Spaces of automobility: diverging trajectories within the Liège-Aachen diffuse city

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Abstract
The Liège-Aachen metropolitan axis sets itself apart from neighbouring cases of diffuse city by lying both at the centre of the continent and at the edge of two countries, languages, and planning cultures. The socio-technical system of automobility constitutes a defining catalyst not only for accentuating already present dispersed settlement structures, but also for producing, within a very short time span, characteristic urban forms linked to the car. This contribution aims to interrogate this very type of transborder diffuse city through the lens of automobility and a future post-car discourse. Specifically, it proposes, in the light of both Belgian and German past planning practices, to compare the spatial impact of current policy objectives and government plans in both regions to reduce future car use.

Keywords: diffuse city, urban morphology, automobility, post-car policies, transborder

Context: automobility and the European diffuse city
Emissions from the transportation sector have been recognized not only as a significant contributing factor to global climate change, but also one of the sectors on which the most ambitious CO_2 emissions reduction targets are set by the members of the European Union (2021). Indeed, one can assume that the goal of reducing emissions by around 35% by 2030 and achieving net zero emissions by 2050 (ibid.) might not be met without a significant shift in how today's mobility practices which today contribute to shaping contemporary urban settlements.

To understand this relationship between mobility practices and production of space, the term 'automobility' has been used to describe the socio-technical system in which the generalised dependency towards the use of a single mode of transportation – the car – enables (Dupuy 1995), conditions (Urry 2004), or even dictates (Böhm et al. 2006) social practices. This 'system of automobility' has subsequently been used to describe various topics related to the challenges facing the contemporary urban condition, such as social marginalisation (Walks 2015), healthcare issues (Solnit 2001), spatial fragmentation (Graham & Marvin 2001), waste of spatial resources (Berger 2006), loss of economic productivity (Rigal 2020), etc.

The rapid expansion of the system of automobility, especially in the three decades following the Second World War (Ross 1998), has also served as a catalyst for a shift in how urban settlements are spatially distributed. Indeed, automobility has allowed to funnel the rapid economic and demographic growth away from the traditional pattern of concentric expansion of the historic urban core towards the one of the 'diffuse city'. This condition has been defined by featuring extensive land use, absence of an overarching spatial hierarchy, dispersion of the built fabric, as well as high degree infrastructural connectivity (Grosjean 2010). The term 'diffuse city' originally was applied to northern Italy (Indovina 1990) but has since been related to many other

geographic contexts around the world (Barcelloni Corte & Viganò 2022), each sporting their own regional characteristics. For the purpose of this article, one can name the German *Zwischenstadt* (Sieverts 2001), the Dutch *tapijtmetropool* (Neutelings 1991), the French *rurbanisation* (Bauer & Roux 1976), and the Belgian *banlieue radieuse* (Smets 1968). For most of these cases studies, patterns of urban diffusion predate the advent of the system of automobility. Yet, the latter, especially through the building of new road infrastructure (e.g., Van Acker 2014) constitutes a defining catalyst not only for accentuating already present dispersed settlement structures, but also for producing characteristic new urban forms (e.g., Buchanan 1963, Pope 2015), within a very short time span.

Recognizing the tight relationship between mobility practices and urban morphology which plays out within the system of automobility, a growing number of research is being conducted on exploring the spatial consequences of a radical shift towards a world "beyond mobility" (Cervero et al. 2017), "after the car" (Dennis & Urry 2010), or "post-car" (Cogato Lanza et al. 2021), in which a potential diminishing of the automobile can lead to new territorial configurations. Indeed, considering what is already there as a potentially formidable resource of grey energy, it would not only reallocate the way road space is shared, but the car's ancillary spaces would also find a new purpose within a post-carbon diffuse city.

Hypothesis: automobility fuelling diverging trajectories

The goal of this paper is to show how the lens of automobility can offer explanations on how diffuse cities can acquire a variety of formal urban characteristics, and how, in turn, a post-car discourse could produce original urban forms. First, it proposes, in the light of the scientific work describing urban planning practices during the 20th century, to compare a hybrid diffuse city context through the means of cartographic visualisation. Secondly, it will feature an overview of government plans being having been drafted in the last decade to dramatically reduce the modal share of the car. This overview will finally be followed by opening a discussion about the potential spatial impact of these policy objectives.

As mentioned above, despite western Europe having undergone as a whole a comparable process of intense urban production, relying on the car as a formidable emancipating power – car adoption rates being similar between countries (Mees 2010) – the multitude of iterations of diffuse city which are still being described around the continent attest to the many ways this process has in effect taken form. Indeed, despite sharing common technical systems, unique characteristics arise through specific geographic and socio-political factors.

Similarly, European countries, bound by common agreements, have been drafting documents aimed at describing how to honour the quantitative targets the transition away from fossil fuels entails. This paper hypothesises that, as different planning cultures produced different spaces of automobility despite sharing comparable metrics, similar targets in CO_2 reduction can possibly result in distinct spatial answers. While the project of the Transition is far from clearly formulated, this paper will use as evidence the transition which is already under way, in the form of official planning documents.

Common ground: automobility in the Liège–Aachen diffuse city

To address this hypothesis, the case study of the Liège-Aachen diffuse city can be of particular interest. This territory, which lies on the border between Belgium and Germany, on the northern Ardennes foothills, features a high degree of almost continuous urban sprawl (EEA 2016), hosts a great variety of interlocking land uses (residential, agricultural, industrial, natural), as well as is irrigated by major transcontinental road and rail infrastructure. It also features a long and shared history of urban diffusion: First, soil composition led to a dispersed agrarian settlement pattern from the Middle Ages onward (Lefèvre 1926). Later, the position of coal deposits has also served as the prime rationality for directing urban expansion in both countries (Kranz 1998, Wiesenmann 1998). Finally, with the advent of the Industrial Revolution, both nations have sought to disperse the rapidly rising population throughout their territory to curb rural exodus (Prince & Rowntree 1910, Blotevogel 2018).

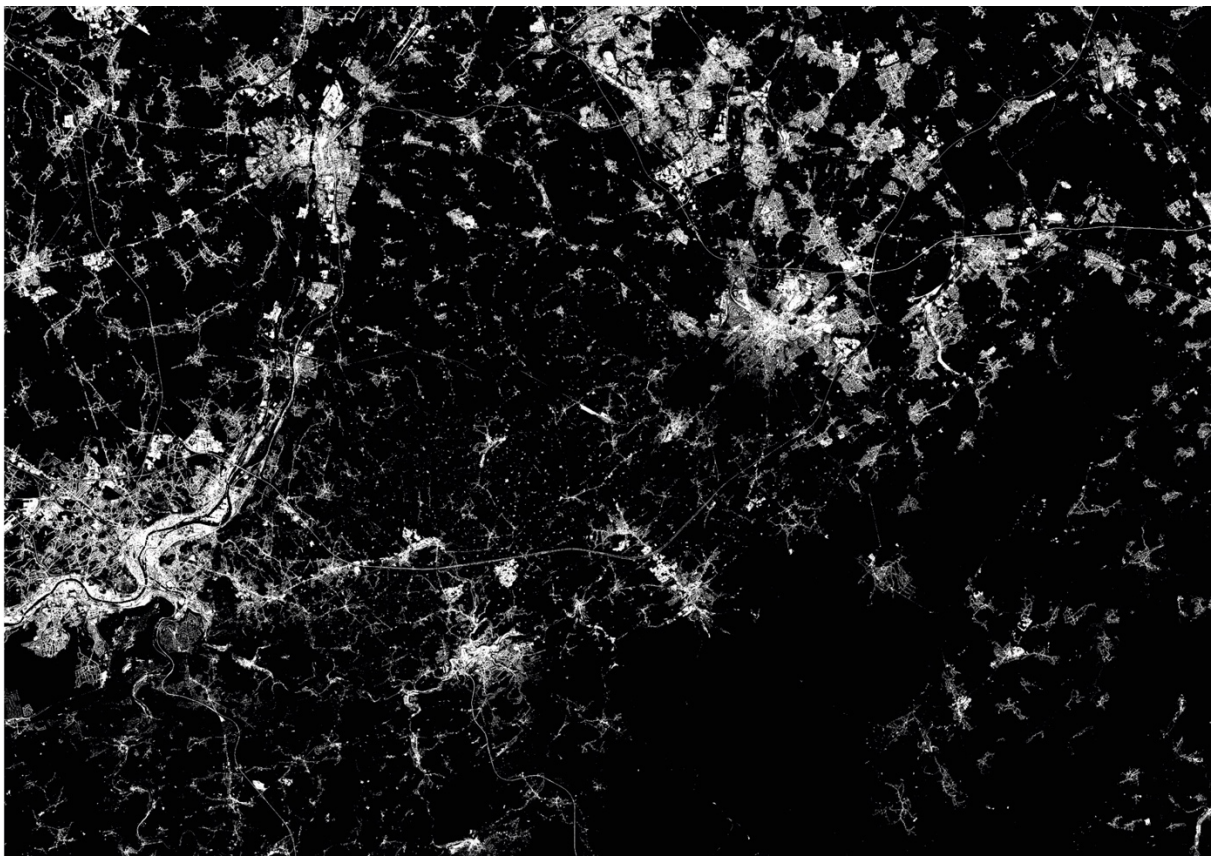

Figure 1. Impermeable areas of the transborder Liège-Aachen diffuse city. Source: elaborated by the author, data from Copernicus 2018.

As detailed above, the Liège-Aachen metropolitan axis fits on many aspects within the definition of the diffuse city (Grosjean 2010) but sets itself apart from neighbouring western European examples in several ways. Firstly, it lies both at the centre of Europe and at the edge of two countries, languages, and planning cultures. Secondly, it crucially lacks a hegemonic urban centre of which this case study can be seen as the hinterland. Lastly, despite being part of the oldest recognized European cross-border collaboration – the Euregio Meuse-Rhine (Geelen 2007) – it lacks a common territorial project.

Drifting borders: the rise of automobility in the Liège–Aachen diffuse city

Being located at the border of two countries, not to mention two major linguistic areas, the large waves of urbanisation hitting the Liège–Aachen diffuse city were throughout history approached in a different way. The period between the end of the Second World War to the mid 1970s offers a particularly clear glimpse into how the opportunities for building a territory adapted to the car were seized with different planning methodologies in mind, and thus morphologically diverging results. Indeed, these three decades see responses to the rapid spread of car use in western Europe, coupled with an increase in centralised planning by the state (Ryckewaert 2011), which lay the groundwork for subsequent zoning and building laws.

The table below aim to compare how, in Belgium and in Germany, a variety of tools of urban planning were harnessed to arrive to the spatial zoning plan, the cartographic document which would cement the urban morphology of the automobile diffuse city. These documents (the Belgian *Plan de secteur* and the German *Flächennutzungsplan*, respectively) indeed lie within a wider cultural genealogy. This genealogy starts at the beginning of the 20th century and is divided into general urban planning principles (territorial equilibrium, de-urbanisation, decentralised concentration, *auflockerung*/loosening up), archetypical spatial models which can incarnate the above principles (garden city, linear city, central place system), spatial plans drafted at different scales, as well as legislative tools aimed at steering urban growth.

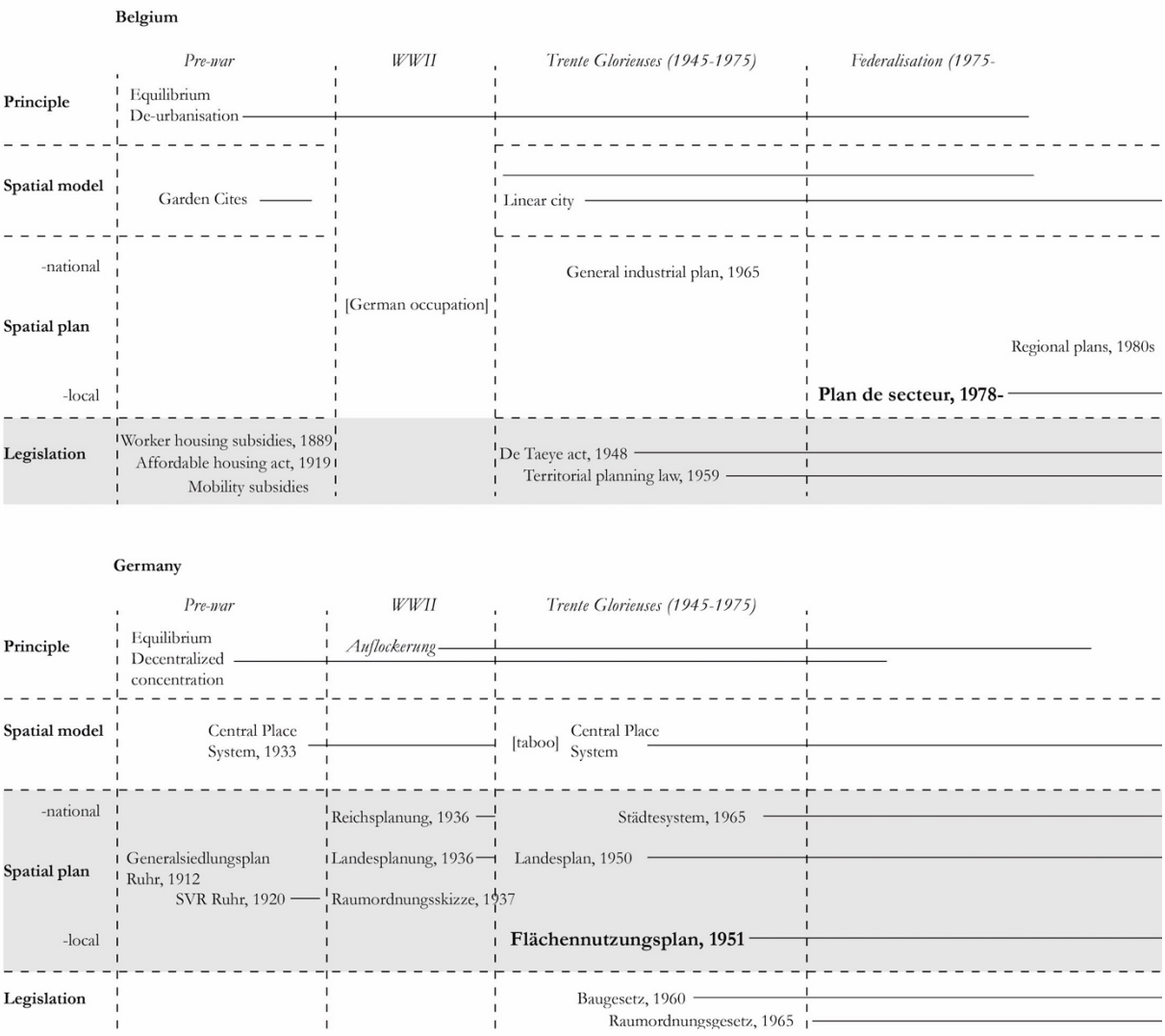

Figure 2. Comparative genealogy of Belgian and German planning instruments during the early to middle of the 20th century. Source: elaborated by the author.

Theses chronologic tables above highlight two urban planning typologies, the German one relying on an integrated spatial approach, while the Belgian chose a primarily legislative one (Nadin & Stead 2008, Dühr 2011). The Aachen region, located close to the heavily planned Ruhr basin, became a laboratory for Christaller's (1933) central space theory. The necessity to organise a vast industrial apparatus, and later the war effort, led to Christaller's theory to enjoy a wide influence (Kegler 2015). After the war, following a brief fall from grace, the central place theory was enshrined as an official planning instrument to hierarchically classify settlements. The Land Nordrhein-Westfalen arrived at a drawn zoning plan as soon as 1951, the rest of the country following suit in the next decade and-a-half (Blotevogel 2004, 2018). In Belgium, however, the more fragmented land ownership structure (Healey 2006) was first developed using mostly legislative tools, facilitating housing production and commuting along a fine mesh of mobility infrastructure (De Block 2014). This accentuated what was later called the *banlieue radieuse* ideal (Smets 1968, De Meulder et al. 1999), in which access to private property outside city centres was encouraged. One thus refrained for drawing corseted buildable areas before the mid 1970s (Coppens et al. 2020), while more integrated spatial planning – in the form of linear bands following

freeways, rivers, and railways (Ryckewaert 2011) – remained the prerogative of the industrial sector[1].

Comparing urban morphologies

In order to accommodate the automobile, new spatial typologies had to be devised by which to transform the territory. Such projects, such as the *autogerechte Stadt* in Germany (Reichow 1959), or imported models from the Anglo-American world, notably Hilberseimer's *New City* (1944), principles from Buchanan's *Traffic in Towns* (1963) or Gibberd's *Town Design* (1959), each propose new typologies of infrastructural space, as well as – to a certain degree – guidelines to transform the existing. Among those, one can mention the 'bypassing network', which allows for fast travel without interacting with the previous urban fabric, as well as the cul-de-sac, arranged in a 'ladder' (Pope 2015) structure, designed to strongly steer vehicular flow, thereby redefining the articulation between the private and the public space (Grosjean 2010).

Despite planners having access to a common canon of references, the divergence in planning methods between Belgium and Germany at this critical period resulted in very different settlement patterns between two regions, despite them sharing similar metrics of population growth, economic fortunes, and car adoption rates. The following couple of maps intends to illustrate this effect within the case study area. In the figure below, showing the sealed surfaces on a fragment of the Belgian-German border, one can appreciate the striking difference in urban morphology, despite the two areas displaying comparable built density and functional typologies.

[1] One should not interpret the here highlighted dichotomy as too rigid. For example, Christaller's influence has been evident on several official urban plans for the Liège region (L'équerre 1963, Nols & Parent 1972, Grulois 2011). However, the recommendations stemming from these documents failed to be implemented in a coherent way across the whole territory (Wahle 1977).

Figure 3. Impermeable surfaces in the Liège–Aachen diffuse city (fragment). Source: elaborated by the author, data from Copernicus, 2018.

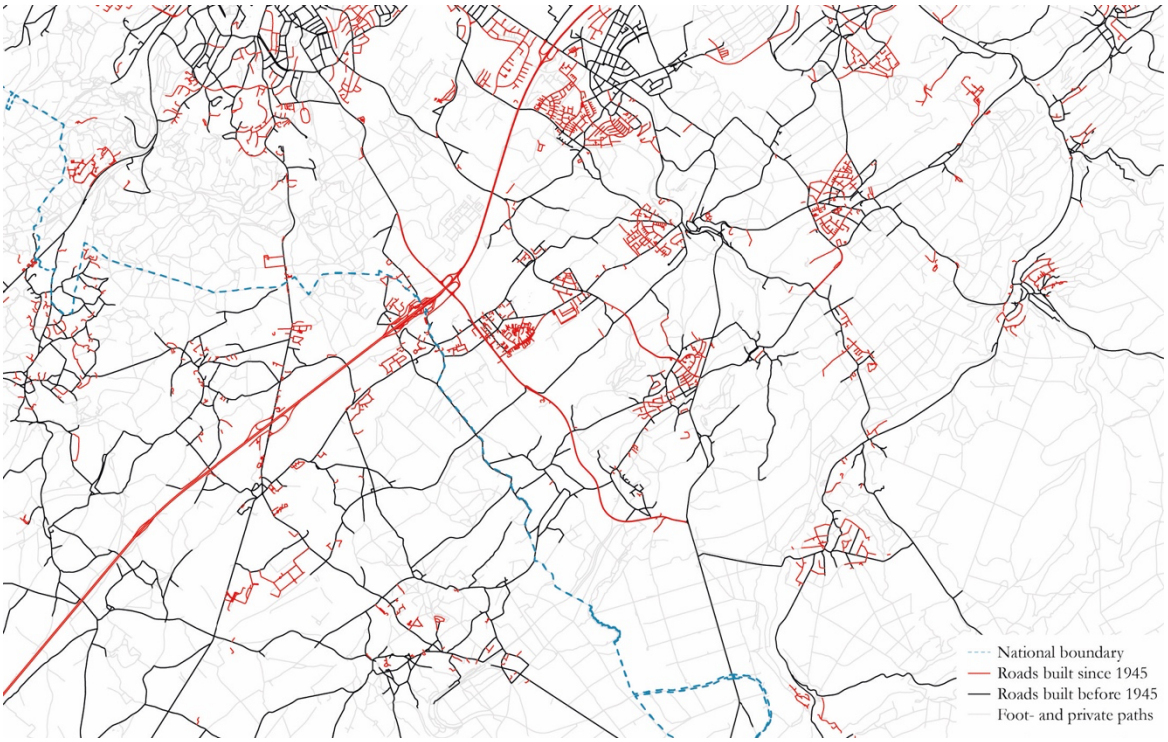

Figure 4. Road network typology in the Liège–Aachen diffuse city (fragment). Source: elaborated by the author.

In figure 4, the red lines, representing roads built since 1945 in the same fragment, highlight how this morphological divergence between the constitutive parts of the Liège-Aachen metropolitan axis has been exacerbated with the rise of automobility. One can observe that the new urbanisation in Belgium occurred mostly along a dense network of pre-existing roads (in black), with the notable exception of the transcontinental – and industrially essential – E40 freeway. Indeed, by looking solely at the map of roads, the urban transformation which has occurred since the middle of the 20th century is almost imperceptible. In Germany, however, the increased population sprawl across the territory was harnessed to shape existing settlements as a system of interconnected discrete small centres. This was achieved through the implementation of a ladder-like new road network serving residential and selected industrial areas, as well as a carefully articulated (partially implemented) fast network bypassing the settled clusters.

Futures of automobility in the Liège–Aachen diffuse city

One has been able in the previous paragraph to observe how adapting a territory to a new socio-technical system can lead to significantly varied spatial results. The following section is dedicated to comparing current plans issued by the government to reduce future car use and honour European climate targets. The table below offers an overview of the two countries' planning system destined to address the first 2030 deadline.

	Belgium	**Germany**
Federal level	Vision de la Mobilité en Belgique, 2017	Leitbilder der Raumentwicklung, 2016
Regional level	*Schéma de développment du territoire, in preparation* Vision FAST 2030, 2019 ↳ Schéma régional de mobilité, 2019	Landesentwicklungsplan, 2022
Agglomeration level	Plan urbain de mobilité (Liège agglomeration), 2019	Regionalplan Bezirk Köln, 2022
Communal level	*Schéma de développment territorial (Liège), in preparation* Plan communal de mobilité (Liège), 2021	Aachen*2030 Masterplan, 2018 ↳ Mobilitätsstrategie 2030, 2020

Figure 5. Comparison of contemporary Belgian and German planning instruments. Source: elaborated by the author.

Both countries being today federal systems, mobility planning is the most articulate at the regional level (Wallonia and Nordrhein-Westfalen, respectively). These main regional strategies are the *vision FAST 2030* (2019) and its operational *Schéma regional de mobilité* (2019) in Wallonia, as well as the chapter on mobility of the integrated *Landesentwicklungsplan* Nordrhein-Westfalen (2022)[2]. Both plans are informed by national guidelines, such as the *Vision de la mobilité en Belgique de l'Autorité fédérale* (2017) and the *Leitbilder der Raumentwicklung* (2016). At the Belgian local level, one can mention the *Plan urbain de mobilité* on the Liège agglomeration (2019), as well numerous communal plans. Here again, these plans

2 In Wallonia, the equivalent document, the *Schéma de développement du territoire* (2023), is still at the drafting stage at the time of writing, the previous iteration, the *Schéma de développement de l'espace regional*, having been approved already in 1999.

have been formulated while the corresponding integrated urban planning document had not been published. Finally, at the German communal level, the Aachener *Mobilitätsstrategie 2030* (2020) serves as a companion piece of the overarching *Aachen*2030 Masterplan* (2018).

In the light of the historic planning cultures displayed by each country, such a systemic difference in architecture can be partly explained by a reliance on integrated spatial and mobility planning in Germany, under the umbrella of urban planning at a regional level. Indeed, in the *Landesentwicklungsplan* (2022), "integration of urban- and mobility planning" serves as an overarching title to the chapter (Ibid.:119). Planning for mobility can improve accessibility, yet also bring nuisances and consume precious land resources. Businesses should be able to implement themselves more flexibly than before (ibid., 9), with the appropriate infrastructure to be supplied if necessary. In the equivalent Wallonian *Schéma directeur de territoire* (2023), however, if many of the proposed measures overlap, the wording is opposite: the space occupied by mobility is considered as an entity in itself, as one should "structure the territory in order to support flexible, durable and carbon-free mobility" (ibid.:74), nudging citizens towards a more sustainable use of the existing infrastructure.

Conclusion and further discussion

This paper has proposed to consider the specific influence of the system of automobility on the morphology of the European diffuse city. In particular, looking at the case study of the transborder Liège–Aachen metropolitan axis has highlighted how regions with comparable economic and social metrics (Geelen 2007) as well as geographic similitudes have, during an intensely directive period of urban planning, developed following divergent paths. Shifting gaze on contemporary practices, a survey of the official documents discussing plans for a rapid modal shift – a way to perhaps signal an end to the hegemonic rule of automobility – has again shown varied approaches to the problem. While the spatial effect of such policies is still to be determined, accentuating these planning culture discrepancies could not only reveal and bolster territorial specificities, but might as well weaken potential leavers for activating synergies between neighbours dealing with common socio-ecological threats.

In 2021, violent floods in both Germany and Belgium (European State of the Climate 2021) highlighted how geographically inherent territorial solidarities are ever more a crucial factor for understanding our territories in a way that is meaningful to tackle the challenges of the transition. However, as there is not only one single way towards success, different approaches to spatialise the same metrics linked to automobility and its possible decline can be found. For new solidarities between territories sharing common ecological threats to emerge, the implication of such diverging paths cannot be ignored.

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