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Sustainable Smart Mobility and Intelligent Transport Systems as Enabling Factors of Smart City Transition Oriented Digital Transition Strategies: Evidences from Italy

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Abstract

This study investigates the opportunities that smart mobility offers as a fundamental part of the transition to a smart city. The study comprises a case study of the city of Taranto, Italy. The data collection was based on semi-structured interviews with policymakers with expertise in transport systems. Findings confirm the relevance of smart mobility as a primary fundamental factor to accelerate and begin the transition to a smart city, and how this transition requires a joint effort by both public actors and companies involving coherent, coordinated, and advantageous territorial development strategies aimed to achieve environmental sustainability and distributive equity.

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1. Introduction

In recent decades, the urban reorganization has been a central issue in the process of economic, environmental, and social development. In this context, smart cities represent an important factor of urban development, as they allow concentrating methods and technologies aimed at obtaining completely new and sustainable urban settings (Albino, Berardi and Dangelico, 2015). Smart city projects embody a significant change in the social paradigm given by the interaction between citizens and enabling technologies, proposing new digital solutions at the service of the urban community (Pereira et al., 2018).

A city can be defined as "smart" when it intelligently manages its mobility, environmental resources, relationships between people, housing policies, and its governance model (Docherty et al., 2018). In addition, a "smart city" is economically sustainable and competitive through the adoption of technological solutions to support local policy actions and improve the quality of life of its citizens (Arroub et al., 2016). Overall, a smart city is based on a system of combinations characterized by specific areas of application, such as (1) *smart governance*, concerning collaboration between citizens and public administration in the decision-making process; (2) *smart living*, concerning new lifestyles based on the use of information and communication technologies related to citizen behavior; (3) *smart environment*, concerning the optimized management of environmental resources and the environment itself; and (4) *smart mobility*, concerning new forms of highly technological mobility, citizen-friendliness, and low environmental impact (Docherty et al., 2018; Ruhlandt, 2018).

The transition from traditional urban communities to smart cities has been identified as a major driver for achieving of sense of making cities and human settlements inclusive, safe, resilient, and sustainable (Wendling et al., 2018; Allam and Newman, 2018). In this regard, the role of technology is recognized as a key factor in connecting people and objects, integrating information intelligence, promoting digital inclusion, and improving the quality of citizens' lives and companies' business models (Dameri, 2013). Therefore, understanding how technological solutions are transforming urban areas, especially in terms of urban mobility, to bring them closer to the concept of a smart city is a particularly interesting area of research (Yigitcanlar et al., 2020).

Smart mobility is often indicated, in strategies for smart cities, as one of the main roads, if not "the road" par excellence, to pursue greater sustainability and efficiency of transport systems. At the European level, transport and personal mobility are considered fundamental nodes for the growth of the EU and have a significant value within the processes that support the green and digital transformation of member countries (van Oers et al., 2020). As indicated by the European Commission (2020) in the action plan called "Strategy for smart and sustainable mobility," the European

transport system must achieve its green and digital transformation and reduce 90% of emissions by 2050 through an intelligent, competitive, safe, accessible, and affordable transport system. However, to the best of our knowledge, few studies have investigated the role of smart mobility as a driving force for the digital transformation of cities into smart cities.

Against this backdrop, this study aims to investigate the opportunities that smart mobility offers as a fundamental part of the transition to a smart city and is immediately activated by analyzing the perception of local policymakers and the possible actions taken to encourage this transformative path. Therefore, we conducted a case study on the city of Taranto, Italy, by interviewing four policymakers who worked on the development of strategies for the green transition of the transport system in that municipality. The remainder of the paper is structured in the following manner. First, we provide an overview of the related literature on smart cities and smart mobility. Second, we describe the research methods employed to collect and analyze the empirical data. Next, in the fourth section, we present the key-findings of our research with the related supporting quotes, in terms of 1) *Strategic Planning and Smart Mobility Promotion*; 2) *Stakeholders' Coordination and Participation*; and 3) *Local Development Future Perspectives*. Finally, in the fifth section, we discuss the main implications of our research, and the main limitation of our study together with plea for future research.

2. Overview of the literature

2.1. Smart city development in territorial local systems

The term "smart city" refers to an urban territory where technological innovations are applied to solve problems inherent to community life, in a sustainable way and, ultimately, to improve the citizens' quality of life (Arroub et al., 2016; De Santis et al., 2014). Prior literature acknowledges that the locution "smart city" is often used to describe a city that has developed technologically through the adoption of new strategies aimed at encouraging coordination and interaction between citizens and technology (Dameri, 2013; Ramaprasad et al., 2017). Although there is no consensus on the concept of a smart city, a growing body of the literature argues that a city can be considered a smart city "when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance" (Caragliu et al., 2011: 70).

Coherently, the transition of urban areas towards the smart city concept is part of the Sustainable Development Goals (SDGs), adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity (UNDP, 2022). Indeed, the smart city approach may on one hand positively contribute to some interesting goals such as the ones related to good health and wellness, clean water and sanitation, affordable

and clean energy, decent work and economic growth, industry innovation and infrastructure, responsible consumption and production; In the other, it finds a suitable place in a dedicated goal which is the one namely "11) *Sustainable Cities and Communities*".

The transformation of a city into a smart city passes through a combination system characterized by six essential areas (Docherty et al., 2018; Ruhlandt, 2018): (1) *smart governance*, with reference to the collaboration that is established between the subjects, the inclusive of balanced and rational management of resources in which every contribution is important for the improvement of community life; (2) *smart economy*, with reference to the positive impacts on the local economy, increasing employment and productivity, using full collaboration between public and private entities; (3) *smart mobility*, with reference to intelligent mobility activities, aim to develop solutions that aim to rationalize costs but at the same time apply an energy efficiency strategy capable of minimizing private traffic and the consequent pollution by adopting more “green”; (4) *smart environment*, with reference to the optimized management of consumption and resources in order to favor the reduction of pollutants and adopting smart grid and smart metering models aimed at the aforementioned purpose; (5) *smart people*, with reference to the process of active involvement of the local population with public institutions thanks to an integrated information system that allows them to take a proactive role by implementing a decision-making process defined as bottom up, that is, from the bottom up; and (6) *smart living* with reference to the objective of guaranteeing citizens the benefit of all aspects relating to health, education, safety and culture, using the technologies readily available to the public service. Undoubtedly, a smart city project is based on the use of emergent technologies (e.g., Internet of Things, Artificial Intelligence) through smart devices that make communication processes more efficient. Such technologies enable the creation of complex ecosystems where the digital transformation facilitates information exchanging between multiple actors (Sestino et al., 2020). Additionally, these technologies are implemented to redesign traditional services (e.g., transport, waste management) creating a new technological ecosystem (Zanella et al., 2014). The key-challenge remains in equipping cities with essential technological and intangible infrastructures to connect people and objects, integrate information and generate intelligence, produce social inclusion and well-being of citizens, and create new businesses opportunities for companies (Osburg and Schmidpeter, 2013).

Moreover, in this scenario, the emerging smart grids technologies may consistently contribute to sustaining the transition toward a smart city (Farmanbar et al., 2019). The smart grid consists of an "intelligent network" in terms of electricity grids and technologies which, thanks to the reciprocal exchange of information permit to manage the distribution of electricity from the production sources, and to satisfy the various electricity requests of connected users, producers, and consumers, resulting in a more efficient, rational and organized energy-management system (Bayindir et al., 2016). Thus, by considering its technicalities, smart grids may positively contribute to the European energy challenge regarding both the consequent energy and digital transition: From a

technological perspective, smart grids application may influence the diffusion of a series of services and functionalities of strategic importance for the creation of intelligent cities of the future (Neffati et al., 2021).

Similarly, an emerging practice able to boost the digital and sustainable transition is the one related to the so-called energy prosumers building, which are apartments, condominiums, or mini energy communities that exploit self-produced energy from renewable sources to make a building eco-sustainable, e.g., through the installation of photovoltaic panels and the like, to become autonomous for energy production (Jacobs, 2016). In this way, prosumers actively participate in the production of the energy they consume (Horstink et al., 2020).

Indeed, smart cities are not characterized merely as physical places or analyzed by an administrative dimension, but precisely as systems of things, people, capabilities and resources, whose internal affinities must be considered at the same time according to social and economic aspects, which qualify and distinguish their borders from other territorial systems (Guido and Pino, 2019). Through technological innovation processes, appropriate infrastructure and synergy between companies, public agents and citizens, local territorial systems can create suitable ecosystems and maximize the economic and social potential that smart cities have to offer (Schleicher et al., 2016). Furthermore, the joint efforts between public and private agents ensures the appropriate conditions for the development of smart cities in terms of four interconnected aspects: (1) *the strategic subject*, as a political governance body must adopt an analytical plan for the creation of an environment conducive to development; (2) *the strategic area*, with which the aim is to identify a specific vocation and to exploit it positively; (3) *the strategic resources*, such as opportunities to be exploited in terms of skills, resources and know-how; and (4) the *strategic object,* in terms of achieving competitive advantage or creating and spreading wellness for the entire community. Overall, it is important the establishment of careful strategic planning to stimulate the developing of an appropriate environment where increasingly flexible relationships between stakeholders can coexist and can grasp the speed of transformations and the complexity of the urban system (Pino et al., 2018).

2.2. The relevance of smart mobility

Transition projects relating to the development and growth of smart cities place economic, social, and environmental development as essential requirements. In the transition process from a "normal city" to a smart city, the issue of sustainability is one of the key components that guide the relationships between government, organizations, and citizens (Domenico et al., 2018). The literature suggests that the interplay between these actors proves to be very useful for both improving sustainable development and safeguarding the public interests involved in the transition (Yigitcanlar and Kamruzzaman, 2018).

In a certain sense, smart cities can be considered as a sort of "containers" capable of comprehending the numerous practices and projects that are relevant from a

digital and sustainable point of view. The smart approach, therefore, stands out in terms of four main domains: Smart governance; Smart living; Smart environment; and Smart Mobility. Smart governance refers to the collaboration between citizens and public administration in the decision-making process. It presupposes the engagement of citizens in the co-creation of projects and co-design of the entire smart city, with the aim of generating in the citizens themselves the awareness of having been active actors in the smart transition (Pereira et al., 2018). Smart living or livability refers to the benefits of the use of information and communication technologies that increase the quality of life and well-being of the citizens (Arroub et al., 2016). Smart environment refers to the optimized management of natural resources. It can involve, for example, the use of renewable energy sources, reduction of harmful pollutants, efficient waste management and monitoring of water resources (Loo and Tang, 2019). Smart mobility is related to new forms of highly technological mobility, with a low environmental impact, and which provides higher accessibility, trust, and safety (Faria et al., 2017; Papa and Lauwers, 2015). Indeed, smart mobility involves coordinated activities aimed at maximizing the efficiency of urban transport modes. It is based on the creation of economies that can achieve certain results in the shortest possible time so that mobility can be made efficient (Ruhlandt, 2018). Although the four domains are complementary to each other and crucial for the transition process to smart cities, this study is focused particularly on the smart mobility domain.

Smart mobility aims to offer a continuous motion experience that is flexible, integrated, and safe (Loo and Tang, 2019), also capturing environmental-concerned consumers' attention in the attempt to both satisfy their commitment, and sometimes their desire to be seen as "green consumers" (Guido, 2009; Sestino et al., 2021). Such forms of mobility may be innovated using new mobile technologies and applications capable of integrating public transport, better infrastructure, and sharing economy services. In this regard, different forms of mobility have been developed and implemented in the urban transition processes, such as ridesharing, car and scooter sharing, green technologies, mobility payment and micro-mobility. Ridesharing refers to a series of activities that exploit the sharing of car rides. These services reduce traffic and pollution impacts by decreasing the number of vehicles in circulation (Furuhata et al., 2013). Car and scooter sharing is related to the use of cars or scooters by several people. Essentially, this is a short-term rental service, where the cars are made available by a company (public or private) and distributed in urban centers, so that citizens, by registering on a dedicated app, can choose and book the use of a car (Ferrero et al., 2018). Green technologies are focused on the use of electric transport modes, or with zero environmental impact, such as electric cars (Casini, 2017). Mobility payment represents an on-demand service that is essential for making a transport service easier and faster, such as smart parking, a service that allows drivers to identify parking availability using an app (Liyange et al., 2019; Shaheen and Cohen, 2020). Micro-mobility refers to a series of transport activities that allow people to travel short distances. This includes bike-sharing services, such as bike rental and the use of skateboards and electric scooters (Jettanasen et al., 2020; Sestino et al., 2021). Moreover, despite vastly various ways

of working, cooperation between public and private companies may be the key to successful smart cities. Public-private partnership: Smart city experts share models of successful initiatives from around the world, and both private smart mobility incentivization (e.g., as for electric scooters to share) and public ones may boost such transition operating as two faces of the same coin (Benevolo, 2016).

Overall, achieving the smart mobility demands a rearrangement in the urban infrastructures to increase the efficiency and sustainability of the transport services. It also relies on cultural changes, as the citizens must feel motivated to think from a greener perspective and, therefore, progressively convert their behavior towards a more ethical and sustainable transport system (Kosnik, 2018). Furthermore, the transport services should not be an end in themselves but should be considered a way to improve the well-being of citizens as well to include their participation in the development of alternatives and more sustainable transport modes (Ho et al., 2018; Wong et al., 2020).

By considering these premises and the opportunity that smart mobility represents in becoming the driving force to start the process of transition to a smart city, and specifically for a local territorial system as a complex reticular model resulting from all those relationships and interactions that occur between public and private, individual and collective, local and supra-local subjects in a territory defined as "local" and characterized by the concept of "physical proximity" (Guido and Pino, 2019), this study aims to investigate the perception of policymakers about smart mobility in regarding the opportunities and benefits for territorial systems, as well as the strategies adopted to maximize these opportunities and benefits. Therefore, two research questions arise:

RQ1. What are the opportunities offered by smart mobility for a local territorial system, in addition to the other transition factors towards smart cities?

RQ2. What is the perception of policy makers about smart mobility and what are the strategies implemented to exploit the opportunities derived from smart mobility?

3. Methodology

In order to answer the outlined research questions, we conducted a qualitative case study. This approach is suitable when the study "investigates a contemporary phenomenon (the 'case') in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident" (Yin, 2014: 16). Therefore, this approach is appropriate for this study, as the study aims to understand the opportunities offered by smart mobility in a particular context (i.e., the city of Taranto). Moreover, the digital transformation of cities and the policies and strategies for the transition from traditional urban communities to smart cities are highly contextualized (Du et al., 2020; Rezende et al., 2015), which requires the adoption of a case study as an ideal approach as it relies on the understanding of the context as part of the research phenomenon.

3.1. Digitalization and smart city: the case of Taranto, Italy

Recently, several European cities have been engaged in their smart transformation, committing energy and time in research aimed at more sustainable mobility, more transparent governance, energy efficiency, and the development of clean technologies that can improve the quality of citizens' life (Docherty et al., 2018). Although at a European level many cities have started transition paths towards smart cities (e.g., Amsterdam, Barcelona, Copenhagen, Paris, Stockholm), in Italy this process began a few years ago. A recent study conducted by the Internet of Things Observatory (European Commission, 2020) shows that 42% of Italian municipalities have started at least one digital project in recent years. Moreover, it also shows a trend of increasingly innovative and integrated orientation towards smartness initiatives. However, the transition to smart cities appears to be very slow in the country, especially in the Southern Italy.

The intervention of the public administration in the urban territories in Italy is decisive for the digitalization of public services that are correlated to the green transition to smart cities (Baykurt and Raetzsch, 2020). The local authorities are responsible for designing mid- and long-term strategies that ultimately define the resource allocation in areas that are considered priority for the smart city. Besides, the local policymakers are also in charge of creating and adopting a set of laws and regulations to control and supervise the delivery of public services (Caragliu and Del Bo, 2012). In 2020, the Italian National Report (Digital 360, 2020) revealed that only three cities in Italy are considered as smart cities: Milan, Florence, and Bologna. The report analyzed the adaptability of 107 cities in the transition towards smart cities, by considering three key-abilities: (1) the ability to make the best use of intangible infrastructures and enabling platforms for developing citizen-oriented digital services; (2) the ability to respond to the technological infrastructure needs; and (3) the ability to use innovative solutions for offering high levels of transparency and enabling new forms of communication and listening to its reference users. In this scenario, Taranto was considered one of the cities with the worst performance in the transition to a smart city compared to other cities. One reason may be the way the COVID-19 pandemic was managed in comparison to cities in the North Italy (Digital 360, 2020).

Taranto was chosen in this study as it is one of the most economically relevant cities in Southern Italy and has shown critical delays in implementing projects to promote the digitalization of public services (Digital 360, 2020). This is the reason why public agents, researchers and entrepreneurs have joint efforts to develop initiatives to coordinate the economic and social activities at the urban area with the purpose of advancing on the technological and sustainable transformation of the city (Palmioti, 2013). One example is the project Taranto Smart City, which has been developed from a collaboration between the Taranto Municipality and the University of Bari. The project encompasses the investment of more than four million euros in the development of research, training, design, implementation, monitoring, and evaluation of processes and services towards the intelligent

transformation related to the fields of health, eGovernment, tourism, the environment, justice, and training (Smartcityweb, 2021).

By considering Italy, the most virtuous smart cities are Florence and Milan, followed by Bergamo, Bologna, Cremona, Modena, Roma Capitale, and Trento (Osservatori Digital Innovation PoliMi, 2022). More specifically, thanks to the commitment dedicated to improving communication for a more sustainable economy and a better quality of life, Milan can be considered the smartest city in Italy (Ossevatorio Agenda Digitale, 2016) and among the best in Europe (Gascó et al., 2016). However, in general, the investments undertaken mainly concern digitization and innovation interventions (in 76% of cases), sustainable infrastructures (61%), and ecological transition (56%; Osservatori Digital Innovation PoliMi, 2022). By considering Southern Italy, the city of Taranto may represent an interesting case study and a promising opportunity for the transformation of a territory historically with an industrial vocation, which today instead attracts numerous capitals given the relaunch of tourist, recreational, and cultural activities and the strong investments dedicated to this territory (Garofalo, Pardolesi and Rinaldi, 2020).In relation to other Italian cities, Taranto faces some particular challenges that may delay the transition to a smart city. First, Taranto is regionally known for presenting several polluting sources, such as a large steel plant, a refinery, the harbor, and both controlled and illegal waste dumps (Pirastu et al., 2013). The pollution of air, water and soil in Taranto has been associated to the increasing rates of mortality due to diseases such as cancers, cardiovascular and respiratory diseases, which characterizes a wicked problem in terms of public health (Mataloni et al., 2012). Second, Taranto faces a political and institutional crisis due to citizens' distrust of the political and legal systems (Greco and Bagnardi, 2018). The inefficiency of the government in mediating conflicts of interest between industrialists and environmentalists has meant that strategic actions by the government to solve urban problems such as social inequality and digital inclusion lose credibility and popular support. Third, in comparison with other Italian cities, Taranto has one of the lowest levels of education and training aimed at innovation, research and creativity. A recent study evidenced that, although the average level of education of citizens is high, the educational system in Taranto is geared towards technical training with a focus on the development of skills and competences generally associated with factory work (Bellantuono et al., 2021). This may be due to the high socioeconomic dependence that the city of Taranto has in relation to the so-called “monoculture of steel”.

Overall, the three above-mentioned aspects (i.e., environmental, political, and socioeconomical) appear as important challenges for Taranto in the transition process to become a smart city. Therefore, we selected it as the research setting for this study as it was an extreme case (see Flyvbjerg, 2006), where the mentioned challenges made highly problematic for the phenomenon under investigation.

3.2. Sampling and data collection

As a part of our exploratory research design, we adopted semi-structured one-to-one interviews, aimed at collecting opinions, meanings, and suggestions from the involved respondents (Martin and Eisenhardt, 2010). The research has been conducted by following the approach of the case study (Corbin and Strauss, 1990), which allowed us to deepen a specific and limited phenomenon in its context, with the aim of identifying current issues and opportunities, and specifically asking managers about their business digital transition as a case study. Finally, this method contributed to obtain a framework applicable to other situations while also exposing the case to further investigation.

The interviews have been conducted from January, 2021 to February 2021, and it was primarily based on semi-structured interviews with policymakers from the city of Taranto, Italy. The sample of respondents consisted of four professionals employed in the public sector and who work with the development of strategies for the green transition of the transport system in the municipality of Taranto. We got access to respondents through the academic and professional network. The respondents have relevant experience in urban mobility and local development and have been working for more than seven years with the development of public policies for the transport industry. According to Martin and Eisenhardt (2010), data was collected through a series of semi-structured face-to-face interviews: More specifically, after the first round of interviews, the other respondents were contacted until additional interviews failed to unearth discrepancies in the categories or relationships that had already been identified or to reveal any new ones (Strauss and Corbin, 1990). The interviews were designed according to a standard protocol that evolved systematically during the research. Each interview lasted approximately one hour, was transcribed verbatim and translated into English.

For the interviews, a semi-structured interview guideline was elaborated with 10 open-ended questions. The interviews lasted a maximum of 90 minutes. The interviews were conducted through an online platform and in Italian by the second author, and then recorded, transcribed verbatim and translated to English. By following Belk (2007), in the following paragraphs, for each excerpt reported, the first word refers to the respondent's code (e.g., R1 for Respondent 1), the second letter to the respondent's gender (M= Male; F= Female), and the third number refers to the respondent's age. The sample descriptive analysis is shown in the table below (Tab. 1): The small number of respondents is also due to the small numbers of administrative employee employed in a medium city as Taranto.

Table 1. Participants involved in the in-depth interviews.

Code	Age	Sex	Role	Interview duration
Respondent 1 (R1)	58	Female	Mobility Area Employee	90 minutes
Respondent 2 (R2)	42	Female	Administrative Employee	60 minutes
Respondent 3 (R3)	45	Male	Cabinet Officer	40 minutes
Respondent 4 (R4)	56	Male	Mobility and Economic Development Employee	60 minutes

Source: Authors' elaboration.

3.3. Data analysis

For data analysis we used the content analysis technique, as it allows to maximizing respondents' perspectives and experiences towards the research phenomenon and generating unique knowledge grounded in the empirical data (Hsieh and Shannon, 2005). Our analysis followed three overlapping steps: Content abbreviation, explanatory analysis, and content structuring analysis. In the content abbreviation step, we reduced the less relevant texts and summarized the similar and redundant content (Belk, 2007). In the explanatory analysis step, we clarified contradictory information to reduce the ambiguity of the content. In the content structuring analysis step, we identified and analyzed the patterns and formal structures of the data. Based on these stages, we classified the findings in three main categories, which are presented in the following section.

4. Findings

Our findings shed light on several issues considered relevant by local policy makers aimed at the development of specific forms of smart mobility. Our qualitative analysis evidenced three relevant topics related to the outlined research questions: (1) *Strategic Planning and Smart Mobility Promotion*; (2) *Stakeholder's Coordination and Participation*; and (3) *Local Development Future Perspectives*. The topics are described in the following subsections.

4.1. Strategic planning and smart mobility promotion

The first topic confirms the respondents' orientation to a unanimous vision in

recognizing how development strategies must be shared on a collective level and how policymakers assume the role of key-player in defining and implementing these strategies. This denotes how the functions of local governance represent a crucial point for introducing a multiplicity of public and private entities into the decision-making process. The strategic decisions of the city of Taranto are moving towards a context of economic and social development as demonstrated, for example, by a respondent who states that:

> "…we are trying to implement a set of policies aimed at inducing the community to a sustainable global vision trying to eliminate a concept of economic development based on the mere use of natural resources...". (R4, 56, M)

By considering this statement, it emerges that the local governance body is focusing on a sustainable governance model capable of protecting the resources present in the territory (Docherty et al., 2018; Ruhlandt, 2018), rationalizing the excessive increase in pollutants and trying to counteract these trends by implementing sustainable action plans and promoting the adoption of zero-impact forms of mobility. The common thread that characterizes the behavior of the local administration can be deduced from the responses provided by two respondents, who stated:

> "…sustainable mobility is one of the most effective ways to protect the environment without prejudice to the ethical understanding of our fellow citizens in the use of new forms of transport, such as the recently adopted scooter sharing service". (R2, 42, F)

> "…smart mobility, in my opinion, is a great improvement for the well-being of our fellow citizens and represents one of the strengths for the transition process towards the smart city of Taranto…". (R1, 58, F)

Therefore, from these last statements, it is evident that the governance body also aims to encourage positive behavior of the local population, trying to find a way that allows a rapid spread of sustainable projects, for example as in the recent introduction of shared electric scooters. These new services can promote an increase on the satisfaction with the participation in the process of smart transition, as well as an impact on greater collective wellness (Domenico et al., 2018; Yigitcanlar and Kamruzzaman, 2018). Yet, the use of these services allows the citizens to becoming aware of the importance of transport models that are less harmful to the environment (Ruhlandt, 2018; Wong et al., 2020). Further, this translates into a new way of safeguarding the environment without losing the needs of citizens (Gooch et al., 2015).

The literature shows how the transition process towards the smart city and its multiple meanings, including smart mobility, must take place through careful management of the economic resources available in the area by local government

bodies, with the aim to model management and logistics projects by leveraging the factor of economic development throughout the urban territory. Concerning this issue, one respondent outlines:

> "…the correct management of sustainable mobility of people and goods in the urban context aims at obtaining a relational network in step with the times that provides for the adoption of local policies focused on consolidated lifestyles of citizens and which in the same way allow ensuring success economic gradually…". (R4, 56, M)

Urban mobility management policies also favor both public and private organizations to understand the behavior of the users of smart forms of mobility through the collection of large amounts of data generated by technological devices (Keitsch, 2018; Sestino et al., 2020). By analyzing such data, public and private organizations can develop new and improve current projects for the benefit of the local population and economic operators. Indeed, the policy makers aim to launch an economic development plan based on innovative solutions that make it possible to combine technology, efficiency, and respect for the environment with the quality of life of citizens and the enhancement of the commercial flows that have joined the experimentation of these new forms of eco-sustainability.

4.2. Stakeholders' Coordination and Participation

The second topic refers to stakeholder's coordination and participation. The transition process towards experimenting with new forms of sustainable transport, to initiate the transition towards the smart city, presupposes the engagement of citizens and local administrators as an essential requirement for the best success of the projects, and especially as regards the citizen's perception of the quality of life within the urban context (Gooch et al., 2015). The participation of privates ~~(~~citizens~~)~~ in the governance of local administrations plays an important role both as a solution to more effectively face the new challenges that characterize the public sector, and as a way to control the actions of the public actors. The vision of social responsibility can be deduced from the answer given by an interviewee, who states:

> "…the institution-citizen participation system we are adopting is synonymous with a constant growth path that must be shared by citizens and through which useful information can be obtained so that more suitable and compliant management policies can be adopted for citizens and businesses…". (R3, 45, M)

It is interesting to note how the response of this subject, strictly speaking, is aimed at the relationship between the government and the citizens, but also includes the role of private companies. In fact, it is precisely the companies that initiate the processes of creating new services, in this case new forms of mobility. Companies assume a role of strategic importance in the decision-making and operational

process in smart cities, as they must design and implement the creation of more innovative project proposals that go hand in hand with digital innovation. The high experience in the field of research and development of companies (Callegati et al., 2017), allows an *ad hoc* analysis on a "citizen's scale" by learning the conduct of the market that are directly influenced by the proponents of the projects (the administration and the community). The strategic importance of a company within local government action is exposed by two respondents:

> "…it is important to have a total approach in involving companies, as they are the ones who develop innovative projects…". (R3, 45, M)

> "…companies will have the opportunity to participate in calls for tenders by taking advantage of specific incentives aimed at satisfying the smart needs of the community. The tenders will aim to design innovative models to meet public demand". (R4, 56, M)

Therefore, the government of Taranto has the objective of directing the external opinions of citizens within an institutional plan in order to analyze the opinions expressed and also managing to assess the perceptions of residents. The collection of data takes place through the use of a dedicated platform (Giffinger and Gudrun, 2010) which uses the information to facilitate the introduction of new services and, consequently, the use of electrical means to improve the already existing relationship between the public and private sectors, as one respondent states:

> "...forms of sustainable mobility can be a huge advantage. The advantage is easy and intuitive use of the apps with immediate access by the citizen/consumer". (R2, 42, F)

By adding to the respondent's statement, the use of mobile platforms as transport services allows to reduce the pre-existing pollutants in the area while not giving up on an easy and fast service that contributes to the wellness of the community. Yet, the government has to consider further ways to raise awareness in the community towards sustainability, by redefining a set of tools aimed at giving new shape to the territorial organization (Schleiner et al., 2016), as two respondents highlight:

> "…we are undertaking various awareness-raising policies aimed at allowing a rational and efficient use of resources". (R2, 42, F)

> "…it is essential that the Taranto area has communication and research tools that can facilitate the constant process of innovation towards new forms of mobility". (R3, 45, M)

From the statements relating to stakeholders' coordination and participation, we can conclude that the area of competence of local administrations requires the participation of citizens (Zygiaris, 2013) which will be essential for the sharing and

implementation of development projects. The local development derives from the establishment of a dedicated network in which the community and external stakeholders can exercise an active role in the analysis and achievement of successful projects. In this sense, good communication channels and trust are crucial in the relationship between government, citizens and companies.

4.3. Local development future perspectives

Regarding to future perspectives for local development, several challenges are identified for the achievement of greater wellness of the community. In this context, policy makers, in concert with private companies, are committing themselves not only concerning short-term objectives but also in terms of trends and concrete eco-sustainable development in the long term. Adopting a global perspective based on several fronts allows obtaining a general understanding about the current strategic points that characterize the city (Docherty et al., 2018).

Thanks to the constant evolution of digital technologies and the virtuous decisions that have been chosen by local administrations, it has been possible to create a new model of sustainability based on the protection of the right to urban and extra-urban mobility, but while ensures a significant improvement in the stability of the private sector for any future research proposals, as evidenced by two respondents:

> "... public goods, including forms of urban transport, will be increasingly supported by the private sector". (R4, 56, M)

> "Mobility companies become part of a circle of services that the public administration itself struggles to keep up, offering seamless transport for local users". (R2, 42, F)

These statements make it clear how local administrators are working on several fronts to ensure the maximum benefit that citizens can receive, accepting solutions that do not bind them to continuous use of the means, as it is easy to think how these methodologies manage to combine the needs and ease of transport that the community seeks.

5. General discussions and conclusion

Smart mobility has been recognized as one of the four most important components of a strategy aimed at transitioning to a smart city (Docherty et al., 2018; Paiva et al., 2021). In this scenario, the strategies aimed at the greater integration of sustainable mobility activities could not only accelerate the process of transforming traditional cities to the concept of intelligent community (e.g., with the integration of electric buses and car-sharing services) but also generate a positive impact on the

surrounding environment. This transformation requires the joint effort of both private and public actors intending to develop a coherent, coordinated, and beneficial territorial development strategy for all stakeholders (Guido and Pino, 2019). These development and growth strategies must not be merely oriented towards a single economic growth, but also and above all aimed at improving social wellness that involves environmental sustainability and distributive equity.
Indeed, our findings shown three reference macro-categories (topics) in terms of: (1) *Strategic planning and smart mobility promotion*; (2) *Stakeholders' coordination and participation*; and (3) *Future perspectives for local development*. In each topic the common thread is represented by the synergistic growth motivation that does not neglect any of the actors involved (private actors, companies, communities, public administrations), but which places the citizen at the center of the growth strategies.

As highlighted in this study, new technologies – not only intended in the sense of digital technologies, but also in terms of technical and mechatronics advances (as in the case of electric buses or vehicles) – assumed a fundamental enabling role in redesigning the urban spaces and individuals' mobility (Giffinger and Gudrun, 2010). In a broader sense, the smart mobility, pushed by the lever of smart governance, is devoted not only to the mere digitization of transport services, but also to the streamlining and re-design of traditional transport services. Smart mobility influences the two other domains of a smart city (i.e. *smart living* and the *smart environment*) as it has an impact both on the renewed styles of view, that could be inspired and moved to a more "green" logic, and on the surrounding environment, as it assumes the rearrangement of public areas to make the transport more accessible and environmental-friendly. Moreover, despite the promising findings we acknowledge that our work is not exempt from limitations: Firstly, the interviewed sample is modest: On the one hand, this is justified by the size of the administrative entity being studied (the city of Taranto); On the other, the low number of insiders on the smart city and smart mobility issue, reflecting on how much it is necessary to provide for investments and to promote a new culture oriented towards sustainable and ecological transition. Moreover, by considering our research goal aimed to catch preliminary findings regarding the issue of sustaining the transition toward a smart city, a simple qualitative approach has been implemented: Future studies may thus both deeply explore the investigated phenomenon in the largest realities and may propose fresher quantitative-based studies also in the attempt to shed light on possible interesting influencing a smart city transition model.

Future efforts of local policymakers should be aimed at encouraging citizens to adopt new forms of mobility, as well as the profound redesign of urban spaces that can accommodate these new forms of transport. In this sense, as anticipated, it would also contribute to the growth effort not only in an economic sense but also in terms of greater widespread well-being at the collective level. We focused only on Taranto as research setting and, therefore, the size of the sample analyzed – the pool of four experts – could be increased to ensure the generalizability of the findings. Findings could also be compared in benchmarking with local realities with similar characteristics in terms of quality of life and current urban structure. Future

research could be aimed at understanding how citizens perceive the introduction of forms of sustainable mobility and on what factors local policymakers must focus to encourage their use.

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