Smart cities: worldwide smart urban transportation´s scenario and importance

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ABSTRACT

Urban mobility should emphasize enough so that its efficiency encompasses the world population, besides being a notwithstanding factor to smart cities, which are basically the ones who integrate adequate utilization of resources, turn their attention to mobility and to the correct use of energy, with the main goal of improving people´s lives. This paper aims at presenting the importance and need for smart urban mobility to promote an improvement of everyone´s life quality, and a portray of smart mobility worldly scenery, which entirely impacts the cities´ constructed environment, so as so that its management should be efficient and fitting within adequate mobility plans and sustainability. The method used initiates at bibliographic review, followed by some smart cities´ analysis. Next, a qualitative and descriptive study is developed with examples of the main smart urban transportation means present in the world and how countries should fit themselves to the construction of smart cities, promoting life quality to people and adequate surveillance of sustainable development. In Brazil, all cities with more than twenty thousand inhabitants must have an urban mobility plan up till 2022 or 2023, which is equivalent to more than 30% of the country´s cities. According to the United Nations, 68% of the world population will live in urban centers until 2050. Therefore, make the cities smart is primordial, including quality mobility, that needs all people´s involvement, besides government, companies and universities for a successful construction and solidification.

KEYWORDS: Smart Cities. Sustainable Development. Smart Urban Mobility.

1. INTRODUCTION

Smart cities encompasses a set of systems and people that intercommunicate and use energy, materials, various services and financing to catalyze excellent economic development and a better quality of life for people (ALBINO et al., 2015).

According to BERRONE et al. (2019), to become a smarty city, it is necessary to integrate ten essential factors: governance, public management, urban planning, technology systems, the environment, international interactions, social cohesion, human capital and the economy, which depict the level of a city´s intelligence. Despite constituting a new concept, it is already being strengthened worldwide and moves the global market towards technological innovations. In favor of solutions, more than half of European cities with more than 100,000 inhabitants have already or intend to implement initiatives to become Smart Cities.

According to SEBRAE (2021), smart cities have differences among them, because each one has unique specificities. They present interconnection within information for better operations and resources management, having clean urban mobility and easy access to it.

It is extremely necessary for smart cities to have a diagnosis, which can be carried out through the Georeferenced Information System (GIS), which allows the quantification and tabulation of variables. After collecting the information, it is possible to know the city´s metabolism, enabling managers to develop solutions that adhere to the existing challenges (SEBRAE, 2021).

The goal of a smart city with smart mobility is functionality for all inhabitants, such as the creation of new bus lines, an exclusive bus system (BRT), which presents an excellent cost-benefit ratio, even though it does not have the same visual appeal as a light rail vehicle (LRT). An effective solution can be the creation of structured cycling paths (SEBRAE, 2021).

In Russia, Moscow, there are problems of major traffic jams that were solved with the help of an English technology company that allows drivers to find parking spaces before leaving their homes. A pilot of the project is already in the test phase in Minsk, also in Russia, which was developed by Telensa. The app can tell drivers where and when spaces are available through a sensor installed on the street (SEBRAE, 2021).

According to Costa et al. 2017, the ability to move from one point to another is mobility. Magagnin 2008, brings the definition that the need for movement within an urban environment is the result of the need to satisfy an end goal, such as work, leisure activities and accessibility to services or goods.

The European Union proposed a model that decomposes the term Smart City into six different segments: Smart governance, Smart economy, Smart mobility, Smart environment, Smart people and Smart living (MANVILLE et al., 2014). The PwC Public Sector Innovation Center and the IE Business School, in Madrid, Spain, determined a change in the model, splitting Smart living into two segments: "Safety" and "Sanity and Health" (CUNHA et al., 2016).

The urban mobility of a smart city implies the possibility of access to an articulated body of spaces and public facilities that solidify knowledge. Culture, science, art, innovation and economy need to be part of the daily life of the citizen, whose city must allow access to museums, jobs, shopping and physical activities, enabling a quality life. The integration of different technologies in the daily life of cities is part of the revolution of connected societies. Smart cities are global trends, with progress towards a better quality of life for the population and the environment as a whole (SUMMIT, 2019).

The absence of an adequate plan for transportation systems and the reality of an increased population residing in cities is greater than the progression of mobility infrastructures resulting in a proportional and exponential increase in mobility difficulties in the face of the number of movements in the urban environment. (COSTA et al., 2017).

The research is carried out through a bibliographic review, with an exploratory and qualitative typology approach through the following steps: literature review, with a search for articles, conference proceedings, news, reports, standards, books that cover resilient cities, sustainability, mobility smart urban and case studies approaching smart cities worldwide. Subsequently, some examples of smart cities is covered and how it is essential for urban mobility to be aligned in favor of the population's quality of life as well as the construction of resilient cities.

The literature review consists of a research and evaluation of the available literature about a specific area or subject, aiming at the documentation on a certain area or theme, formalization and presentation of some concepts considered relevant for the project, consisting of the set of extracted knowledge about the theme of the project, allowing the studies of others to be the starting point for the unfolding of the project (ROYAL LITERARY FUND, 2019).

2. THEORETICAL FRAMEWORK

Urban mobility is an attribute of cities that refers to the property of moving people and goods in urban space. Urban displacement is carried out by means of vehicles, roads, sidewalks

and encompasses all the infrastructure that makes it possible for people to come and go. According to what a certain area develops, it is necessary to have adequate means and infrastructure that allow the sufficient movement of goods and people (Ministry of cities, 2005, p.3).

According to SEBRAE (2021), smart cities can be classified through their approach: bottom-up or top-down. In the bottom-up approach, cities work with data from sensors installed by the city, monitoring cameras, social networks, among other means. Everything is integrated into a single platform, which ensures efficient management of services. Decisions are made according to the attitudes and thinking of the main users. The top-down approach recreates cities from scratch, making the initial structure work in their favor. Songdo, in South Korea, for example, has its entire structure assembled for the city to be smart. The objective of these approaches is to make localities more pleasant, sustainable, clean and with adequate accessibility.

2.1. UN SUSTAINABLE DEVELOPMENT GOALS AND URBAN MOBILITY

In 2015, the 2030 Agenda was launched, a plan for all interested parties to work to eliminate socio-environmental issues by the year 2030. The Agenda has 17 daring goals: the Sustainable Development Goals, with their reach being the main agenda of the organizations and the hope to eliminate the biggest problems of human beings (UN, 2021).

According to the United Nations - UN 2021, the emergence of the Sustainable Development Goals began before 2015. In 1992, the United Nations Conference on Environment and Development, ECO-92, brought together more than 100 leaders of State in Rio de Janeiro to plan how to protect the right to development for future generations. This meeting resulted in the adoption of Agenda 21, the first letter of intent to promote, globally, a new pattern of development for the next century through the 8 Millennium Development Goals (MDGs).

After 20 years of ECO-92, 193 delegations, in addition to representatives of civil society, met in Rio de Janeiro to renew their commitment to sustainable development during a meeting called Rio+20, which evaluated the progress achieved and identified the 92 meeting points that still needed improvement. Thus, the 2030 Agenda emerged, with 17 new Goals called Sustainable Development Goals, the SDGs.

According to the UN (2021), the population residing in urban areas by the year 2050 will correspond to 66% of the world's population and the estimate is that by 2030 there will be 41 megacities with a population of over 10 million inhabitants. Below Figure 1 represents the UN Sustainable Development Goals, highlighting Goal 11 – Sustainable Cities and Communities – Challenges and Opportunities (Making Cities and Human Settlements Inclusive, Safe, Resilient and Sustainable), which includes themes of urban planning, urban mobility, solid waste management, sanitation and the growth of the resilience of these areas, constituting the goals of the objective described later.

Picture 1: UN Sustainable Development Goals

Source: UN, 2021

Among the global goals are: by 2030 countries need to reduce the negative environmental impact per capita of cities, including paying special attention to air quality, municipal waste management, strengthening efforts to protect and maintain the world's cultural and natural heritage; as well as increasing inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable planning and management of human settlements in all countries and providing access to safe, accessible, sustainable and affordable transportation systems, improving road safety through the expansion of public transportation, with an emphasis on the needs of people in vulnerable situations, women, children, people with disabilities and the elderly, promoting adaptation to cities that are increasingly smart, accessible and with quality of life (UN, 2021).

In view of these goals, the UN (2021) emphasizes the importance of the Agenda 2030 project, which understands planet, people, prosperity, peace and partnership as crucial areas for the healthy development of life and determines goals to be achieved by 2030 for the eradication of related problems. As a whole, there are 17 Goals, as mentioned above, composed of 169 goals and 232 indicators that point to the urgency of putting society on a more sustainable path. The UN defines the SDGs as integrated and indivisible, listed below:

1. No poverty
2. Zero hunger
3. Good health and well-being
4. Quality education
5. Gender equality
6. Clean water and sanitation
7. Affordable and clean energy
8. Decent work and economic growth
9. Industry, innovation and infrastructure
10. Reduced inequalities
11. Sustainable cities and communities
12. Responsible consumption and production
13. Climate action
14. Life below water
15. Life on land

16. Peace, justice and strong institutions
17. Partnerships for the goals

The evaluation and monitoring of the Sustainable Development Goals are carried out by: United Nations High-level Political Forum on Sustainable Development (HLPF), which is responsible for oversight at a global level (UN, 2021).

Some sustainable urban mobility initiatives make possible the UN SDGs listed below (SUMMIT, 2021).

1. By 2030, enable access to safe, accessible, sustainable and affordable transportation systems for all, with improved road safety through the expansion of public transportation, with due regard for the needs of people in vulnerable situations, women, children, people with disabilities and the elderly (SUMMIT, 2021).

For example, Curitiba (PR) is one of the few Brazilian cities with gold standard BRT, where the bus rapid transit (BRT) transportation system has replaced the need for subways in a capital with a population of over 2 million. Tube stations located on the main axes of the city allow people to move easily and quickly. Despite stops, there are buses every five minutes. Also noteworthy is accessibility: people with limited mobility access the tube stations through a platform that places them at the level of the vehicle, allowing quick boarding and getting off (SUMMIT, 2021).

2. By 2030, reduce the per capita negative environmental impact of cities, including paying special attention to air quality, municipal waste management and others (SUMMIT, 2021).

Santiago, Chile, has become a reference on the subject with a strategy that aims to have at least 40% of private cars and 100% of public transportation vehicles powered by electricity by 2050.

The Institute of Applied Economic Research – IPEA (2021), portrays the importance of all goals of all UN sustainable development goals. Sustainable Development Goal 11 – Sustainable Cities and Communities, which aims to make cities and human settlements inclusive, safe, resilient and sustainable, is integrally related to the need for smart and adequate urban mobility.

SDG 11, in target 11.2, has as an objective, specified by the United Nations, the availability of access to transportation systems with safety, accessibility, sustainability and at an adequate and fair price for the entire population, in order to promote the improvement of safety through the expansion of public transportation with an emphasis on the elderly, vulnerable individuals, women, children and people with disabilities (IPEA, 2021).

In Brazil, SDG 11, in target 11.2, aims to achieve improved road safety by 2030 through an increasingly sustainable urban mobility system, with inclusion, efficiency and justice, emphasizing mass public transportation as well as active transportation, highlighting people with special needs, people in vulnerable situations, people with reduced mobility, women, children and the elderly (IPEA, 2021).

The adequacy by Brazil of SDG 11, in goal 11.2, follows the guidelines of the National Policy on Urban Mobility, aiming to promote active transportation to achieve transportation systems with inclusion and sustainability, which are recognized by official documents of the Ministry of Cities, World Organization of Health and UN Habitat. Among the main concepts emphasized in the adequacy, the importance of road safety that reduces the risk of accidents

stands out. The term mass transportation encompasses means of transportation such as buses, trains, metro and Bus Rapid Transit (BRT). The target achievement indicators will be monitored by the proportion in which all inhabitants have adequate access to public transportation, divided by sex, age and people with special needs (IPEA, 2021).

3. URBAN MOBILITY PROBLEMS

With increasing urbanization, great problems of urban mobility have arisen. The Master Plan appeared in Brazil recently, together with the 1988 Constitution, and the developments in urban mobility plans have not yet become a reality in most Brazilian cities. All cities that have more than 20 thousand inhabitants must have an urban mobility plan by 2022 or 2023 equivalent to more than 30% of the cities in the country.

Bicycles are still not prioritized in Brazil. Public transportation in Brazil is expensive and offers poor quality for the user; as a result, car sales increased 132% in 2020, and motorcycles have been equally sought after, motivated by the popularization of apps for delivery services.

The population of São Paulo increased from 5,115,856 inhabitants in 1966 to 12 million in 2018. Consequently, the number of vehicles in urban areas increased. According to data from Detran-SP (São Paulo´s Transportation Department), the vehicle fleet has increased by 82% in 20 years, from 4.7 million units in 1998 to 8.7 million by July 2018. As data from Sindipeças show, there was an increase in national fleet from 39.41 million in 2009 to 56.57 million in 2017. Therefore, it is up to each city to establish rules that equalize the use of public and individual transportation, aiming at sustainability and the improvement of transportation in the urban environment so that it promotes quality in all sectors of society.

4. SMART CITIES WITH EFFICIENT SOLUTIONS FOR URBAN MOBILITY PROBLEMS

Singapore, in Asia, is one of the smallest countries in the world in terms of territory, with a huge demographic concentration and several problems. To solve congestion, the country created a very effective urban toll policy. To enter the capital´s downtown by car, you must pay a high fee. As a result, two out of three inhabitants commute every day by means of public transportation.

London (England), has achieved success in adhering to urban tolls and to encourage active mobility, the government has created high-speed bike lanes, designed for those who cycle long distances. Thus, with the implementation of Cycle Superhighways, a route of several kilometers can be done safely and quickly.

Stuttgart, Germany has a bike friendly metro. You can cycle in the city, and take the bike underground. It has an extremely competent integration of modes, having articulation between active mobility and public transportation.

Medellín is the capital of the district of Antioquia, in northwest Colombia, a mountainous

region that divides the city into high and low regions, presenting a major challenge for mobility. As a result, a cable car system known as *metrocabo* (metrocable) was installed, which enabled the city to acquire the Sustainable Transportation Award in 2012.

Denmark has more than 12,000 kilometers of bike lanes, and stands out as one of the countries that considers most their cyclists, with suspended bike lanes that allow cyclists not to stop at intersections, providing greater speed and safety.

In Brazil´s case, the World Bank does not recommend the construction of subways in Latin American countries, as it is a very high investment to be financed by emerging cities, with latent industrialization and several financial challenges. Thus, it is suggested for the transportation of passengers the Bus Rapid Transit (BRT), being Curitiba a pioneer in this model in Latin America, with exclusive lanes for bi-articulated buses being considered gold standard.

In Pontevedra, Spain, represented by Picture 2 below, the entire center does not use motor vehicles: instead of streets, large, regular, one-level sidewalks. Instead of cars, children, baby strollers, elderly people and wheelchair users, in the midst of cafes and a commerce center with revitalization, which portray a dream in urban mobility.

Picture 2: Pontevedra (Espanha)

Fonte: SUMMIT, 2021.

5. SMART TRANSPORTATIONATION AND TECHNOLOGY INTEGRATION

According to Connected Smart Cities (2019), Campinas (SP) stood out in: economy and technology and innovation (1st place), entrepreneurship (2nd place), governance (3rd place) and mobility (4th place). São Paulo (SP), obtained the vice-leadership but remained in the first position in terms of mobility and accessibility, due to interstate and air connections due to Congonhas and Guarulhos airports, in addition to the great mileage of cycle paths.

São Paulo stands out in the smart mobility ranking for offering innovative services, such as shared electric scooters, which help in the micromobility of the population, which led the government to establish rules such as the prohibition of vehicles on sidewalks and a maximum speed of 20 km/h. Scooters share the place with bicycles on the São Paulo cycling network, which has approximately 500 km of cycle lanes and cycle paths. Innovation is integrated into electronic ticketing. With more than 10 million daily departures, passengers who pay bus fares with the

Bilhete Único (One Ticket Only) will soon be able to rely on payment using credit, debit cards or cell phones.

To help the mobility of people with autism, deaf-blindness and physical disabilities, SPTrans provides the Atende+ service, a free door-to-door mode of transportation that is operated by bus companies and accessible taxi cooperatives that circulate about a million kilometers per month.

In Rio de Janeiro city, an extensive cycling network was implemented with more than 450 km and 12 priority lanes for buses, with another four under study for implementation. According to the 2012 Urban Transportation Master Plan, more than 70% of all trips in motorized mode are carried out by public transportation.

Innovation is growing for mobility in general. Air Mobility already has an on-demand shared helicopter flight booking platform. On the market there are already cars powered by electricity and natural gas; applications with details about routes, heavy traffic and accidents on the roads; video surveillance technologies for intelligent traffic management in transit; intelligent lighting according to the flow of traffic; in addition to a shared public transportation system through vans and drones that help hospitals transportation human organs intended for donation.

In Brazil, sharing electric scooters, bicycles and on-demand transportation already works in several cities. In Rio de Janeiro, there is a project with the new MetrôRio card, which allows users to recharge them online or through the MetrôFácil app for trips. In addition, the card offers discounts on trips made using the Uber app and also on shared bike rentals.

Citatti has developed CittaMobi, an application that informs the bus timetable in real time, provides convenience services and has the function of selling electronic credits for transportation tickets. CittaMobi has more than 6 million downloads in Brazil, around 1.5 million new active users every month and operates in more than 80 cities.

Moovit, a flexible and intermodal Mobility Solutions as a Service (MaaS) application, used by passengers to consult transportation timetables and which includes other benefits, such as tracing the route and consulting points and line itineraries, has data and analysis solutions of urban mobility for cities and transit agencies to control systems. Yellow, a Brazilian company in the mobility sector, has a bicycle sharing service with a free redistribution system 8 (dockless) through which bikes are released through a cell phone application.

The Riba Share application offers scooter sharing for IPhone and Android users looking for mobility in a city where traffic is impeded by nature. Initially, the service is available in the perimeter that includes the neighborhoods of Brooklin, Cerqueira César, Ibirapuera, Itaim Bibi, Jardim Europa, Vila Madalena and Vila Olímpia (all in the city of São Paulo). In these places, the company has technology to provide access and obtain the return of motorcycles. Lady Driver, an urban mobility application that connects female passengers and drivers, has more than 25,000 drivers registered on the platform.

Car sharing is also a modality that has been growing in the Brazilian market. Zazcar brought car sharing to Brazil and already has more than 130 cars spread across the city of São

Paulo. Urbano is already developing an expansion plan initiated in 2019 in the city of Campinas, SP, creating a green area and specific parking spaces for electric shared cars with the support of an energy company.

The cities of the future are being delimited by connectivity. Several features such as: possibility of previously identifying if pedestrians will cross the street, possibility of predicting that a vehicle has made an unexpected stop at a distance of 100 meters, identifying that a traffic light located three blocks ahead of the current location is not working and from the speed optimization it will be possible to overtake the intersection and with the appropriate change of route it is possible to identify parking spaces. Such capabilities are being solidified due to connectivity and IoT (internet of things). Modern technologies such as C-V2X (Cellular Vehicle to Everything), which consists of a vehicle communication system, favorably contribute to the realization of these resources and other scenarios through connectivity and IoT.

C-V2X technology, designed especially for the transportation sector, applies to smart connected vehicles and autonomous driving, and has communication components including vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I), vehicle-to-pedestrian (V2P) and vehicle-to-network (V2N).

The Paris subway in France exemplifies the benefits of the driverless model. Inaugurated in 1900, line 1, the most traditional in the city, concluded the system migration in 2013. The change took place after good results were achieved on line 14, inaugurated in 1998. On line 1, the gaps between one train and another have been reduced from 105 seconds to 85 seconds. As the trains are perfectly synchronized, there is less need for sudden stops, which reduced energy consumption by 15% on both lines.

In the city of Petaling Jaya, in Malaysia, a system was adopted that allows simulating how the transportation infrastructure would be impacted if more people started using the public system. The goal is to help local authorities plan investments in urban infrastructure. Currently, a fifth of the population uses public transportation. By 2030, the government estimates that 40% of the population will move through using the public system.

The financing of transportation in cities is still an important topic, as the growth of resource structures is the key to fulfilling mobility plans and also the search for new technologies. The global investment need for transportation infrastructure is estimated at US$1.4 to US$2.1 trillion per year, constituting an enormous global challenge.

The Paris Agreement plays an important role in the effort to attract investment in sustainable initiatives. The United Nations report highlights the fundamental importance of private sector engagement and its partnerships with the public sector, international financial institutions and climate funds, which, according to the document, by May 2016 already reached a value of US$ 36, 5 billion in pledges and contributions from countries around the world.
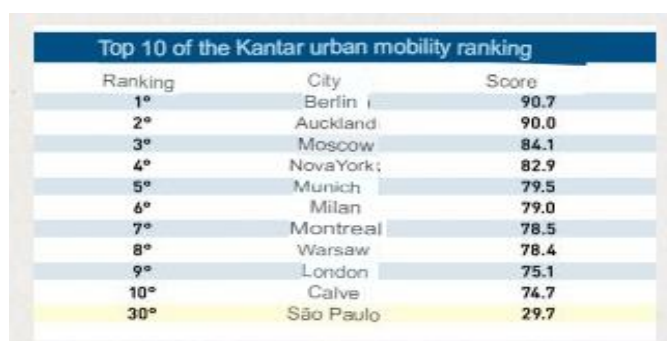
The UN launched the Innovative Financing Platform, a tool that will accompany financing initiatives and innovative solutions that will support the SDGs until 2030. It is important and essential to integrate technology, efficient plans that add value to the quality of urban mobility worldwide.

The ideal, multimodal transport, with integration between surface trains, subways, BRT, corridors, buses in selective lanes of good quality, vehicle sharing and active mobility – cycling and walking – can become a reality with the advanced technology, the integration of connected systems and a massive network user-centered intelligently.

6. CURRENT SCENARIO AND FUTURE PERSPECTIVES FOR WORLDWIDE URBAN MOBILITY

Shown in Picture 3 below, the urban mobility ranking carried out by Kantar, a company specializing in data, insights and consulting, carried out a study based on more than 20,000 interviews with users of different means of transport and travelers in 31 cities around the world. Berlin ranks first for its extensive public transport infrastructure and ride-sharing and cost-effective traveling options. Then Auckland, located in New Zealand, and Moscow, that ranked third.

**Picture 3. Top 10 Kantar Urban Mobility Ranking**

Ranking	City	Score
1º	Berlin	90.7
2º	Auckland	90.0
3º	Moscow	84.1
4º	NovaYork	82.9
5º	Munich	79.5
6º	Milan	79.0
7º	Montreal	78.5
8º	Warsaw	78.4
9º	London	75.1
10º	Calve	74.7
30º	São Paulo	29.7

Source: SINDSEGRS, 2019

Due to the lack of varied infrastructure and failure to meet other requirements, São Paulo, in Brazil, did not obtain a good ranking. Of the 31 cities analyzed, the capital of São Paulo state ranked second to last, ahead only of Nairobi, located in Kenya. The information generated through the analysis of cities was produced from in-depth interviews with 53 of the world's leading mobility experts. The objective, in addition to presenting the ranking, is to have greater urban planning and business strategies for new and previously existing companies in the transport and mobility sector, improving the infrastructure of cities.

Picture 4: Cities with transportation modes in transformation until 2030
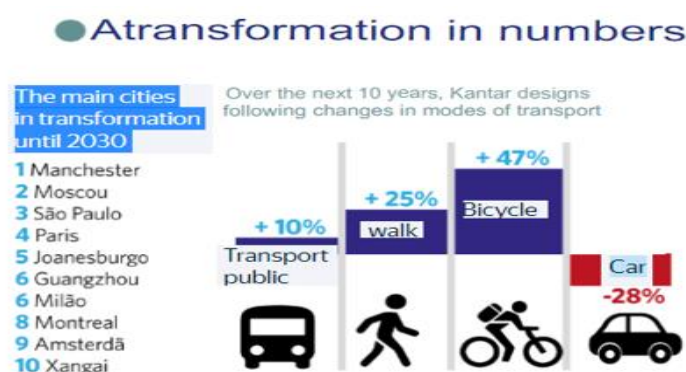
Source: KANTAR, 2019.

The transformation is growing in the world regarding changes in means of transportation, Picture 4 above lists the main cities with emerging changes until the year 2030, where Manchester appears in the lead and Shanghai in 10th place, the projection made by Kantar brings a 10% increase in public transportation, a 25% increase in walkers, a 47% increase in bicycle use and a 28% decrease in car use.

The IESE Business School, an entity affiliated to the University of Navarra, in Spain, created the "Cities Motion Index", an index that aims to evaluate and name urban groups based on attributes that fit the typology of smart cities, taking into account the criteria: Human Capital; Social aspects; Economic Aspects; Administration; Nature Conservation; Urban Mobility and Urban Planning; International Links and Technological Innovations. Based on this classification, a ranking of the smartest cities in the world was created. Below is the 2019 ranking according to the IESE Cities in Motion Index:

1. London, United Kingdom
2. New York, United States
3. Amsterdam, Netherlands
4. Paris, France
5. Reykjavik, Iceland
6. Tokyo, Japan
7. Singapore, Singapore
8. Copenhagen, Denmark
9. Berlin, Germany
10. Vienna, Austria

One of the biggest benefits that smart cities can provide is the power to take accessibility and inclusion to a whole new level, bringing a variety of solutions to improve the autonomy of people with disabilities. Audible timers that provide traffic information and help visually impaired pedestrians to cross; Collaborative mobility applications (crowdsourcing) such as the Wheel Guide to help plan your destinations and check the accessibility conditions of establishments. Inclusive Smart Cities represent a huge scale. According to current estimates, the smart city market is expected to grow from $308 billion in 2018 to $717 billion in 2023.

With the Covid-19 pandemic, the concept of the Smart City so discussed in recent years comes to question how life is directed in the 21st century. Planning a life with quality, safety, accessibility and concern for future generations is essential to guarantee urban sustainability and allow the citizens of the future to have resources for a full and intelligent life.

7. CONCLUSIONS

As cities grow, making them smart is essential. According to the study by the United Nations Department for Economic and Social Agendas, the World Urbanization Prospects, it is estimated that by 2050 two thirds of the world's population will live in urban centers. Universities, companies and public institutions must join forces so that solutions are applied and serve citizens more and more effectively. Faced with several concepts, this is the main goal. In Brazil, for example, all cities with more than 20,000 inhabitants must have an urban mobility plan by 2022 or 2023, equivalent to more than 30% of cities in the country.

The European Union plans to lay the groundwork to enable the EU transport system to achieve its ecological and digital transformation to become more resilient to future crises. As indicated in the European Green Deal, it is expected to achieve a 90% reduction in emissions by 2050, achieved through an intelligent transport system, with correct competition, adequate safety, adequate accessibility and fair prices. There will be a fully operational multimodal Trans-European Transport Network (TEN-T) for sustainable and smart transport, with high-speed connectivity. Promoting the adoption of zero-emission vehicles, ships and planes, low-carbon and renewable fuels and related infrastructure – for example, through the installation of three million public charging stations by 2030, creation of zero-emission airports and ports, will promote innovation and the use of data and artificial intelligence (AI) for smarter mobility.

Despite the modalities and the transport sector having been greatly affected by the COVID-19 pandemic and many companies in the sector finding themselves with enormous operational and financial difficulties, it is important to plan the post-vaccine life, with changes that will delimit the future of people´s mobility.

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