SMARTAINABILITY AND MOBILITY STRATEGY: THE CASE OF BELGIAN LOCAL GOVERNMENTS

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Abstract

Purpose: In order to be smarter and more sustainable, local governments have to face urban mobility challenges. Even if they integrate sustainable and smart approaches, local governments meet obstacles to define the adapted combination between smart mobility and sustainable mobility. For this propose, this paper aims at understanding the impact of different combinations on the development of mobility strategies in Belgian local governments. The alternative Venn diagrams of urban mobility developed by Lyons (2016) are used as a theoretical lens to explore the link between smartainability and mobility strategy.

Design/methodology/approach: An exploratory case study was used for the propose of this study. The case study utilised semi-structured interviews with mobility managers in ten Belgian local governments. To strengthen the analysis, documentary analysis with a focus on publicly-available reports on sustainability, smart city strategies and urban mobility were collected before and after the interviews. Further, different mobility projects initiated by start-ups and organisations of local governments have been collected during different mobility meetings in Belgium.

Findings: Even if there is different combinations between smart and sustainable mobility, the definition of sustainability as a part of smart mobility contributes to develop mobility strategy. This "*"smartainable"*" alternative encourages transitions to anticipate future challenges. Citizens are initiated to new solutions and are eager to contribute in the development of mobility strategy. All public, private and civil actors collaborate to face sustainability challenges like pollution and CO2 emission. Mobility strategy is then more oriented towards integrated smart mobility platforms.

Research/practical implications: The outcomes for practice of this paper is to identify the best combination between smart and sustainable approaches to facilitate the development of strategies in local governments. Moreover, these exploratory case studies offer new insights for future research on the concept of smartainability in strategic axes of smart city such as mobility.

Originality/value: Current researches on urban mobility follow either a sustainable paradigm or a smart paradigm. There is few researches exploring the interdependencies between the two paradigms. In addition, there is no significant researches which explored the link between smartainability and mobility strategy in the context of public sector.

Keywords: key word, key word, key word (3-5) Urban mobility, smart city, sustainability, strategy, local governments.

JEL Codes: R41, M48, H76.

Introduction

To be competitive and to face social, economic and technological challenges, local governments integrate new strategic visions (Naldi, & al. 2015). A deep understanding of interdependencies between strategic sectors is required to make cities smarter (Kourtit, Nijkamp & Steenbruggen, 2017). Urban transport or urban mobility is a strategic sector with a significant impact on life quality, safety and sustainability (MrKajic & Anguelovski, 2016). Urban mobility is directly related to local transport, urban infrastructures and energy environmental performance (Konrad, 2015). In order to be smarter and more sustainable, cities have to face mobility challenges (Schaltegger, 2011). Urban mobility contributes, defines and influences the achievement of smart city goals through the strategic impact of complex transport systems.

Urban mobility in smart cities is based on the sharing economy which involved both top-down public initiatives and bottom-up private and individual initiatives (Giffinger, & al. 2007). To manage the complex system, transport technology is used (applications, smart lighting, smart speed limit control) to increase connectivity between infrastructures, drivers, pedestrians and cyclists. However, digital technologies based on smart urban mobility is not a complete solution which enablers to solve all mobility issues (Ilarri, Stojanovic & Ray, 2015). Based on that, multimodality transports are encouraged through the development of sustainable mobility plans and strategies (Kesselring & Tschoerner, 2016).

This paper aims at understanding the impact of different combinations of smart and sustainable approaches on the development of mobility strategies in Belgian local governments. The alternative Venn diagrams of urban mobility developed by Lyons (2016) are used as a theoretical lens to explore the link between smartainability and mobility strategy. The paper is organised as follows. The first section explores the link between smartainaibility and mobility strategy in recent literature. the second section outlines the research method applied in this

study, followed by findings in the third section. Finally, the last section draws discussions from this research.

1 Literature review

Urban mobility requires the integration of smart tools with a sustainable way on different matters like intelligent transport, development of apps and "*datafication*", and sharing systems (Giffinger, Haindlmaier, & Kramar, 2010). Local governments have to identify the best combination between urban sustainability challenges and needs of digital development to facilitate the development of mobility strategy (Behrendt 2016; Ben Lataifa, 2015).

1.1 Smartainability and mobility strategy

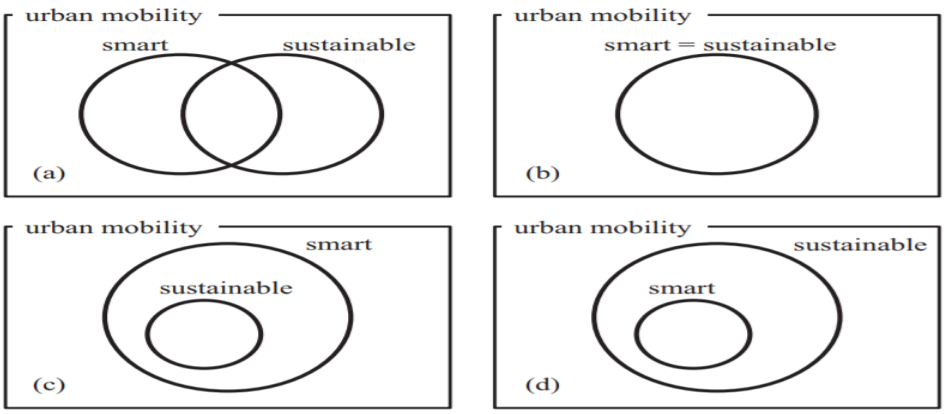
The smartainability is an approach combining different alternatives of sustainable and smart visions to facilitate the deployment of smart technologies in sustainable actions. This approach is developed and tested on the Expo Milano 2015 (Pierpaolo & Temporeli, 2017). This study highlights the combination between functionalities, benefits and key performance indicators for smart cities to improve life quality, sustainability and energy usages (Yeh, 2017), The orientation of urban mobility strategy is defined by sustainable (environmental), social and economic components (Meekan & al., 2017). Even if mobility strategy tens to integrate sustainable and smart approaches, it is difficult to distinguish between the definition of a smart mobility, a sustainable mobility and a "smartainable" mobility. This definition varies according to city profiles (garden city, sustainable city, eco-city, green city, compact city, smart city, resilient city), city protocols and to city keys (Ahvenniemi & al. 2017; Eremia, Toma & Sanduleac, 2017). A sustainable city is associated to walkable, competitive and intelligent; a smart one is associated to digital, open and integrated for social, economic and governance issues (Eremia, Toma & Sanduleac, 2017).

The "smartainable" mobility refers to participative initiatives developed by successful top-down and bottom-up collaborations to face mobility issues. A mobility strategy which is both smart and sustainable brings behavioural changes on dynamic signalisations, traffic management systems, urban control driving and on eco-driving (Chen, Ardila-Gomez & Frame, 2017). The orientations of a "smartainable" mobility strategy are adapted to city building planning (shopping centres, strategic infrastructures, companies) and budgeting (municipal budget, indirect funding, municipal public debt) (Baucelles Aleta, Moreno Alonso & Arce Ruiz, 2017). The development of an adapted "smartainable" mobility strategy requires to be supported by coordinated data and information, monitoring and evaluating system. These components facilitate how mobility strategy is planned, administrated and controlled. They refer to indicators developed in Sustainable Mobility Plans, SUMP, EcoMobility SHIFT, EPOPP-TERMS, KPIs of the CONDUITS project, ESPON TRACC, European Air Quality Database, Global City Indicators Facility, EUROSTAT, Economist Intelligence Unit and ARCADIS. Even if mobility controls are gathered from international experiences, they are completed according to location specific development objectives (Kesselring & Tschoerner, 2016).

1.2 Motivations from a Smartainability paradigm

The link between smartainability and mobility strategy is well defined in a framework developed by Glenn Lyons (2016) in his article "Getting smart about urban mobility – Aligning the paradigms of smart and sustainable" published in Transport Research Part A. His framework illustrates different alternatives of the alignment between smart mobility and sustainable mobility paradigms in the four alternatives of Venn diagrams for urban mobility.

Fig. 1: Venn diagrams for urban mobility



Source: (Lyons, 2016, p. 5).

The first alternative refers to a medium harmonious coalition between smart and sustainable according to city goals (Bibri & Krogstie, 2017). The second alternative refers to the sustainable mobility paradigm that does not distinguish between smart and sustainable. The third alternative presents sustainable as a part of smart mobility. The last alternative integrates smart mobility as a part of sustainable mobility (Lyons, 2016). As illustrated in the figure 1, the four alternative of Venn Diagrams for urban mobility is used as a framework to analyse how local governments link between smart and sustainability in the development of their mobility strategy.

2 Research method

This research is based on an exploratory qualitative case study of ten local governments in Belgium based on documentary analysis and interviews with mobility managers. This paper focuses on top-down actions developed by local governments to strengthen mobility strategy with an integrated smart and sustainability vision.

2.1 Sample

Belgium is a federal state, divided into three different regions: Brussels (the capital), Flanders (the Flemish region), and Wallonia (the Walloon region). Based on this division and on the list of the fifteen biggest local governments in Belgium, our sample is composed by ten local governments. Further, our case studies use different means of transport (car users, public

transport, car-pooling, cycling and promotion of city walkers) in order to understand how mobility is oriented, specially the use of public transport and bikes.

Tab. 1: Presentation of means of transport in the studied Belgian local governments

/	*Region*	*Car users*	*Carpooling*	*Train*	*Bus*	*Bike*	*Walkers*
Antwerp	Flanders	53,8%	2,7%	10%	11,9%	14,8%	2,1%
Brugge	Flanders	56,3%	1,5%	10,5%	3,8%	25,4%	0,9%
Brussels	Capital	31,1%	0,8%	43,8%	19,6%	2,2%	1,5%
Charleroi	Wallonia	83,8%	3,2%	6,1%	4,3%	0,4%	1,6%
Ghent	Flanders	60,2%	4,0%	10,6%	5,7%	15,6%	1,3%
Hasselt	Flanders	68,5%	2,5%	7,6%	4,5%	14,5%	1,3%
Leuven	Flanders	58,8%	1,6%	13,2%	5,9%	17,7%	1,5%
Liege	Wallonia	75,4%	1,3%	6,4%	12,5%	1,5%	2,4%
Mons	Wallonia	78,0%	1,7%	12,1%	3,0%	1,7%	2,1%
Namur	Wallonia	70,2%	2,6%	13,4%	7,7%	1,8%	3,4%

Source: Based on federal Belgian and Eurostat statistics [1]

They also develop projects and strategies to be more sustainable and smart. In order to have a good representation of the Belgian territory (see Tab.1), all regions are represented by case studies (one for the capital, five for Flanders, and four for Wallonia).

2.2 Data collection

The Research is based on ten semi-structured interviews conducted with mobility managers to identify top-downs actions. Each interview lasted 2 hours and was recorded to understand the how mobility strategies are planned, implemented and controlled. The interviewees were previously informed on prior axes of our research. However, they did not know more details about the interview guide. To strengthen the analysis, documentary analysis with a focus on publicly-available reports on sustainability, smart city strategies and urban mobility were collected before and after the interviews. These documents are published by the studied local governments, Belgian federal government and European institutions such as the European Commission. Copies of other relevant written documents were requested during the interviews (long-range plans, action plans, list of indicators etc.). Further, documentary analysis of different mobility projects initiated by start-ups and organisations of local governments have been collected during different mobility meetings in Belgium.

2.3 Data analysis

The data were analysed according to the principles of the qualitative content analysis. The data were organised and classified into several categories in a systematic analysis grid. Horizontal and vertical analyses were successfully undertaken. Firstly, the data were classified in six

[1] Federal Belgian statistics : http://statbel.fgov.be/en/statistics/figures/
University reports: http://ec.europa.eu/eurostat/statistics-explained/index.php/Tertiary_education_statistics/fr

different categories to determine how mobility strategy is planned, organised and controlled in the context of smart city. Secondly, data were organised according to how interviewees estimate the development of mobility strategy.

A third classification divided the data into four categories (alternatives of Venn Diagram). To do so, the classification refers to documentary analysis of different official reports and documents on sustainability and smart city strategies of the ten local governments (strategic projects, vision, underdeveloped themes, long-range objectives, the importance of sustainability and smartness). The last classification divided the data to highlight differences and similarities between the Belgian regions (Wallonia, Brussels and Flanders). For the ethical aspects of the research, all interviewees agreed to use all the data collected during the interview including open-access documents and some parts or pages of internal documents. Confidential documents have not been shared during the interview.

3 Results

This section identifies different combinations between smart and sustainable approaches developed by Belgian local governments to support their urban mobility strategy. It then explores the link between smartainability and the development of mobility strategy.

3.1 Identification of different combinations between smart and sustainable approaches for mobility

In terms of mobility, the studied local governments develop smart projects with a focus on technology, digitalisation, smart lighting and smart traffic control. They also develop sustainable projects to reduce pollution, congestion and CO2 emissions. The studied local governments dissociate between smart and sustainable projects. These projects are initiated and developed by different departments of local government according to their priorities and interests. The results highlight that the link between smart and sustainable mobility is developed only for strategic axes which necessitate important financial, infrastructural and human supports (such as urban and building transformations; strategic collaborations between local governments, regions and the federal government and long-term budgeting). The “smartainable” mobility refers to a vision and values that define the main directions of mobility strategy according to the challenges of local governments.

The vision of smartainability mobility differs between local governments of the north (Flanders) and the south (Wallonia) of Belgium. Local governments in Wallonia are more oriented to alternatives B and D of the Venn Diagrams for urban mobility developed by Lyons.

Local governments with an orientation to alternative B do not distinguish between smart and sustainable mobility. They define smart digital actions, such as the development of mobility apps and platforms, as an enabler to reach sustainable mobility. On the other hand, they define sustainable behavioural changes, such as the use of bike and public transport, as smart integrative solutions through the development of citizen participation. However, local governments with an orientation to alternative D promote entrepreneurship and bottom-up initiatives through integrative citizen participations.

Smart mobility is defined as a component of sustainable mobility. For this propose, innovative and smart projects with a strong sustainability impact are highly promoted and supported by these local governments. The case studies show that local governments in the north of Belgium (Flanders) define sustainable mobility (sharing values, quality of life, zero emission) as a condition to reach smart mobility (the alternative C of Venn Diagrams for urban mobility). Neutral climate projects and shared accountable sustainability are strategic components to develop Mobility 4.0 (fleet & ride sharing, autonomous transport system, smart parking and connected vehicle). These local governments support cooperation and complementarity between sustainable modes of transport. Sustainable values are then used as an enabler to convince citizen, public administrations and politics to use integrated mobility platforms.

3.2 Smartainability and mobility strategy in Belgian local governments

Urban mobility planning is associated to smart city strategy and to long-range challenges. For this propose, local governments with a focus on smart mobility orient their strategy to smart solutions and to integrated mobility platforms. On the other hand, local governments with a focus on sustainability reinforce behavioural changes. However, local governments which do not distinguish between smart and sustainable mobility plan innovative actions with a strong impact on life quality. Mobility planning is supported by administrative structures and procedures. Findings show that the definition of sustainable mobility as a part of smart mobility impact on how mobility strategy is implemented. The alternative C encourages more collaborations with transport actors (train, buses, taxis,..) and transport start-ups to facilitate the development of a smarter mobility. These collaborations necessitate efficient mobility measurement systems to control how citizen support sustainability transition and digital transformation. However, measurement systems are less developed and up-dated in local governments with an orientation to alternative B and D.

To support the development of “smartainable” mobility, local governments with an orientation to alternative B organise different sensitizing campaigns to promote behavioural changes (use of bikes and public transport) and to initiate citizens to digital solutions (smart applications, autonomous cars). Values and symbols are more developed in the studied local governments with an orientation to alternative D.

Tab. 2: Presentation of means of transport in the studied Belgian local governments

Axes	***Alternative B: Smart means Sustainable approach***	***Alternative C: Sustainable as a part of smart approach***	***Alternative D: Smart as a part of sustainable approach***
Planning	-Obsolete mobility plans -Mobility projects are mainly focused on traffic and cycling -Anticipation of congestion challenges	-Mobility projects are updated according to sustainable challenges. -Mobility projects are mainly focused on sustainable solutions to support integrated mobility platforms. -Anticipation of future digital challenges	- Obsolete mobility plans -Mobility projects are mainly focused on bottom-up smart initiatives proposed by citizens and start-ups -Developing a strong sustainability culture
Smart city vision	-Starting to integrate a smart city vision	- Integration of smart city strategy	-Integration of smart city strategy
Collaboration and management	- Weak formal collaborations and decision-making - Strategic and organisational limits	- Formal collaborations based on coalition and interdependencies -Decentralisation is an enabler and a constrain	- Complex formal collaborations and decision-making - Strategic and organisational limits
Project monitoring	- Obsolete measurement systems and indicators -Informal controls on the use of bike, cars, parking and mobility applications	-Adapted measurement systems and indicators - Formal controls on the impact of mobility projects on sustainability -Formal controls based on digital platforms and tools	- Obsolete measurement systems and indicators -Formal controls on traffic congestion and on the use of sustainable transport.
Awareness campaigns	- Sensitizing citizens to sustainability and digitalization	-Focus on integrated mobility platforms (mobility 4.0)	- Sensitizing to inclusive citizen participation -Sensitizing to datafication and digital apps
Citizen participation	-Citizens perceive mobility projects as a danger for their routines and habits -Slow positive behavioural change	-Citizens are initiated to smart and sustainable solutions -Citizens are eager to contribute in the development of mobility projects	-Raising citizen collaboration and participation - Sustainability is perceived as a long-term solution -Slow positive behavioural change
Observed in	-Local governments in Wallonia	-Local governments in Flanders -Local governments in Brussels	- Local governments in Wallonia
Development of mobility strategy	Weak	Strong	Medium

To support the development of “smartainable” mobility, local governments with an orientation to alternative B organise different sensitizing campaigns to promote behavioural changes (use of bikes and public transport) and to initiate citizens to digital solutions (smart

applications, autonomous cars). Values and symbols are more developed in the studied local governments with an orientation to alternative D. Citizens are initiated to digital and sustainable alternatives. To strengthen this, local governments encourage citizen participation and shared accountability culture. Table 2 summarizes how mobility strategy is deployed in Belgian local governments according to how they align smart and sustainable approaches.

In order to develop a smart region, mobility is defined as a framework improving social and economic environment in local governments with an orientation to alternative C. For this propose, the development of integrated mobility platforms improve safety, international transit traffic, smart traffic flow system, road pricing and life quality. These findings conclude to a direct link between the vision of smartainability and to how mobility strategy is defined and developed. According to our case studies, local governments with a weak developed mobility strategy do not distinguish between smart and sustainable mobility. They develop different actions and values to sensitize citizens to new solutions, however, they face different strategic and organisational limits. Moreover, citizens perceive mobility projects as a danger for their culture (urban renewal, car usage) and routines (parking, speed limits).

Local governments with a medium developed mobility strategy are aware about their limits and integrate improvements through a strong collaboration with citizens. They focus on the development of a strong mobility culture to face mobility issues such as traffic congestion. To do so, local governments encourage bottom-ups initiatives and the development of smart applications to support mobility strategy in order to be greener, neutral and sustainable. Finally, local governments with a developed mobility strategy have more adapted measurement systems and indicators to anticipate future challenges. Citizens in these local governments are initiated to “smartainable” solutions and are eager to contribute in the development of mobility strategy. All public, private and civil actors collaborate to face sustainability challenges like pollution and CO2 emission. Mobility strategy is then more oriented to future challenges and to more integrated mobility.

Conclusion

This paper contributed to understand how local governments combine between sustainable and smart approaches to develop urban mobility on their territory. Further, the development of urban mobility necessitates collaborations with citizens and start-ups to encourage bottom-ups initiatives. Current researches on urban mobility follow either a sustainable paradigm or a smart paradigm. There is few researches exploring the interdependencies between the two paradigms. Our case studies explored different approaches combining sustainability challenges (pollution,

CO2 emission) and digital solutions (integrated mobility platforms) to face mobility issues in Belgian local governments.

This paper explored how mobility strategies are defined and are impacted according to different smartainability approaches. However, our research faces different limits. The link between smart and sustainable approaches is not well defined in the literature review. Moreover, the Venn diagrams of urban mobility developed by Lyons is an initial model exploring the link between sustainability and smartness in the context of urban mobility. Further researches need to develop this model and to more deeply explain the components, limits and opportunities of the four alternative smartainable approaches. In addition, we do not identify a relevant research exploring the link between smartainability and strategy in the context of urban mobility. It is interesting to investigate deeply on how mobility strategy can efficiently be planned, controlled and administrated in different alternatives of a smart and sustainable vision.

Our exploratory case studies offer new insights for future research on the link between smartainability, strategy and active collaborations. It is interesting to investigate on the impact of citizen participation on the development of integrated mobility platforms with a strong sustainable impact. Moreover, researches on the link between smartainability and strategy are encouraged to explore other smart city dimensions such as governance, living and economy. The exploration of Venn diagrams of urban mobility developed by Lyons contributes to the understanding of the smartainability. However, this framework should be adapted and explored on other researchers related to the development of strategies in local governments or in the public sector.

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