MANAGING POTENTIAL IMPACTS AND UNCERTAINTIES OF HIGH-SPEED RAIL ACCESS AT LOCAL LEVEL: INSIGHTS FROM FOUR GERMAN CITIES

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Summary: This paper empirically investigates how local actors manage potential impacts and uncertainties associated with a new high-speed rail (HSR) access. The provision of such supra-regional transport infrastructure offers significant benefits to accessed cities and regions. However, the main challenge lies in transforming the potentials into actual local impacts. We conducted expert interviews in four German cities equipped with HSR stations to examine ways and practices of local responsible actors in this context. The study focuses on the voiced objectives and approaches, the instruments and actions used, and the factors that facilitate or impede leveraging potential impacts. Using the conceptual framework of strategic planning, we show that both linear and adaptive strategies are required to cope with uncertainties. Furthermore, anticipation of potential impacts by politicians and planners with a long-term horizon can prove advantageous in the face of complex dynamics. Promising and necessary progress could be made through enhanced cooperation and coordination with Germany's HSR operator and by taking greater account of local concerns with regard to a stronger integration of HSR-related transport and spatial planning.

Keywords: Germany, high-speed rail, strategic planning, impacts, uncertainties, urban development

1 Introduction

Given that high-speed rail (HSR) is a top-tier transport infrastructure with the potential to positively influence the development of cities and regions, having access to the HSR network is to be regarded as a distinct asset. Planned and implemented by higher administrative levels, the improved accessibility offered by HSR services can serve as an exogenous shock (Preston & Wall 2008, Vickerman 2015). This provides new opportunities for spatial interaction and connectivity, especially at the local level (Yin et al. 2015).

While local companies and households benefit from increased accessibility, cities are also encouraged to incorporate HSR into comprehensive urban development strategies aimed at attracting new residents and higher-value business activities. Moreover, urban (re-)development in HSR station areas can be promoted (van den Berg & Pol 1998, Trip 2008), with stations possibly serving as focal points for wider economic impacts and urban dynamics, even if specific local preconditions are ultimately decisive (Bertolini & Spit 1998, Ribalaygua et al. 2020, Weiß & Münter 2022).

Planning research has sought to frame planning approaches with a view to capturing the socio-economic impacts of increased HSR accessibility. In this context, the perspective of anticipation describes the early recognition and uptake of potential impacts induced by HSR. While references to this term remain vague in the literature (Loukaitou-Sideris et al. 2012, Blanquart & Koning 2017), anticipation seems to require active local actors to create appropriate conditions in advance, react to emerging opportunities following HSR arrival, and transform the initial situation into lasting impacts (Bruinsma et al. 2008).

But such promises may collide with reality in planning and policy. Concerning HSR, Chen & Hall (2015: 301) state that "given that transport is a necessary but not sufficient condition for urban and regional development, wider impacts require strategic planning that extends beyond transport, and that varies with different contexts and conditions". Furthermore, proactive planning, i.e. creating favourable preconditions, seems a promising way of leveraging HSR stations as accessibility providers and catalysts for urban growth (Wenner & Thierstein 2022).

In this context, strategic spatial planning is understood as a comprehensive framework, selective focus, and process for defining long-term objectives and strategies for achieving a shared consensus on spatial use and development. A variety of methods and instruments are used. The focus is on coordinated and integrated approaches to address the

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framework conditions and influencing factors to meet society's current and future needs (Albrechts 2004, Healey 2009). Strategic planning thus forms the conceptual framework for this paper. However, little research has been done on how municipalities conduct such responsible, anticipatory and strategic planning when being connected to the HSR network (Facchinetti-Mannone 2019, Hermelin & Gustafsson 2022).

For this reason, this paper aims to empirically ascertain how potential impacts and uncertainties surrounding the creation of a new HSR stop are managed at the local level, observing local public actors' anticipatory and planning behaviour through the theoretical lens of strategic planning. The focus is on the following three research questions:

(1) Which objectives and approaches regarding HSR access have been voiced by local public actors?
(2) Which instruments and actions have been used by local public actors to exploit potential HSR impacts?
(3) Which factors facilitate or impede the leveraging of potential HSR impacts, and how are they strategically managed?

The remainder of this paper is structured as follows. Chapter 2 introduces the conceptual framework and the state of research before chapter 3 provides more detail on HSR and spatial planning in Germany. Chapter 4 goes on to describe the methodological approach and the case studies. Chapter 5 presents the key empirical results before these are discussed in chapter 6. Conclusions and possible implications are drawn in the final chapter.

2 Conceptual framework: Strategic planning for HSR to succeed at the local level

Given the policy goals of decarbonizing transport and investing in the rail infrastructure, HSR has become an important object of study in planning research. Major transport infrastructure projects and their operation are associated with high complexity and multi-level challenges (Sartori 2008, Moyano & Dobruszkes 2017), as witnessed by their huge financial and spatial implications and the involvement of stakeholders from different functional and hierarchical levels (Feliu 2012, Dai 2015). Moreover, infrastructure projects are long-running undertakings with territorial inertia that require careful assessment (Facchinetti-Mannone 2019). To better handle these complexities and associated path dependencies, statutory planning is being complemented by strategic planning elements (Wiechmann 2008, Healey 2009, Albrechts 2017).

2.1 The strategic planning approach

In general, strategies aim to reduce complexity and encourage the consistent behaviour of all actively involved players. Depending on their degree of abstraction, strategies can appear as guiding principles and visions or in overarching objectives, programs and plans, as well as in concrete projects and individual actions (Wiechmann 2008, 2018). Furthermore, strategic spatial planning is described as a transformative and integrative socio-spatial process mainly driven by the public sector. By shaping and framing space, it aims to generate visions, coherent actions and resources (Albrechts 2004), also in dealing with remaining uncertainties in the planning process and outcome.

Anglo-Saxon and German planning literature agree that the shortcomings of project-oriented planning, uncoordinated sectoral planning and the neoliberal politics of the 1980s are at the origin of strategic planning (Albrechts 2004, Wiechmann 2018). Such planning has an integrative and cooperative character involving several players and institutions. For example, Albrechts (2004) sees strategic planning as a new understanding of planning that complements the statutory land-use planning found in comprehensive spatial planning. Legally standardized and subject to political system logic, the latter's procedures are little able to cope with today's complex challenges (Danielzyk & Münter 2018, Wiechmann 2018). As a result, strategic planning complements formal modes of planning, and in Germany, this has required informal modes of planning outside the statutory framework to emerge. These informal – i.e., not legally formalized – planning instruments include, for example, communication and moderation in planning processes alongside state hierarchical modes without substituting existing structures (Danielzyk & Sondermann 2018).

The attribute of being integrative (both in a territorial and contextual meaning) is often stressed (Albrechts 2017). While Healey (2009) underlines the role of strategic planning as a social process, Albrechts (2004) emphasizes the strength of strategic planning, which is equipped with a broad set of concepts, procedures and tools adaptable to specific situations. Moreover, strategic planning can assist in dealing with an increasingly complex, uncertain

and changing world (Albrechts 2017). Yet there is criticism that strategic planning insufficiently considers statutory political processes (Newman 2008). In this context, Wiechmann (2008) addresses a key issue: how long-term strategic planning can and should be carried out at all in dynamic and complex environments.

The broad understanding of strategic planning has long been debated in the literature, with a fundamental distinction made between *linear* and *adaptive* strategy development strands. Providing a comprehensive overview of their characteristics, Wiechmann (2008, 2018) demonstrates that the respective fields build on different logics (Tab. 1).

There is an ongoing debate on the convergence of the two paradigms, with Mintzberg & McHugh (1985) even speaking of their coexistence. Indeed, each offers advantages and they may even alternate over time. For example, linear strategy development is probably better suited to simple structured situations (engineering problems or project plans in the sense of Mastop & Faludi (1997)), while an adaptive approach is more suitable for complex situations and uncertainty regarding the decision-making environment, objectives and values. Ultimately, however, the key task and challenge for strategic planning is to combine these two understandings in an integrative approach (Wiechmann 2008).

In practice, the framework of strategic planning is applied to different domains. Taking the shift towards sustainable mobility as an example, numerous studies consider strategic planning as a key factor in promoting the necessary integration of land-use and transport planning (Hrelja 2015, Levin-Keitel & Reeker 2021). This also leads to the question of whether both strategy paradigms are necessary for successfully translating HSR potentials into actual impacts. Consequently, when considering the long-term local-level gains of improved accessibility, a complex and long-term transport infrastructure project like HSR may necessitate both a rational strategic framework and an incremental, project-based implementation led by local authorities (Trip 2008, Feliu 2012).

2.2 Objectives and issues pursued at the local level in the context of HSR

Depending on the stakeholder, various objectives can be defined and pursued during HSR planning. In the literature, there is consensus on these stakeholder-specific objectives. For instance, strengthening territorial cohesion through obtaining a new HSR stop is one such objective at the regional level. In contrast, local actors, particularly politicians and project developers, may prioritize objectives such as attracting business development, specifically for knowledge-intensive activities (Chen & Hall 2011) or enhancing tourism and retail (Yin et al. 2015). A further local key objective is to spatially integrate a centrally located HSR station to better balance its twin functions as a transportation node and urban place (Bertolini 1996). To achieve these ambitions, local public actors focus on developing urban qualities through mixed-use, dense and compact development around the station (Cervero et al. 2004, Trip 2008).

Tab. 1: Comparison of linear and adaptive strategy models

Component	Linear strategy model	Adaptive strategy model
Strategy (concept)	strategy as a plan	strategy as a pattern
Actors	rational and informed	boundedly rational, intuitive
Starting point	internal and external analysis	discovery of consistent actions
Time perspective	prognostic	retrospective
Method	formal planning	collective learning
Formulation of strategy	complete and explicit	incomplete and implicit
Steering mode	central implementation	adaptive, gradual adjustment
Interaction	limited to strategists and experts	participative in collective processes
Ends-means relationship	from ends to means	from means to ends
Strategy content	defined ends and the required means	behavioural patterns and routines
Purpose	decision support, intentional guidance	decision heuristics, mobilization
Decision-making patterns	rational / intended / deliberate / logical in decision-making	incremental / emergent / pragmatic
Logic	technical	political
Steering perspective	foresighted, comprehensive	gradual, pragmatic

Source: Modified from Wiechmann (2018)

These aspects pertain to the far-reaching spatial planning approach of *Transit-Oriented Development* (*TOD*) (see Ibraeva et al. 2020 for an overview). Achieving sustainable urban growth requires an effective land policy combining railbound transport infrastructure and land-use development. Local authorities can achieve this by taking deliberate *TOD* action (Bertolini et al. 2012, Loukaitou-Sideris & Peters 2020). Even though many of these issues are the public sector's responsibility, project developers and investors also pursue business objectives in realizing construction projects and need to be involved (Fig. 1).

2.3 Stakeholders in the HSR system

Vickerman has drawn attention to the essential role of careful planning "to effect necessary ancillary investment" (1997: 36), and for local and regional authorities to work together on new transport infrastructure "to ensure the right type of complementary development" (2015: 164). This point is emphasized by a growing international body of literature on HSR (Givoni 2006, Preston & Wall 2008, Wang et al. 2022). Stakeholders in HSR issues usually include national, regional and local governments and their respective planning institutions, train operators, project developers, investors, passengers and civil society (Yin et al. 2015). However, the vertical planning levels usually pursue different interests regarding HSR. Such conflicts can even hamper unfolding local development, as shown by a comparison of medium-sized European cities (Feliu 2012). The diverging logics between the objective of greater equality in spatial accessibility and the network-based economics of HSR operation resulting from transport operators' supra-territorial logic (Facchinetti-Mannone 2019) lead to challenges for cities, as witnessed by operators seeking efficiency and profitability gains through bypassing smaller, intermediate cities (Ureña et al. 2009, Moyano & Dobruszkes 2017).

In the face of these conflicting interests, local authorities often lack the power to influence higher-level HSR infrastructure decisions. For example, when planning an integrated station area, the various planning domains intertwine spatially. To counter such circumstances effectively, Hermelin & Gustafsson (2022) suggest that municipalities should proactively pursue urban development strategies as an important concomitant to major infrastructure planning. Consequently, this also affects their local strategic planning (Vickerman 2015).

Literature exploring the overlap between HSR and spatial planning describes the previously mentioned perspectives as *organizing* and *adaptive capacities* of local strategic planning. *Organizing capacity* subsumes the ability to involve stakeholders and accommodate their interests, to implement strategies, and to create conditions for the strategic uptake of HSR potentials (van den Berg & Pol 1998, Feliu 2012). *Adaptive capacity* expresses the ability to adjust in response to changing conditions and uncertainties by taking additional measures, albeit aided by long-term spatial planning visions or strategies (Stead & Meijers 2009).

2.4 Spatial preconditions facilitating urban development

First, preconditions for urban development triggered by HSR are linked to spatial settings at different scales. As crucial success factors, they have been examined in numerous international studies (e.g., Preston & Wall 2008, Ureña et al. 2009, Chen & Hall 2011), with the focus often on urban development near (high-speed) rail stations (e.g., Peters & Novy 2012, Thomas & Bertolini 2017, Ribalaygua et al. 2020). Research continues to critically discuss the complex interdependencies, as there is no general relationship between accessibility and wider economic impacts at high-speed and long-distance rail stations (Reggiani & Ortiz-Moya 2022, Eichhorn et al. 2023).

However, the various authors concur that adequate spatial and built environment resources are key to turning increased HSR-induced accessibility into added value. A distinction needs to be made between prerequisites in large first-tier and smaller second-tier cities, as emphasized by Loukaitou-Sideris et al. (2013) in a review of the predicted (*ex-ante studies*) and actually observed (*ex-post studies*) impacts of high-speed rail, highlighting generally stronger impacts in larger cities, but also considerable impacts in smaller cities. This underscores the significance of the *absorptive capacity* of cities or station areas (Cohen & Levinthal 1990, Nooteboom 2000). While an appropriate supply of building land and office space must exist in principle (Beckerich et al. 2019, Wenner & Thierstein 2022), planners can initiate accompanying land management measures by applying planning instruments to address the practical and political obstacles to the utilization of land for HSR-related development (Weiß & Münter 2022).

3 High-speed rail and spatial planning in Germany

HSR encompasses newly built lines designed for speeds of at least 250 kph or upgraded lines for speeds of 200 kph (European Council 1996). This study consciously focuses on the former, since accessibility improvements are expected to be more significant. The current German 250+ kph HSR network comprises 32 stations exclusively serving passenger transport. Since the network has largely evolved historically, most stations are in inner-city locations and have been upgraded to HSR needs. With its central location in Europe, the German HSR network covers key sections of many core network corridors of the European Union's Trans-European Transport Network (TEN-T), a policy guideline prioritizing routes to be upgraded through significant financial incentives.

Reflecting Germany's administrative governance as a three-level federal structure, the country's comprehensive spatial planning system is decentralized (Fig. 1, Danielzyk & Münter 2018). The main task of coordinating different, partly competing land-use demands is guided by the vision of sustainable spatial development for which different laws and formal instruments apply. These resources may be supplemented by informal planning instruments, especially at the local level (Danielzyk & Sondermann 2018). Endowed with far-reaching autonomy, municipalities (in German: *Städte und Gemeinden*) – the local and lowest level of the planning system – make planning decisions on land use within their territory. Their autonomy is, however, limited by framework conditions set by the states (*Länder*) and regional planning authorities via the mutual feedback principle (*Gegenstromprinzip*) (Danielzyk & Münter 2018 for further reading).

In addition, spatially relevant sectoral policies have their own legal basis and specialized administrations. While similarly interacting with the different levels of comprehensive spatial planning, they are often more powerful as they dispose of large budgets and attract greater political attention (Blotevogel et al. 2014). One such sectoral policy is transport planning, where overall responsibility for the rail sector (including HSR) and stations is assigned solely to the federal level. *Deutsche Bahn* (*DB*), which was transformed into an enterprise under private law in 1994 but is still 100 percent state-owned, is responsible for most of Germany's rail infrastructure, while at the same time operating most HSR and long-distance services. In order to realize a major transport infrastructure pro-

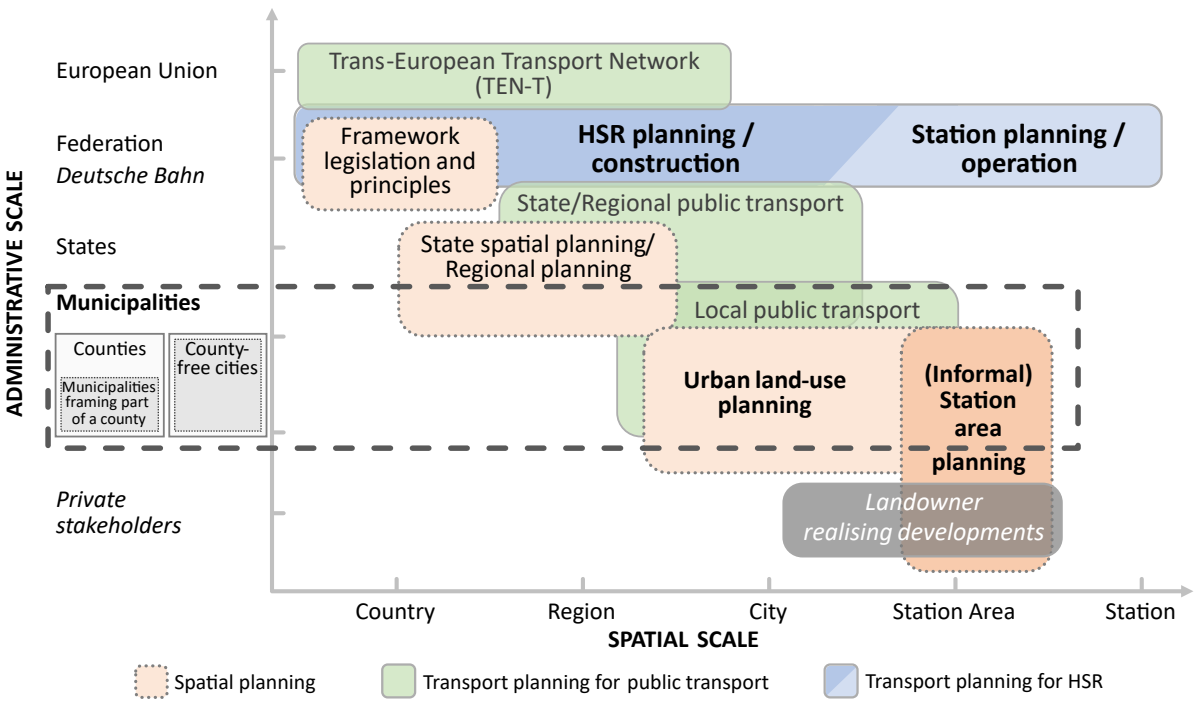


Fig. 1: The German multi-level system of administrative governance in the context of HSR
Source: Own illustration, modified from Blotevogel et al. (2014), Münter & Reimer (2023)

ject with a supra-local dimension and spatial relevance, two major planning procedures are conducted in advance. The spatial impact assessment (*Raumverträglichkeitsprüfung*) (formerly until 2023: spatial planning procedure, *Raumordnungsverfahren*) initially verifies the fundamental conformity with the requirements of comprehensive spatial planning and coordination with other spatially significant plans and measures. Although the result is not legally binding, it must be taken into account in the subsequent procedure, the planning approval procedure (*Planfeststellungsverfahren*) as the actual entire approval process. The Federal Railway Authority (*Eisenbahnbundesamt*) carries out the approval procedure for such railway infrastructure projects at the request of *DB* as the project developer (*Vorhabenträger*). The municipalities are only involved in the planning approval procedure as one of many public agencies (*Träger öffentlicher Belange*) via the mandatory participation of public authorities (Pahl-Weber & Henckel 2008). Due to the public and supra-local interest in developing such transport infrastructure, sectoral planning thus takes precedence over local land-use planning. As a result of this federal focus backed by federal-level laws and procedures, the negotiating power of subordinated levels with regard to sectoral planning projects is weaker. While the federal states have considerable bargaining power, sometimes successfully affecting HSR projects, the influence of municipalities on HSR policy issues is very limited (Ahlfeldt & Feddersen 2018, Wenner & Thierstein 2020).

Despite the high territorial implications and formal procedures of public authorities participation, local spatial planning and supra-local transport planning in Germany are generally carried out separately and are not always free of conflict in an "extremely complex" relationship (Danielzyk & Münter 2018: 8). This means that municipalities – representing the local level – only act as third parties in supra-local transport planning (Fig. 1). These restrictions on municipal action continue after the decision to build an HSR station in station area development projects, where municipalities are only responsible for planning the surrounding area but not the station itself. Moreover, private stakeholders (often landowners) are also involved, for instance, assuming responsibility for realizing developments. Underpinning our research interest, this set-up reveals the conflicting interrelationship between land-use planning and transportation planning, leading to challenges for integrated strategic approaches (Hrelja 2015).

4 Methodological approach

4.1 Case studies of HSR stations and their background

Based on the principle of maximum variation cases (Flyvbjerg 2006), we chose four cities in Germany served by HSR as case studies for our analysis. The four cities contrast in their inhabitants, station status (upgraded or newly built) and station location (Tab. 2 and Fig. A1 and Fig. A2 in the appendix).

Compared to other HSR cities in Germany, all case study cities feature highly increased accessibility due to the arrival of HSR, helping us to distinguish between induced impacts and other exogenous factors. Fulda is served by the newly built HSR line Hanover–Würzburg (completed in 1991) and benefitted greatly from travel time reductions (e.g., Hanover–Fulda: 88min (-48min, -35%)). Similarly, the newly built HSR line Cologne–Frankfurt (completed in 2002) halved the travel time between the two largest German metropolitan areas to one hour. Since then, Köln Messe/Deutz serves as substitute stop for Cologne Main Station to save travel time for HSR trains. The smaller cities of Siegburg, Montabaur and Limburg were newly connected as intermediate stops (Fig. 2).

The genesis of these routes and the individual decisions for the HSR access have been shaped by many factors, and initial planning dates back to the late 1960s. In the case of Fulda, the newly built HSR line Hanover–Würzburg should serve as a capacity increase for the large-scale and important north-south axis in the former Federal Republic of Germany. At first, the railway operator aimed to route the line bypassing Fulda with the option of a peripheral station to be built later. After many years of discussion, the efforts of the local administration and politicians succeeded in achieving a stop along the HSR corridor at the existing station (Engels et al. 1987, Interview 1). From the city of Fulda's perspective, this was extremely important and was argued with the large catchment area of Fulda as a high-order centre with a great distance to the nearest large cities (Fuldaer Zeitung 2021, Interview 1). Supported by the HSR connection, the city increasingly positioned itself as a venue and location for tourism and strengthened the urban-spatial integration of the station since the 1990s (Weiß & Münter 2022).

For planning a new route to connect the two largest metropolitan areas in Germany (Rhine-Ruhr area and Rhine-Main area) faster, various route variants have been developed since the 1970s. The final

Tab. 2: Information on the case studies

Station *City*	**Year of HSR implementation**	**Services of long-distance rail on weekdays** In 2019 (before HSR)	**Station status**	**Station location** to city centre	**Station location** in region
Fulda *Fulda*	1991	136 (94)	upgraded	central	station in medium-sized city outside urban region[3]
Köln Messe/Deutz *Cologne*	2002	54 (2)	upgraded	central/edge	secondary station in core city (Cologne)
Montabaur *Montabaur*[1]	2002	36 (-)	newly built	edge	station in medium-sized city outside urban region
Siegburg/ Bonn *Siegburg*[2]	2002	73 (20)	upgraded	central	station in vicinity of core city (Bonn)

Station *City*	**Inhabitants** in municipality In 2019 Δ 1990–2019 [%]	**Employees** at place of work In 2019 Δ 2002–2019 [%]	**City context and characteristics**
Fulda *Fulda*	68,600 (+23.9)	52,900 (+29.9)	- high-order centre; counties‘ administration city; central city in peripheral region - rather rural hinterland with great distance to the nearest large cities - supra-regional orientation to Frankfurt am Main - manufacturing SMEs, university of applied science, tourism region
Köln Messe/Deutz *Cologne*	1,087,900 (+15.0)	582,600 (+25.5)	- high-order centre; metropolis; very centrally located - very large service sector - high international significance for trade fair, congress, tourism - headquarters of large companies and institutes; several universities
Montabaur *Montabaur*[1]	40,100 (+18.0)	16,800 (+41.8)	- middle-order centre; counties‘ administration city; larger small town; centrally located in rather peripheral region - rather rural hinterland - regional orientation to Koblenz - manufacturing SMEs, industrial and craft sector
Siegburg/ Bonn *Siegburg*[2]	41,600 (+19.6)	19,000 (+13.1)	- middle-order centre; counties‘ administration city; very centrally located - regional orientation to Bonn and Cologne - branch mixture with a surplus in the service sector - close to the Cologne Bonn airport

Sources: BBSR (2022), Federal Employment Agency (2021), Grahnert & Krings (2024)
[1] Values refer to the administrative association of Montabaur
[2] Values refer to the municipality of Siegburg
[3] Fina et al. (2020)

Cologne-Rhine/Main route, inaugurated in 2002, resulted from different variants in favour of the most direct route designed exclusively for passenger transport and allowing for a train speed of up to 300 kph. The route follows a pronounced parallel course to the highway A3 and allows for halving travel time between Cologne and Frankfurt from about two hours to one hour (Hughes 1994). However, the planned direct route also meant that the (then) federal capital Bonn and other large cities (Koblenz, Mainz, and

Wiesbaden) with long-distance stops would not be directly connected to the new HSR line, leading to (local) resistance. Due to the envisaged route without planned intermediate stops, the three involved states – and in the case of Montabaur in particular, the local political and economic actors – successfully exerted political pressure, resulting in intermediate stops on its territory of North Rhine-Westphalia (Siegburg), Rhineland-Palatinate (Montabaur) and Hesse (Limburg). This results in the well-known but controversial case of having two HSR stops in Montabaur and Limburg, despite the short distance of 20 km and their small number of inhabitants (Stadt Montabaur 2017, Ahlfeldt & Feddersen 2018).

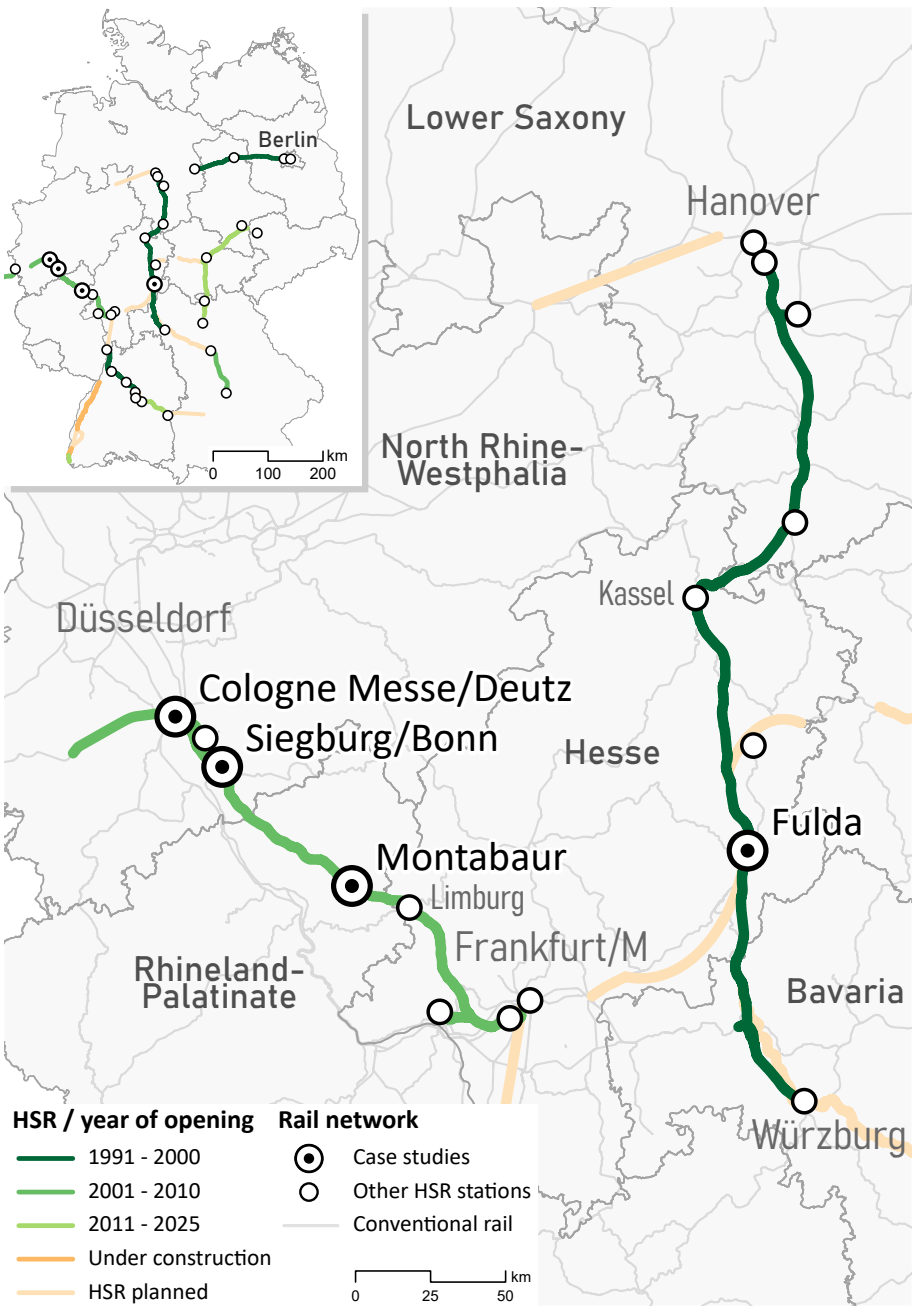


Fig. 2: HSR network in Germany and case studies
Geodata: GeoBasis-DE/BKG 2020, Data: DB Netz AG (2022)

Besides considerations at the higher level, the local level also positioned themselves individually. Even though the Cologne local actors preferred an HSR stop at the main station at the time, *DB* forced a stop on the right bank of the Rhine on account of reduced travel time, resulting in the decision favouring Köln Messe/Deutz (Interview 8). Surrounded by the trade fair, hotels, a multi-purpose hall, and (former) large brownfield sites, the station today forms an important international node with high passenger volumes and intermodal transport. Large-scale mixed-use developments were initiated to capture the potential offered by the increased HSR accessibility. An exceptional new station building and high-rise buildings in the adjacent station area were planned but never realized (Morchner 2006, Weiß & Münter 2022). Additionally, a new branch connects the Cologne Bonn airport to the HSR network.

The station in Siegburg serves as an HSR stop for the Rhine/Sieg region and, in a broader sense, for the former federal capital Bonn, which is directly connected to the HSR station by tramway (Interview 16). The station was renamed 'Siegburg/Bonn' to emphasize this regional importance. The railway station was newly built during the construction of the new HSR line. The HSR station was literally seen as a gift and perspective for the region, particularly against the background of the enactment regarding the capital (*Hauptstadtbeschluss*) in favour of Berlin and the associated concerns of an economic decline in the Bonn region (DBBauProjekt GmbH 1997).

In contrast, the HSR station in Montabaur has a different background. It is mainly based on the successful influence of regional and local actors and is not driven by existing or expected demand (Ahlfeldt & Feddersen 2018). Montabaur (similar to nearby Limburg) benefited from its location next to the existing highway A3, along which the planned route was to run, and from its location about mid-way between the first-tier cities of Cologne and Frankfurt. As a result, the local administration actively created the preconditions for spatial and economic impacts through the new HSR node with anticipatory urban planning in an unparalleled way in Germany (Interview 10). Thus, the route planning at the higher federal level has already been accompanied by numerous efforts and expectations at the local level, with the municipalities recognizing the positive momentum of becoming part of the HSR network.

4.2 Expert interviews with local public actors

Our methodological approach is based on semi-structured interviews with 16 key public representatives in leading functions (local administration, business promotion and politics) – designated here as local public actors. Identified in advance as key agents with in-depth knowledge, these experts were closely involved in the HSR implementation process. All interviews were carried out by telephone or video call in the winter of 2021/22 and lasted 70 min on average (see Tab. A1 and Fig. A3 in the appendix). With the participants' informed consent, the interviews were recorded and transcribed. The interview guideline contained questions on the following main topics, among others: defined objectives, actions of politicians and planners as well as their interaction, planning and business promotion instruments used, and facilitating and impeding factors. The transcripts underwent inductive coding as summarizing qualitative content analysis without a predefined coding scheme using MAXQDA (Mayring 2022). The interview guideline merely provided initial superordinated categories aligned with the extant literature and research questions. Our questions were informed by the research demands and key issues on this subject, guiding our targeted approach to questioning the interviewees. Nonetheless, the analysis remained flexible and open to new findings without presuppositions.

Since these actors were involved before, during and/or after HSR implementation, we were able to cover all HSR implementation phases in detail, thereby limiting the risk of overestimating time-specific situations or of details not being captured. With interviewees on average more than 16 years in employment, and seven persons already employed in their positions before HSR implementation, we were able to gain long-term views of anticipation processes. However, on account of the long period, it should be acknowledged that actor memories may have been selective.

As part of a larger research project, additional documents (like council minutes, *Deutsche Bahn* publications, newspaper articles and planning documents provided by the interviewees) were selected to supplement the empirical material and to gain robust evidence. Sometimes cited in this paper, these documents provided valuable background information to contextualize the interview material.

5 Empirical results: Local strategic planning to anticipate and manage potential impacts of HSR access

5.1 Point of departure – Local objectives and approaches regarding HSR access

At the start of HSR planning, formally and federally regulated procedures serve to define the intended route. During this typically long phase, competition between municipalities for a stop along the route reflects the complexities of diverging *DB* and municipal interests. In all cases, tough discussions and negotiations accompanied this process (see also 4.1). Statutory cost-benefit analyses, for instance, assess whether an inner-city stop at an existing station is preferable to a bypass to a new peripheral station. However, such analyses may neglect locally unfolding impacts (Interviews 2, 8).

Particularly in Fulda and Montabaur, efforts to establish a centrally-located stop began decades before the respective HSR lines were built. These aimed to strategically leverage development impulses for the station area (such as upgrading the station's rear side and fostering economic transformation, as seen in C Messe/Deutz[1]) and to achieve the urban-spatial integration of the new transport service. Such attempts are often accompanied by uncertainties (e.g., financing) but also trigger costly public-sector projects for the inter-/multimodal integration of HSR services with other transport modes. The integration of a tramway in the stations' basement (Siegburg) or the construction of a nearby central bus station (Fulda, Montabaur, Siegburg) exemplify these efforts (Interviews 2, 3, 8, 9, 12–16).

Further objectives covered urban development projects aimed at establishing mixed-use areas around the station, with a strong tendency for higher-value services (esp. C Messe/Deutz and Montabaur). Furthermore, strengthening sectors with an HSR affinity, such as the conference, congress and tourism sector, were pursued in all cases (Interviews 1, 4, 5, 7, 11, 13).

Given their low level of influence in superordinated processes (Fig. 1), municipalities aimed to establish informal but solid coordination structures, bringing urban and regional actors together to collectively manage complex situations (e.g., Montabaur, Siegburg). Lastly, one obvious objective is to take advantage of the emerging metropolitan integration induced by better connections to larger metropolitan areas, as seen in Fulda also prospectively for an upcoming further HSR network upgrade:

> "Combined with the future half-hour travel time to Frankfurt [am Main; compared to about 55min today], we plan to give Fulda a suburban character. The high-speed line will generate new development potential for Fulda."[2] (Interview 3, Fulda)

In contrast to those fundamental ex-ante objectives, subsequent approaches were longer-term, shaped by a certain openness towards ongoing developments and thus more flexible in adapting to uncertainties (Interviews 9, 10, 13, 14). Evidence backing this observation includes urban land-use planning projects aimed at gradually developing prestigious properties near the railway station, some of which are still pending (C Messe/Deutz, Montabaur, Siegburg). However, many of the objectives mentioned were only vaguely transposed into policy documents or plans, especially those aimed at fostering knowledge-intensive activities.

5.2 Practical application – instruments and actions aimed at exploiting potential HSR impacts

Public actors relied on various instruments to pursue their planning objectives. In general, the instruments mentioned in the interviews to exploit the potential HSR impacts were applied to both the wider urban fabric and the station areas, albeit focussing on the latter (Tab. 3). In local land-use planning, the binding land-use plan (BLUP) (*Bebauungsplan*) is usually the most powerful instrument in German planning law. A BLUP allows the municipality to stipulate legally binding the desired land use within the area covered, regardless of who owns the land. The case studies reveal an intention to steer distinct spatial development by implementing BLUPs in the station areas, partly adapted to changing circumstances. As a formal instrument with a legally defined process, interviewees emphasized that such BLUPs paved the way for desirable developments (Interviews 2, 3, 6, 9, 10, 13–15), but are not an instrument for actually implementing them.

In order to support the implementation and for sites within the station area for which the municipalities lack steering options, other planning procedures

[1] C Messe/Deutz = Köln (Cologne) Messe/Deutz

[2] Quotations translated by the authors

Tab. 3: Main municipal instruments and actions to exploit potential HSR impacts

Subject	Time	**Station** *City* **Fulda** *Fulda*	**Köln Messe/Deutz** *Cologne*	**Montabaur** *Montabaur*	**Siegburg/Bonn** *Siegburg*
Urban land-use planning	In the past	- *urban developments occasionally based on BLUP*, some without BLUP - construction of the adjacent pedestrian zone	- *numerous BLUP* (*on large plots*) - diverse informal concepts and competitions - architecture competition (esp. for redesigning station building and area)	- *Urban Development Measure* (*1994–2017*) and framework development plan - *numerous BLUP to erect the new station area*	- *focus on inner development* (*usually based on BLUP*) - new station building in cooperation with DB - urban design competition for station area - large-scale urban master plan
	Current / proposed	- large-scale residential development - redesign of the station square - relocation of the bus terminal - preparations for improved HSR connection to Frankfurt - more pronounced public participation	- long-term efforts to improve the station area - conceptions for the last unrealized site - promotion of intermodality	- concept for the revitalization of uses inside the station - extension of Factory Outlet Centre (*with BLUP and spatial planning procedure*) - improvement of the inner-urban road traffic situation - promotion of intermodality	- large-scale urban revitalization - planned improvement of the adjacent pedestrian zone - promotion of intermodality - more pronounced public participation
	Continuously	- established procedure for urban developments with an architectural advisory board, ideas competitions, *formal process*	- continuous regeneration of large industrial brownfields (*with BLUP*)	- established procedure for company settlements prior to the formal process	- continuous efforts to foster inner development with residential uses (*with BLUP*)
Business development/ promotion		- support for commuter hubs/co-working spaces - regional innovation centre (for health and quality of life) - PR campaign targeting out-commuters - IT start-up centre	- attempts to establish high-quality business uses (originally high-rise buildings) - location marketing at international fairs	- regional marketing initiative to coordinate HSR-related activities - ongoing location marketing - PR campaign	- location marketing - for some years, own resources for business promotion

Sources: Own interviews, DBBauProjekt GmbH (2001, 2002), Fuldaer Zeitung (2021), Morchner (2006), Schmitz (2022), Stadt Montabaur (2017)
Note: Formal instruments written in italics; those instruments and actions underlined also apply beyond the station area

have to be applied. This is particularly necessary where *DB* is the landowner, and the corresponding areas have been dedicated to the purpose of rail operation, which is often the case for (already disused) sites around stations:

> *"Deutsche Bahn* resold the land it had acquired while building the tracks in the 1990s to 2000s, but unfortunately, not to the municipality of Siegburg. The relevant agreements were not signed quickly enough." (Interview 13, Siegburg)

In such situations, it is common to use informal planning instruments such as strategic development concepts (often named *Stadtentwicklungskonzept* or *Masterplan*) and urban design competitions (*Städtebaulicher Entwurf/Wettbewerb*). The former is

primarily used to formulate sub-area urban development objectives and to coordinate the various sectoral plans to align them with common development objectives and guiding principles, often using dialogue-oriented procedures. Conversely, the latter is mainly used to generate the best ideas and solutions for architectural and urban development tasks with a long-term perspective, often followed by significant investment and project development (Pahl-Weber & Henckel 2008). Several interviewees underlined the advantages of such informal instruments for key projects, reinforcing statutory planning and capturing complexities (Interviews 3, 5, 6, 10, 13, 14). However, the timing of such concepts varied: for example, while an urban design competition was conducted in Siegburg as early as 1995, one was only held in Fulda in 2019 – nearly three decades after the HSR arrival.

Initiated parallel to the planning approval procedure for the HSR route, Montabaur's Urban Development Measure (*Städtebauliche Entwicklungsmaßnahme*) is particularly worth mentioning. Retrospectively, this distinct formal planning instrument succeeded in integrating the new edge-located HSR station into the urban fabric:

> "A major advantage of the Urban Development Measure is the possibility to acquire all properties relevant for its implementation. (…) However, it should be mentioned that the local authority needs to invest a large amount of capital when purchasing the land. But without this instrument, the undertaking would not have succeeded." (Interview 9, Montabaur)

As stated by the interviewee, this formal instrument helped in exercising the right of first refusal (*Besonderes Vorkaufsrecht*) under high legal conditions, far below the expected market value, to enable a comprehensive urban development project in the public interest. After completion, the zoned land was resold at a higher market value to refinance the measure within the legal framework of the Urban Development Measure. This distinguishes the Montabaur case from the other case studies. Although municipalities, in principle, also have a general right of first refusal (*Allgemeines Vorkaufsrecht*) to implement their urban development objectives when land or properties are offered on the market (Pahl-Weber & Henckel 2008), this instrument is generally rarely used, as municipalities can only exercise this right at the market price. In our case studies, therefore, the general right of first refusal did not play any role in the active development of an station area.

Despite longer experience with HSR, continuing efforts to realize (long-planned) construction projects (C Messe/Deutz, Siegburg) and the initiation of recent projects (Fulda, Montabaur, Siegburg) were reported, suggesting long-term and permanent HSR impacts. Furthermore, besides the classical urban planning tasks, the empirical material revealed collaboration projects with neighbouring municipalities or counties in all cases (Interviews 3–5, 7–11, 13, 16). One particular purpose of such alliances was to gain a better bargaining position towards *DB*. However, they were anything but formalized and successful every time. For the most part, however, the only occasions available for a municipality to speak with *DB* are annual timetable negotiations, discussions on the urban design of the station surroundings or the redevelopment of nearby brownfield sites.

The case study cities also used HSR as an image booster when promoting their locational advantages at trade fairs and towards possible investors and companies (esp. C Messe/Deutz and Montabaur). We also observed further business promotion actions to leverage potential impacts – even far beyond the station area – such as a regional marketing initiative (Montabaur) or the establishment of a regional innovation and IT start-up centre (Fulda) (Interviews 4, 7, 11).

5.3 Facilitating and impeding factors in leveraging the potential HSR impacts

Despite the wide variety of public actors interviewed, certain facilitating and impeding factors were common to several cases. We focus on the key factors mentioned by the interviewees, without neglecting the important factors already described in the literature that may influence any leveraging of potential HSR impacts.

Obviously, whether a factor is facilitating or impeding depends on local circumstances and the perspective of the respective actor. For instance, some interviewees viewed a central and well-integrated HSR station as beneficial, while for others inner-city space restrictions and a cramped station area impeded further development (Interviews 2, 3, 9, 13, 14). Furthermore, interviewees from different cities unanimously confirmed that having the land surrounding a station in municipal ownership facilitates development (Interviews 3, 11, 13). This scarcity of available land – except for Montabaur

during the Urban Development Measure – reduces steering options and increases uncertainties for public planning authorities. In their stead, private project developers, especially major initial investors, were the key players in the construction of significant buildings, so the public actors are strategically engaged in intensive interaction with them (Fulda, C Messe/Deutz, Montabaur) (DBBauProjekt GmbH 2002, Interviews 1, 5, 10, 11). As reported, an anchor tenant or initial higher-value uses were deemed to be both desirable and conducive to development as especially observed in Montabaur (*1&1* Telecommunication), C Messe/Deutz (*Zurich* Insurance for the recent project *MesseCity*) but yet absent in Siegburg, for example.

Additionally, several interviewees described the flexible handling of the planning instruments also used to react to changed circumstances – if required – as very beneficial:

> "We did not stick to a specific urban development concept but rather adapted the development to the framework conditions resulting from the changing demands of investors. In most cases, these were justifiable from an urban planning perspective. The fact that the urban land-use planning was responsive to the investors' requests also played a major role in project development." (Interview 10, Montabaur)

In this context, the unlimited validity of BLUPs is key to ensuring planning consistency, as these could be formally adapted to changing requirements. The planning intention of the municipalities is thus constantly guaranteed, indicating and enabling a strategic orientation (Interviews 10, 14, 15).

A shared optimistic mindset of local public actors and political perseverance in the face of long-lasting processes proved to be helpful and have been acknowledged several times. Likewise, local responsibles' anticipation of potential impacts as well as citizens' backing were considered supportive (Interviews 9, 12, 16). Distinctive locational advantages, sometimes named as flagships (e.g., *Koelnmesse* trade fair in Cologne; *Fulda University of Applied Sciences*; Siegburg's attractive pedestrian zone and broad retail offering), complemented the facilitating factors in all cases. Intermodal links with other modes of public transport are similarly seen as beneficial, but accessibility by road or a nearby international airport was also considered crucial (DBBauProjekt GmbH 2001).

By contrast, a mixed picture was drawn for more peripheral cities with regard to property prices compared to the connected metropolitan regions. While more affordable residential and commercial space could be offered, often appealing to young families or to commuters and local firms to relocate, some interviewees indicated difficulties in attracting highly-qualified employees due to the less central location and compared fewer urban amenities (Interviews 3, 4, 13, 15).

One main impeding factor concerns the coordination with *DB* – as the network, train, and station operator. This was described as cumbersome and, to some extent, exhausting:

> "*Deutsche Bahn* pursues a different agenda than local authorities, and developing public space around a station is certainly not a high priority. Nor are there any budgets available for this. But rail passengers pass through these spaces. On the part of municipalities, it would be desirable for *Deutsche Bahn* to take local concerns into greater account and demonstrate flexibility in dealing with local circumstances." (Interview 6, C Messe/Deutz)

This perception that *DB* generally seems to solely pursue interests in line with the profitability of its HSR operation was shared unanimously by other interviewees (Interviews 7, 8, 12). As a result, some tensions arise, e.g., concerning the urban integration of the HSR station into the public space, the retail use within the station or the HSR service offering.

Finally, regarding the multi-level system of administrative governance in Germany, the early termination of formal constellations with municipal influence (e.g., for federal transport infrastructures, Fig. 1) was seen as a significant – if not decisive from a municipal perspective – obstacle to institutional networking for better integrated HSR implementation and actor involvement (Interviews 9, 10, 13, 16).

6 Discussion: Managing potential impacts and uncertainties

Based on our findings, we now discuss how the case study cities used strategic planning to manage potential HSR-related impacts and uncertainties. With regard to expressing objectives and approaches (Question 1), two distinct phases can be seen. In the pre-HSR phase, the cities demonstrated the prognostic, all-encompassing objective of 'HSR as a must', as-

signing it early strategic relevance. In the post-HSR-arrival phase, a gradual shift was seen towards more precise objectives for initiating on-the-ground urban development and promoting business, focusing on the station area. Although this policymaking demonstrates the early anticipation of potential impacts, it does not lead to their actual exploitation. Rather, it is subject to the complexity that arises through the stakeholders' heterogeneous objectives and often through the lack of a clear definition of the desired development (Blanquart & Koning 2017).

As reported, necessary adjustments to the strategic orientation resulted from the medium- to long-term nature of HSR impacts, changing circumstances and uncertainties. As a result, objectives sometimes needed to be re-examined and adapted over time (*adaptive capacity,* Chen et al. 2019). For instance, in C Messe/Deutz, the rejection of plans for high-rise buildings necessitated flexible handling, though striking buildings were nevertheless erected (Morchner 2006). Referring to the so-called 'performance principle' of plans (Mastop & Faludi 1997) – i.e. the effectiveness of strategic plans as a frame of reference –, this highlights the actual plan application instead of just plan implementation.

It is important to acknowledge that examining the objectives was not as revealing as expected. This can be attributed to very long timeframes in certain instances, but more significantly, to the absence of a systematic process with a clear definition and articulation of objectives. By contrast, the approaches examined proved to be more insightful. They essentially testify to attempts to strategically leverage development impulses. The long-term, yet to a certain extent open orientation reflects the fact that some HSR impulses only emerge time delayed, as some of the case-specific approaches are more recent. A more general absorbing approach is the establishment of informal stakeholder structures to reinforce the envisaged objectives and harmonize possible diverging interests.

Instruments and actions (Question 2) appeared as a rather broad set, albeit with BLUPs – in the station areas – as the most distinctively applied (Weiß & Münter 2022). While these ensure the municipal planning intention (e.g., pursuing mixed-use station areas and/or increasing the allowable building densities) and thus limit uncertainties, from a municipal perspective, the adoption of a BLUP remains little more than a basis for desired development without any direct starting point for realization (Albrechts 2004). In this context, it is noteworthy that, in contrast to HSR station areas in other countries (Trip 2008, Ribalaygua et al. 2020), the spatial dimensions of urban developments in Germany are often significantly smaller. In addition, fragmented built-up areas in more central station locations constitute a challenge to integrated approaches. This leads to smaller BLUP application areas, in turn hindering a comprehensive development framework. By contrast, C Messe/Deutz and Montabaur represent two cases with larger contiguous BLUP areas, reflecting their more extensive spatial conditions.

In terms of integration, the case study cities testify to the participative interweaving of urban planning, business development and location marketing measures. The extensive application of informal planning instruments (Tab. 3) is also emblematic of strategic planning (Danielzyk & Sondermann 2018, Wiechmann 2018).

Certain innovative processes were also observable, though their greater use – alongside more institutional innovation – could further leverage future HSR impacts (Yin et al. 2015). For example, the construction of Siegburg's new railway station represented a pioneering form of cooperation between the municipality and *DB* for the first time (Krieger 2012). Likewise, Montabaur's regional marketing association promoted the location in combination with the HSR access industriously (*organizing capacity,* van den Berg & Pol (1998)).

For the most part, the mentioned factors facilitating leveraging potential HSR impacts (Question 3) confirmed prior studies and the interwoven character of HSR with other beneficial preconditions (Loukaitou-Sideris et al. 2012). In the study, however, we focused on factors that – in addition to those already described in the literature – were found to be particularly important in the present cases, are transferable to cases with similar preconditions, and thus contribute to the scientific knowledge of the underlying mechanisms. On the one hand, we were able to confirm 'hard' facilitating factors, such as the high relevance of the station *location* itself for subsequent development or the importance of building land. At the same time, however, we have also verified 'soft' factors and, in particular, the role of strong political willingness at the local level to meet nascent expectations. Based on the as yet unexplored situation in Germany, our study again underlines the need for a certain set of preconditions to leverage subsequent impacts. Ultimately, the emphasis is on a mix of facilitating factors, while mitigating as much as possible the impeding factors, without picking out single factors across the board. Stressing a single factor would also not do justice to the complexity of the

impact structure. Undoubtedly, impacts will not be achieved simply by having access to HSR (ibid., Chen et al. 2019).

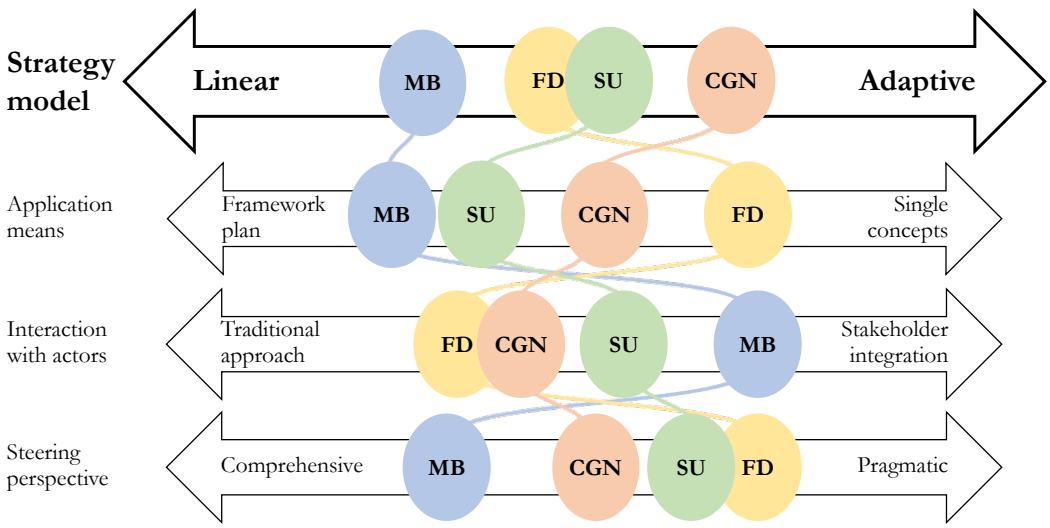
From a municipal perspective, it should be emphasized that steering options and access to land near a station proved significant, as otherwise, local authorities were dependent on private landowners. Nonetheless, municipal land stockpiling is not financially viable, highlighting the importance of alternative steering modes like balancing stakeholders' interests. Montabaur's Urban Development Measure and the large-scale municipal acquisition of formerly residential land (*Barmer Viertel*) in C Messe/Deutz thus remain the exception.

Significant impeding factors mainly concern the lack of integrated planning domains. As observed across the interviews in all case studies and demonstrated in Fig. 1, the considerable friction between the rigid planning competencies of the superordinated federal (HSR-)transport planning and the local land-use planning is an obstacle to approaches like *Transit-Oriented Development* (*TOD*). Thus, the absorptive capacity (Cohen & Levinthal 1990) of the respective city or station area is reduced, despite the promise arising from HSR access and irrespective of the case study cities' preconditions. In addition to the general criticism of Blotevogel et al. (2014) on shortcomings in the German spatial planning system, these findings highlight the need for the systematically integrated coordination of HSR processes to form a holistic infrastructure policy both covering all administrative levels as well as sectoral transport planning and comprehensive spatial planning.

Furthermore, HSR cities are subject to superordinate decisions taken by the HSR operator *DB*. They suffer from unclear responsibilities and tough negotiations about timetables or concerns about the station area. Out of necessity, municipalities attempt to improve their bargaining positions primarily by forming supra-local and -institutional collaborations (*organizing capacity*, van den Berg & Pol (1998)). Moreover, for prime properties owned by profit-seeking landowners, involving them and other stakeholders in joint communication formats is crucial for development in the public interest.

As regards the concept of strategic planning, the four case studies are examples of different ways of managing HSR issues, resulting in individual appearances. By leveraging selected components of the linear and adaptive models, as outlined in Tab. 1, a qualitative classification along a continuum can be made (Fig. 3).

Montabaur essentially embodies a linear approach, as its early vision and overarching framework development plan – eight years before HSR arrival – framed the orientation and consistency of its urban development strategy. Moreover, Montabaur's local administration alone delimited the relevant station area to be developed (van den Berg & Pol 1998) and was able to make regular – also downward – adjustments, indicating adaptive elements. Combined with the extensive use of instruments and stakeholder integration, it represents a prototype strategic approach resulting in a plethora of coherent development impacts. Indeed, this almost ideal initial situation was conducive to making Montabaur better known, albeit at the cost of much effort.



CGN = **Köln Messe/Deutz** (*Cologne*), FD = **Fulda** (*Fulda*), MB = **Montabaur** (*Montabaur*), SU = **Siegburg/Bonn** (*Siegburg*)

Fig. 3: Position of the case studies within selected strategic planning components

By contrast, the case study of C Messe/Deutz initially proposed a vision (a refurbished station surrounded by high-rise buildings). However, this case failed to adopt an integrative approach to managing the different stakeholder interests. This led to numerous significant but isolated construction projects, often guided by uncoordinated interests and uncertainties. This indicates a more incremental-adaptive model.

Despite being the oldest case in our study, the analysis of Fulda revealed the fewest overarching concepts and strategic orientation. Instead, we observed lower-key but steady developments over a prolonged period, reflecting a predominantly linear approach. Fulda's deliberate strategic approach was to exploit the city's position in a functional and relational hierarchy of cities, and therefore its endogenous resources (Feliu 2012) and central location in Germany, to promote events and tourism.

Lastly, Siegburg displayed similarities to Fulda but basically relied on an urban design competition for the station area adopted seven years before HSR arrival (Tab. 3). The ensuing actions were undertaken adaptively but remained lower-key, resulting in appropriately scaled developments and in an accompanying strategic planning addressing the emerging challenges.

Overall, we can confirm that the HSR potentials and uncertainties were well anticipated, with different approaches and strategies used to manage them. Local actors are aware of their responsibility to be proactive, since mere access to new transport infrastructure does not automatically guarantee benefits (Vickerman 2015). Interestingly, the trajectories of these cases – although less pronounced for Montabaur – point to the significance of emergent strategies as an alternative steering approach able to achieve the intended outcomes stepwise and via detours. This behaviour is especially notable among the current generation of planning practitioners who, in the face of increasingly complex and uncertain conditions, need to recognize endogenously emerging dynamics and patterns – i.e., when decision-making processes produce consistent behaviour over time, whether intended or not (Wiechmann 2008, 2018).

Unexpectedly, the cases did not reveal any distinct, guiding and long-term local strategies to deal with HSR arrival, despite local actors being well aware of its importance. For instance, interviews and planning documents provided only weak evidence – if any – that striving for *TOD* as a planning approach is voiced. However, the evidence suggested that such a fundamental strategy to manage HSR locally needed to be first set up and expressed (linear approach) and then implemented gradually (adaptive approach), all while maintaining an integrative manner. Wiechmann called this "simultaneous management" (Wiechmann 2008: 167).

However, it can also be argued that any HSR project is too extensive and complex to be covered by a persistent strategy. Comprising all case studies, Tab. 3 lists the many different instruments and actions applied over decades, signalling the planning imperative for conducting instruments and actions presently, continuously and also in the future. This reveals – even if rather implicitly – a certain long-term local planning perspective in terms of HSR issues, albeit with shifting emphases. These findings imply the term 'accompanying perpetuation', which we use to describe the need to maintain local management even after the HSR arrival. At the same time, it reflects that the cases studied henceforth refer to the HSR station as a locational advantage and significant for urban development. This is particularly evident for the intermediate cities, which are well aware of their challenges due to their relative location to avoid being passed over as a stop between major cities (as larger markets) (Moyano & Dobruszkes 2017). Thus, all local planning efforts are accompanied by the common promise of economic and population growth through the melange of being integrated into larger territorial contexts and reinforcing their specific local assets (Schmitz 2022, Interview 4, 11). However, any assessment must always consider the respective relational role within both the HSR and the city network.

7 Conclusions

This paper examined how local public actors manage potential impacts and uncertainties surrounding a new HSR stop brought to cities. We analyzed their actions through expert interviews conducted in four German cities and by applying the concept of strategic planning. Although HSR is studied from different perspectives in numerous countries, there is still limited understanding of institutional set-ups on HSR issues, particularly within the German context.

Our study initially aimed to fill this gap by demonstrating how those responsible specifically anticipate the improved HSR accessibility to and connectivity of their respective city and which mechanisms facilitate the management of the associated potentials. Despite highly individual trajectories, certain similarities between the case studies emerged, with the bottom line being that the successful leveraging of potential impacts to shape developments depends very

much on local political and planning structures – implying evidence of path dependence and path plasticity (Strambach 2010).

Local planning practitioners can benefit from politically defined long-term but adjustable objectives and the ability to flexibly combine instruments and actions of urban planning, business promotion and stakeholder involvement – also beyond the immediate station area. As a recommendation, this finding is also applicable outside the German context. Moreover, perseverance and consistent action over decades seem beneficial in reinforcing facilitating factors and mitigating impeding ones.

The case studies reveal institutional conditions that reflect an imbalance of power across the levels of administrative governance and a lack of integrated (cross-domain) planning. While significantly impeding progress, this situation is not exclusive to the German context (Feliu 2012). In many countries, conflicting interests frequently collide, hampering the integrated exploitation of HSR potentials and often negatively affecting local ambitions due to weaker negotiating power.

Successful efforts can be attributed to strategic planning, a far-reaching concept which is portrayed in the literature (e.g., Albrechts 2004, Wiechmann 2008, Healey 2009) in as many ways as it appears in the case studies. Departing from the rigid dichotomy of linear versus adaptive planning, anticipatory HSR-related action generally suggests that elements of both approaches are convergently required to tackle challenges and uncertainties. Although not immediately evident, the cross-case discussion revealed the implicit strategic orientation of local actors. Overall, local strategic planning for HSR is an ongoing process, with no single solution for managing its complex dynamics while accepting possible lack of success and remaining uncertainties. Politicians and planning practitioners need to be aware of this. At the same time, the actual impacts, particularly those related to knowledge-intensive activities, were surprisingly challenging for the interviewees to grasp and articulate. One reason could be the more complex HSR-related causality in Germany compared to other countries. Germany's polycentric settlement structure has historically led to a higher station density and, thus, to a less hierarchical HSR system. This constitutes possible difficulties when attempting to isolate HSR impacts from other mechanisms.

By employing the strategic planning approach, we were able to guide the empirical work in systematically investigating the observed phenomena of managing potential impacts and uncertainties of HSR access at the local level. This approach allowed us to gain meaningful insights into the accompanying local planning around HSR, thus contributing to the broader scientific debate in a novel way, initially for the German case. The strong indications found in favour of the strategic planning concept suggest that this kind of planning action may also be applicable in related contexts to leverage potentials offered by HSR.

This paper also paves the way for further research. While the interviews primarily reflect the subjective perceptions of local public actors, the planning results can be analyzed on this basis. Basically, the evaluation of strategic planning is about how it improves decision-maker's understanding of the problems they face (Faludi 2000). Furthermore, since HSR plays a key role in transportation in several countries, a broader comparison with experiences abroad, e.g., through further international case studies, may provide useful insights into how local public actors manage potential HSR impacts in different contexts. Stations similar to the cases studied in terms of their initial socio-economic conditions, relative position in the HSR network structure, and geographical context could serve as comparisons. To a certain extent, Lille Europe could be an interesting comparative case with C Messe/Deutz due to its similar industrial background and urban development projects in the station area (Preston & Wall 2008, Ureña et al. 2009). For the other cases of Fulda, Montabaur, and Siegburg – all of them small or medium-sized cities – comparative cases would be particularly suitable, which are similar in size, also form intermediate stops and are therefore also distant from metropolitan regions, but are still widely embedded in polycentric structures (Feliu 2012, Moyano & Dobruszkes 2017, Ribalaygua et al. 2020).

Our findings suggest that proactive and anticipatory action by local responsible is required within the current institutional boundaries, as exemplified in Germany. The cross-cutting discussion highlights the critical significance of specific planning and political action with regard to leveraging the accessibility benefits of HSR locally as well. As observed, promising progress can be made by implementing innovative elements in both institutional procedures and planning. In this respect, facilitating or adapting the legal framework would be beneficial. Similarly, the interviewees confirmed cumbersome interactions with the German HSR operator. Improvements in federal policy and formalized cooperation between the administrative governance levels can overcome the barriers between top-down transport planning and bottom-up urban land-use planning.

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Data availability statement

To guarantee the anonymity promised, direct quotes were not assigned to an individual person, but to the respective case study. Due to the character of this qualitative approach, the interviewees did not agree to allow their data to be shared. Therefore, no transcripts can be made available on request.

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Appendix

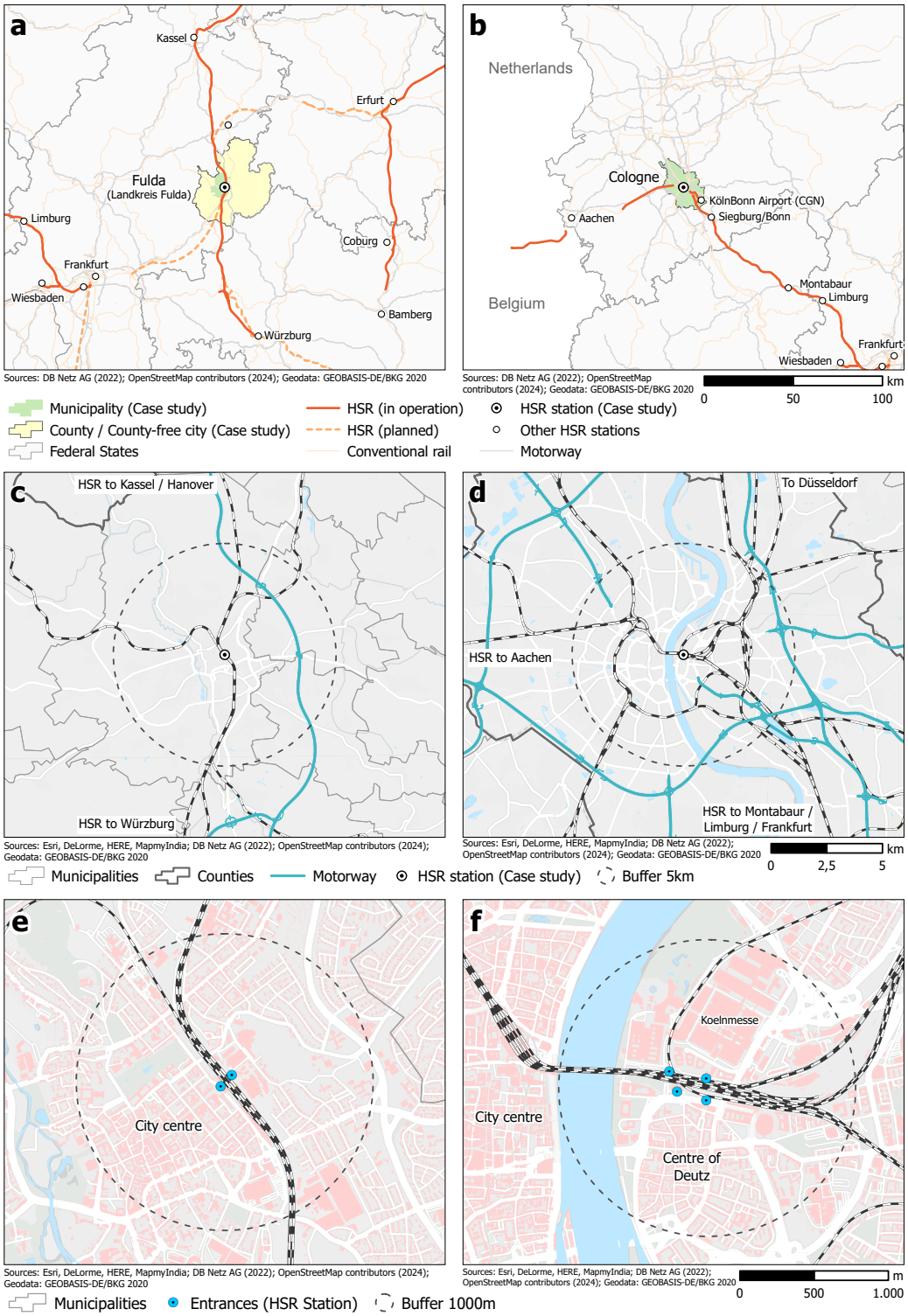

Fig. A1: Maps of the case study 'Fulda' for the regional context (a), the cities' context (c), and the station area (e) and the case study 'Köln Messe/Deutz' for the regional context (b), the cities' context (d) and the station area (f)

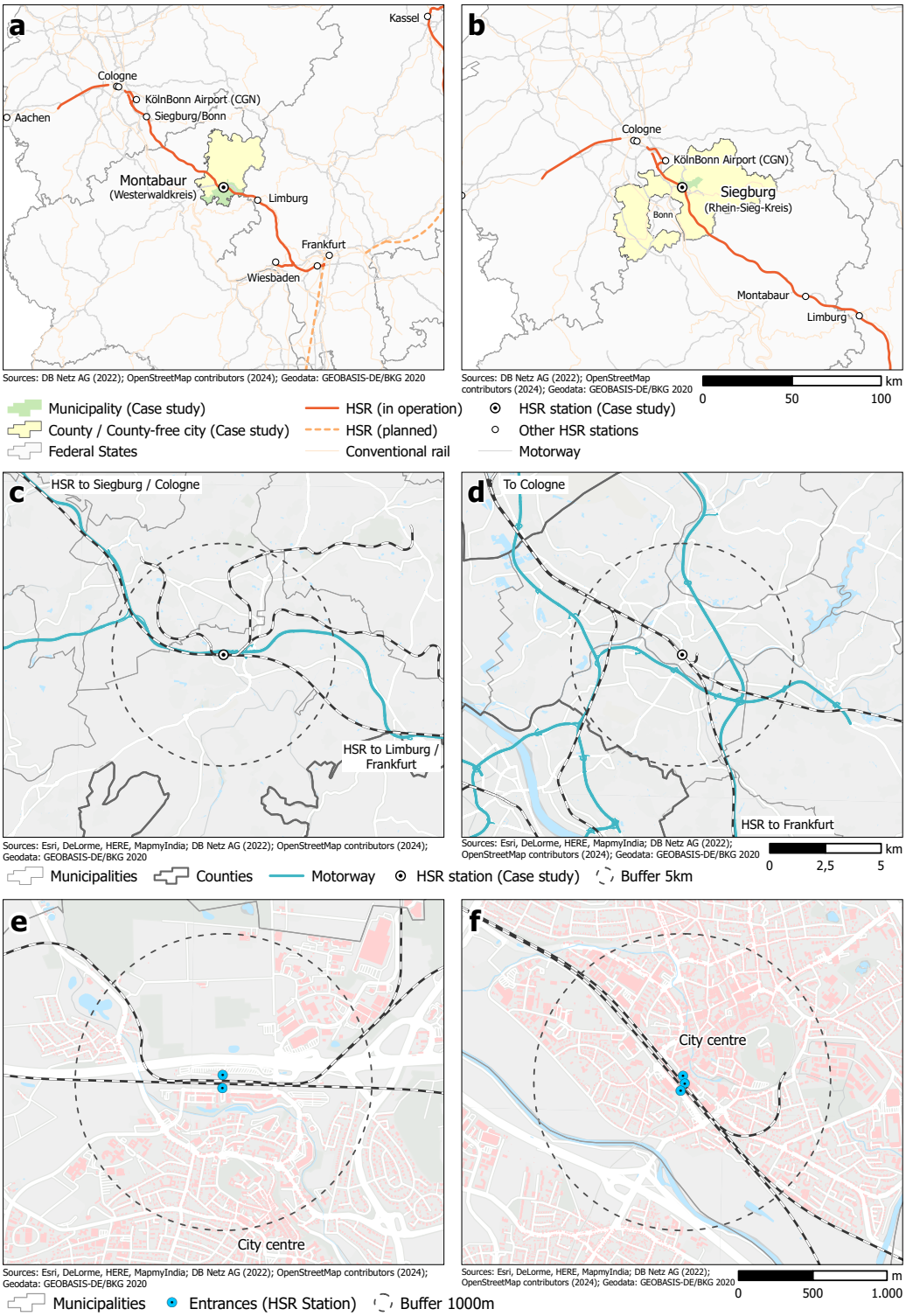

Fig. A2: Maps of the case study 'Montabaur' for the regional context (a), the cities' context (c), and the station area (e) and the case study 'Siegburg/Bonn' for the regional context (b), the cities' context (d) and the station area (f)

Tab. A1: List of the Interviewees

No.	Case study	Institution	Date	Duration (h:mm)
1	Fulda	Local administration	19.11.2021	0:36
2	Fulda	Local administration	9.12.2021	1:11
3	Fulda	Local administration	9.12.2021	1:11
4	Fulda	Business promotion	13.12.2021	1:08
5	C-Messe/Deutz	Local administration	26.11.2021	1:00
6	C-Messe/Deutz	Local administration	6.01.2022	0:59
7	C-Messe/Deutz	Business promotion	3.02.2022	0:44
8	C-Messe/Deutz	Politics	22.11.2021	1:33
9	Montabaur	Local administration	22.11.2021	1:28
10	Montabaur	Local administration	22.11.2021	1:28
11	Montabaur	Business promotion	12.11.2021	1:21
12	Montabaur	Politics	16.12.2021	0:46
13	Siegburg	Local administration	21.02.2022	2:12
14	Siegburg	Local administration	10.12.2021	1:29
15	Siegburg	Local administration	10.12.2021	1:29
16	Siegburg	County administration	3.03.2022	1:00
				Ø 1:10

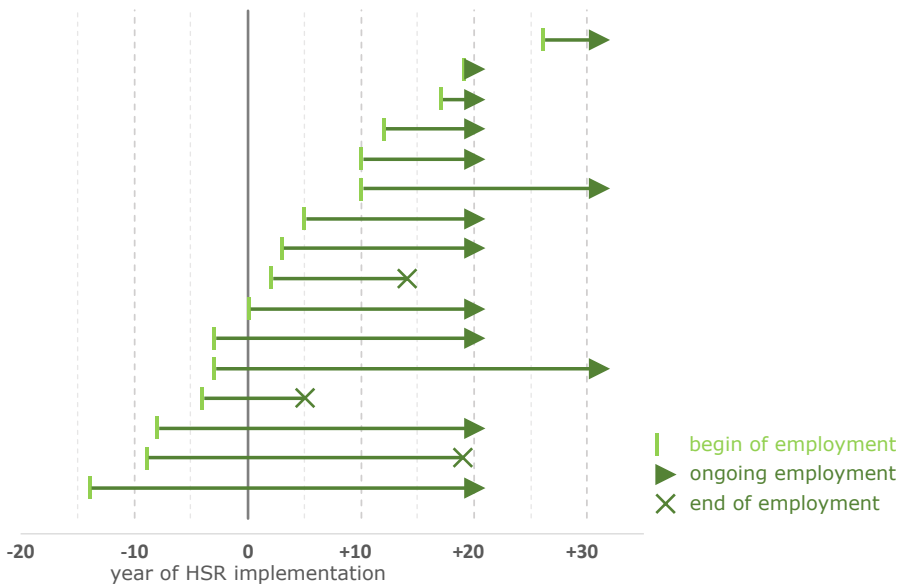

Fig. A3: Employment phases of the interviewees in relation to the year of HSR arrival