculture as an alternative to imported vegetables

The community-supported agriculture model represents an interesting alternative to imported produce, as a community farm not only cultivates regional vegetables but also a culture of sharing responsibility, coming together as a community, and interacting with each other. In community-supported agriculture (CSA for short, or SoLawi in German, a contraction of 'solidarity agriculture'), people who are familiar with growing vegetables join forces with people who would like to eat regional produce from a farm with a fair, sustainable and environmentally friendly approach. Furthermore, a CSA initiative needs suitable land, seeds and seedlings, organic fertiliser such as compost, good organisational skills and an appetite for working the land. As CSA farms use regenerative farming methods and refrain from pesticide use, they enrich the biodiversity of the land and contribute to the accumulation of humus in the soil and to carbon storage.

The basic principle of CSA is that the budget needed to produce the fresh food the members receive in weekly harvest shares is calculated at the beginning of each growing season. This necessary budget includes all the outlays involved in producing vegetables – from incomes (and ideally also pensions provision) for the people who run the farm to costs

for equipment, land and buildings. The CSA members club together to reach this budget, and each member pledges to pay a defined monthly contribution for one year. In return, the members each receive a weekly harvest share of the farm's seasonal production. This means that CSA members do not pay for individual carrots or tomatoes but facilitate regional, sustainable and fair vegetable cultivation through membership fees.

Seasonality plays a major role in CSA. What is harvested varies from week to week throughout the year and between CSA farms. At the beginning of the year, fresh winter salad leaves are complemented by winter-stored vegetables such as potatoes, carrots, celeriac, cabbage and colorful beets. As spring advances, chard, radishes, peas and an expanding variety of salad leaves appear. In summer, the produce is especially wide-ranging and often includes tomatoes, cucumbers, zucchinis, fennel, peppers and beans. Autumn then brings pumpkins, cauliflower, broccoli, leeks, kale, onions and a fresh crop of potatoes. In addition, herbs and heirloom vegetables are often grown. Many CSA farms can also grow and harvest in the cooler months of the year because their greenhouses or polytunnels enable them to take advantage of sunshine while protecting plants from harsh conditions.

Solidarity with other members and the farm

While some CSA farms have socially inclusive subscription models that enable users to choose from discounted, normal and solidarity subscription rates instead of paying a fixed membership fee, others use bidding rounds in which every member submits anonymous offers over several rounds until the total budget for the year has been reached. These approaches foster solidarity in the community and enable everyone to participate according to their means. In addition, the CSA members show practical solidarity with the farm and the farmers by enabling planning security for them. On top of their monthly financial contributions, members can also volunteer labour by helping out in the fields or with organisational tasks.

Many CSAs offer harvest shares in more than one size. A small harvest share is usually enough for two people, and a large share suffices for about four people. The cost of a monthly harvest share varies from one CSA to the next and depends on what is included (usually vegetables, but in some cases also fruit, animal products or herbs). Monthly rates currently vary in a range between €60 and €140. Comparing these figures with the €62 per month an average household in Germany spends on fruit, vegetables and potatoes according to the Federal Statistical Office shows that the costs of a sustainable regional produce supply correspond to CSA membership fees at the lower end of the spectrum, although CSA also provides a level of quality and freshness that supermarkets are far from being able to match.

CSA in Brandenburg: Opportunities and challenges

In spring 2025, a total of 32 CSA farms in Brandenburg were listed on the Solidarische Landwirtschaft e.V. website. About one third of them are fairly small CSA initiatives supplying up to 50 households each, and two thirds are larger initiatives that produce fresh vegetables, fruit and in some cases also animal products for up to 350 households every week. Brandenburg's largest CSA farm has around 850 members. It is clear from these figures that a single CSA initiative could potentially supply a village with fresh produce all year round.

So why haven't many more CSA initiatives sprung up yet? One reason is that many people have still never heard of the model. Another is that becoming a CSA member not only involves delicious regional produce and meaningful community activities but also changes to ingrained habits. The weekly harvest share needs to be collected from the farm or a pick-up point, processed and eaten. While CSA members who are used to regularly preparing meals at home enjoy the surprises in their weekly harvest box and feel relief at having avoided a supermarket trip and dodged decisions about what to buy, people who travel a lot and often eat out can easily feel overwhelmed when they find themselves regularly inundated with vegetables. Nor does every lifestyle have room for helping out in the fields or taking part in CSA activities like farm festivals. What some people experience as enriching and enjoyable can feel like one more burden in a hectic life to others.

This all means that conditions for farmers or market gardeners running a CSA are often challenging. To be able to set an annual budget that covers all the operation's costs, they need confidence in their own work and enough members who are willing to pledge monthly contributions for a full year. Although the CSA movement in Germany has been expanding for years and almost five hundred CSA farms are now operational, finding and maintaining the member numbers needed to sustain the livelihood of the producers still represents a significant challenge, especially during the initial development phase.

We spoke to CSA farmers in Brandenburg who report that newcomers and young families were more likely to become members than long-standing inhabitants of the original rural community. Harvest shares are also delivered to pick-up points in larger towns and transported all the way to Berlin. Some SoLawis offer introductory trial memberships. In addition, the solidarity of CSA members also sometimes makes it possible for people who would otherwise not be able to afford the vegetables to receive harvest shares at no charge.

Education for Sustainable Development and social cohesion
CSA farms are multifaceted and can potentially provide meeting places and sites of learning as well as a local food supply. Member activities bring people from diverse backgrounds together to interact, exchange ideas, work together and support each other. Some CSA farms host farm open days, regular farm cafés and cultural events like concerts, author appearances or film nights. It follows that CSA farms can make a contribution to revitalising rural regions and strengthening community cohesion in these ways.

With the opportunities CSAs provide for getting practically involved and working together, they are also remarkable venues for learning and Education for Sustainable Development. Members become familiar with preparing vegetable varieties that are rarely available in supermarkets and discover how much effort is involved in growing vegetables in guided work sessions. Many CSA members develop a personal relationship with their CSA and the people who keep it running. And as members develop an appreciation not only for seasonal and local produce, but also for the labour and expertise involved, their efforts to cut food waste and make fair contributions increase.

Many CSAs regularly host children and young people, giving them the opportunity to learn more about vegetable growing, healthy soils and biodiversity. Some daycare centres and schools have opted to become CSA members and to use this regular vegetable supply in the lunches they serve. In these cases, however, it is important that their premises have kitchens and trained kitchen staff who can turn a varied supply of fresh regional produce into tasty meals.

Shortage of skilled workers despite meaningful roles
From vegetable cultivation to cultural outreach – running a CSA is jam-packed with variety and affords extensive scope for personal development and self-determination. Tasks arise in areas that include farm work, organisation, communication and education. CSA operators often experience their work as profoundly meaningful and fulfilling. But earning prospects that sometimes align with minimum wage levels and the physically tough work deter all but a handful of people from taking up these roles. In 2023, only three people in Brandenburg qualified in the state-recognised training occupation of vegetable cultivation. Only nine people were enrolled in training in the area altogether in that year. This training could possibly become more attractive if a specialisation in CSA (including educational work and the organisation involved in managing memberships) was integrated directly into the programme to give CSA beginners the necessary foundations in operating a CSA farm professionally. Furthermore, it is highly desirable that CSA farms should be remunerated for the educational work they perform on top of the work of vegetable growing. The provision of support services by local or state-level authorities to assist them with this educational work would also represent a major step forward.

Recognising and rewarding services for the common good and health
To make CSA jobs and memberships as attractive as possible, it is important that community-supported agriculture is recognised and rewarded for the real benefits it has for the environment and the common good. CSA farms currently have to compete with supermarket prices. The playing field here is not level, as the socio-ecological costs of the supermarket produce – biodiversity loss, soil degradation, greenhouse gas emissions, polluted waterways and plastic pollution – are externalised onto the public while large food corporations internalise profits. Agriculture subsidies need to be reconfigured to honour services to the common good rather than being based on the size of the agricultural area. Lowering the rate of VAT for more sustainable products would also make them also more attractive for consumers. People who are dedicated to the common good and the preservation of liveable conditions for future generations need to be able to make a living from their work, and sustainable food needs to become available and affordable for all. At the same time, optimising school and vocational education to integrate a cross-cutting focus on sustainability is also desirable to establish socio-ecological approaches and standards in work and life contexts. Community catering should switch to sourcing sustainable regional and seasonal produce. Health insurance companies could recognise the value of CSA membership for preventive health by offering lower health insurance contributions to their holders. In principle, every town and village would need its *own* CSA to be as resilient and independent as possible in these times of socio-ecological crisis. This would create jobs and keep money spent on daily necessities in local circulation.

6 Peatlands: Climate champions or a source of emissions?

Kathleen Mar

Natural peatlands, a type of wetland, store twice as much carbon as all of the world's forests combined – and they do so on just three percent the world's land surface. But peatlands that have been drained – as has been done since the 17th century to create dry land for settlements, farming, and forestry – release that carbon back into the atmosphere. Brandenburg wants to rewet its drained peatlands for climate protection and biodiversity restoration – but the farmers that are currently using this land aren't all that enthusiastic about this idea. In this case study we explore the options for rewetting drained peatlands in Brandenburg, the associated conflicts and challenges, and reflect on what we can learn about addressing sustainability challenges as a whole.

Methodology
The basis for this case study was a combination of textual analysis and informal interviews ("Hintergrundgespräche") conducted with stakeholders in Brandenburg, including with scientists, farmers, a representative from the private sector, a representative from a local nature conservation organization, and a staff member at the Brandenburg Environment Agency (Landesamt für Umwelt). Contact to the stakeholders with whom I spoke was, in part, made via personal connections. A web-based search, complemented by tips given to me by contacts, was used to identify additional relevant stakeholders, organizations, and initiatives in Brandenburg. After identifying these actors I also made direct inquiries with people with whom I had no previous contact. Further insight into the discussion surrounding peatland restoration was gathered via attending an expert discussion hosted at the Brandenburg State Parliament (Fachgespräch im Landtag, "Unsere Kulturlandschaft braucht Wasser!"). Further information was gathered by reviewing federal and Brandenburg policy documents, including climate and peat protection plans, and background information including, e.g., the Peatland Atlas published by the Heinrich Böll Stiftung.

Peatlands and their impact on climate
In their natural state, peatlands are climate heroes, storing large amounts of carbon in the soil as peat. They can even be a net sink for CO_2 – that is, drawing down more CO_2 than they emit. As such, protecting intact peatlands is an important priority in climate mitigation. Peatlands also help to keep water in the landscape and can buffer the impacts of flooding, making them valuable for climate adaptation. Beyond climate benefits, natural peatlands are hotspots for biodiversity as well.

On the flip side, drained peatlands emit almost 2 billion tonnes of greenhouse gases every year, twice as much as the global aviation sector. Germany's emissions from drained peatlands amount to around 50 million tons of CO_2 emissions, or around 7% of its total greenhouse gas emissions. The federal state of Brandenburg contains about 15 percent (264,000 hectares) of Germany's total peatland area; this makes it one of the most peatland-rich states alongside Bavaria, Mecklenburg-Western Pomerania, Lower Saxony and Schleswig-Holstein. Over 90% of Brandenburg's peatlands have been drained and are currently in use for agriculture (predominantly as pastureland) and to a lesser extent for forestry. In Brandenburg drained peatlands are responsible for around 7 million tonnes of greenhouse gas emissions, more than the whole of its traffic sector. When Brandenburg's coal-phase out is completed, it is expected that its peatlands will be the largest source of GHG emissions in the state.

Peatland protection and emissions reductions: Strategies and plans
In November 2022, the German Federal Cabinet adopted the National Peatland Protection Strategy (Nationale Moorschutzstrategie), framed as one of the necessary elements for

achieving Germany's target of climate neutrality by 2045.[1] The aim is to reduce annual greenhouse gas emissions from peatlands by at least five million tons of CO_2e by 2030. Before the adoption of the national strategy, the Brandenburg state parliament had passed a resolution on the development and implementation of a peatland protection program ("Moorschutzprogramm erarbeiten und umsetzen", Landtag-Drucksache 7/1122-B, 2020). In 2024 Brandenburg adopted a climate plan that includes a number of measures for rewetting and protecting its peatlands. Brandenburg's modeled pathways to climate neutrality by 2045 include net negative emissions for the land use sector (i.e., that land use will contribute to removing CO_2 from the atmosphere) by 2040, which will require a near complete rewetting of its peatland areas.

Rewetting is the fundamental measure for restoring peatlands and thereby reducing their greenhouse gas emissions. Wet peatland soils store carbon, whereas dry peatland soils react with the oxygen in the atmosphere, producing CO_2 emissions. In the case of rewetting peatlands, it is not an all or nothing (i.e., wet or dry) proposition. Some measures in Brandenburg's 2024 climate plan foresee raising the water table only partially, at least in the near- to midterm. This reduces emissions only somewhat, but can preserve some of the current agricultural practices – particularly when the areas are used as pastureland (i.e., grassland for animal feed).

Approaches for achieving peatland restoration and emissions reductions

On the purely technical side, rewetting peatlands is a technically feasible and low-cost climate mitigation measure. It is also a "nature-based solution," something which has been seen favorably in climate and sustainability strategies within Germany and the EU. But in practice there are significant political and societal barriers to the large-scale rewetting of peatlands in Brandenburg and Germany. The crux of the matter is that these lands are nearly all in use – predominantly for agriculture, but also for forestry. Most of the land is in a patchwork of private ownership, and the land users (e.g., farmers) are often not the land owners. This presents a complicated legal landscape if the government wanted to achieve rewetting via regulation. Even more problematic is the strong resistance from farmers: a full rewetting of peatlands effectively means that these areas can no longer produce the crops that they are currently producing (i.e., grass for animal feed or grains). Simply put, different types of plants grow in wet soils. What's more, conventional agricultural machinery like tractors will sink and get stuck in boggy, wet ground. For farmers currently tilling drained peatlands this means either giving up farming on these tracts (and thereby forgoing a part of their income) or a complete change in their farming practices to produce other economical crops – for instance, raising water buffalo or growing reeds that can be used for bio-based materials for construction, insulation, or packaging. This latter option of wet agriculture has been termed "paludiculture." While there are many ideas and concepts for paludiculture that are being discussed and tested, the market for these products does not yet exist in Germany, on either the producer or the consumer side.

Emphasis on voluntary measures

Currently, both Germany's federal and Brandenburg's plans for peatland protection and associated emissions reductions rely completely on voluntary measures combined with financial incentives. The voluntary nature of these measures and the need to work in cooperation with local farmers and landowners is stressed.

In Brandenburg, several farmers that I heard from support the idea of a partial rewetting, in the form of raising the water table only somewhat – e.g., to a level of 30 cm below the surface, for which there are some financial incentives.[2] In their perspective, this is a win-win situation for everyone – it reduces greenhouse gas emissions and the farmers can more or less continue with business-as-usual, with the same crops and same equipment. Furthermore, this form of rewetting is also likely to provide additional benefits for agriculture by holding more water in the landscape. It certainly makes sense to take this intermediate step, for which barriers are fairly low. But if we stop at this solution, we will not achieve our climate goals: climate neutrality will require peatland emissions to go to near zero, which requires a full rewetting.

A second pillar of Brandenburg's peatland strategy is the creation of climate- and biodiversity-friendly value chains that allow agricultural usage of fully rewetted peatlands – in essence, the paludiculture concept. Like for other peatland protection measures outlined in the strategy, these new forms of wet agriculture and the creation of a new market for paludi-biomass should be developed together with farmers and other stakeholders on the basis of voluntary cooperation. Here, strategy documents stress the need for innovation and

[1] Climate neutrality is defined as net zero greenhouse gas emissions.

[2] These financial incentives are within the Framework of EU Agricultural Policy, see, e.g., "Richtlinie AUKM Klimaschutz und Wasserqualität": https://mleuv.brandenburg.de/sixcms/media.php/9/RL-AUKM-Klimaschutz-Wasserqualitaet.pdf

testing. Drained peatlands represent about one fourth of Brandenburg's total agricultural land; a shift to paludiculture in these areas would involve a shift to new types of largely non-food crops: e.g., reeds and bulrushes that could be used as sustainable materials for construction, insulation or packaging. In addition to different crops, shifting to paludiculture would require farmers to invest in new equipment, such as tracked vehicles ("Raupenfahrzeuge") that distribute weight more evenly and do not sink into wet ground. In the interest of developing viable paludiculture concepts and markets, the federal government has funded several large-scale pilot projects[3] (circa 10 years durations with funding in the tens of millions of Euros). The goal is to come up with a successful model for paludiculture by experimenting under real-world conditions, so that rewetting of peatlands is not just good for the climate, but also profitable for farmers and businesses.

Change agents and pioneers

There are already several groups of actors in Brandenburg who have embraced the idea of paludiculture and are actively trying to make it a reality. This includes a self-proclaimed "Peatland climate farmer" who has a small herd of water buffalo and uses (as well as further develops) special equipment that is suitable for tilling and harvesting his wet fields. There is also an "Alliance of Pioneers" with actors from the private sector whose aim is to establish value chains for paludiculture products. Among the members are companies that produce recycled paper, prefabricated houses, insulation, and other construction materials. All see the potential to make products with paludi-biomass and want to demonstrate that this is economically viable; some are already in the product testing phases. Nonetheless, they also face challenges, albeit different ones than the farmers. One industry representative pointed out that even if they develop a desirable product, for the time being production would rely on imported paludi-biomass – since right now it is not produced in any significant quantities in Germany. In many cases it is also reasonable to expect that a product produced with paludi-biomass will be more expensive than its conventional counterpart, at least at first (e.g., in the case of paper), so interventions in the market would be needed to make it an attractive option for consumers. Manufacturers that want to make products out of paludi-biomass are in a double bind – at this point in time, they have neither the supply of raw materials nor the customers for their product. And whereas for farmers there is some financial support for transitioning to paludiculture (and at least the prospect of more support down the line), the actors from the private sector are missing the incentives that would help them in their product development. An industry representative also pointed out a more fundamental challenge with paludi-biomass as a raw material: industrial processes generally rely on a high degree of uniformity in their raw materials, and the closer a rewetted peatland is to a 'natural' state, the less this can be expected. That is, the natural variations in the types of reeds and grasses that grow make it difficult to produce a uniform product.

Despite these pioneers and early movers, paludiculture remains a niche concept that many view with skepticism. The majority of farmers remain unconvinced and reluctant to invest in a completely new and unproven business model. Brandenburg's experiment in paludiculture is still in its infancy, with its pilot projects just beginning. It is too early to say if a paludiculture model for Brandenburg will succeed. But in all likelihood a transformation to this new form of agriculture – going beyond niche actors and usages – will require stronger policies and financial instruments that can support new markets for paludiculture products.

Competing concepts of sustainability?

Within Brandenburg's overarching sustainability strategy, its peatland protection program is named at contributing to SDG 6 (Clean Water and Sanitation), SDG 13 (Climate Action), and SDG 15 (Life on Land). Indeed, from an ecological perspective, natural peatlands have many benefits. Nonetheless, it is well-recognized that despite synergies between many of the SDGs, conflicts can also arise. Interestingly, in Brandenburg's 2020 resolution on developing and implementing a peatland protection program, climate protection and the need to minimize greenhouse gas emissions is explicitly named as a "priority goal." Indeed, while the other benefits of wet peatlands are always mentioned (biodiversity, retaining water in the landscape), the driver behind the federal and state strategies and plans is the need to reduce emissions so that Germany can achieve its target of climate neutrality by 2045.

In speaking with farmers, climate neutrality was almost never mentioned as an important frame for their work – with the exception of Sebastian Petri, the self-named "Peatland Climate Farmer" who has made public statements about being motivated by the well-being of future generations. Sustainability, on the other hand, was an important concept to many farmers, who raised questions about whether these rewetting plans were, in fact, sustainable. Several pointed out that the (drained) peatlands being used for pasture make an important contribution to local food production. In the case of the Stockhoffs, interviewed

[3] Projects include BLuMo Pilotvorhaben Moorbodenschutz Brandenburg; WetNetBB Bewirtschaftung und Biomasseverwertung von nassen Niedermooren: Netz von Modell- und Demonstrationsvorhaben; and Klimamoor Brandenburg.

for the podcast, their pastureland provides quality feed for the cattle that they raise, most of which ends up at the meat counter at the German supermarket chain Edeka. Providing regionally-produced food is something the Stockhoffs are proud of. Another farmer I spoke to said that his pastureland (on drained peatland) provides feed for the horses at the riding stable down the road. Both pointed out that if this source of locally-produced animal feed goes away (due to rewetting), it will not mean that the animals will disappear – and their feed would have to be purchased, perhaps even imported. "Better [and more sustainable] than importing soy beans from South America," as Godehard Stockhoff put it.

This can be seen as a legitimate conflict between different sustainability goals: on the one hand, regional food production (noting that the role of meat in sustainable diets is controversial), and on the other hand, climate and biodiversity protection. In the case of a conflict, a decision then needs to be made as to which goal has priority. In the case of peatlands, the government (state and federal) has made the decision that climate protection takes priority – but the farmers are not yet convinced. And while emphasis is placed on cooperation and dialogue with farmers when it comes to the question of how to implement peatland rewetting, it seems that they still feel a need to discuss why (and if) peatland rewetting is the right decision for Brandenburg.

Governance and experimentation – with the risk of failure

A clear objective has been set by the federal and state government: reduce emissions from peatlands, ideally in a way that preserves agricultural usage (i.e., paludiculture). But in the question of *how* that should work, experimentation and innovation is demanded – and also funded via pilot projects. The private sector has also demonstrated a willingness to innovate new products. But to achieve a large-scale transformation to using peatlands for paludiculture, learnings from the experimentation phase will need to be followed by strong governance with clear plan for where the market should go and the financial instruments to steer the market in the right direction. And in case that paludiculture experiments fail, achieving climate targets will require new concepts for rewetting peatlands – ones that would likely need to involve financial compensation schemes analogous to those developed for the coal phase-out.

7 Sharing in the Financial Benefits of the Energy Transition: The Wind Energy Levy in Brandenburg

Franziska Mey

The energy transition is one of the key pillars of the sustainability transformation. Germany has already made great progress with transforming its electricity sector, but further ambitious efforts are needed to achieve net greenhouse gas neutrality from 2045. Brandenburg is one of the largest federal states in Germany by area and one of the four leading states in the production of renewable electricity. The state has been a particular trailblazer for the expansion of wind power. But new approaches and incentives are needed to deliver tangible benefits to residents and communities and distribute the burdens and benefits of renewables more fairly. This contribution looks at the wind energy levy that has been introduced in Brandenburg and at its initial effects. Interviews were conducted with a range of stakeholders – including representatives of local authorities, energy producers, associations and the state government – and initial impressions were summarised.

The complete transition of our energy system from fossil fuels to renewable energy sources is a cornerstone of the sustainability transformation. Much progress has already been made: A record 63.4 per cent of Germany's power generation came from renewable sources in the third quarter of 2024, and wind energy alone accounted for 24.7 per cent (Destatis, 2025). Following strong expansion, Brandenburg is now the fourth-largest producer of wind power nationwide. According to the German Federal Network Agency (Bundesnetzagentur), Brandenburg now has 4,096 wind power plants, 142,782 photovoltaic plants and 740 biogas plants (Bundesnetzagentur, 2025). But to achieve Germany's climate targets, renewable capacity must now expand further – and, above all, faster. The previous German government determined that at least 80 per cent of German electricity demand should be met from renewable sources by 2030 (Federal Ministry for Economic Affairs and Climate Action (BMWK), 2025). Recent regulatory adjustments geared to accelerating the energy transition include the Onshore Wind Act (WindBG)[4] and simplification of the bureaucracy of planning permission and approval processes (BMWK, 2023). Brandenburg aims to generate 100 per cent of its electricity from renewable energy sources by 2030, according to its Ministry of Economic Affairs, Labour, Energy and Climate Action (MWAEK), and to achieve net greenhouse gas neutrality by no later than 2045 (MWAEK Brandenburg, 2022).

Efforts to expand wind power and ground-mounted solar installations are increasingly sparking opposition at the local level, however. Protests against the construction, extension or repowering of wind farms and solar parks are becoming increasingly frequent. Protesters are motivated by concerns about the visual character of the landscape or nature conservation and by questions of fair distribution and justice. According to Germany's Renewable Energy Agency (AEE), a slight decline in support for the energy transition is observable nationwide (AEE, 2023, 2024). Surveys have clarified that many people particularly want to see a fairer distribution of the costs and benefits that transformative change have for society (Wolf et al., 2023). Residents in rural areas bear the brunt of the burden of dealing with changes in their environment wrought by developments that are often of little personal benefit to them. In the federal states of Mecklenburg-West Pomerania and Brandenburg, for example, local populations have been affected by the strong expansion of wind power, but they have rarely benefitted directly from the growth of renewable energy in their immediate environment.

Enabling residents to share in the financial benefits of renewables appears to be an important lever that could boost support for their rollout. Studies have repeatedly shown that

[4] The Onshore Wind Act obliges the federal states to achieve surface area targets for the expansion of wind energy. By the end of 2032, two per cent of the country's total land area must be zoned for wind power development. By 2027, 1.4 per cent of the total land area must already be zoned for wind power. Repowering measures at existing sites should take priority.

societal acceptance for the energy transition rises and that its implementation picks up speed when people who are affected become active participants in the process (Langer et al., 2017; Lienhoop, 2018). The research literature – in which the topic is embedded in the wider discourse on climate and energy justice – emphasises three key dimensions: distributive justice (financial participation in energy infrastructure), procedural justice (participation in the planning and implementation of energy transition projects), and recognition justice (acknowledgement of local communities and their concerns) (Creamer et al., 2019; Heffron & McCauley, 2017; Jenkins et al., 2016, 2018; Sovacool et al., 2017).

The question investigated for this contribution related to how the expansion of renewable energies is being perceived at the local level and to the effects of financial participation. Initial insights were gained by talking to local stakeholders in three communities in northern and southern Brandenburg (Uckerland, Brüssow, and Mühlenfließ), representatives from the association for renewable energies in the states of Berlin and Brandenburg (LEE BB), the state government in Brandenburg, and project developers.

A recent survey of mayors nationwide by Initiative Klimaneutrales Deutschland (IKND) ascertained, unsurprisingly enough, that the prospect of financial revenue is a major stimulus prompting local authorities to move forward with local renewable energy projects (IKND, 2024). The local authorities affected by projects are often heavily indebted or have limited financial resources, and these additional funds are especially valuable to them because they can be allocated flexibly and used for a range of purposes (from visual enhancements to the local environment to holding local authority events or supporting local associations and social infrastructure more generally (interviews).

The task of navigating the local challenges of the energy transition in Brandenburg is largely falling to holders of honorary office – the unpaid mayors and councillors in many small and medium-sized local authority areas. Much hinges on the struggle to secure benefits for the region, local acceptance and an accelerated energy transition. Annett Hartwig, who heads the local authority area around the small rural town of Brüssow in the Uckermark, emphasises that “residents have to be brought on board. And something must [...] remain here where the wind turbines are. Definitely!” (interview).

Local representatives report that wind turbines and the land they occupy are privately owned in many areas of Brandenburg. This means that they bring only minimal or imperceptible benefits to the wider local population and to local authority areas. What is all too perceptible to local people, however, is that local infrastructure is disintegrating and that schools and kindergartens are closing. Brandenburg residents also pay some of the highest prices nationwide for electricity because the expansion of renewable capacity has led to high network charges. This has also been unfavourable for local acceptance of the energy transition.

Brandenburg is the second federal state (after Mecklenburg-West Pomerania) that has sought to increase the acceptability of wind power expansion by introducing a regulatory mechanism for financial benefit sharing. A special levy for new wind power plants was introduced at the state level in June 2019 (Energieportal Brandenburg, 2025; Brandenburg State Government, 2019). The Wind Turbine Levy Act (BbgWindAbgG for short) obliges operators of wind energy systems to pay an annual special levy of ten thousand euros to local authority areas within three kilometres. The funds are divided up proportionately between the affected local authority areas on the basis of area. The aim pursued by the state government is to increase the benefits to local communities of expanding wind energy further and to strengthen grassroots support for renewables. In September 2024, this regulation was extended to additionally encompass solar parks.

The new regulations provide project developers and communities with a dependable framework and fill a gap that some (but not all) project developers had previously addressed in various ways on their own initiative – with donations to local associations or local authorities, for instance, contributions to local infrastructure or other local benefits such as discounted electricity tariffs. In these cases, local authorities had to rely on their own capacity to negotiate and on the willingness of project developers to accommodate their needs (interviews).

New regulations are intended to address these issues. The idea pursued by the legislative in Brandenburg was that a wind power levy would both boost the availability of local resources and increase the local added value, ultimately contributing to increased acceptability of wind power (interview). MWAEK reports that entitlements to payments totalling EUR 1.87 million have already resulted (MWAEK Brandenburg, 2024). Experiences to date are still limited, however, as the first payments were only received in 2024. An evaluation identified the lack of mandatory reporting as the main issue that poses challenges for

quantifying the use of these funds (Brandenburg State Government, 2024). Representatives of associations in the energy sector criticise that a lack of harmonisation between the Brandenburg levy and the voluntary payment of 0.2 cents/kWh specified in federal legislation (Renewable Energy Sources Act, EEG) represents a further burden for the sector (interview). LEE BB predicts that the current strong expansion of wind power in Brandenburg will result in payments of up to three million euros to local authorities for 2023 and 2024 (LEE BB, 2025).

What the effects of this financial participation will be nevertheless remains to be seen. Will the funds be perceived as benefiting communities in tangible ways? This will depend especially on the communication of local authorities around their use. Initial examples show that the regulation is flowing fruitfully into local discussions, as attention can now be drawn to opportunities that are arising as budgetary leeway increases (interviews). However, the challenge of fair distribution (between neighbourhoods, for instance) also needs to be addressed at this level.

Criticism expressed in other federal states –for instance by ThEGA, the state energy agency in Thuringia – suggests that participation legislation is not a surefire formula for increasing local acceptance (ThEGA, 2024). Multiple states have introduced legislation in the past two years that seeks to secure the participation of residents and local authorities in the expansion of renewables (see Fig. 1). In the wake of the federal legislation introducing voluntary contributions to local authorities by operators of wind energy and solar installations (the 0.2 cents/kWh specified in Section 6 EEG 2021 (Federal Government, 2024), several federal states decided to introduce mandatory measures, as the German Wind Energy Association (BWE) reports (BWE, 2025). Like Brandenburg, Thuringia and Saxony opted for regulations that only envisage contributions to local authorities. North Rhine-Westphalia and Bavaria have embraced more flexible models that allow for individual participation agreements to be drawn up between residents, local authorities and project developers. The options range from receiving a stake in the project company to discounted electricity prices or funding for not-for-profit endeavours.

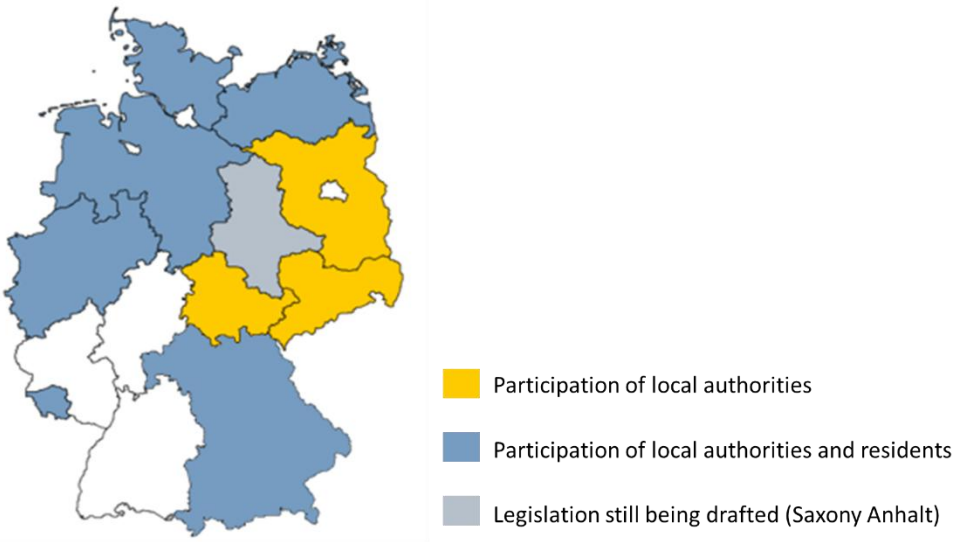

FIGURE 1: STATE-LEVEL LEGISLATION ON FINANCIAL PARTICIPATION IN THE ENERGY TRANSITION

The Thuringian Energy Agency (ThEGA) is calling for residents in Thuringia to be afforded opportunities to share in the benefits of expanding renewables in the form of discounted green electricity prices or electricity credits (ThEGA, 2024). Meaningful data that could demonstrate the extent to which this action would have the desired effects at local level are also lacking in this case, however. Although the role of financial benefits is important, case studies demonstrate that “soft factors” including timely communication, transparent implementation, securing the involvement of the local community, and trust in the actors involved can also be decisive (BePart project, results forthcoming). In this light, the regulations appear to be key building blocks, especially for giving local authority representatives better arguments and more room for manoeuvre. More research is needed to evaluate their effectiveness while answers to the following questions need to be found:

- How much revenue do local authorities receive from the participation legislation in Brandenburg, and how are these funds used?
- What action is taken to communicate the benefits of the regulation at the local level, and how does it change local narratives?
- What effects do the level of revenue, and the uses found for it, have on the perception, acceptance and expansion of renewable energy?
- What benefits would potentially result for local authority funding levels, the acceptance of renewables, and their accelerated expansion if the regulatory framework for sharing financial benefits with local authorities was extended to all renewable energy systems?
- Considering the answers to these questions, what conclusions can be drawn for efforts to implement the financial participation of local authorities in the expansion of renewables effectively?

8 Climate-Conscious Artistic Productions and the Local Public Sphere

Manuel Rivera

The culture industry, the cultural sector, the arts and culture – these are not terms and topics that feature in the sustainability strategy of the state of Brandenburg. But the sustainability strategy does list the cultural policy strategy that Brandenburg adopted in the same year as a contribution to multiple UN Sustainable Development Goals including education and responsible production. The major action areas in the cultural policy strategy, in turn, include two that obviously relate to sustainability: “Advancing transformation, taking responsibility for the future, enabling experiences of change” and “Respecting nature, conserving resources, working sustainably and communicating sustainability”. Is the contribution that culture can make to sustainability perhaps being underestimated? A look at Potsdam.

2024 saw “eure paläste sind leer (all we ever wanted)” [your palaces are empty (all we ever wanted)] performed at Potsdam’s Hans Otto Theater (HOT) – a text by Thomas Köck, one of the few prominent playwrights working in German to have attempted to find aesthetic approaches to socio-ecological issues like climate change that operate at the planetary scale. While the thematic substance of “eure paläste” deals mainly with imperial wars of conquest and the overexploitation of resources, the actual staging of the production supplied an opportunity to pilot a climate-neutral approach to producing theatre. HOT was one of 22 cultural institutions awarded grant funding from the “Zero Fund” of the German Federal Cultural Foundation (KSB) to trial approaches to slashing the greenhouse gas emissions of a cultural production drastically in 2023/2024. “Climate neutrality” is a key concept in the KSB funding programme, and up to one per cent of the funding granted can be used to purchase carbon offsets. My research showed that this was not popular with theatre folk who were making efforts to reduce their emissions.[5] Many of them found the concept of “climate neutrality” advanced by the programme meaningless or misleading, and some even went so far as to call it a case of fraudulent labelling. (I will return to the transformative or obstructive role of conceptual frames like this one at the end of this contribution)

Drivers of motivation within the theatre

A long chain of developments preceded the award of KSB funding. In 2018, HOT’s then new director opened her first season with a climate play (“paradies spielen”, also by Thomas Köck). A surge of interest in the topic and its ramifications for programme content and practical operations was beginning to sweep through the national theatre scene. HOT was right at the forefront of these developments partly because of the passionate commitment of a dramaturge there who had explored climate theatre deeply before joining HOT, both in Bremen (including cooperation with the Alfred Wegener Institute for Polar and Marine Research) and internationally (a research trip to look at climate theatre in South America and Southeast Asia). She initiated a forum for exchanges on climate issues between theatres just before the Covid pandemic, founded an internal sustainability initiative with five other colleagues, and supported the development of a play on the topic with young people in Potsdam. Her stand-in when she took parental leave (a colleague who had previously worked in theatre hotspots including Hamburg and Berlin and who would subsequently go on to join HOT’s permanent staff) endeavoured to continue these initiatives, pursued the “Zero Fund” application, and provided artistic support to the pilot production.

Receiving funding from the KSB carries a certain cachet within the cultural sector, and HOT’s climate-related activities also attracted the kind of national and international media coverage that is much coveted by city theatres. But interviewees only mentioned such

[1] Twelve interviews were conducted with ten staff members at the theatre between April and November 2024. The audio recordings were coded in a way that captured some dimensions of interest that transcend the individual case. In addition, semi-structured observations of seven rehearsals, two performances, a discussion with the audience, and a press conference were conducted as a passive participant and recorded in written field notes. Attending performances and conducting interviews at Leipzig Opera and theatres in Berlin and Braunschweig (Schaubühne Berlin and Staatstheater Braunschweig) supplied an instructive overview of the national context, as did various informal discussions (since 2022/2023) with culture professionals at events hosted by Nikolaisaal Potsdam, Anlaufstelle Green Culture (in Sanssouci, Potsdam and elsewhere) and Climate Alliance Germany.

sources of extrinsic motivation in very rare comments implying that they were the drivers behind the rather half-hearted efforts of other colleagues to reduce operational greenhouse gas emissions. In every other respect, most of the interviewees showed strong intrinsic interest in the topic – and while this interest was normatively guided by a sense of personal and institutional responsibility for working to mitigate climate change, as one might expect, it was also inspired by the appeal of experimenting, overcoming ingrained routine and prevailing over resistance to innovation. The climate action taken included virtual technical rehearsals (to save electricity), reducing aesthetic prejudices against LED lighting, changing rehearsal schedules (to reduce the staff mobility involved), transporting larger props by cargo bike, enabling more holistic communication between the various technical departments (e.g. to create more transparency in advance on required and available materials or to reduce transports by means of better coordination) and generally increasing opportunities for people to participate and have their say in the theatre's day-to-day operations.

A shortage of allies

It appears from the interviews that this motivation to transform the *internal day-to-day work of the theatre* was complemented (and even fuelled to some extent) rather than being sapped by sluggish ingrained routines, the traditionalist attitudes of some colleagues, and some further factors that were often mentioned in the same breath as this kind of motivation. Serious doubts and even signs of frustration about whether the lessons learned from the pilot production and the accompanying carbon footprint process (also supported by KSB) would lead to a more climate-friendly, circular economy-based approach to productions often emerged when the topic of *stakeholders from outside HOT* came up, especially:

- *the artistic teams* engaged for individual productions (self-employed directors, costume designers, etc.). Interviewees felt that most of these external staff (although not the team who worked on "eure Paläste") often tended to be too insistent on artistic licence, not sensitive enough to questions of resource utilisation, and not open enough to climate-friendly standards or case-by-case solutions.
- *the city of Potsdam* as the owner and main funder of the HOT theatre company and its buildings. Not only were doubts raised about whether the city administration's general commitment to the theatre and cultural location was robust and consistent – blame was also assigned to local politicians, administrators, and municipal enterprises for delays to the delivery of major site upgrades (a solar system, refurbishments), the transition to sustainable heating, and improvements to the frequency of public transport services that were needed to reduce the transport emissions of theatre patrons.

Many interviewees anticipated that a handout on climate-friendly approaches that they expected to soon become available would represent a suitable approach to influencing the actions of the first-mentioned stakeholder group in the short-term. Some also saw the far-reaching idea of introducing a per-performance CO_2 budget as promising, but more as a "conceivable" future project in light of the many challenges involved. (Introducing such a budget would necessitate the creation of a basis for better comparability between productions, extensive cataloguing of materials, and some shifting of general responsibility for the climate from the level of individual productions up to the level of the theatre's overall management.) Ideas for entering into more constructive dialogue with "politics" in a similar spirit were lacking; this major stakeholder was viewed with scepticism, especially below the management level. None of the interviewees reported feeling supported and valued for their efforts to work in more climate-friendly ways.

Nor did any interviewee dare to venture a clear and decisive appraisal of what issues were of the greatest concern to the theatre's audience and the city's society and whether they included the climate crisis or not – despite existing cooperation projects with multiple educational facilities in the city, also in connection with the pilot production. Staff at HOT *did not* describe the public as driving or expressing demand for climate-friendly theatre productions. They did not perceive any signs that the campaign launched in connection with the staging of "eure paläste" to encourage car-free visits to the theatre ("#ohneautoinstheater") was effective. Scarcely any mention was made of productive exchanges with peer organisations such as other theatres in the state of Brandenburg or in the national group of "Zero"-funded pilot productions. Although interviewees occasionally mentioned that they would like to have exchanges in more formats than those offered by the Zero programme (or in more specific formats, for instance with a focus on technology or props), they also expressed doubts about whether day-to-day operations would allow them the leeway to actively make use of such formats. HOT cannot afford to retain a transformation manager on its fixed staff, in contrast to better-equipped and larger theatres, and this was occasionally cited as a disadvantage.

Public discourse as an objective and a driver of transformation

The objective necessity of fundamental structural change – and the reality that it is already happening – is not nearly as glaringly obvious in Potsdam, the state capital, as in other Brandenburg regions, since Potsdam profits from its proximity to the metropolis of Berlin and from a well-established service economy. This may partially explain why its cultural institutions do not act to the same extent as in Lusatia, for instance, as "motors of innovation and drivers of the future […] through cross-sector cooperation with the tourism, trades, industry or logistics sectors to create new value chains" (Ministry of Science, Research and Culture in Brandenburg, 2024, p. 28). It is nevertheless obvious that HOT has the *potential* to become such a motor, be it by creating demand for more sustainable materials that would make these alternatives strikingly visible in the fullest sense, by reusing and pooling existing resources in costume and stage design, by addressing social conflicts connected with the transformation on stage and in debate formats developed and delivered together with the society of the city, or by helping to get the ball rolling on climate change mitigation and adaptation by engaging in construction activities in its own immediate environment (in this specific case, the "Schiffbauergasse" cultural quarter).

The case study suggests that this potential of state-funded cultural institutions can be unleashed to a greater extent if

1. change agents who are already active are encouraged and supported by the directors of their institutions, be it with acquiring funding, internal networking, or the top-down approval of standards that have been developed for productions through collaborative experimentation and that can then give further impetus to those people in the institution who are intent on achieving change,
2. managing and funding bodies help to network operational ecology activities at various cultural institutions more strongly than has been the case and provide resources for the necessary work and experimentation, if necessary by at least temporarily accepting quantitatively lower outputs from staff,
3. both the practitioners of culture and their sponsors understand and use networking that extends into the society of their city as a source of leverage for both supporting more ecology-led production and – even more vitally – nurturing the discourse about the transformation that is needed, and
4. refrain, in so doing, from drawing on efficiency-focused frames such as "climate neutrality" and favour frames that include social aspects — especially internal working conditions and participation in decision-making. "Sustainability" was often understood in this sense in the series of interviews conducted at HOT.

A look at the two funding rounds of "Zero" that have taken place up to now (KSB, 2024) suggests that at least the first three hypotheses may also be shared by the KSB programme managers and jury members, perhaps in response to the feedback they have received on the programme. In the second round, which has been slowly ramping up since 2024, funding has been allocated to a remarkably high number of cooperation projects, including some in which educational and research institutions are involved. It is also noticeable that the project descriptions now focus less frequently on individual productions than in the first funding round and give more focus to changing structures and routines. An even more striking change is that dimensions of operational ecology and goals in this area are now more strongly linked with artistic content than in the first round. Only three of the 16 theatre and performing arts projects funded in the first round had a clear thematic connection to issues like climate change, urban development or mobility, but 14 projects in the current round – almost all of them – make these connections.

This last point further underlines the rich potential of forging transformation within, together with, and through cultural institutions. The local collaborations and discourse they create generate nothing less than *awareness* of socio-ecological issues. The flip side of this coin is that the presence of such public awareness is one of the major conditions required for theatres to recognise that work on climate issues is needed from them and demanded of them. Brandenburg's cultural policy strategy has set a good course here. But its stakeholders also need to give some serious thought to the question of whether the services provided to society by culture can continue to be considered only marginally at best. Point (3) above could be particularly interesting for transformation research, as the broad question of whether local socio-ecological discourses and networks involving the arts emerge at all is likely to be decisive for fostering structural change and shifts in priorities at individual institutions. An experiment like "eure paläste" currently still stands out as isolated in Potsdam's – and Brandenburg's – cultural scene.

9 Rethinking mobility in Potsdam's city centre

Erika von Schneidemesser and Alexandre Caseiro

Shifting away from individual car use is key to making cities more sustainable, improving air quality, and enhancing urban life. Potsdam's "City Centre: Rethinking Street Spaces" aims to reclaim parking spaces for people—boosting safety, reducing pollution, and creating vibrant public spaces. But is it enough? Our research tracks these changes, measuring real-world impacts. Can such initiatives truly transform cities? Join us in exploring what's needed for a healthier urban future.

Part of making cities more sustainable is a mobility transition. A move away from individual vehicle use to mobility options that are healthier, not only for us, but also the environment we live in. There are myriad reasons to pursue a mobility transition. As air quality researchers, one of our main focus areas is on improving air quality and thereby improving and protecting human health. But the mobility transition promises to deliver more than clean air. Reducing individual vehicle use can reduce traffic accidents, reduce noise pollution, free up space for more liveable cities that foster social interaction, and even reduce stress. A host of cities across Europe are making strides in this direction – Paris with its 'Code de la Rue', Barcelona with the super blocks, and Berlin with the Berlin Mobility Act. But it isn't just big cities, smaller cities also need to act and are making changes. Here in Potsdam, we are accompanying the implementation of one policy of the larger policy concept 'City Centre: Rethinking Street Spaces'.

The concept is based on two resolutions passed by the City Council:

- Reducing on-street parking (DS 20/SVV/0858)
- Improving the quality of public spaces (DS 20/SVV/1009).

In the concept put forward by the City of Potsdam, one of the main ideas is to reallocate some of the space currently used for car parking and use it for other purposes, whether for restaurants, local shops, pedestrians, or bicycling. Some of the key aims that the LHP has communicated around this effort relate to traffic safety, reducing environmental burdens, creating a liveable city centre for all, and ensuring the equitable use of urban space. And while this is an initiative of the city, any changes to the (infra)structure of a city are of interest to all of the people living there, but also people commuting into the city for work, or visiting for pleasure. There are a variety of different interests that can/do cause conflicts. A number of these are acknowledged in the concept that the city put together, with the aim to implement changes that will minimize such conflicts, including conflicts over the use of space for parking or as public areas, conflicts between different groups of road users (pedestrians, cyclists, motorists, public transport users, delivery traffic, etc.).

As part of the process of creating the overall concept, a number of workshops were held where local residents were invited to share their ideas. And while this is a step in the right direction, there are some major hurdles to any substantial changes sufficient to meaningfully reduce emissions. Removing some parking is unlikely to reduce car-use substantially. Indeed, the City of Potsdam has set its sights on creating a 'low-car city centre', not a car-free one, as the planning document states: "The aim of this concept is to achieve an equitable use of space through fewer cars and more spaces for all, but not a completely car-free city in the near term." Removing some parking here and there is positive and may potentially make a difference to the feel of the city centre, depending on how it is repurposed and how many spaces are taken out, but it falls far short of what is needed for sustainable cities. The effects on overall traffic through an area and on noise and air quality are likely to be minimal and hyper local at best. Unfortunately, there have not been and are no a priori plans to quantitatively evaluate these end points either, beyond the very small part we are accompanying.

Relevance to Sustainability Science and Transformations

In our research, we plan to quantify any possible changes that might result, based on air quality and traffic count measurements on one of the streets where changes will be made. This includes monitoring the situation before the change is made, as well as after, and integrating the monitoring data with background information. We use small sensors along

with data from monitoring stations to evaluate a policy like this, since monitoring stations are large and expensive and cannot be present everywhere. We have done this in similar scenarios in Berlin, where we accompanied the implementation of mobility-related policies to quantify the effect on air quality. For example, the redistribution of street space on Kottbusser Damm to create a protected bike lane reduced cyclists' exposure to nitrogen dioxide by roughly 20%, while the pedestrianization of Friedrichstrasse reduced nitrogen dioxide concentrations to that of the general urban background, rather than higher concentrations that are often seen on heavily trafficked streets as was the case before the change. While beneficial for the local population and people spending time in the area or cycling through, these changes were all found to be hyper local, without any broader influence on the city's air quality and had little effect on particulate matter concentrations. To achieve farther reaching results and adequately protect health, much more will need to be done. The revisions to the Ambient Air Quality Directive make it clear that cities still have a lot of work to do to adequately protect human health. That also means addressing the use of individual motor vehicles in urban areas, which is a politically charged issue, especially here in Germany.

The larger framework of the concept and the research that we are doing in this area, is related to the sustainable urban cities, and the Sustainable Development Goals (SDGs) related to cities and air pollution is SDG 11: Sustainable Cities and Communities and SDG 3: Good Health and Well-being.

SDG 11 (Sustainable Cities and Communities)

- Target 11.6: Reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and waste management.
- Indicator 11.6.2: Annual mean levels of fine particulate matter (PM2.5 and PM10) in cities.

SDG 3 (Good Health and Well-being)

- Target 3.9: Reduce deaths and illnesses from hazardous chemicals and air, water, and soil pollution.
- Indicator 3.9.1: Mortality rate attributed to household and ambient air pollution.

In addition, Brandenburg's State Sustainability Strategy (LNHS), adopted on 5 March 2024, aims to foster development that is environmentally sustainable, economically robust, and socially equitable. The LNHS addresses several aspects relevant to the development of a low-traffic city centre:

1. Sustainable Mobility: The strategy prioritizes the adoption of eco-friendly mobility solutions to reduce CO_2 emissions and enhance urban quality of life.
2. Health Strategy: The health strategy aims to improve citizens' quality of life and promote equitable access to health.
3. Biodiversity: The update to the biodiversity action plan focuses on safeguarding and enhancing urban green spaces, a crucial element of sustainable cities.

These goals highlight the importance of reducing air pollution to improve health and create sustainable urban environments.

Key Findings, Hypotheses, and Unresolved Questions

A lot of different policy measures are being implemented in cities to address sustainability, and more specifically air pollution reduction. Much of the air pollution reduction measures, especially for nitrogen dioxide, are tied to mobility and the reduction of individual car usage. (There are also Euro norms for vehicle emissions which have an impact, but these are not under the control of cities.) While the potential or expected effect of such policy measures are often estimated through different types of models, few are evaluated with measurements. Much of this has to do with logistics and capacity to do so. In addition, air pollution is just one reason for many of these policy measures. It can be difficult to get permissions, even with the backing and interest of the city to implement measurement devices to accompany such policy implementations. This is a hurdle that can take quite a bit of time and effort from all parties involved. Such measurements would however, provide a strong evidence-base for decision-making that could focus on those policies that have the most substantial impact, as well as synergies with other areas (noise pollution, traffic safety, etc.).

One of the other areas that such mobility policies influence is linked to the economic impact on local businesses. The voice of these local business owners can be important for either the support or opposition to such a policy measure. Local business and business

associations have garnered a reputation for e.g., opposing bike lanes in favour of on-street car storage space, based on the perception that car use is more important than active transport modes. However, as a limited, but growing number of studies have shown, the opposite is actually true – that active travel and transit infrastructure is likely to benefit local businesses. Despite this, the transferability of the research from one region to another is often questioned. Similarly so, the more data we have on the implementation of such localized policies and their effects on different aspects of sustainable cities, the more the transferability of such results can be demonstrated and the policies can be used as examples that other cities can learn from and adopt.

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The Research Institute for Sustainability (RIFS) conducts research with the goal of understanding, advancing, and guiding processes of societal change towards sustainable development in Germany and abroad. The Institute is embedded within the GFZ Helmholtz Centre for Geosciences and is thus part of the Helmholtz Association. Its research approach is transdisciplinary, transformative, and co-creative: RIFS cooperates with partners in science, political and administrative institutions, the business community, and civil society to understand the problems of sustainable development, identify appropriate solutions, and support their implementation in cooperation with relevant actors and affected communities. Its central research topics include the energy transition, climate change and socio-technical transformations, as well as sustainable governance and participation. A strong network of national and international partners and a Fellow Programme support the work of the Institute.

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