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Retrofitting the Future: Sustainable Development Through Inclusive Community Initiatives in East Germany's Mitteldeutsches Revier Region

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1 ABSTRACT

This paper examines community-led innovation efforts in the Mitteldeutsches Revier, East Germany's coal-producing region undergoing a seismic transition. These initiatives are reshaping the local innovation system, in performing some of the functions of the traditional pillars of industry, government, and academia amid limited resources. The case studies we look at here rely on trial-and-error methods and local knowledge to act as transfer intermediaries between their communities and external actors. They retrofit old factories, repurpose historical landmarks, and redistribute funds from the coal industry to participatory planning, environmental rehabilitation, and other forward-looking projects. Multifaceted, inclusive collaborations involving different demographic groups, craftspeople, and scientists focus on talent retention, digitalization, and sustainability, addressing broader challenges linked to economic transition. But despite their creativity and resilience, these initiatives encounter persistent barriers such as inadequate infrastructure, unstable funding, participant disengagement or distrust, and overburdened leaders who struggle to meet their goals within institutional frameworks. Through interviews with leaders of selected initiatives, this study explores their obstacles, motivations, existing resources, and learning processes. It focuses on how they transform knowledge into actionable strategies and develop the capability to innovate despite persistent local deficiencies and bureaucracy. Beyond technical expertise, these organizations rely heavily on collaborative decision-making and social connectedness, which propel inclusivity and a shared sense of purpose. These elements, we argue, are essential for achieving sustainable local development in resource-constrained areas. Our analysis points especially to the importance of socialization, as we found the nurturing of strong networks, trust, and a collaborative spirit across stakeholder groups to be a core capability to absorb, apply, and transfer knowledge within a local innovation system.

Keywords: Innovation Systems, East Germany, Sustainability, Triple Bottom Line, Rural-Urban Divide

2 INTRODUCTION

Economic transitions pose grave challenges for cities and regions reliant on declining industries. Whether due to recessions, outsourcing, technological advances, regime shifts, or environmental imperatives to transform the energy grid, heavy industries' departure has been found to undermine communities' economies and social bonds (Beckfield et al., 2020). In Germany, this has contributed to a regional divide spurring commercial and population exoduses as well as political radicalization. At the same time, this scenario has created opportunities for civil-society organizations in East Germany to step in where support is absent or limited. These organizations often pursue sustainable objectives in their services, which are closely linked to their communities' needs.

The integrated version of the triple bottom line, which is gaining traction in academic circles, advocates for environmental, social, and economic sustainability to be given equal importance in business models, city planning, and policymaking (Elkington, 1994; Farny & Binder, 2021). The world's failure in taking such a holistic approach to sustainability thus far is evident in record-high carbon emissions, rising inequality, and environmental and political fallouts (van Zanten & van Tulder, 2021; United Nations, 2024). When economic development goals are reached, still based on monolithic measures such as Gross Domestic Product (GDP), environmental ones often take a hit. When progress is made in preservation and energy transition policies, the social part tends to be neglected; workers in traditional industries feel left behind and may misdirect their rage into electing parties that oppose sustainability efforts and threaten their continuity locally and internationally.

In the present study, we apply a case-study approach to inquire what we can learn from local intermediaries' mix of sustainability and social solidarity with cultural and economic aims, alongside their resource limitations and barriers, in rural areas now transitioning from coal. Initiatives in the district of Burgenlandkreis, state of Saxony-Anhalt, are retrofitting old factories and historical landmarks into centres

for innovative collaborations. In Meißen, Saxony, youth and industry professionals are working together towards youth competency development and talent retention, amid an aging population. Nordsachsen, also in Saxony, hosts socially sustainable environmental initiatives. Through semi-structured interviews with these entities and qualitative analysis, we tested assumptions derived from innovation-studies theories and arrived at some suprising results: Our data indicates that socialization conditions in tight-knit communities may still allow for knowledge transfers and product or service innovations, even if incrementally, where coordination and systematization are weak.

Based on our findings, we also propose that a high level of intrinsic motivation to serve and honour the needs of the community facilitates the adoption of an integrated approach to the triple bottom line of sustainability. Members of civil society in resource-constrained regions may be especially poised to do so, as they have had to learn how to creatively achieve more with less. As bridges between external and internal stakeholders in their districts, intermediaries may be uniquely positioned to channel different resources, knowledge, interests, and groups of participants into collective projects to address pressing issues for the local social fabric. This is underlined by the self-positioning of one of our interviewees, who leads a protestant diaconical service in Nordsachsen: "In the end (…) we are the glue of society. To a large extent, we ensure that our society doesn't fall apart. And that, at the very least, marginalized groups find some space to be heard and acknowledged."[1]

Such civil-society actors rely on experimentation and the resources at hand to redefine what a local innovation ecosystem could become, serving as a fourth pillar in a "quadruple-helix" model to compensate for the absence of the traditional "triple-helix" pillars of government, industry, and research, or link the community to external resources from those pillars (González-Martinez et al., 2021; Leydesdorff & Etzkowitz, 1998). Due to their competencies, motivations, personal values, and positions in social space, local intermediaries can see both the trees and the forest, so to speak. They can address sustainability both from a local perspective and more diverse, global viewpoints. To contextualize these projects, districts, and their region, Mitteldeutsches Revier, we now discuss the relevant historical and industrial background, before turning to our methodology and case studies.

3 BACKGROUND

3.1 The Tough Transition from Coal Mining and Heavy or Traditional Industries

Mining has been an integral part of East Germany's economy for centuries. It encompasses a deeply ingrained system of social ranks and identity, surviving in regionalartifacts, festivals, songs, and folklore, as well as in environmental decay and disadvantages to the working class still living off this traditional activity. While other minerals have seen their heyday come and go in Germany, coal is perhaps the most emblematic of the ongoing economic transition: Once the world's third-largest coal producer, Germany plans to phase out its coal-fired power generation by 2038. This deadline could be moved up as the country strives to quickly reduce its dependence on Russian fossil fuels amid climate change, the war in Ukraine, and rising prices in a declining economy and uncertain world order (Furnaro et al., 2021; Curry, 2022; Twidale, 2024; Fairless & Benoit, 2025).

Meanwhile, the Mitteldeutsches Revierand adjacent Lusatia regions are still known as Germany's hotspot for lignite (brown coal). Furnaro et al. (2021) report that productionreached an estimated430 million tons per year at its peak in the mid-1980s, making the area and its industrial ecosystem heavily dependent on one commodity.Then, after Reunification in 1990, two-thirds of coal-industry jobs, or 100,000, disappeared from East (Central) Germany. Population lows for both rural and urban areas in the region rapidly followed, as the industrial and business ecosystem collapsed.Nearby textile and chemical plants were abandoned and rural railways defunded. Without the Wall and with more opportunities in West Germany, many companies and inhabitants went there.

The effects of the accelerating industrial shift have been particularly harsh on a rural population that lacks the training to transition from traditional to technology-intensive services. Older professionals not yet at retirement age are often unable to compete in the job market with the younger generations which are in turn

[1] Translated by Lucina Diehl from the original German interview, conducted with Janet Liebich on site at the Evangelisches Diakoniewerk Oschatz-Torgau, on November 13, 2024.

flocking, along with jobs, to urban areas. Besides heavy manufacturing, the obsolescence issue extends to crafts industries such as bakeries and wood- and metalwork, which must now learn to digitalize to reach customers. In recent years, government funding for rural regions has intensified and local educational offers have become more focused on in-demand competences, but the Mitteldeutsches Reviercontinues to struggle to secure investments, a skilled workforce, and the capacity for entrepreneurial innovation (Gramlich, 2019; Rammer, Gottschalk et al., 2020).

In fact, Germany as a country is found to be struggling to match other European Unionmembers' level of digitalization due to its resistance to new technologies and gaps in its telecommunications infrastructure, among other factors (Płóciennik, 2021).Also contributing to stagnation may be imbalanced infrastructural investments in general and a failure to tailor funding schemes for regional development, and their often steep bureaucratic requirements, to local communities' or intermediaries' needs and limitations. Whereas in the 20th century, theMitteldeutsches Revier had to dramatically adapt as towns were razed to clear way for the coal mines, this infrastructure is now gradually being replaced by windmills and human-made lakes with leisure areas.But outside bigger, more urbanized cities such as Berlin, Leipzig, Dresden, Chemnitz, and Halle, tourism and transport infrastructure, which often go hand in hand, remain underdeveloped in East Germany.Many of its smaller cities' once-buzzing commercial buildings and factories still lie empty, and this low activity translates into limited leisure and tourism options.A case in point is Zeitz,historically the biggest city in Burgenlandkreis and about 40 km from the Saxon city of Leipzig, which is about 20 times its size.Once a residence for bishops,monks, and dukes, the millennium-old Zeitz has seen its identity reshaped by the Industrial Revolution and now, again, by the Digital Revolution it must enter (Agents of Change in Old-Industrial Regions in Europe, n.d.).

Zeitzonce thrived on industries such as mechanical engineering, sugar production, and stroller manufacturing.Now, it has seen that base reduced to only a few major employers, namely the surviving coal operations of the Mitteldeutsche Braunkohlengesellschaft (MIBRAG), the Zetti confectionery, and the Südzucker sugar and bioethanol factory (Agents of Change in Old-Industrial Regions in Europe, n.d.). Despite government and grassroots efforts over the past 20 years to promote digitalization, organize large community events, and rehabilitate landmarks such as the Moritzburg Castle to attract business, tourists, and local culture enthusiasts, recovery for Zeitz and surroundings has been slow and painful (Zeitz Digital, n.d.; Agents of Change in Old-Industrial Regions in Europe, n.d.; Mitteldeutsche Zeitung, 2021).Zeitz has lost nearly half its 50,000 residents since 1989, with half the area's businesses having closed by 2001, after unemployment reached up to30%in some parts of the Mitteldeutsches Revier (Agents of Change in Old-Industrial Regions in Europe, n.d.).

Image 1: Old monastery retrofitted into the communal living, working, and cultural space Kloster Posa in Zeitz (Burgenlandkreis, Saxony-Anhalt). Taken by Ana Beatriz Ribeiro.

The State Chancellery of Saxony (2017) estimates this state to have lost 15% of its five million peoplein the two decades following the year 1990. Between 1930 and 1998, Leipzig itself, its biggest city, had lost 40% of its 718,000 inhabitants. But along with Dresden, the state capital and one of its main touristic hubs, Leipzig has since entered the 500,000-1 million population range once again, qualifying as a "metropolitan area" (OECD, n.d.).Leipzig's population could grow by up to an estimated 13% and Dresden's by up to 10%

by 2030, with Leipzig on the way to recouping its population peak by 2040 as Germany's fastest-growing city (State Chancellery of Saxony, 2017; City of Leipzig, 2025). This makes both cities more attractive to new industries – and thus further investments and renovations – than surrounding districts, whose populations keep declining.

For the Saxon district of Nordsachsen, projections point to an additional loss of as much as 7.5% of its present 200,000 residents by 2030 (State Chancellery of Saxony, 2017). Although its town of Schkeuditz houses one of DHL's global hubs and the Leipzig-Halle Airport, employing thousands of people, it is likely that due to its proximity to both Leipzig and Halle, at less than 30 km, most of its employees would rather live in those bigger cities. Meißen,next to Dresden, could lose a similar 7.2% out of its 250,000 residents, despite its eponymous city's reclaiming of its historic charm, built on the porcelain industry and a renovated cathedral and castle.

Without the diversified industries, research hubs, workforce, and institutional support densely populated urban areas enjoy, smaller, rural cities have been on the losing side of liberalization and its demands (Horbach & Rammer, 2022; Rammer, Kinne et al., 2020).High unemployment, low innovation, and weak infrastructure continue to drive people away or sow deep fear and discontent in German rural areas (Gramlich, 2019; Rammer, Gottschalk et al., 2020). It is telling that, with its populist, anti-globalization discourse, the far-right party "Alternative for Germany" (AfD) had won over more voters in the Mitteldeutsches Revier and Lusatia than anywhere else in the country by the 2021 Federal Elections (Voce & Clarke, 2021). The vote in Berlin was markedly more progressive and aligned with West-German metropolises; this mirrors regional, rural-urban divisions elsewhere in Europe and across the ocean in a United States undergoing similar industrial transitions.

Extreme right-wing parties have ridden to a meteoric rise on this tsunami of anger and scapegoating among those who believe democratic governments have failed them, taken advantage of by malicious political actors. However, as the subsequent sections will illustrate, intermediaries are rising up as progressive forces in rural East German communities to combat the illiberal influences that threaten plans for sustainability and inclusion.

3.2 The Rural-Urban Economic Divide and Social Counter efforts at the Grassroots Level

Germany's East-West, rural-urban divide has continued to manifest over the decades insocioeconomic figures. According to Gramlich (2019), East Germany's 18% unemployment rate in the early 2000swas twiceas high as West Germany's, and disposable income was 20% lower.Although East Germany narrowed these gaps over the next two decades, bringing unemployment below 10%, its per-capita productivity remained the lowest in the country. This applies to states of the former German Democratic Republic (GDR) – Thuringia, Saxony, Saxony-Anhalt, Brandenburg, and Mecklenburg-Western Pomerania – except for the Berlin metropolitan area, whose productivity surpassed that of the predominantly rural Schleswig-Holstein state in West Germany.

On a related note,Rammer, Gottschalk et al. (2020) found participation in research and development (R&D) activities among rural small and medium-sized enterprises (SMEs) in East Germany to be up to 9 percentage points lower than that of urban firms in the region. By comparison, they point to a much narrower gap in R&D,at 2 percentage points, between rural and urban firms in West Germany. This oftenleads toSMEs'low competitiveness and ability to bring product and process innovations to market vis-a-vis their urban or West German counterparts. Relying on a stronger innovation system and capabilities, bigger cities tend to be more resilient and able to eventually turn transitions and market demands into trade and renewal opportunities.

It follows that resources from academia, industry, and government, known as the traditional three pillars of innovation systems, are often concentrated in more populous, centrally-connected regions, leaving peripheral areas at a disadvantage (Ansari Vaghef, 2022; Leydesdorff & Etzkowitz, 1998). Such a disparity stresses the growing significance and integration of civil society, now recognized as a fourth pillar in innovation-systems theory (González-Martinez et al., 2021). In our research, we treat intermediaries as the fourth pillar in their respective local innovation systems due to their civil-society core: In the Mitteldeutscher Revier, they play a catalytic role in supporting underserved communities and linking them to external resources. They even take onother, missing pillars' functions.This brings hope that revitalization efforts capitalizing on the region's

existing strengths, alongside the drive for sustainability, will facilitate a rebirth for ruralMitteldeutsches Revier areas.

In line with this aim, some of our interviewees have taken on retrofitting infrastructure, such as an old monastery and a food factory, for cultural and educational offers and events (Kultur- und Bildungsstätte Kloster Posa, n.d.; Nudelfabrik Zeitz, n.d.). Another runs a MIBRAG-supported foundation to preserve local coal-related history, while inviting diverse local and international stakeholders to discuss sustainable transitions from coal (Recarbo Erlebnisregion, n.d.). At least one small entity, a digital-platform provider, has assumed a mediator role in a community forum helping bring far-right voters into more moderate positions (WeCreate, n.d.).Others develop locally innovative agricultural, environmental, or social outreach initiatives (Sächsisches Staatsministerium für Umwelt und Landwirtschaft, n.d.; Metropolregion Mitteldeutschland, n.d.; Sprungbrett e.V., n.d.).

As we will seek to demonstrate in the next sections, rural intermediaries could become established innovation facilitators locally if provided with the right forms of support to strengthen the region's collective capabilities and sustainability potential. Although these initiatives contend with many obstacles, and many are still works-in-progress, they reflect a deep determination to remake the region more sustainably and inclusively. In our research, we investigate such intermediaries' ability to turn from community cooperation spaces to innovation facilitators based on their existing capabilities, motivations, resources, and ways of knowledge transfer.We now turn to a discussion on how innovation-study theories shaped our assumptions and how we adjusted them based on our results from interviews with more than 30 service providers in the Mitteldeutsches Revier.The section includes an overview of our methodology and overall results informing our case-study selection and analysis.

4 CONCEPTUAL FRAMEWORK AND FINDINGS

Based on the extant literature on innovation and strategic management, we began our empirical research on the assumption that entities could only transition from cooperation spaces (coworking, networking events) to innovation facilitators (novel product and service development) once they had reached the exploitative stage of learning alongside robust socialization, systematization, and coordination capabilities (Kogut & Zander, 1992; Teece et al. 1997;Lichtenthaler, 2009;Gebauer et al., 2012; Ansari Vaghef, 2022).We found that most of our interviewees had not yet reached the exploitative stage, that in which knowledge, often externally acquired, is transmuted and applied into market-responsive, scalable innovations which can be transferred further as knowledge or technology (Lichtenthaler, 2009;Gebauer et al., 2012;Ansari Vaghef, 2022). However, manyinterviewees showed strong evidence of transformative learning, able to internally maintain and distribute knowledge, as well as reactivate it in response to identified opportunities for innovation. We nowargue that this is sufficient for them to transfer knowledge to the local community – without a profit- or market-driven core – in the form of training, consultancies, event planning and organization, structural renovations, makerspaces, and workshops and forums. They thus impart to recipients new or renewed forms of living, working, or interacting.

The organizations we identified for our sample are mostly led by private citizens who took the initiative, as individuals or like-minded groups, to address pressing issues for their communities, forming associations or small private operations. Our selection criteria for interviewees called for evidence of at least incremental innovations, meaning process or product improvements, or of knowledge transfers through active networks, consultancies, or cultural or job-related education in the districts of Nordsachsen, Meißen, or Burgenlandkreis. We used software-assisted qualitative content analysis (QCA) to categorize our sample and extract themes from our interviews, most conducted on site over 2023-24 (Schreier, 2012). About half the intermediaries we reached out to agreed to an interview. The distribution of theirorganizations' locations and types is seen in Table 1.

Table 1 displays a fairly even distribution among districts for our 33 interviews with leading representatives of intermediary organizations – those creating spaces for others to cooperate on potential innovations or offering innovative services or products themselves. About a third (8) took place with what we classified as "regional development organization," followed closely by "sustainable business or consultancy" (7). The former type, often non-profit, addresses aspects like tourism, economic diversification, or transport-network development. Some are closely associated with local or regional government bodies, which strengthens their ability to connect beneficiaries to resources and knowledge from external pillars. The latter refers to private

operations or non-profit associations involved in organic production, material recycling, or sustainable-tech development, or working as consultancies on innovative practices with a sustainability core. They often perform multiple roles, and could serve as both a civil-society and business pillar in creating innovations with close community input. These two categories of organizations were mostly concentrated in Burgenlandkreis and Nordsachsen (12).

Code System	Burgenlandkreis	Nordsachsen	Meißen	SUM
Type of organization				0
Coworking or networking event space	1	1	1	3
Sustainability promotion organization	1	2		3
Regional development organization	4	3	1	8
Continuing or vocational ed school	1	1	2	4
Educational association			2	2
Community improvement association	1	1		2
Sustainable business or consultancy	2	3	2	7
Cultural organization	3	1		4
SUM	13	12	8	33

Table 1: The types of organizations in the study's sample and their numbers per district. Generated with MAXQDA.

Six of the intermediaries we interviewed focus on education, four of them in Meißen. Four are institutions providing continuing or vocational education; two are non-profits whose primary aim is educational, although they are not official schools. From our interviews, we found some of the main concerns among intermediaries in this district to revolve around the training of craftspeople to become more competitive, digitalization for local SMEs, and youth talent retention. Although these intermediaries may not have explicitly expressed a concern with sustainability, the social dimension of the triple bottom line was evident for most under these categories.

We identified coworking spaces for each of the three districts, which speaks to a slowly growing trend in the region, tied to economic and social sustainability in their desire to offer affordable options to attract SMEs or keep them closer to home. About 9 percent (3) of the intermediaries we interviewed were found to be primarily dedicated to promoting sustainability, engaging in activities such as resource preservation or environmental rehabilitation. In Burgenlandkreis and Nordsachsen, the most locally embedded organizations were those spearheading culture or community improvements, playing an important role in preserving local identity and rebuilding social cohesion through community events and small renovation projects. In the absence of strong institutional support or innovation hubs, initiatives in culture or sustainability have emerged as potential local drivers of innovations as incremental as improved local theatre ticketing or as broad as regional organic farming.

The key catalyst to intermediaries' evolution into innovation facilitators we identified was socialization: that is, the capability to form, maintain, and link a dense social network within and outside the community (Gebauer et al., 2012). It emerged as the main combinative capability in our interviews, allowing for innovative activities and transfers even in the absence of robust systematization (standardizing procedures) and coordination (leading effective collaboration among stakeholders in decision-making). While cooperation, often face-to-face, has been essential to internal and external knowledge transfers, formalized communication and knowledge-storage procedures did not necessarily have to be in place in the case of the mainly small operations we interviewed.

But while socialization can function without the other two capabilities for them, the same is not true in reverse. Most of our interviewees saw themselves as both cooperation and innovation facilitators, speaking to the functions' mutual dependence in an environment where civil society has taken on innovation-pillar functions. Next, our case studies show the importance of community-rooted and intrinsic motivations, a commitment to sustainability, and robust social networks to establishing innovative initiatives despite significant obstacles.

5 CASE STUDIES

5.1 The Main Motivations Guiding Local Innovation Facilitation

In choosing our case studies for this paper, we sought to be representative of the diversity of offers for each of the districts, while accounting for sustainability dimensions and intermediares' potential to integrate the triple bottom line in their work. For Nordsachsen, we selected the "Peter Holstein Engineering Office" (Ingenieurbüro für ingenieur-wissenschaftliche Dienstleistungen),whose sustainable operation has developed an environmental sensor tested in the district (Metropolregion Mitteldeutschland, n.d.). For Meißen, we chose Sprungbrett e.V., a non-profit association that educates disadvantaged youth and rebuilds community cohesion (Sprungbrett e.V., n.d.). Finally, for Burgenlandkreis, our choice was Kloster Posa, premised upon cultural offers, alongside communal living and working and sustainable wine and crafts production (Kultur- und Bildungsstätte Kloster Posa, n.d.). All three interviewees shared motivations that put serving others above themselves, with profit-driven considerations playing a marginal role. All three also provided informed consent for their data to be used.

We conceptualized our interview guide and literature- and data-driven coding frame to analyze all interviews for motivations, obstacles, stages of learning, capabilities, and sustainable innovations in their operations. Table 2 presents their most-often mentioned personal motivations or skills in engaging in innovative activities. The numbers and colour intensities relate to how many times we detected each of the themes across the interviews.

Code System	Kloster Posa	Ingenieurbüro Peter Holstein	Sprungbrett e.V.	SUM
Motivation or pre-requisites for innovative work				0
Competence development	5	8	5	18
Community engagement or recognition	6	2	19	27
Sense of purpose or meaning	4	2	7	13
Instrinsic values or preferences	8	9	1	18
SUM	23	21	32	76

Table 2: The types of motivations or skills in the study's sample and number of mentions per case study. Generated with MAXQDA.

As can be inferred from Table 2, we assigned the theme "community engagement or recognition" to more than a third (27) of the 76 interview answers we classified under the "motivation" category. It appeared more frequently than any other types of motivation overall, although not evenly across the three interviews. While we found this to be the main motivation for Sprungbrett Deputy Board Chairman Martin Tritschler, it was not mentioned as often by our other two interviewees. The theme comprises a feeling of belonging, relatedness, engagement, or affiliation with the community served (Ryan & Deci, 2000;Kasser & Ahuvia, 2002;Seligman, 2010). For intermediaries, it is also tied to the notion that offers must be tailored directly to their local beneficiaries' levels and needs, based on deep knowledge of the community. It is perhaps best encapsulated by this answer by Tritschler, who indicated he valued practice-oriented over external academic input for the entity's youth-education, civic-participation, and structure-revitalization efforts: "You have to meet people where they are. It's no use if I say we're doing big things and no one comes. (…) If I set it too high, they can't do anything with it, they don't want to do it. But when it becomes concrete in their real lives, then something happens."[2]

Trischler has a background in intensive youth therapy and social work. Another interviewee, Peter Holstein, has been a university professor and inventor. Our third interviewee among the case studies, Lennart Sütterlin, is a graphic designer and board member at the Kloster Posa non-profit, where he manages the "musical printing workshop." The main motivation we identified for Holstein in running his small engineering operation, in which he and others work independently and remotely, concerned "intrinsic values or preferences." These encompass the ability to express one's authentic self, to accept oneself, or to derive pleasure or a sense of autonomy from the work (Ryff, 1989; Ryan & Deci, 2000; Keyes et al., 2002; Waterman, 2008; Seligman, 2010).This also came up as the main motivation for Sütterlin, who affirmed: "I don't want to sound arrogant, but I think that's our main point of view, that we do things the way we think [is] right and make offers the way we say would be good. (…) Like if I'm a good artist… I paint something

[2] Translated by Ana Beatriz Ribeiro from the original German interview, conducted in person with Martin Tritschler at the SEPT Competence Center in Leipzig on November 7, 2024.

because I think it's right [and not] to sell something. (…) I think that when we adapt to the demands of a market or a region or something like that, then we do it more out of our own motivation [by and large]."[3] But as Table 2 illustrates, he also pointed to the importance of competence development, for instance in navigating bureaucratic and legal matters. The theme applies to honing one's skills for productive pursuits or self-improvement (Ryan & Deci, 2000;Kasser & Ahuvia, 2002).

This motivation, and prerequisite to being able to facilitate innovations, was a close second for Holstein. A pure "sense of purpose or meaning" in performing an activity was the motivation least alluded to overall (Ryff, 1989; Keyes et al., 2002; Seligman, 2010). Pertaining both to competence development and intrinsic values or preferences, as well as to evidence of his having reached exploitative learning, Holstein told us in our interview:

I've always invented things in life… I've always really done my own things and tried to implement them (…) I've brought new devices onto the market [assembled from existing] components. (…) I can think of applications where in practice you would say, yes, that might be too difficult, you can't do that. And I've always tried to fill gaps like that, even earlier in industry. (…) I didn't just work as a service provider and as a fulfilment authority in industry, but at the same time I also held an A-professorship at the TU Ilmenau. (…) It is still a triangle of independence, serving a company and, at the university, student education…and that is actually an excellent climate for innovation.[4]

Given the local rural and economic-transition context and findings from sustainability literature, we readjusted our initial definition of "innovation" from tech- or R&D-intensive activities (Rammer, Gottschalk et al., 2020). For our purposes, "innovative" offers from intermediaries are those that address a service or product gap locally and at least two sustainability dimensions: social and environmental, social and economic, or environmental and economic (Schaltegger et al., 2012;Mignon & Kanda, 2018; Kundurpi at al., 2021; Cornish et al., 2024). This applies to novelties or improvements in tangible goods such as devices for resource management, as in Holstein's case; and intangible goods such as educational and cultural offers, as with Sprungbrett and Kloster Posa. In the following section, we take a closer look at each of our case studies from a sustainability perspective. We also examine how its dimensions relate to their motivations, obstacles, learning stages, and capabilities.

5.2 Sustainability in Product Development, Education, and Culture

All three of our case studies displayed at least moderate integration with the triple bottom line of sustainability (Elkington, 1994; Farny & Binder, 2021;van Zanten & van Tulder, 2021;Schaltegger et al., 2012).This means that intermediaries' activities classified as primarily environmentally sustainable, for instance emission reduction or greater resource efficiency or conservation, carry indirect economic or social benefits. Likewise, those primarily aimed at social sustainability – enhancing social well-being, cohesion, and inclusion via, for example, community events or job-creation programs – bring indirect environmental or economic benefits. At either end of the sustainability spectrum, we noted instances of high triple-bottom-line integration, in which the three dimensions have equal weight; and low integration, in which economic aims (greater cost efficiency, funding acquisition, or market competitiveness for the entity or its beneficiaries) take almost full precedence over the other two dimensions. Table 3 presents our analysis results on these points for our case studies.

Code System	Kloster Posa	Ingenieurbüro Peter Holstein	Sprungbrett e.V.	SUM
Level of TBL integration				0
3-dimensional (high integration)		1	2	3
Environmental (moderate integration)	1	2		3
Social (moderate integration)	4	2	12	18
Economic (low integration)		3		3
SUM	5	8	14	27

Table 3: Triple-bottom-line integration in the study's sample and number of mentions per case study. Generated with MAXQDA.

[3] Translated by Ana Beatriz Ribeiro from the original German interview, conducted with Lennart Sütterlin on site at Kloster Posa in Zeitz on November 17, 2023.
[4] Translated by Ana Beatriz Ribeiro from the original German interview, conducted with Peter Holstein via Zoom on October 29, 2024

Of the three interviewees, Holstein demonstrated the most evenly distributed engagement with sustainability dimensions (Table 3). His engineering office specializes in adapting and recombining existing technologies to, for instance, monitor water evaporation and thus improve public resource management amid local and global concerns over water scarcity. It serves as a new-industry pillar and intermediary between technical expertise and public administration, working with partners across government, academia, and industry to validate its products' applicability, demand, and market readiness. The water sensor Holstein invented, whose production is being scaled up, could raise the region's profile in sustainability offers, touching on all parts of the triple bottom line. To pilot the project in Nordsachsen over 2019-20, Holstein received about €127,000 under the regionally-targeted Unternehmen Revierprogramm of the Federal Ministry for Economic Affairs and Climate Action (BMWK), according to online data (Metropolregion Mitteldeutschland, n.d).But he indicates preferring to obtain smaller public grants bearing fewer bureaucratic hurdles, towards achieving incremental innovations.

Hence, Holstein's activities speak to both environmental and economic sustainability, although the obstacles he emphasizes are precisely related to government financing and bureaucracy, underscoring systemic issues he fears will continue to hinder innovation in Germany. He notes that public funding schemes tend to place high recruitment conditions for beneficiaries and favour younger, less-experienced founders while sidelining seasoned, independent innovators like himself, who possess the technical expertise for impactful advancements.

As for social sustainability, we observed it especially in answers attesting to Holstein's strong socialization and competences, which allow for exploitative learning despite weaker systematization and coordination:

It is very important for innovation that you don't think of it on your own [as it often emerges] from having cooperation networks in constellations that didn't exist before. (…) I have been working with a meteorologist for 40 years [and] we thought of many new things [together]due to good professional and personal relations. And if you keep that up, company-like structures emerge… engineering plus university offshoots plus other friendly colleagues in a network [which] drives innovation forward, even if it is not yet organized in direct product development. (…) It [is also] important that you go out there very actively in terms of your expertise [which benefits you] when you come into a new field – I have the advantage of having worked in several fields in my life. (…) You become more well-known and then slowly, for me mostly through conferences[, consultancies and teaching], you get the opportunity to meet many, many colleagues… that then becomes the personal network, which is also technically resilient for many, many years. (…) And these structures create really stable networks.[5]

We found Tritschler, the interviewee most highly motivated by community engagement, to be also the most attuned to social sustainability (tables 2, 3). These two aspects are integral to Sprungbrett, established in 1992 as a youth employment workshop linked to the Diaconal Work Riesa (Sprungbrett e.V., n.d.). Evidence that the association has reached transformative learning lies in Tritschler's understanding of the importance and practice of systematizing frameworks to maintain and reactivate knowledge, thus enabling innovative services. Ashe explained: "[Our] working groups are both external… and internal [to Sprungbrett such as in] assistant groups for the Board [in each of] five areas: public relations, organizational development, values, personnel, and finance, where employees get involved, and these groups try to drive things forward and create new things for the association."[6] Sprungbrett has come to combine vocational training with community- and civic-development projects through local partnerships, addressing issues of youth outmigration, recidivism, demographic shifts, and the destructive tendencies of right-wing populism – which capitalize on the enduring post-GDR fallout to win over supporters, as he also described. Such multifaceted offers can spill over into local economic and environmental sustainability, as youth gain new skills and, beyond boosting their own employability, come to see themselves as active parts of sustainable community development, which may be an incentive to stay local.

Sprunbrett's initiatives include the "Roll-In Bicycle Workshop," boosting youth-offender rehabilitation with skills training under socio-pedagogical supervision; a micro-grant program for residents to implement

[5] Translated by Ana Beatriz Ribeiro from the original German interview, conducted with Peter Holstein via Zoom on October 29, 2024.

[6] Translated by Ana Beatriz Ribeiro from the original German interview, conducted in person with Martin Tritschler at the SEPT Competence Center in Leipzig on November 7, 2024.

projects through participatory budgeting; and its "Week of Democracy," during which high schoolers receive hands-on experience in voting and project evaluation. The association's future vision centres on retrofitting Meißen's historic Göhlis Manor into a space for recreation, collaboration, learning, and dialogue for people of different ages, professions, and backgrounds. This may be especially vital given current pressing challenges (Table 4).

Code System	Kloster Posa	Ingenieurbüro Peter Holstein	Sprungbrett e.V.	SUM
Obstacles to service provision				0
Financial		5	2	7
Political or governmental	1	4	2	7
Socio-cultural	1	2	6	9
Infrastructural	8	1	1	10
Combinative capabilities				0
Systematization	1	2	5	8
Coordination		3	8	11
Socialization	11	10	12	33
SUM	22	27	36	85

Table 4: The main obstacles and capabilities identified and number of mentions per case study. Generated with MAXQDA.

The "obstacles" category in Table 4 emerged entirely from the interview data, rather than having a conceptual basis in innovation or management studies. The QCA method recommends a mix of both, to balance the achievement of theory-informed research goals with letting the data speak for itself (Schreier, 2012). Based on our QCA, "social-cultural" obstacles emerged as the most pressing for Sprungbrett: capable members being unable to rally together due to differences in approach; a lack of understanding by urban organizations or academics that attempt to help its rural beneficiaries; as well as a disconnect between different interest groups the association works with in the region. Tritschler emphasized the importance of developing more effective communication and adaptation methods leveraging his social skills to get through to different stakeholders, such as entrepreneurs, towards the community's integrated sustainable development. The inviting atmosphere at the Göhlis Manor could help "break the ice" between the different demographics Sprungbrett targets. Another helpful point would be the further development of coordination and systematization capabilities, which are not as strong as socialization for any of the interviewees. While socialization can lead to transfers, as we have argued, more coordination and systematization are needed to ensure communication and knowledge-retention methods are maintained and positive changes are scalable and outlast the presence of the leaders interviewed.

In fact, Sütterlin identified such internal infrastructural obstacles as the main ones preventing Kloster Posa, a retrofitted former monastery in Zeitz, from establishing itself as an innovation facilitator from its cooperative core. Despite acknowledging that he and his co-decision-makers have become good at publicizing and writing grants for the project, he lamented weak systematization and coordination for hindering internal knowledge sharing and external communications such as with the city administration. The association depends on the city both as its landlord and as co-developer of a concept that should eventually bring sustainable electricity and heating for Kloster Posa all year round, whereas its unstable gas heating keeps members away in winter now. Sütterlin also points out that it is hard to be strategic when the association's members still have to work other jobs to make ends meet and take care of basic issues to keep Kloster Posa functional, amid its flat hierarchies.

We argue that in its informality, Kloster Posa is still in the exploratory learning stage: While Sütterlin recognizes members' existing competences and the importance of obtaining knowledge – assimilated into managing their festivals and sustainable vineyard and crafts making workshops – he admits lacking a system to maintain or reactivate it. The latter functions would be essential for transformative learning and eventually knowledge transfers for strategic innovation (Ansari Vaghef, 2022; Gebauer et al., 2012). Besides mainly focusing on its socialization capability, the communal project prioritizes social over economic sustainability (tables 3 and 4),which is both part of its charm and a potential impediment to its further professionalization and longevity.

Nevertheless, Kloster Posa, launched in 2013 by private citizens from Meißen and Leipzig, has managed to turn a monastery into a celebrated cultural and artisanal centre unique in the region; and that, in itself, is an innovation (Kultur- und Bildungsstätte Kloster Posa, n.d.; Mitteldeutsche Zeitung, 2021). Amid his

pragmatic interview answers, Sütterlin took a moment to reflect on his pride over the non-profit's accomplishments thus far:

Image 2: Hand-cultivated vineyard at Kloster Posa in Zeitz, first run by monks in the 12th century and since rehabilitated, alongside the entity's modern crafts workshop. Taken by Ana Beatriz Ribeiro.

[Our overarching goal has been] to offer alternative cultural activities in rural areas and thus fill gaps [and] to create a positive example of the fact that social structures can be built here and that this can also have an impact on the city. (…) And now it is 10 years later. So something is happening in Zeitz, you can see that. People in various German cities, Leipzig in particular of course, have heard of Zeitz. There were quite a few who hadn't necessarily been here, but many had heard that something was going on… and we were definitely not the only ones, but Posa was one of the first places to make cultural innovations in the broadest sense [locally]. (…) There are a lot of other factors that have led to this, but I think you always need pioneers who go into the room and say, we are the first here to do something like this. Back then, I think – I wasn't here yet – there were individuals with whom you could network, but they didn't necessarily have a structure, so they weren't [a] club or… institution.[7]

Sütterlin's statement perfectly reflects the essence of civil-society intermediaries' role in the region: the ability to identify local gaps and existing opportunities and inhabit both the community and institutional realms, thus helping to formalize community members' interactions into a structure that could meaningfully contribute to the local innovation system. It is up to the other three, established pillars of innovation in Germany – industry, academia, and government – to provide support better tailored to these vital facilitators' needs, for raising their level of integration with the triple bottom line of sustainability and ensuring they thrive in the long term.

6 CONCLUSION

The shift from extractive industries to sustainable development and digitalization poses a significant challenge for smaller cities and rural regions that have historically relied on coal mining, heavy manufacturing, and other resource-intensive sectors. As these industries decline due to shifts in global markets, technological change, and environmental reforms, communities are often left grappling with economic stagnation, population loss, and underdeveloped support structures. This has come to lead to political radicalization which threatens the global sustainability agenda (United Nations, 2024).East Germany's Mitteldeutsches Revier exemplifies these points: As a region with a long history of mining, it faces profound economic restructuring and discontent amid the phase-out of lignite extraction. Unlike metropolitan centres with established innovation and R&D hubs, more rural regions such as the Mitteldeutsches Revier find themselves having to create alternative models for local development, reliant on civil society. The models we identified consider social and environmental goals more so than economic ones, as community-driven initiatives that prioritize multi-purpose, inclusive transformations.

[7] Translated by Ana Beatriz Ribeiro from the original German interview, conducted with Lennart Sütterlin on site at Kloster Posa in Zeitz on November 17, 2023.

The ongoing transition in the Mitteldeutsches Revier underscores both the vulnerabilities and resilience of post-industrial communities. This study has illustrated how three community-driven intermediaries in the region's districts are stepping in to fill gaps left by traditional innovation pillars. Through initiatives focused on education (Sprungbrett), cultural revival (Kloster Posa), and adaptive reuse of technology and infrastructure (Peter Holstein), these actors can offer a blueprint for balancing economic, social, and environmental sustainability. Their efforts, however, remain constrained by financial limitations, infrastructural deficiencies, and the need for stronger systemic support, alongside those of other small-scale intermediaries. As one of our interviewees from the theatre sector reported, emphasizing the importance and overburdening of the individual: "All of this is a crisis that I try to mitigate, where I go to a New Year's reception or summer party, and where I try to talk to people. And it only works through the person [i.e., her personal ability to rally support and raise funds]."[8]

Unlike top-down government interventions, such community-driven efforts are often rooted in local contexts, drawing on the knowledge, creativity, and agency of private citizens. They activate underutilized assets such as disused industrial sites, old factories, and historic residences, transforming them into versatile facilities that serve as cultural centres, coworking spaces, artisanal production sites, and vocational training areas. By engaging stakeholders from multiple sectors – including craftspeople, artists, entrepreneurs, and government authorities – these initiatives support capacity-building and participatory governance, which could help lead to shared economic growth. The strength of their socialization can have positive implications for a better integrated approach to sustainability, including socially conscious environmental rehabilitation in former coal extraction zones. At the same time, issues with receiving funding for viable, incremental innovations and necessities such as heating highlight the gaps in external support, such as from the government pillar, which could threaten the initiatives' very survival. If unable to cover the basics, how can they be expected to maintain innovations?

While the case studies we presented from the Mitteldeutsches Revier demonstrate remarkable adaptability, their sustainability, and that of other active intermediaries at the grassroots level, depends on broader changes in Germany. A multi-scalar approach – integrating bottom-up innovative solutions with top-down policies and targeted funds – could ensure that these efforts contribute meaningfully to a more enduring and fair economic transformation. By aligning funding, institutional, and social resources, East Germany's transitioning regions could avoid further pitfalls of stagnation and chart a path towards more inclusive, innovation-driven growth.

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[8] Translated by Lucina Diehl from the original German interview, conducted with Jana Bauke on site at the BAFF Theater Delitzsch, Nordsachsen, on January30, 2024.

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