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Smart Mobility Recommendations in Multimodal Transport for Local Authorities

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ABSTRACT

Smart transportation systems are one of the most important components of the smart city, which was affected by the fourth industrial revolution. Smart transportation types, systems, and infrastructures, which are undergoing a rapid transformation in the information age with the effect of information-communication infrastructure and technological developments, have become one of the important issues that local governments should focus on. The rational use of smart transportation applications has great importance in terms of increasing the quality of urban life, preventing environmental pollution, and preventing many material and vital losses. Smart mobility defines a safe, clean, and effective smart transport framework in which different transport types and infrastructures are integrated with each other. Smart mobility elements that are successfully maintained in the world that should be adopted for Turkey's local government conditions for producing a successful transport policy. In this study, the legal-administrative structure in Turkey, the urban transport infrastructure, the extent of the permit application stage, and the type of transportation system that will help the local government recommendations are developed.

1. INTRODUCTION

Smart transportation, which is the most basic component of a smart city, that the whole of transportation types, systems, and infrastructures are supported by information and communication technology infrastructure, which is seen as an important building block of industry 4.0 (Kırmızı et al., 2012). A variety of smart transportation systems are implemented in the world and Turkey for transportation, traffic, and passenger management applications. These are traffic management system, electronic toll collection system, passenger information systems, smart public transportation systems, smart vehicle highway systems, smart stop, smart parking management and payment solutions, smart routing system, load-fleet management system, driver support and security systems, commercial vehicle management (Smart City Terminology, 2020; AUSDER, 2019).

On the other hand, smart mobility defines a safe, clean, and effective smart transportation framework in which different transportation types and infrastructures

are integrated with each other. Four main components affect the working principle of smart mobility systems. These are traffic data collection, data transmission, traffic data analysis, and traveler information (Heremobility, 2020a). Smart mobility has many benefits for cities. The most important of these are; it reduces traffic congestion, prevents environmental pollution, reduces emission production, prevents traffic noise, is economical in terms of reducing costs, reduces traffic accidents (Heremobility, 2020b). Based on these benefits, green and smart mobility is always at the forefront. Green and smart mobility is mostly related to autonomous robots, the internet of things, cybersecurity, cloud software, artificial intelligence, machine learning, and big data.

The impact of the increasing world population on resource consumption raises the need for decision-making and rational solutions that will ensure the continuity of sustainability for local governments. Developing transportation approaches with rational approaches will have positive effects on quality of life (Mezei and Lazányi, 2018). For smart cities to have a smart mobility network, they must first adapt and

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develop their existing infrastructure to smart mobility components. In this context, starting a new use of smart mobility elements in Turkey, the future uses of the considering potential of existing transport modes and systems with the urban transport infrastructure needs to be determined that could be used in how to be more efficient in terms of local governments.

2. METHOD

In this study, examples of smart mobility applications in countries such as the USA, France, the United Kingdom, South Korea, and especially in cities such as Los Angeles, Columbus, Singapore, Barcelona, Copenhagen, Amsterdam, Helsinki, Songdo, Dubai were analyzed from an analytical perspective. It also focuses on the development of multimodal and integrated smart mobility suggestions for local governments in Turkey.

3. RESULTS

3.1. Three Dimensions of Smart Mobility

The results obtained within the scope of this study show that the inferences obtained from the examples of the world make it necessary to consider smart mobility approaches with three dimensions of urban transportation. These will be in the fields of individual mobility, public transport, and urban freight transport. World examples of inferences derived from the smart mobility of local governments in Turkey are required to be presented as a set of suggestions. For this, firstly; it is beneficial to put forward the theoretical and applicability infrastructure as well as the legal-administrative framework for the use of type, system, and infrastructure information of smart mobility. In this context, evaluations will be presented under each heading.

3.1.1. Individual mobility

Individual mobility is one of the most preferred modes of transport in Turkey. There are many types of transportation for individual mobility. Bicycles, motorcycles, private cars, and e-scooters, which are one of the micro-mobility types that have just been integrated into transportation systems can be given as examples. Individual mobility also has a shared mobility dimension. In this context, there are shared driving methods such as carsharing, ridesharing, carpooling, and vanpooling. Although few formal services offered by shared mobility company in Turkey, it can also be performed by friends and colleagues as informal surroundings. In this context, it is important for local governments to focus on individual mobility-based solutions in terms of responsibility, safety, and control.

3.1.2. Public transport

With the effect of today's technology and smart city components, smart public transport approaches have great importance in increasing travel quality and travel satisfaction (Sutar et al., 2016). One of the most important focuses in smart public transport management is optimization in transportation. New self-

driving autonomous vehicles will provide ease of use with higher efficiency and capacity due to flexibility in work and working hours (Durmuş, 2019). It has a smart public transport management system that can perform public transport, line, and route optimization shaped by the smart transportation network. The smart public transport management system provides real-time information flow to the users regarding the route information system, passenger density, headway frequency, vehicle attributes information, not only warns about accidents but also conveys the danger and current status information regarding the road (Akdemir and Önder, 2020).

Smart mobility systems have an important place in the provision of urban transportation services, especially in the field of public transport. In addition to rail systems and bus systems, there are paratransit modes such as minibus, taxi, and shuttle in public transport systems. Local governments can integrate private mobility and public transport systems using smart transportation system components. This situation allows the development of local governments' multimodal mobility infrastructure.

3.1.3. Urban freight transport

It is important to evaluate autonomous systems, which are an important element of smart transportation systems, in the field of urban freight transportation, that is, urban logistics. Along with technological developments, the concept of logistics is developing in terms of resource planning, storage management, business management, smart transportation systems, and information security (Barreto et al., 2017). In the freight transport dimension of urban transport, a structure in which smart transport infrastructure is integrated with the logistics infrastructure is emphasized. Vehicles such as delivery vehicles, delivery drones, delivery robots are used in urban freight transportation. For the cargo and freight transportation area, which has become a large distribution market day by day with the concept of e-commerce, local governments have a significant role in preventing financial and vital losses caused by traffic congestion and traffic accidents, especially in urban transportation.

3.2. Recommendations for Local Authorities

When the evaluation of Smart Mobility's three dimensions, how smart mobility approach by local authorities in Turkey within the scope of this study can be applied with the suggestions to what extent and what steps are being developed. For local governments to achieve success in many issues such as increasing the quality of urban life, reducing emissions, preventing environmental pollution, minimizing noise, ensuring safety in public transportation, in the context of green and smart mobility; Transportation types, systems, and infrastructures should be integrated into smart transportation in three stages. These stages can be specified as (Heremobility, 2020c);

1. Information management and optimization,
2. Light infrastructure
3. Heavy infrastructure.

4. DISCUSSION

Although emerging technologies and smart mobility in the urban transport of the future will find great information-technology infrastructure in Turkey, though, it must be handled carefully with the applicability of context. There are difficulties that local governments will encounter in the field of smart mobility during the implementation phase. These can be specified as legal and administrative deficiencies, implementation problems, governance problems, maintenance problems, lack of qualified human resources, etc. However, Target 2023 Turkey Transport and Communication Strategy prepared by Republic of Turkey Maritime Transport and Communications Ministry in 2011; National Intelligent Transportation Systems Strategy Document and its Annex Action Plan which is prepared in 2014; Smart Transportation Systems Terms Dictionary prepared in 2017; 2019-2022 National Smart Cities Strategy and Action Plan and Smart Cities Whitepaper prepared by Republic of Turkey Ministry of Environment and Urbanization in 2019; The Eleventh Development Plan 2019-2023, prepared by Republic of Turkey Presidency of Strategy and Budget in 2019 can be useful for the legal administrative framework for smart cities and smart mobility in Turkey while offering ideas about responsibilities and priorities.

5. CONCLUSION

The results obtained from this study show that there are many issues that need to be focused on sensitively to ensure smart mobility by local governments by improving transportation in the focus of green and smart mobility. To list a few of them;

- Transportation types should minimize the use of fossil fuels and prefer alternative energy types.
- Individual mobility and public transport systems need to be integrated with each other.
- Transport infrastructure needs to be updated to include smart transport components.
- Most importantly, it needs to be reconsidered in the context of the sustainability of Turkey's legislation in the field of transportation.

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