Smart, sustainable mobility in the Hungarian urban development discourse

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Abstract

Objectives: The paper aims to define the specific characteristics of the smart, sustainable urban mobility, with a focus on the urban development discourse in Hungary. Prior work: Smart mobility has traditionally been a central topic in the discourse on smart cities. In recent years, however, related scientific publications and EU/Member State policies have increasingly focused on the contribution of (smart) urban mobility to sustainability. Accordingly, this research draws on the latest literature and policies concerning smart, sustainable urban mobility. Approach: The paper primarily employs the content analysis method developed by Klaus Krippendorff, combined with some elements from the discourse analysis toolkit. Using this method, the terms "smart", "sustainability" and "(urban) mobility" are analysed in documents representative of local-level discourse on urban mobility in Hungary. These documents include sustainable urban mobility plans (SUMPs) and sustainable urban development strategies (SUDSs) from the most significant Hungarian cities. Results: Higher-level policies have a significant, albeit non-deterministic, impact on municipalities in Hungary. This is most evident in the case of the 'smart" dimension: municipalities that were more committed to participating in the smart, sustainable urban mobility discourse (i. e. those with SUMPs) have adapted to a broader, management-centred, value- and interest-driven approach inspired by EU policies, rather than to the traditional technology-oriented approach. The situation is less clear with regard to the "sustainability" and '(urban) mobility" dimensions. In these latter cases, there was a greater scope for local interpretations of the terms. Implications/value: The paper is intended to provide guidance not only to researchers but also to practitioners, such as local stakeholders preparing or reviewing their SUMPs. In particular, it can help to align the concept of smart, sustainable urban mobility with academic standards, higher-level political expectations and local characteristics.

Keywords: smart city, urban mobility, sustainability, urban development, Hungary.

1. Introduction

The aim of the following study is to provide an up-to-date overview of how the term "smart, sustainable urban mobility" is used at the local (municipal) level of the Hungarian urban development discourse. Smart urban mobility, inspired mainly by urban traffic issues [1], has been considered as a central element of the so-called "smart city" discourse from the outset [2], fitting into the broader context of spatial planning [3]. Accordingly, the smart urban mobility concept has subsequently moved more or less in sync with the general direction of the smart city discourse. In a previous paper [4], I illustrated these changes through the example of the changing meanings attached to the terms "smart" and "sustainable". As for the term "smart", I have highlighted innovations that are not necessarily technological in nature, focusing instead on improving the efficiency of service organisations in general and bringing a variety of management-centred approaches to the fore [5]. Within such management-centred approaches, technological solutions can be seen less and less as an end in itself, and are gradually being reinterpreted as a tool for administrative decision-making [6]. With regard to the term "sustainable",

approaches that emphasised the financial sustainability of projects [7] were initially replaced by an ecologically driven approach that focused on the interaction between the natural and human spheres [8], and then by an even more complex understanding of sustainability that took into account economic, social and environmental perspectives, respectively [9]. The transformation of the meaning of the terms “smart” and “sustainable” can hardly be dissociated. Within the concept of smart sustainable city, a convergence of the two approaches has been increasingly observed recently [10]. This convergence began to accelerate in the second half of the 2010s. According to a review by Zaheer Allam and Ayyoob Sharifi, sustainability became increasingly prominent in academic discourse related to smart urban mobility between 2016 and 2019 [11].

To understand smart, sustainable urban mobility, we must examine the various elements that comprise this complex concept. Re-thinking the meaning of the term “smart” goes far beyond the simple recognition tha urban mobility systems can be made smarter in more than just the technological sense. A good example could be Katharina Burger's recent study [12], which distinguished five governance archetypes related to smart urban mobility. The Resource Optimiser is the closest to the traditional smart discourse. For this archetype, the development of smart urban mobility is most concerned with issues such as obtaining financial resources, introducing mobility modes that can best serve consumer needs, or system-wide data and technology integration. This management approach becomes even more pronounced in the Institutional Architect archetype, where the primary priority is policy harmonisation and better coordination between institutions. The Behaviour & Culture Challenger archetype focuses on individuals' mobility choices and emphasises the need to change behaviour and culture. For example, it encourages people to walk, cycle, and use public transport. The Equity Champion archetype strives for equitable access to sustainable mobility options, particularly for marginalised and vulnerable communities. Finally, the Inclusive Mobiliser archetype argues that collaborative governance, community engagement, and cross-sector partnerships should play a crucial role in developing socially relevant and responsive mobility solutions. Burger concludes that hybrid governance configurations based on a combination of different archetypes must be created and operated. However, another important conclusion can be drawn from the aforementioned governance strategies. Accordingly, rational strategies of technology- and/or management-oriented archetypes (such as the Resource Optimiser and the Institutional Architect) can undoubtedly make mobility management more efficient [13]. However, only archetypes driven by values and interests (such as the Behaviour & Culture Challenger, the Equity Champion, and the Inclusive Mobiliser) can contribute to radical change in our approach to mobility.

Turning to the difficulties in interpreting sustainability, the most significant issue is the tension between the "single-pillar" model, which focuses on the environmental-ecological goals, and the "three pillar" model, which pursues environmental-ecological, economic and social goals in equal measure [14]. In the discourse on smart, sustainable urban mobility, the "three pillar" model is no longer essentially contested. However, the relative importance of the three pillars remains a matter of debate. Emphasising the social pillar could be a valuable attempt at interpreting sustainability, as it can provide an alternative to the traditional environmental-ecological approach to sustainable development outlined in the Brundtland Report [15]. In line with this insight, Hans Jeekel's analysis [16] describes the so-called "social sustainability sensu stricto" interpretation. According to this, creating conditions of social justice, equity, equality, and cohesion is a central issue in itself, independent of the other pillars of sustainability, most notably the environmental-ecological pillar. However, in the era of fighting climate change, it is difficult to imagine anyone constructing a complex urban mobility system based solely on a "social sustainability sensu stricto" interpretation. This is largely because the vast majority of urban mobility projects serve the interests of local society as well as the environmental protection in general: "*to be sustainable, mobility must be smart, safe, fair, and take into account the harmful effects on the environment"* [17]. Nevertheless, the "social sustainability sensu stricto" interpretation may still be appropriate for some mobility projects that are less linked to the environmental-ecological pillar (e.g. those related to security or equal opportunities).

At the heart of the concept of smart, sustainable urban mobility are the various urban mobility modes. I will now distinguish three paradigms of urban mobility. I have adopted the term "paradigm" from the philosopher of science Thomas S. Kuhn, who, in his work The Structure of Scientific Revolutions, defines paradigms as "*universally recognised scientific achievements that, for a time, provide model problems and solutions to a community of practitioners*" [18]. Paradigms are not just used to describe scientific progress, of course. It is easy to imagine, for example, that the problems of urban mobility and related solutions will be organised into different paradigms as the policy discourse evolves. The paradigms I have hypothesised are similar to the major narratives of Erling Holden and his colleagues [19], which were originally related to sustainable mobility but have more recently been extended to the field of smart, sustainable urban mobility by Aleksandra Gulc and Klaudia Budna [20]. Accordingly, three major narratives can be distinguished: electromobility, collective transport 2.0, and low mobility societies. In the electromobility narrative, the challenges of deploying and diffusing electric and hydrogen vehicles in urban environments lie at the heart of mobility management. The collective transport 2.0 narrative focuses on alternatives to collective transport 1.0 (according to which traditional public transport "*is a key factor for the sustainable development of cities"* [21]), with a particular emphasis on different

shared mobility modes. Finally, the narrative of low mobility societies is based on the assumption that the most common urban mobility problems, such as congestion and pollution, should primarily be addressed by reducing mobility events themselves rather than by alternative mobility modes.

In what follows, I consider it necessary to modify this division based on three major narratives for two reasons. Firstly, the distinction between the narratives of electromobility and collective transport 2.0 is unclear: e-bikes and e-scooters based on sharing can be classified under both. More importantly, these three narratives do not adequately contextualise smart, sustainable urban mobility within the challenges of the modern era. Taking this into account, mobility management can provide three possible responses to contemporary urban challenges. The conservative paradigm would essentially leave everything as it is, i.e. continue to prioritise urban transport based on individual motorisation. Clearly, this conservative paradigm does not qualify as a model for smart, sustainable urban mobility. Its significance lies in the fact that the discourse of smart, sustainable urban mobility defines itself in contrast to this paradigm. Like the conservative paradigm, the reformer paradigm does not aim to reduce urban mobility. However, it no longer seeks to maintain the status quo. Instead, it argues that urban transport can and should address sustainability challenges by implementing a vide range of smart solutions. Finally, the abolitionist paradigm hopes to free urban society from the need for mobility, in line with the idea of low-mobility societies. In the current urban planning literature, the concept of the 15-minute city [22, 23], or, even more frequently, the "*relatively high-density, mixed-use*" compact city [24] can be associated with this paradigm. As Jochem Van Der Waals claims, "*compact urbanisation leads to a reduction in car mobility. Creating a compact urban structure can lead to a reduction in car traffic because reducing the distance between different functions can reduce the distance travelled, and the modal split can change in favour of public transport, walking and cycling because the conditions for these modes of transport are improved*" [25].

In addition to the three paradigms mentioned above, it is worth noting that specific intermediate approaches can also be identified. The first lies between the conservative and reformer paradigms. This approach attempts to retain individual motorisation by focusing on electric vehicles [26], smart parking solutions [27, 28] etc. under the guise of "emission reduction", disregarding the fact that some of the issues facing modern transport (e.g. congestion) necessitate a more profound paradigm shift. Between the reformist and abolitionist paradigms, there is an other intermediate approach that emphasizes various micromobility options and/or integrated (multimodal) transport systems which also include micromobility [29]. While the focus on various micromobility devices (such as bicycles, scooters) may be an important step towards the abolitionist paradigm, it is not strictly identifiable

with it. After all, micromobility devices can serve many purposes besides reducing urban mobility, such as active leisure.

In the following, I will try to define the specific characteristics of the use of the term "smart, sustainable urban mobility" along the "smart", "sustainability" and "(urban) mobility" dimensions, paying particular attention to the local level of urban management in Hungary. As for the "smart" dimension, I would start by contrasting the different understandings of innovation, pitting technology- and management-oriented smart solutions constructed in the spirit of efficiency against a mindset driven by values and interests. Regarding the "sustainability" dimension, I would like to focus primarily on the tensions between the social and environmental-ecological pillars of sustainability. Finally, with regard to the "(urban) mobility" dimension, I would examine how municipalities involved relate to the earlier introduced paradigms. However, before presenting our results, it is necessary to briefly discuss the source base and methodology of the research.

2. Material and methodology

In my study, I combine two methodological tools, content analysis and discourse analysis. Klaus Krippendorff defines content analysis as "*a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use*" [30]. Here and now, I will only briefly reflect on two elements of this definition, namely the texts under study (i.e. the source base of the research), and their broader context (the EU and Member State discourse on smart, sustainable urban mobility).

The research draws on strategic documents that most clearly reveal the specific characteristics of the use of the term "smart, sustainable urban mobility" and determine the directions of subsequent implementation projects. In this context, two types of document warrant particular attention: sustainable urban mobility plans (SUMPs) and sustainable urban development strategies (SUDSs). Although SUMPs are not required by any EU- or Member State legislation, an increasing number of Hungarian municipalities are choosing to prepare them to clarify strategic mobility management directions. The specific characteristics of the use of the term "smart, sustainable urban mobility" at the municipal level can therefore be best understood through SUMPs. The preparation of SUDSs, on the other hand, is mandatory for Hungary's most important cities according to Government Decree 256/2021 (18 May), as SUDSs are key to accessing sustainable urban development funds in the EU budget cycle 2021–27 [31]. The SUDSs, which also address the problems of mobility management at local level, may therefore allow the specificities of the smart, sustainable urban mobility for those municipalities that do not currently have SUMPs.

The research analyses the SUDSs and SUMPs of the 26 most important Hungarian cities, including those with county rights and the capital Budapest. There are practical reasons for this, such as reducing the size of the resource base, but more importantly, this is because mobility problems mainly affect large cities and metropolitan areas. As all the relevant Hungarian municipalities had already prepared their SUDs by the time the research was conducted, a complete sample was available. However, seven cities with county rights (Baja, Érd, Hódmezővásárhely, Nagykanizsa, Sopron, Szekszárd and Zalaegerszeg) have not yet prepared their SUMPs. In these cases, I had to reconstruct the specific characteristics of the use of the term "smart, sustainable urban mobility" based only on their SUDSs. Finally, I completely ignored the city of Székesfehérvár because, although it had prepared its SUMP in 2018, I was unable to obtain it while writing the study.

When setting the context, I have assumed that the specific characteristics of the use of the term "smart, sustainable urban mobility" were determined by a set of rules within a broader discourse. While colloquially the term "discourse" has come to mean a conversation, modern social sciences have given it a much more complex and profound meaning in recent decades. Authors examining the concept generally agree that that discourse should be understood as the institutionalised ways of thinking which shape our social life [32]. We will see that discourse content related to smart, sustainable urban mobility is most often transmitted through EU- and Member State level policies to the local level. One of the most fascinating questions in my research concerns the extent to which local-level discourse aligns with higher-level discourse, and how this alignment occurs. In other words, I will analyse the available Hungarian SUMPs and SUDSs to investigate whether the use of the term at the local level is a result of alignment with higher levels and whether the local level plays an active role in constructing meanings related to smart, sustainable urban mobility.

3. Clarifying the broader policy framework

3.1.The EU context

Smart, sustainable urban mobility entered the mainstream of EU policies sometime in the 2010s, as a "modernised" version of sustainable urban mobility. According to the European Court of Auditors' Special Report 2020 [33], sustainable urban mobility is one of the biggest challenges for European cities. Based on the aforementioned working document, the Commission was the first to systematically incorporate sustainability into urban mobility issues in its 2007 Green Book. This was followed in 2009 by the first comprehensive urban mobility support package entitled Action Plan on Urban Mobility. However, the real breakthrough in local-level mobility planning came in 2013, when the Commission encouraged Member States to develop and implement sustainable urban mobility plans (SUMPs) in their

urban areas, integrating them into their wider urban or territorial strategies. The publication entitled Guidelines. Developing and Implementing a Sustainable Urban Mobility Plan to support the development and implementation of SUMPs was released in January 2014 [34]. However, changes in the broader social and political context in the second half of the 2010s made a review of the EU guidelines inevitable. This updated version was finally published in 2020 [35].

Now, let us turn our attention to the "smart" dimension of the EU's discourse on sustainable mobility. The first edition of the EU Guidelines only makes passing reference to Intelligent Transport Systems and information technologies [36]. The second edition, however, highlights the importance of emerging technologies as a reason for the update [37], suggesting a potential shift towards a technology-centred approach. Nevertheless, the second edition still adopts the definition of a sustainable urban mobility plan which omits any reference to technologies and emphasises only the importance of "*integration*", "*participation*" and "*evaluation principles*" [38]. Thus, both editions link the use of the term "smart" to a broader, management-centred and/or value- and interest-driven understanding of innovation, interpreting technological solutions as mere tools for mobility management.

The "sustainability" dimension, however, has changed significantly over this period. Firstly, the narrow economic pillar, which focuses on the financial sustainability of mobility projects, has lost some of its importance. In his analysis comparing the two EU Guidelines, Tamás Fleischer rightly points out that "*where the economic efficiency aspect was prioritised in the earlier conception of the SUMP principles, here they have tried to reduce its importance and place it among, or even behind, the other social goals*" [39]. The relationship between the social and environmental-ecological pillars deserves closer attention. Above all, it should be noted that the social pillar was already dominant in the first edition of the EU Guidelines. Three out of the five objectives of a sustainable urban transport system listed at the beginning:

- ensure all citizens are offered transport options that enable access to key destinations and services;
- improve safety and security;
- contribute to enhancing the attractiveness and quality of the urban environment and urban design for the benefits of citizens, the economy and society as a whole; are undoubtedly social-centred, with only one objective linked to the environmental-ecological pillar ("*reduce air and noise pollution, greenhouse gas emissions and energy use"*) and another to the economic pillar ("*improve the efficiency and unit cost performance of transporting people and goods*") [40]. However, the second edition concentrates even more on the social pillar of sustainability, as illustrated by the fact that the environmental-ecological pillar is absent from the eight principles of the

sustainable urban nobility planning presented here [38]. Nevertheless, the accompanying Decision Makers Summary to the second edition states that "*SUMP helps cities and regions to reduce their climate impact from transport*" [41]. By doing so, this summary has essentially incorporated one of the key theses of the European Green Deal into the smart, sustainable urban mobility discourse: to mitigate climate change, emissions from the transport sector should be reduced by 90% by 2050.

Finally, let us examine whether the EU discourse favours a particular paradigm on smart, sustainable urban mobility. Given the emphasis in EU guidelines on the broadest possible stakeholder involvement, no single paradigm could be considered favoured a priori. However, when one reads that "*a Sustainable Urban Mobility Plan covers all modes and forms of transport in the entire urban agglomeration, including public and private, passenger and freight, motorised and non-motorised, moving and parking*" [40], it seems likely that the reformer paradigm will predominate over the abolitionist one in practice. Notably, the term "*compact city*" is mentioned only once in the first edition [42], and this single reference is omitted by 2020 [35].

In summary, the EU discourse on smart, sustainable urban mobility does not really provide a solid basis for decision-makers at local level. The "smart" dimension is dominated by an approach to innovation that is management-centred and/or driven by values and interests. However, this does not contradict the idea that technologies are important tools for urban mobility management. The situation becomes even more complex when it comes to sustainability. Those who determine the direction of the discourse are divided into two camps: those who would move toward the "social sustainability sensu stricto" interpretation and those suggesting the dominance of the environmental-ecological pillar. Although the EU level discourse on smart, sustainable urban mobility have originally tended to move towards a social-centred approach, the "green shift" inspired by the European Green Deal may recently have provided strong support for the other alternative. The only clear commitment is perhaps the preference for a modernist paradigm over abolitionism.

3.2.The member state context

In December 2015, the Government of Hungary published a call for proposals under the Integrated Transport Operational Programme (ICOP) entitled Development of sustainable urban transport and improvement of suburban rail accessibility in less developed regions. The call for proposals stipulated that "*the urban transport project must be included in the municipality's Sustainable Urban Mobility Plan (SUMP) and the SUMP must be adopted by the time the project is physically completed*" [43]. At that time, the Hungarian translation of the first edition of the EU Guidelines was already available. In addition, a Hungarian-language working

paper entitled Methodological Guidelines for the Preparation of a Sustainable Urban Mobility Plan (SUMP) – hereinafter: the Hungarian Guidelines – was published on behalf of the Government of Hungary in 2016. Its aim was to ensure that the process, methodology, content and range of documents submitted for the preparation of the SUMPs met the criteria set by the European Commission and Hungarian planning requirements [44]. The Hungarian Guidelines are based on the first edition of the EU Guidelines, reproducing their previously indicated specificities. The traditional (technology-centred) "smart" dimension is only mentioned in passing, mostly as a tool, foregrounding broader interpretations of innovation that are management-centred (linked to operational, regulatory, financing and institutional types of interventions in the transport system) an/or driven by values and interests (especially by the implementation of a broad and substantive partnership) [45]. With regard to the "sustainability" dimension, the introductory section of the Hungarian Guidelines recommends preparing strategic plans, strategies and programmes in which "*aspects of social, economic and environmental sustainability are emphasised*" [46]. However, similar to the approach at EU level, the social pillar seems to prevail here as well. For example, on pages 31-32, we can read that the main criterion for evaluating projects is their social utility [47]. Finally, the reformer paradigm dominates in the "(urban) mobility" dimension, within which are detailed specific sectors of public transport, rather than alternatives to collective transport 2.0 [48].

As the eligibility of the planned ICOP projects depended on the evaluation and approval of the SUMPs by the funding agency, the Hungarian SUMPs could not differ significantly from the Hungarian Guidelines. The study by András Munkácsy and Álmos Virág shows that the designers generally complied with this requirement, with few exceptions. In response to the authors' queries, the thirteen companies that prepared SUMPs gave an average score of 9 out of 10 for adherence to the Hungarian Guidelines – only one SUMP significantly deviated from this [43].

During the current programming period (2021–2027), the need to adapt to Member State level discourse appears to be decreasing. The most significant reason for this change is that SUMPs are no longer tied to a single call for proposals. Instead, they are being reinterpreted as all-encompassing planning tools to help secure various EU- or member State funds. The increased focus on the local level is clearly demonstrated by the fact that TRENECON Ltd., which already prepared the 2016 Hungarian Guidelines, has published two mobility management guidelines in 2021. The Sustainable urban mobility planning. Designer Guidelines [49], like the 2016 Hungary Guidelines, was primarily intended to support the work of designer companies. The Sustainable Urban Mobility Planning. Customer Guidelines [50], however, was specifically designed to provide useful advice to municipalities. The

Customer Guidelines explicitly state that "*the preparation of SUMPs in Hungary is not required by law, nor is there any legislative intention to do so in the new EU financial cycle starting in 2021*". Therefore, "*following the recommendations in the guidelines is only a suggestion"*, and they only become mandatory if a call for tenders contains specific requirements for their use [51]. Notably, the Customer Guidelines offer not only a planning methodology but also good practices that have been implemented thus far. They set out a list of SUMPs that are available online and provide links to them [52].

4. Smart, sustainable urban mobility at the local level

What follows is an exploration of the specific characteristics of Hungarian usage of the term "smart, sustainable urban mobility" in the local level, focusing on the extent and the way of the adaptation to the higher level discourse. Special attention will be paid to differences in attitude between municipalities with and without SUMPs (with the former presumably being more committed to participating in the smart, sustainable urban mobility discourse), as well as whether there are significant differences in the interpretation of smart. sustainable urban mobility between the pre- and post-2020 periods.

4.1.The "smart" dimension

Previously, I identified three levels within the "smart" dimension: (a) a technology-centred approach in the narrowest sense; (b) a management-centred approach; and (c) a value- and interest-driven approach. It has been observed that discourse on smart, sustainable urban mobility at EU- and Member State levels primarily focuses on management-centred and value- and interest-driven approaches. Given this, it is unsurprising that more traditional, technology-centred interpretations are mainly characteristic of municipalities without SUMPs. In these cases, the "smart" dimension usually emerges alongside various technological solutions. These technologies are often specific in nature, affecting particular segments of urban mobility without moving towards system-wide integration. The central role of electrification technologies is often highlighted, as can be seen in the availability or expansion of electric charging stations [53, 54, 55, 56, 57];

- the purchase of electric vehicles [58, 59, 60];
- or even the development and operation of electric micromobility [48, 61].

We can also encounter a variety of other technological solutions, most of which were in the implementation phase. These include a passenger information system based on real-time traffic monitoring [54, 55] and the digitisation of parking [62]. Demand for integration can be interpreted as a sign of transitioning to a management-centred approach. For example, this could be based on the geographic information system that already existed in Szekszárd at the time its SUDS was written [63]. However, explicit management-centricity is only evident in the SUDS

of Zalaegerszeg, which identifies "*intelligent and sustainable mobility*" not with particular technologies, but with multimodality, preference for non-motorised transport, traffic calming, and, last but not least, transport organization [64].

When reading the SUDSs of municipalities without SUMPs, it is striking that the term "(smart) mobility" is not associated with a value- and interest-driven approach, e. g. efforts to involve groups interested in mobility planning. It is also true, of course, that the Hungarian Methodological Manual for Sustainable Urban Development Strategies 2021-2027 [65] – which sets out the content requirements for SUDSs at the Member State level – considers partnership to be a tool of paramount importance in the urban development process in general. Nevertheless, it is thought-provoking that when drafting the SUDSs, designers and/or customer municipalities associated smart urban mobility with particular technologies rather than the value- and interest-driven approach.

In the case of municipalities that also have SUMPs, there is a much greater tendency to align with the management-centred and/or value- and interest-driven approaches that are favoured at EU- and Member State level. This is particularly evident in terms of participation, given that partnership planning is such a central element of discourse at higher levels that no SUMPs can afford to ignore it. The situation is more mixed in the case of management-centricity. Some SUMPs published before 2020 place too much emphasis on management. Good examples of this are the SUMPs prepared by Mobilissimus ltd., which emphasise the need for integrated planning, yet provide no details on specific smart solutions [66, 67]. In Szeged's SUMP, however, information and communication technologies (ICTs) were already emphasised as essential tools for the operation of intelligent transport systems/services [68]. Over time, the combination of management tools and supporting technologies that improve the efficiency of mobility organisation has become dominant. Of course, minor differences in approach can still be observed to this day. Szolnok's SUMP, for instance, places equal emphasis on "*development*" and "*management*" tools, assigning a significant role to particular technological solutions in the former category, including smart crosswalks, smart stops, and the "Smart Commuter' digital education platform [69]. Salgótarján, on the other hand, only interprets the ICTs as tools for supply management, with the aim of increasing traffic safety, reducing congestion and traffic disruptions, mitigating adverse environmental impacts, promoting efficient land use and transport integration, and facilitating information flow [70].

4.2.The "sustainability" dimension

Prior to 2020, the social pillar seemed to dominate the EU- and Member State discourse on smart, sustainable urban mobility. However, in the 2020s, the environmental-ecological pillar has gained importance as a result of the "green shift'

inspired by the European Green Deal. Given this, it is unsurprising that municipalities without SUMPs that have tried to interpret the concept of sustainability in their SUDSs only after the green shift tend to have a weaker social focus. A good example is the approach designed by EX ANTE Ltd., which equates sustainable mobility with prioritising solutions with the lowest possible energy consumption and emission values [55, 71, 72]. Baja and Sopron's interpretations do not differ greatly from this; they see the essence of sustainable mobility planning as "*serving the city's transport needs in an environmentally conscious manner*" [73] and "*giving preference to environmentally friendly modes of transport and technologies*" [74]. Zalaegerszeg's reductionist position can also be classified here; its SUDS refers to "*CO_2 emissions"* as the sole indicator of "*sustainable resource use"* [75]. Of the municipalities without SUMPs, only Érd appears to take a more balanced approach, defining sustainable mobility as "*the exploitation of mutual benefits derived from the complex interrelationship between accessibility, quality of life, sustainability, economic revitalisation, social equality, public health and environmental quality*" [76].

In the case of municipalities with SUMPs, however, the social pillar is dominant, at least before 2020. The SUMPs created at that time focused on city dwellers [77, 78, 79, 80] or on improving their quality of life and well-being [66, 81]. The approach of the TRENECON Ltd., designer of the SUMPs for Szeged and Kaposvár, is perhaps even clearer. In these cases, in line with the National Transport and Infrastructure Development Strategy published domestically in 2014, the comprehensive objectives forming the basis of the planning process are presented as "*social objectives*" [82, 83]. Finally, it should be noted that even such social-centred approaches do not necessarily negate the "three-pillar" model. The SUMP of Miskolc is noteworthy in that, despite its social-centred approach, it took into account "*environmentally friendly development*" of individual transport sub-sectors as an "*indispensable basis*" for the sustainable mobility plan [84].

The dominance of the social pillar in SUMPs created after 2020 has clearly receded: only two cases of Szombathely and Tatabánya [85, 86] showing a clear continuation of the social focus. However, the fact that municipalities with SUMPs do not shift towards a "single-pillar" model dominated by the environmental-ecological pillar even in this period shows that the inherently social-centred approach continues to some extent. The relevant passages do not form a homogeneous mass. There are some very clear statements, for example in the SUMP of Salgótarján, which clearly state that "*the three pillars must be in balance*" and that "*sustainable urban mobility planning (...) reflects an open, complex approach that (...) takes into account the needs of the population as well as social, economic, and environmental factors*" [87]. A similarly balanced — albeit perhaps less precisely articulated — approach is suggested by the SUMPs of Békéscsaba, Veszprém and Esztergom [88, 89, 90].

Elsewhere, however, the balance seems to be shifting towards the environmental-ecological pillar. For example, although Debrecen's SUMP refers to the "three pillar" model of sustainability in one section, it focuses almost exclusively on environmentally motivated municipal programmes which contribute to the creation of a carbon-neutral city [91]. Győr's SUMP pays special attention to responding to climate change as a key aspect of meeting sustainability requirements [92]. Finally, although Szolnok SUDS document pays special attention to "*improving quality of life*" and "*increasing economic competitiveness*" in line with the "three pillar" model, it only uses the term "sustainability' in relation to the environmental pillar [93].

4.3.The "(urban) mobility" dimension

As we saw earlier, smart, sustainable urban mobility was interpreted in line with the reformer paradigm in the EU and Member State discourses. Hungarian municipalities essentially aligned with this interpretation. Therefore, I will not detail the ubiquitous examples of the reformer paradigm here, but rather reflect on the traces of the subordinate (conservative and abolitionist) paradigms.

Electromobility was placed at the mainstream of the EU's sustainability discourse by Regulation (EU) No 2014/94 of the European Parliament and of the Council on the deployment of alternative fuels infrastructure (hereinafter: AFI Regulation) [94]. The AFI Regulation primarily focused on the electrification of private transport. However, Article 3 (1) also encouraged Member States to promote the deployment of infrastructure for alternative fuels in public transport services. This resulted in the electrification of alternative mobility modes being included in the SUMPs prepared during this period. Examples include efforts to purchase electric buses and expand fleets [95, 96, 97, 98]. In Kaposvár's case, micro-mobility is also mentioned, specifically the 32 electric bicycles and six electric scooters available through the municipal e-mobility system [99]. Nevertheless, most SUMPs produced before 2020 emphasized the importance of electrification in private vehicle use, and, in connection with this, the development and expansion of the electric charging network and parking spaces. Some of these documents explicitly referred to the AFI Directive and the first Hungarian electromobility plan prepared in line with it: the Jedlik Ányos Plan [100, 101]. During this period, conservative reflexes persisted to a certain extent.

In the 2020s, there will be a noticeable shift in emphasis towards electrified alternative modes of mobility. Essentially, all of the SUMPs and SUDSs created at that time emphasise the electrification of public transport and/or micromobility. This does not, of course, mean that the importance of electric cars is being denied; only a few exceptions refer to a moderation of earlier ambitious goals related to the

spread of electric cars [102], or even state that "*a lovable, liveable city does not prioritise car transportation*" [103].
Examining the presence of the abolitionist paradigm requires a high degree of caution, as neither the EU- nor Member State levels have made it a central element of the discourse on smart, sustainable urban mobility. Taking all this into account, it is somewhat surprising that the compact city, closely related to the abolitionist paradigm, is present in the majority of the SUMPs examined. Only five SUMPs [104, 105, 106, 107, 108] completely omit the term "*compact city*". In the other cases, the concept aligns closely with the abolitionist paradigm, which seeks to minimise the need for mobility by establishing sub-centres. The only exception is the SUMP of Dunaújváros, which treats the compactness of the city as a simple urban structural feature [109]. Although these SUMPs only briefly touch on the concept of the compact city, I do not consider this to be a mistake. Efforts to make urban structures more compact should be emphasised rather in the sustainable urban development documents, as this is not primarily a mobility planning issue.

Nevertheless, the SUDSs examined paint an unfavourable picture in this respect. Only 15 municipalities include the term "*compact city*" in their SUDSs, and even then, it is usually mentioned in passing. The SUDS of Pécs was the only one to address the issues related to developing a compact city in detail. This document yielded 174 results for the search term "*compact city*" [110], whereas in other cases the number of results remained below 10. In other respects, the few SUDSs that give the concept of the compact city a designated role in the planning process objectives may be noteworthy. In the SUDS of Pécs, which deals with the concept in the most detail, the compact city is presented as a strategic objective [111]; in Debrecen's SUDS, it is presented as a sub-objective of a strategic objective [112]; in Győr's SUDS, it is presented as a thematic sub-objective [113]; and in Kecskemét's SUDS, is presented as a measure objective [114]. In the remaining cases, however, the inclusion of the concept gives a rather ad hoc impression. In view of these findings, the integration of the compact city (or the abolitionist paradigm) into sustainable urban development still leaves much to be desired.

5. Conclusion

In my paper, I attempted to define the specific characteristics of the term "smart, sustainable urban mobility" at the local level of urban development discourse in Hungary, focusing particularly on its "smart", "sustainable" and "urban mobility" dimensions. I started from the assumption that discourse content related to smart, sustainable urban mobility was conveyed to the local (municipal) level through EU- and Member State policies. I therefore sought to answer the question of whether the use of the term "smart, sustainable urban mobility" at the local level can be seen as a result of alignment with higher levels and whether the local level plays an active role in constructing meanings related to it. My empirical investigation based on the

sustainable urban mobility plans (SUMPs) and sustainable urban development strategies (SUDSs) of the most significant Hungarian cities as a source base revealed the significant, albeit non-deterministic, influence of higher-level policies. This became most evident in the case of the "smart" dimension, as municipalities that were more committed to participating in the smart, sustainable urban mobility discourse – those with SUMPs – essentially identified with the management-centred, value- and interest-driven approach of the higher levels. They interpreted technological solutions as mere tools for mobility management. The situation is less clear with regard to the "sustainability" dimension, as neither the EU nor Member States are currently clearly committed to an approach that suggests the dominance of the social or environmental-ecological pillar. However, it can be observed that municipalities prepared their SUMPs before the European Green Deal (2020) tend to have a social focus which was originally characteristic of the discourse at the EU and Member State levels. A similarly mixed picture emerges in the case of the "(urban) mobility" dimension. On the one hand, the municipalities covered by the study undoubtedly identify with the EU- and Member State-inspired "reformer" paradigm, which focuses on alternative mobility modes. By contrast, traces of the "conservative" (not yet willing to abandon individual motorisation completely) and "abolitionist" (seeking to restrict urban mobility) paradigms can also be seen in the Sustainable Urban Mobility Plans (SUMP) examined.

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