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Urban mobility in Morocco ahead of the FIFA World Cup in 2030: current situation, challenges and prospects

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ABSTRACT

In recent decades, Morocco has witnessed considerable advancement in urban mobility, largely due to the establishing of contemporary infrastructure such as tramways and Bus Rapid Transit (BRT) systems. Nevertheless, the country continues to confront significant structural impediments that impede the implementation of genuinely sustainable mobility solutions. This paper examines the principal developments achieved, particularly in the period preceding the 2030 World Cup, while also identifying persistent deficiencies, including inadequate infrastructure, a lack of institutional coordination, and a reliance on private vehicles. Furthermore, this paper presents an in-depth analysis of the negative externalities of mobility, such as congestion and pollution, while emphasizing the potential benefits of new technologies and the transition to intelligent mobility. It thus proposes a reflection on the strategies to be adopted to meet the challenges of urban mobility in Morocco by 2030, considering economic, environmental, and social requirements.

Key words: Urban mobility, Sustainability, Intelligent mobility, FIFA World Cup, Intelligent transport system

1. INTRODUCTION

In the 21st century, cities are undergoing a significant transformation, characterized by rapid urbanization and mounting pressure on transport infrastructure. The management of urban mobility, previously regarded as a relatively straightforward matter of regulating the movement of people and goods, has now emerged as a pivotal concern in the development of urban environments at the global and national levels (Banister, 2021). The concept of urban mobility has undergone a process of evolution, shifting from a purely technical dimension to a more comprehensive approach that integrates economic, social, and environmental aspects. The concept of sustainable urban mobility, supported by technological innovations, is now regarded as a crucial instrument for confronting the challenges associated with urbanization (Cohen & Kietzmann, 2022). Nevertheless, the transition towards more sustainable and intelligent mobility necessitates substantial investments, meticulous planning, and participatory governance to engage all stakeholders (Zhao et al., 2022).

In Morocco, as in many developing countries, the process of urbanization gives rise to particular challenges about the capacity of transport infrastructure to meet the growing demand. As forecast, by 2030, over 60% of the Moroccan population will reside in urban areas, exerting considerable pressure on mobility systems in major cities such as Casablanca, Rabat, and Tangier (Haddad & Zouiten, 2022).

In this context, the issue of urban mobility in Morocco assumes particular importance, particularly as the country prepares to host a major global event: the 2030 World Cup. This event represents not only a unique opportunity for the development of transport infrastructure but also a challenge for public policymakers who must anticipate future mobility needs while ensuring the sustainability of the solutions adopted (Al Maghraoui et al., 2017).

It is thus incumbent upon Morocco to reconcile the objective of modernizing its infrastructure with the concomitant demands for greater sustainability and the reduction of negative externalities, including congestion, air pollution, and unequal access.

This article aims to provide an overview of urban mobility in Morocco, examining the current challenges and opportunities related to the organization of the 2030 World Cup. Following a review of the literature on the conceptual and theoretical evolution of urban mobility, the negative externalities of infrastructure growth, and the prospects offered by sustainable and intelligent mobility, the article will analyze the specificities of the Moroccan context. The final section will focus on strategic recommendations to support the transition towards more resilient and inclusive urban mobility, emphasizing the key role of digital technologies and intelligent transport systems.

2. LITERATURE REVIEW

The topic of urban mobility is becoming an increasingly central concern within contemporary urban studies, reflecting the social, economic and environmental transformations that are occurring within urban spaces. As urban areas continue to grow and become more densely populated, transport systems must evolve in order to meet the increasing demand for travel while minimizing any negative impact on the environment and on the quality of life of citizens. This necessity for transformation of mobility systems has resulted in a re-evaluation of the concept of urban mobility, which is no longer constrained to mere physical movement, but rather encompasses a more expansive range of considerations, including accessibility, sustainability, and the integration of novel technologies. To gain a deeper understanding of the contemporary challenges of urban mobility, it is essential to examine its conceptual evolution, the changes in mobility practices over time, and the negative externalities associated with these practices. Concurrently, the concepts of sustainable and intelligent mobility have emerged as potential solutions to the current challenges. This literature review is structured around these main themes. Initially, it examines the evolution of the concept of urban mobility, delineating its various theoretical dimensions. Subsequently, it analyses changes in urban mobility practices and the challenges they present. Finally, it presents an analysis of the negative externalities of mobility, followed by an examination of the prospects offered by sustainable and intelligent mobility.

2.1. The evolution of the concept of urban mobility

The concept of mobility has long been associated with physical movement within a given geographical space, primarily for work, leisure, or access to basic services. However, with the evolution of societies and urban spaces, urban mobility has become a much more complex and interdisciplinary field of study (Kaufmann, 2008). The concept of mobility has evolved to encompass not only physical movement but also issues of accessibility, social justice, and the interconnection between different modes of transportation.

Historically, studies on urban mobility concentrated on transport infrastructure and the technical requirements associated with urban planning. Orfeuil (2001) highlighted that this technical approach failed to adequately address the social dynamics and economic implications of transport systems. In the 1970s, the emergence of energy crises and the initial reflections on sustainability prompted a broader reconsideration of urban mobility, incorporating environmental and behavioural elements.

The concept of urban mobility is now widely recognised as multidimensional, encompassing not only the flows of people and goods but also the interactions between infrastructure, technologies and social practices (Huguenin-Richard, 2010). This conceptual evolution is embedded in an interdisciplinary logic, which requires collaboration between urban planners, sociologists, economists and engineers in defining mobility policies.

In this context, Zgaya (2007) defines urban mobility as the totality of daily movements undertaken within an urban space by various modes of transport and for different reasons, from one origin to a destination. The concept of daily mobility is not merely a description of movement; it also encompasses an understanding of the underlying causes and consequences of these movements. From this definition, it can be inferred that the examination of urban mobility is based on the study of habits and the reasons behind the daily movements of city dwellers. It can therefore be concluded that these movements are becoming increasingly diverse in terms of their underlying motives and the transport modes used to facilitate them.

As posited by Garreton (2013), urban mobility can be defined as the practices, trade-offs, and strategies undertaken by households to select a location within the city and to navigate their desired destinations. In other words, urban mobility is the result of the interaction between residential mobility and daily mobility within an urban environment. In addition to encompassing movements, this definition also incorporates the utilization and decision-making processes employed by households in the selection of desired destinations.

To gain a deeper comprehension of the evolution of the concept of urban mobility, the following table presents a

synthesis of the principal periods and developments in mobility studies, emphasizing the main characteristics and scholarly contributions that have emerged over time.

Table 1: Evolution of the concept of urban mobility

Period	Key Characteristics	References	Description
Pre-1970s	Physical Movement Focus	Kaufmann (2008)	Mobility was seen as the physical movement of people and goods for basic needs.
1970s - Energy Crises	Beginning of Multidimensional Perspective	Orfeuil (2001)	The energy crises highlighted the need for environmental and behavioral considerations in transport.
1980s - 1990s	Emerging Interdisciplinary Approach	Zgaya (2007)	Mobility studies integrated urban sociology, economics, and geography.
2000s - Sustainability	Shift to Sustainable and Inclusive Mobility	Huguenin-Richard (2010)	Emphasis on sustainability, environmental impact, and inclusive transport services.
Present	Technological Integration and Complex Urban Systems	Cohen & Kietzmann (2022), Zhao et al. (2022)	Urban mobility is shaped by technological advancements and requires complex governance.

Source: authors

The table demonstrates the evolution of thinking on the subject, moving from an initial focus on physical movement within urban environments to a more holistic and interdisciplinary perspective. This progression reflects an increasing awareness of the social, economic, and environmental dimensions of mobility, with a recent emphasis on sustainability, technological integration, and the complexity of urban systems.

The evolution of the urban mobility concept reflects its intrinsic relationship with a range of transport-related issues. There is a growing focus on diagnosing urban transport supply, analysing urban morphology, the job market, the location of businesses, and the measures taken by policymakers to organise, plan, and develop urban spaces. This evolution is indicative of significant changes occurring within urban environments, as well as the advancement of transportation technologies and methodologies. The following discussion will examine the transformations currently occurring in urban spaces and their impact on mobility practices.

2.2. Urban Mobility Practices: Transformations and Impacts

The practices associated with urban mobility have undergone a significant evolution over decades, shaped by a complex interplay of socio-economic, technological, and environmental factors. One of the earliest significant transformations observed in urban areas from the 1960s onwards was the substantial increase in the number of private vehicles. At that time, the democratisation of automobile ownership, in conjunction with the accelerated expansion of road infrastructure, rendered car travel progressively more accessible. This phenomenon facilitated not only individual mobility but also contributed to the transformation of urban spaces. The increasing utilisation of private vehicles enabled a significant proportion of the urban population to establish their residences at greater distances from the urban core, thereby precipitating a substantial phenomenon of urban sprawl. As a result, cities expanded gradually, increasing the distances between residential areas, workplaces, and leisure activities. This further reinforced the dependence on automobiles for daily commutes (Crozet et al., 2001).

However, the ascendancy of the private car was not without repercussions. The phenomenon of urban sprawl, which has resulted in a fragmented spatial organization and a dependence on automobiles, has given rise to several new challenges, including road congestion, air pollution and excessive energy consumption. These negative externalities have become a primary concern for policymakers and urban planners, as they directly impact the quality of life in urban areas. Furthermore, this dependence on private vehicles has resulted in disparities in accessibility. Those with lower incomes, the elderly, or individuals with physical limitations often lack access to personal vehicles, forcing them to rely on inadequate public transport systems, particularly in peri-urban areas. This situation has served to exacerbate socio-spatial inequalities within urban agglomerations (Caubel, 2006).

In response to these challenges, urban areas have increasingly diversified their transportation systems, introducing alternatives to private vehicles. The development of public transportation networks has constituted a significant response to the issue of congestion in urban centers, offering residents a more efficient and sustainable alternative. Trams, metros and

high-service-level buses (BHNS) have become integral elements of urban mobility policies. Such systems not only serve to reduce congestion but also to lower greenhouse gas emissions, replacing car trips with more eco-friendly collective solutions (Cascetta, 2009). Concurrently, there has been a notable increase in the significance attributed to active mobility policies. The promotion of walking and cycling as modes of transportation has resulted in the creation of dedicated infrastructure, such as bike lanes and pedestrian areas, in numerous cities. These provide viable alternatives for short-distance trips while simultaneously reducing the ecological footprint of urban travel (Flamm & Kaufmann, 2020).

Another noteworthy transformation in urban mobility practices is the emergence of shared mobility. The advent of digital platforms has facilitated the proliferation of solutions such as carpooling, car-sharing, and services like bike- and scooter-sharing across cities worldwide. These innovations optimise resource use by reducing the number of vehicles on the road and offering greater flexibility to users. Shared mobility is perceived as a solution to congestion and pollution, while also meeting the evolving demands of urban residents for flexible and personalised transportation (Shaheen & Cohen, 2019).

Concurrently, the digital revolution has had a profound effect on mobility practices, with the integration of information and communication technologies into the management of urban flows representing a significant development in this regard. Intelligent transportation systems (ITS) facilitate the optimisation of traffic in real time through the utilisation of big data analysis for the regulation of mobility. These technologies afford cities the capacity to more accurately anticipate traffic congestion, administer public transportation networks with greater efficacy, and furnish users with precise information regarding traffic conditions or public transportation schedules (Zhao et al., 2022). Furthermore, the advent of digital platforms for integrated mobility management, designated as "Mobility as a Service" (MaaS), proffers a multimodal solution where disparate transport modes are integrated into a unified user interface, thereby simplifying journeys and promoting the utilization of alternatives to private vehicles (Flamm & Kaufmann, 2020).

The impact of technology extends beyond the improvement of urban flow management systems. Additionally, the advent of new technologies has facilitated the development of environmentally friendly vehicles, including electric and, to a lesser extent, autonomous vehicles. These innovations hold the potential to further transform urban mobility, reducing pollutant emissions, enhancing user safety, and improving transportation fluidity and efficiency (Banister, 2021). However, the widespread adoption of these solutions presents new challenges, particularly regarding technology regulation, personal data protection, and the financial accessibility of these new transportation modes. The following table summarizes the key transformations in urban mobility practices over recent decades, highlighting their defining characteristics and impacts on urban spaces.

Table 2: Summary of key transformations in urban mobility practices

Period	Key Characteristics	References	Consequences
Pre-1970s	Physical Movement Focus	Kaufmann (2008)	Focus on infrastructure and basic transportation needs.
1970s - Energy Crises	Beginning of Multidimensional Perspective	Orfeuil (2001)	Shift towards integrating environmental concerns into transport planning.
1980s - 1990s	Emerging Interdisciplinary Approach	Zgaya (2007)	Broader understanding of the social, economic, and environmental impacts of mobility.
2000s - Sustainability	Shift to Sustainable and Inclusive Mobility	Huguenin-Richard (2010)	Increased focus on eco-friendly, accessible, and inclusive transport systems.
Present	Technological Integration and Complex Urban Systems	Cohen & Kietzmann (2022), Zhao et al. (2022)	Complexity in governance models and the integration of advanced technologies in mobility systems.

Source: authors

This table outlines the progression of urban mobility practices from the widespread adoption of private cars in the 1960s to the current emphasis on sustainable and shared mobility solutions. Each period marks a shift in both the nature of transportation and the corresponding social, economic, and environmental consequences. These transformations reflect a gradual move away from car dependency towards more diversified, efficient, and environmentally friendly systems of transport, driven by technological innovations and urban planning strategies aimed at addressing the negative externalities of earlier mobility models.

In conclusion, the evolution of urban mobility practices has been shaped by the challenges posed by the rise of private

vehicles and the growing necessity for transportation in urban areas that are continuously expanding. To address the challenges posed by the rise of private cars and the growing need for transportation in ever-expanding urban areas, cities have sought to diversify their transportation modes, promote shared solutions, and integrate new technologies to improve the efficiency of transport systems and reduce negative externalities. It seems inevitable that urban mobility will continue to be shaped by these dynamics in the future. There will undoubtedly be an increasing focus on sustainability, inclusiveness and the integration of digital technologies to address the environmental and social challenges of modern cities.

While the changes in urban mobility practices have enabled the diversification of transportation modes and the integration of innovative technologies, they have also had unintended consequences. The growth of the private car, urban sprawl and the increasing reliance on transport infrastructure have all contributed to the emergence of a range of negative externalities that affect urban areas and their inhabitants. These externalities, frequently regarded as unfavorable consequences of mobility, have become pivotal concerns for public policymakers, due to their direct impact on quality of life and the environment. The issues of air pollution, road congestion, noise, and inequalities in access to urban services are of significant concern and require specific attention and tailored solutions. It is therefore imperative to conduct a detailed examination of these negative externalities to gain insight into their impact on urban mobility and the structural and functional dynamics of cities.

2.3. The negative externalities of urban mobility

The provision of urban mobility systems is a crucial aspect of modern city life. However, these systems also give rise to a range of adverse externalities that have an impact on the quality of life of residents and the sustainability of urban environments. Among these externalities, urban congestion is undoubtedly one of the most conspicuous. This phenomenon occurs when the volume of traffic exceeds the capacity of the transport infrastructure, resulting in congestion and a general slowdown in traffic flow. As observed by Boiteux (2001) and Buisson & Lesort (2010), congestion arises from an imbalance between the supply and demand for transport, leading to congestion in circulation networks, particularly during peak hours. This phenomenon has a direct impact on urban productivity, as it increases travel times and raises transport costs for both individuals and businesses. Furthermore, congestion has considerable environmental implications. When vehicles are stationary or moving at reduced speeds, they consume more fuel, which in turn increases greenhouse gas emissions and other pollutants. Urban congestion is closely associated with another significant issue, namely air pollution. Motorized vehicles are the primary source of pollution in urban areas, emitting a range of harmful gases including carbon dioxide (CO_2) and nitrogen oxides (NO_x), as well as particulate matter (PM), which have adverse effects on public health and the environment (Kaufmann et al., 2001).

The World Health Organization (WHO) has highlighted that urban air pollution is a significant contributor to premature mortality, with millions of deaths annually attributed to respiratory and cardiovascular diseases resulting from prolonged exposure to these pollutants (WHO, 2021). In major urban centres, the extensive utilization of fossil fuels and the proliferation of motor vehicles have intensified this issue, posing a considerable obstacle to the implementation of public policies aimed at curbing greenhouse gas emissions. Furthermore, this reliance on automobiles exacerbates environmental inequalities, as the most vulnerable populations, particularly those residing near major road infrastructures, are frequently the most exposed to elevated levels of pollution.

Furthermore, urban mobility has an additional detrimental impact on air quality, as well as generating a significant source of noise pollution. The urban environment is characterized by a high level of noise pollution, predominantly caused by road traffic. This represents a significant source of disruption for city dwellers daily. As Serrou (1995) observes, noise is pervasive in densely populated areas, where vehicle concentration and traffic intensity are high. Noise has a detrimental impact on the quality of life of residents, as well as on their mental and physical health. It can cause sleep disturbances, stress, and, in the long term, cardiovascular diseases (WHO, 2021). The impact of noise pollution is particularly pronounced in neighborhoods situated near major thoroughfares and heavy transport infrastructures, including urban highways and railway stations. Notwithstanding the implementation of measures to mitigate noise pollution, such as the utilization of quieter electric vehicles or the erection of acoustic barriers, the issue persists in the majority of major metropolises.

The ramifications of urban mobility extend beyond the environmental and public health concerns; it also pertains to social justice and the equitable provision of services. Indeed, reliance on private vehicles, coupled with the frequently insufficient public transportation infrastructure, serves to reinforce social inequalities within urban areas. As Cucu (2012) elucidates, low-income populations, the elderly, and those with reduced mobility are frequently the most adversely affected by this situation, as they have restricted access to alternative transportation modes. In numerous urban centres, peripheral or low-density districts, where housing costs are comparatively low, are inadequately served by public transport networks. This situation creates significant challenges for a considerable proportion of the urban population in accessing employment, education and essential services, thereby further intensifying social and spatial divisions (Vanco, 2011).

Such mobility inequalities also result in social and spatial exclusion, whereby specific segments of the population are isolated and deprived of opportunities due to their inability to move with ease. The phenomenon is further exacerbated by urban sprawl, encouraged by the widespread use of cars. Residents in suburban areas face higher transport costs and longer commutes to reach economic and cultural centres. This situation serves to widen the gap between different social classes, thereby limiting social mobility and intensifying economic inequalities (Petiot, 2002). The following table summarizes the main negative externalities associated with urban mobility systems, highlighting their causes and impacts on both the environment and society.

Table 3: Negative Externalities of Urban Mobility

Externality	Description	Impact	References
Congestion	Traffic demand exceeds infrastructure capacity, leading to traffic jams and slower traffic flow.	Increased travel times, higher transport costs, and more fuel consumption.	Boiteux (2001), Buisson & Lesort (2010)
Air Pollution	Motorized vehicles emit harmful gases such as CO2, NOx, and particulate matter (PM), which affect public health and the environment.	Respiratory and cardiovascular diseases, environmental degradation, and increased greenhouse gas emissions.	Kaufmann et al. (2001), WHO (2021)
Noise Pollution	Urban noise from road traffic disturbs daily life and harms residents' mental and physical health.	Sleep disturbances, stress, and long-term cardiovascular diseases.	Serrou (1995), WHO (2021)
Inequality in Access to Mobility	Dependence on private cars combined with inadequate public transport reinforces social inequalities, especially for low-income and vulnerable populations.	Social and spatial exclusion, difficulty accessing employment, education, and basic services.	Cucu (2012), Vanco (2011)
Environmental Inequalities	Vulnerable populations near major transport infrastructures are disproportionately exposed to higher levels of air and noise pollution.	Increased health risks for marginalized communities.	Cucu (2012), WHO (2021)

Source: authors

It is therefore evident that the negative externalities associated with urban mobility, including congestion, pollution, noise, and access inequalities, underscore the imperative for a review of transport policies in modern cities. In light of the continued growth in demand for mobility associated with rapid urbanization, it is imperative to rethink infrastructure and transport systems to address the challenges that this growth presents. The transition to sustainable and inclusive mobility solutions represents a promising avenue for mitigating these externalities. However, it will necessitate collaborative efforts between governments, urban planners, and citizens. Closely examining these externalities reveals cities' multifaceted challenges in managing mobility, emphasizing the urgent need for sustainable solutions to mitigate these negative consequences.

2.4. Urban Mobility: Towards a Sustainable and Intelligent Future

In light of the environmental, social, and economic challenges faced by contemporary cities, there is an urgent need to rethink urban mobility through the lens of sustainability. The rapid growth of urban areas, coupled with rising populations and an increased demand for mobility, has led to a significant exacerbation of the negative externalities associated with traditional transport models. Consequently, the concept of sustainable urban mobility has emerged as a systemic response to these issues, to promote transport modes that meet current travel needs while minimizing negative environmental impacts and ensuring equitable access for all citizens (Banister, 2021). This approach is based on several fundamental principles, including the reduction of greenhouse gas emissions, the promotion of collective and active transport modes, and the optimization of energy efficiency in transport infrastructure.

Scholars concur that sustainable mobility is not solely concerned with pollution reduction; it also encompasses social considerations such as inclusion and equity in access to transport services (Cohen & Kietzmann, 2022). The objective of sustainable mobility policies is not only to reduce pollution and congestion but also to enhance the urban quality of life by facilitating access to essential services such as employment, healthcare, and education. As posited by Flamm & Kaufmann (2020), integrating environmentally friendly transport modes, including trams, electric buses, and shared bicycle networks, not only reduces the ecological footprint of cities but also reinforces their resilience against climatic and energy-related disruptions.

A fundamental aspect of sustainable mobility is the promotion of public transportation, which reduces the reliance on private vehicles while enhancing the efficiency of travel in densely populated urban areas. Investments in public transport

infrastructure, including tram systems, bus rapid transit (BRT) services, and light metro networks, have been demonstrated to be an effective means of limiting car use while simultaneously providing more accessible transport solutions, particularly for populations residing in underserved or peripheral neighborhoods (Cascetta, 2009). Such solutions contribute not only to a reduction in CO_2 emissions but also to the mitigation of socio-spatial inequalities by enhancing the accessibility of areas that have been marginalised by traditional transport infrastructures.

However, the implementation of sustainable urban mobility necessitates a profound reorganization of current transport systems, which in turn requires substantial investments. The transformation of existing infrastructure to enhance efficiency and reduce environmental impact entails significant upfront costs, which presents a significant challenge for many cities, particularly in developing countries. Nevertheless, the long-term benefits, including reduced public health costs

associated with pollution, lower energy expenditure, and improved quality of life, clearly justify these investments (Banister, 2021). Moreover, this transition necessitates effective coordination among urban stakeholders, including policymakers, transport companies, and citizens.

To facilitate the transition towards sustainable mobility, governments must implement measures to encourage behavioral changes among users. The widespread adoption of alternative transport modes, such as cycling, public transit, or electric vehicles, will not occur in the absence of genuine economic and behavioral incentives. Consequently, public policies should encompass measures such as the taxation of polluting vehicles, the implementation of urban tolls to reduce traffic congestion in city centers, and subsidies for eco-friendly transport modes (Cohen & Kietzmann, 2022). Several cities have successfully implemented such measures. For example, London has introduced a congestion charge to limit the use of private vehicles in the city center. Similarly, cities such as Copenhagen and Amsterdam have invested heavily in cycling infrastructure intending to promote cycling as an alternative to driving. Furthermore, technology is a pivotal factor in enabling the transition to sustainable mobility. The implementation of intelligent transport systems (ITS), which facilitate real-time traffic flow optimization, and mobility-as-a-service (MaaS) platforms, which integrate disparate modes of transport into a unified application, represents a valuable avenue for congestion reduction and enhanced travel efficiency (Zhao et al., 2022). The combination of these technological innovations with well-designed infrastructure serves not only to reduce pollution but also to create more flexible and user-centered transport systems that are tailored to the diverse needs of urban citizens.

It is crucial to acknowledge that the transition to sustainable mobility will only be successful if accompanied by an increase in public awareness. Citizens must be made aware of the advantages offered by these novel transport solutions, both in terms of environmental impact and about their quality of life. The implementation of public awareness campaigns and the education of children on the significance of sustainable mobility represent pivotal components in the cultivation of environmentally conscious conduct over the long term (Flamm & Kaufmann, 2020). In the absence of such collective commitment, there is a risk that sustainable infrastructure will not be utilized to its full potential. The following table provides a concise overview of the key shifts and innovations in urban mobility, summarizing the evolution from traditional models to sustainable and smart solutions. It highlights the integration of environmental, technological, and social dimensions in shaping the future of mobility in modern cities.

Table 4: Comparative overview of traditional and sustainable smart urban mobility practices

Aspect	Traditional urban mobility	Sustainable and smart urban mobility
Mobility Focus	Physical movement of people and goods	Integration of economic, social, and environmental dimensions
Transport Modes	Predominantly private car use	Public transport, cycling, walking, electric vehicles
Environmental Impact	High CO2 emissions, air pollution	Reduction of emissions, promotion of clean energy
Technology Integration	Minimal use of technology	Smart systems, real-time data management, MaaS
Social Equity	Inequitable access, reliance on private cars	Inclusive solutions, improved access to services
Government Role	Infrastructure investment, minimal environmental focus	Policies incentivizing green transport, technology adoption
Public Engagement	Limited awareness of environmental impacts	Public awareness campaigns, education on sustainable practices

Source: authors

This table outlines the major elements of change, comparing conventional practices with contemporary strategies for enhancing urban mobility. It also demonstrates the growing role of technology and sustainability in addressing the complexities of urban transportation.

In conclusion, sustainable urban mobility is no longer a mere optional consideration; it has become imperative for

confronting the contemporary challenges posed by urbanization and climate change. It provides a solution to the issues of greenhouse gas emissions and urban pollution, while also facilitating a rethink of urban organization in favor of greater inclusivity and energy efficiency. While the transition to sustainable transport systems requires considerable investment and significant behavioral changes, the anticipated benefits for future generations are immeasurable.

While sustainable urban mobility represents a crucial pillar for addressing current challenges related to congestion, pollution, and social inclusion, technological advancements also offer new perspectives for shaping the future of urban transport systems. The combination of sustainability and technological innovation provides solutions that address the growing mobility needs of modern societies while optimizing infrastructure and improving the efficiency of transport networks. The incorporation of novel technologies into the domain of urban mobility management represents a promising avenue for addressing the flexibility and connectivity demands characteristic of contemporary urban environments. The advent of intelligent transport systems and digital solutions heralds the advent of a new era in urban mobility: the era of smart urban mobility. These pioneering technologies not only redefine modes of travel but also transform urban planning and management, paving the way for more efficient, safer, and responsive mobility systems that will meet the needs of tomorrow.

However, for these global dynamics to be fully effective, they must be adapted to local realities and specific contexts. In light of the aforementioned considerations, we will now proceed to an examination of urban mobility in Morocco as it prepares for the 2030 World Cup. This analysis will concentrate on the present state of infrastructure, the difficulties inherent in hosting this global event, and the potential for a transition towards more sustainable and inclusive mobility. This analysis will take into account the specific circumstances of Morocco, as well as the opportunities presented by this transformative horizon.

3. URBAN MOBILITY IN MOROCCO: CURRENT SITUATION AND CHALLENGES TO OVERCOME

The acceleration of urbanization, the constant increase in demand for mobility, and the shortcomings of urban public transportation have resulted in numerous mobility issues in Moroccan cities. The issue of urban mobility has now become a matter of great importance, as it not only determines access to services and opportunities but has also become one of the primary sources of discontent among urban residents. It constitutes a substantial impediment to the country's economic and social development. In response to these challenges, Morocco has made notable progress in developing modern infrastructure, particularly in the area of sustainable urban transport. Notable initiatives include the implementation of tramway networks and electric Bus Rapid Transit (BRT) systems. These developments have been made possible by the introduction of new legislative and regulatory frameworks, as well as the establishment of novel forms of territorial governance (CESE, 2021). Nevertheless, despite these advances, several shortcomings and challenges remain. The demand for urban transport in Morocco continues to grow exponentially. Furthermore, the existing model of urban transport organization, which is characterised by its multidimensional and multi-scale complexity, involving a plurality of actors, is beginning to demonstrate its limitations. This model places a significant financial burden on the state, businesses, and citizens, while also having a considerable negative impact on public health, the environment, the climate, and overall quality of life. This section will analyze the key advancements made by Morocco in terms of sustainable urban mobility, while also identifying the barriers that continue to hinder its development.

3.1. Progress Towards Sustainable Urban Mobility in Morocco: Achievements and Prospects

The issue of sustainable mobility has become a pivotal concern for Moroccan cities, particularly in the context of preparations for the 2030 FIFA World Cup. The accelerated transformation of urban environments, coupled with the emergence of pressing environmental and social challenges, underscores the imperative for the implementation of contemporary and sustainable transport solutions. In this context, Morocco has adopted a proactive approach to modernizing its infrastructure, introducing innovations in urban transport and adjusting its regulatory framework to meet international standards, intending to achieve a significant reduction in its carbon footprint.

The development of high-quality transport infrastructure represents a fundamental aspect of this transition. The transport sector accounts for approximately 6% of the national GDP and contributes 15% to the state's general budget revenues, while playing a pivotal role in reducing territorial disparities (METLE, 2018). The sector directly employs approximately 500,000 individuals, representing 5% of the active population (METLE, 2018). Nevertheless, the sector remains predominantly reliant on thermal vehicles, with 99% of the car fleet powered by diesel or gasoline. This energy dependency presents significant challenges, both in terms of air pollution and the fight against climate change, particularly in urban areas where CO2 emissions and congestion have reached critical levels (CESE, 2021).

To address these challenges and in preparation for the 2030 World Cup, Morocco has accelerated its investments in public transport infrastructure. The tramway networks, which were inaugurated in Rabat and Casablanca in 2011 and 2012, are undergoing expansion, with the addition of new lines planned to connect peripheral areas to urban centres. The objective of these extensions is to alleviate congestion on major roadways while providing a viable and ecological alternative to car use (Benmoussa et al., 2020). Furthermore, the Bus Rapid Transit

(BRT) system, which commenced operations with the inaugural line in Agadir, has experienced considerable success, leading to its expansion in Casablanca with the introduction of two additional lines spanning 22.5 kilometers (METLE, 2019). These initiatives demonstrate Morocco's commitment to developing sustainable transport solutions that are tailored to the specific needs of its large urban centres, while also addressing the increasing demand for urban mobility.

Furthermore, the preparations for the 2030 World Cup have provided a significant impetus for the enhancement of airport and railway infrastructure. In anticipation of a significant increase in visitors during the event, the National Railways Office (ONCF) has invested in the modernization of train stations in Casablanca, Rabat, and Tangier. Furthermore, the expansion of the Al Boraq high-speed rail network, which will link key new cities, is intended to provide a fast and efficient alternative for intercity travel (ONCF, 2023). The high-speed rail network serves to enhance urban and regional connectivity, whilst simultaneously functioning as a catalyst for growth in the tourism sector and the national economy, within the context of a sustainable mobility framework.

Concurrently, Morocco has augmented its endeavors to advance the concept of soft mobility, thereby addressing its international commitments regarding sustainability. Infrastructure for pedestrians and cyclists has been constructed in the principal host cities for the World Cup, most notably in Rabat, Casablanca, and Marrakesh. In Rabat, an extensive network of bicycle lanes has been established, and pedestrian zones have been created to encourage the use of non-motorized modes of transport, by global sustainable mobility practices (Cohen & Kietzmann, 2022). These initiatives are further complemented by the introduction of bicycle-sharing services in several cities, which facilitate the transition towards more environmentally friendly modes of transport.

These infrastructure initiatives have been reinforced by the implementation of comprehensive national strategies to transform urban mobility. The National Sustainable Development Strategy (SNDD) and the National Urban Mobility Strategy (SNDU) represent an approach to enhance the efficiency of transport while reducing its ecological footprint. The SNDU, developed in collaboration with the World Bank in 2008, facilitated the formulation of urban mobility plans for 13 major cities, aligned with principles of sustainability, energy efficiency, and greenhouse gas emission reduction (METLE, 2019). These strategies are supported by mechanisms such as the Urban and Peri-Urban Transport Reform Support Fund (FART), which provides financial assistance for collective transport projects in Morocco's major urban centres (Benmoussa et al., 2020).

In terms of technological innovation, Morocco has pledged to advance the adoption of electric mobility, a pivotal sector in curbing greenhouse gas emissions. The gradual introduction of electric vehicles is intended to meet the requirements of the 2030 World Cup, with an increase in the number of electric charging stations in host cities and along major transportation routes (CESE, 2021). These endeavours are bolstered by public-private collaborations with global enterprises, whose objective is to cultivate the requisite infrastructure to facilitate the utilisation of electric vehicles by both visitors and citizens (Banister, 2021). The National Energy Efficiency Strategy, which aims to reduce the transport sector's energy consumption by 35% by 2030, also contributes to the promotion of eco-mobility. This is achieved through initiatives such as eco-driving, the introduction of hybrid vehicles in public fleets, and the support of low-carbon transport projects (METLE, 2019).

Table 5: Summary of Key Progress and Challenges in Morocco's Urban Mobility

Category	Key Progress	Challenges
Infrastructure	Expansion of tram networks and BRT systems in Rabat and Casablanca	Need for more comprehensive public transport; persistent congestion
Sustainable Mobility	Promotion of soft mobility and bike-sharing systems	Low adoption of electric/hybrid vehicles and insufficient charging infrastructure
Public Transport	Investment in tram and BRT lines, expansion to underserved areas	Heavy reliance on diesel buses, need for eco-friendly fleets
Technological Innovation	Development of charging stations and commitment to electric mobility	High initial investment costs for sustainable transport technologies
Governance	Establishment of SDLs and ECIs for project management	Complex coordination between public and private sectors
Environmental Goals	Implementation of National Energy Efficiency Strategy, eco-driving initiatives	Low public awareness and participation in eco-friendly transport behaviors

Source: authors

In the context of preparations for the 2030 World Cup, Morocco has initiated a process of institutional modernisation and decentralization, to enhance territorial governance through advanced regionalization. The role of Local Development Companies (SDL) and Intercommunal Cooperation Entities (ECI) in the management of urban transport projects has now become a central aspect of the process. These entities, which are supported by financing mechanisms such as the FART, are responsible for planning and implementing sustainable mobility projects in the host

cities (Benmoussa et al., 2020). The expansion of tram networks in Casablanca and Rabat, as well as the introduction of BRT systems in other cities, represent tangible instances of collaboration between the state, local authorities, and private partners to address mobility challenges during the World Cup while ensuring sustainable legacy post-event (Cascetta, 2009).

However, despite these advances, challenges remain. Coordination between the various public and private actors remains a major issue. The multiplicity of stakeholders in transport management, combined with the pressure of deadlines for the World Cup preparations, highlights the need for more integrated governance. Such integration is essential to ensure not only the event's success but also the long-term sustainability of transport infrastructure, ensuring financial viability and minimizing negative externalities, such as congestion and urban pollution (Buisson & Lesort, 2010). To provide a clearer overview of Morocco's advancements and the challenges that remain in the realm of urban mobility, the following table synthesizes the main infrastructure developments, technological innovations, and governance reforms undertaken as part of the country's preparations for the 2030 World Cup. The table highlights specific areas of progress and outlines the ongoing obstacles that need to be addressed to ensure a sustainable mobility transition.

This table demonstrates that while Morocco has made significant strides in its efforts to modernize urban mobility, particularly in preparation for the 2030 World Cup, it must continue to address various challenges related to governance, infrastructure, and sustainability.

In summary, the preparations for the 2030 World Cup have catalyzed unprecedented efforts to modernize Morocco's transport infrastructure. Through massive investments, technological innovations, and institutional reforms, the country is well-positioned to meet the challenges of sustainable mobility while fulfilling the requirements of a global event of this scale. However, the success of these initiatives hinges on enhanced coordination between actors, effective project management, and a constant commitment to environmental and social sustainability.

3.2. Persistent challenges hindering the development of sustainable urban mobility in Morocco

Notwithstanding the evident advancement in urban mobility in Morocco, several shortcomings persist, impeding the transition towards a genuinely sustainable model. The major challenges include accelerated urbanization, inadequate transport supply, a lack of an integrated vision, negative externalities related to transport, and an insufficient regulatory framework. These obstacles highlight the intricate nature of the current situation and emphasize the necessity for innovative solutions that are tailored to the country's distinctive context.

The rapid urbanization that is occurring in Morocco, both in large cities and in small and medium-sized agglomerations, serves to exacerbate the challenges that are associated with sustainable mobility. The urban population increased from 16.4 million in 2004 to over 20 million in 2014, representing a growth in the urbanization rate from 29.1% in 1960 to 60.3% in 2014 (El Allam & Abdouni, 2021). This rapid urbanization, coupled with the establishment of new urban centres and the expansion of city boundaries, is indicative of profound social transformations. However, this also places increasing pressure on urban transport systems, which are unable to keep pace with the growing demand for mobility (El Moujaddidi, 2017). Morocco is confronted with considerable challenges in managing this urban expansion and must implement suitable accompanying measures to address it.

The exponential growth in demand for urban mobility, driven by the process of urbanization, has resulted in a transport supply that is inadequate to meet the needs of the population. The growth of the Moroccan population, the development of new urban areas and the densification of existing urbanised zones have led to a significant increase in the demand for travel in the majority of Moroccan cities. Unfortunately, public transport systems are unable to meet the increased demand. In its 2014 report, the Court of Auditors identified several deficiencies in the management of local public services, including inadequate preparation by municipalities, an absence of effective pricing regulation, and insufficient infrastructure (Berrahou, 2018). A significant proportion of the Moroccan population, particularly those in economically vulnerable circumstances, are compelled to undertake lengthy journeys on foot due to the prohibitive costs of transportation and the absence of viable alternatives.

Furthermore, although the taxi fleet renewal program has resulted in some advancement, it has not yet incorporated electric vehicles, thereby failing to seize an invaluable opportunity to advance more sustainable mobility. Taxis, particularly small taxis, continue to exhibit structural and organizational weaknesses, compounded by the absence of social coverage for their employees and an opaque regulatory framework regarding the granting of licences (CESE, 2021). The absence of sustainable solutions in the realm of public transport has also contributed to the proliferation of informal transport, such as large taxis, which often operate in unregulated conditions.

Furthermore, the lack of an integrated vision contributes to the existing inadequacies in the provision of transport. Even though several cities, including Rabat and Casablanca, have developed urban mobility plans with the technical assistance of the Directorate General of Territorial Communities (DGCT), the national roadmap for sustainable urban mobility, created with the support of GIZ, has yet to be officially adopted by the government. The prevailing approach to policy-making continues to prioritize the development of infrastructure, with insufficient attention paid to enhancing

accessibility to essential social services or reducing travel through more effective urban planning (Berrahou, 2018).

The prevailing mobility paradigm continues to be anchored in the private automobile, thereby perpetuating a reliance on an environmentally and economically untenable mode of transportation. In this context, walking and cycling, which are essential components of sustainable mobility, remain marginalized and often dangerous due to the lack of adequate infrastructure. Furthermore, the transition to electric mobility is still in its infancy in Morocco, with only a negligible proportion (approximately 1%) of the vehicle fleet consisting of electric or hybrid vehicles. In the absence of a comprehensive incentive policy for sustainable public transport, the country will remain reliant on fossil fuels, leading to an increase in greenhouse gas emissions and a further exacerbation of social inequalities.

The negative externalities of urban mobility, particularly air pollution, congestion, and greenhouse gas emissions (GHGs), also present a significant challenge. The transport sector accounts for 38% of Morocco's final energy consumption and a considerable proportion of GHG emissions. The cities of Casablanca, Marrakesh, and Fez are among the most polluted in the country, due to the high levels of road traffic. The congestion caused by the circulation of heavy trucks and thermal vehicles not only hurts air quality but also gives rise to public health concerns, including respiratory and cardiovascular diseases (CESE, 2020). The governance of the transport sector in Morocco remains fragmented and complex. The multiplicity of actors at various levels (local, regional, and national) presents a challenge to coordination, which in turn limits the effectiveness of mobility policies. Notwithstanding the implementation of public service delegation contracts, particularly for the management of buses, the results remain insufficient. The fragmentation of responsibilities between local authorities, Local Development Companies (SDLs), and national authorities frequently results in inefficiency in public action (Benmoussa et al., 2020).

Furthermore, the regulatory framework is also characterized by several shortcomings. Despite recent legislative efforts to enhance the sustainability of transport systems, the efficacy of governance mechanisms remains a concern. The ongoing project of advanced regionalization, although progressing, is gradually transferring responsibilities from the central state to the regions, which further complicates the implementation of mobility policies. It is therefore imperative to reconsider the distribution of roles between the delegating authorities and transport operators, integrating more innovative solutions to facilitate the transition towards sustainable urban mobility.

Table 6: Key Challenges hindering sustainable urban mobility in Morocco

Category	Key Challenges	Impacts
Urbanization	Rapid urban growth without adequate accompanying transport measures	Increased pressure on transport systems, leading to congestion and inadequate service provision
Transport Supply	Insufficient and inadequate public transport systems	High transport costs, and limited alternatives, force citizens, especially the poor, to travel on foot.
Vision & Governance	Lack of an integrated national vision for sustainable urban mobility	Fragmentation of responsibilities and inefficiency in public action, slowing down progress.
Pollution & GHGs	High greenhouse gas emissions from fossil fuel-dependent vehicles	Worsening air quality in cities like Casablanca and Marrakech, leading to public health issues.
Taxi Sector	Structural weaknesses and lack of integration of electric vehicles in the taxi fleet	Missed opportunity to promote sustainable mobility, maintaining dependence on fossil fuels.
Regulatory Framework	Delayed implementation of advanced regionalization and decentralization of transport responsibilities.	Inconsistent application of sustainable transport policies across regions.

Source: authors

This table provides a succinct overview of the intractable issues confronting Morocco's urban mobility system, underscoring the imperative for a more integrated, coordinated, and sustainable approach.

In conclusion, although considerable progress has been made, the ongoing deficiencies in urban mobility management in Morocco underscore the necessity for a more comprehensive and inclusive strategy. These challenges must be addressed with the utmost urgency to guarantee accessible, sustainable, and equitable mobility for all citizens.

3.3. Future Perspectives: Towards Sustainable and Smart Urban Mobility in Morocco

Given the mounting difficulties Morocco is encountering in the field of urban mobility, a radical transformation is essential if the requirements of sustainability, efficiency, and inclusivity are to be met. The development of more intelligent and environmentally friendly transport systems has become a necessity. The preparations for the 2030 World Cup provide a unique opportunity to drive this transition forward. The future of urban mobility in Morocco is contingent upon the integration of intelligent technologies. Indeed, intelligent transportation systems (ITS) are increasingly regarded as a key

solution to improving the flow of urban traffic. The utilization of technologies such as artificial intelligence (AI) and big data enables the real-time management of traffic flows, thereby optimizing the utilization of existing infrastructure. The implementation of these technologies in major Moroccan cities, such as Casablanca, would not only mitigate traffic congestion but also enhance coordination between disparate modes of transportation, including public transit, shared vehicles, and bicycle-sharing services (Zhao et al., 2022).

Furthermore, the implementation of artificial intelligence in traffic management could potentially address the issue of parking, which is a persistent challenge in major Moroccan cities. By optimizing the allocation of parking spaces and reducing the time spent searching for a parking spot, these systems would contribute to the ease of traffic flow. Furthermore, the incorporation of real-time traffic data would facilitate a more tailored approach to infrastructure development, while simultaneously reducing the environmental impact of urban transportation.

In addition to the introduction of Intelligent Transport Systems (ITS), the integration of Mobility as a Service (MaaS) represents another promising avenue of research. By aggregating all available transport services—including buses, trams, taxis, shared cars, and bicycles—on a unified digital platform, MaaS enables users to plan and manage their journeys seamlessly and conveniently. This approach, which has been demonstrated to be effective in cities such as Helsinki with the Whim app, could prove particularly beneficial in Morocco for reducing reliance on private vehicles and promoting the use of collective and shared transport (Flamm & Kaufmann, 2020). Such a solution would afford users greater flexibility and a more seamless travel experience, while also improving access to peripheral areas.

The issue of electrifying transport also plays a pivotal role in the transition towards sustainable urban mobility. Morocco is well-positioned to promote the adoption of electric (EV) and hybrid vehicles, given its ambitious goal of producing 52% of its energy from renewable sources by 2030 (METLE, 2023). The electrification of public transport fleets and taxis would constitute a pivotal measure in the reduction of greenhouse gas emissions, particularly in urban areas such as Casablanca and Marrakesh, which are among the most polluted in the country. To facilitate the transition towards sustainable urban mobility, it would be advisable for Moroccan authorities to consider accelerating the adoption of electric vehicles. This could be achieved by promoting the acquisition of electric buses, which are already being deployed in Marrakesh, and by introducing tax incentives to encourage individuals to adopt electric vehicles. The implementation of such a policy, in conjunction with the establishment of an enhanced charging infrastructure for electric vehicles, would not only serve to reduce CO_2 emissions but would also contribute to an improvement in air quality within urban areas.

In addition to the technological aspects, the development of infrastructure represents a significant challenge. Investments in transport infrastructure must be intensified to improve existing networks and support active mobility. It is recommended that the construction of dedicated bicycle lanes, secure pavements and parking facilities for bicycles and electric vehicles should be a fundamental element of urban development projects. It is of particular importance to consider the outskirts of major Moroccan cities, where urban expansion can often impede access to public transportation. The interconnection between different modes of transport is a fundamental aspect of ensuring smooth and sustainable mobility (Benmoussa et al., 2020). The following table summarizes the key perspectives for Morocco's transition towards sustainable and smart urban mobility, highlighting the potential impacts of technological, infrastructural, and social innovations.

Table 7: Key future perspectives for sustainable and smart urban mobility in Morocco

Area of Focus	Key Perspective	Impact
Technological Integration	Adoption of Intelligent Transportation Systems (ITS) and real-time traffic management through AI and big data	Improved traffic flow, reduced congestion, and enhanced coordination between various transport modes.
Mobility as a Service (MaaS)	Development of MaaS platforms integrating all transport modes into a single app	Reduced dependency on private cars, increased use of shared and public transport, and greater flexibility for users.
Electrification of Transport	Promotion of electric vehicles (EVs) and charging infrastructure	Significant reduction in CO2 emissions and improved air quality in urban areas.
Infrastructure Development	Investment in infrastructure for active mobility, including bike lanes and safe sidewalk	Enhanced accessibility and safety for non-motorized transport users, supporting sustainable urban mobility.
Social Inclusivity	Ensuring affordable public transport and equitable access for vulnerable populations	Improved social inclusion and reduced inequality in access to transport services.

Source: authors

This table summarizes the key perspectives for Morocco's transition towards sustainable and smart urban mobility, highlighting the potential impacts of technological, infrastructural, and social innovations.

Concurrently, it is of paramount importance to ensure that urban mobility is accessible to all. Inclusivity constitutes a fundamental tenet of any sustainable mobility strategy. It is imperative that vulnerable populations, including those with reduced mobility, rural residents, and low-income individuals, are provided with equitable access to transport services. It is imperative that public transport fares remain affordable, and that specific policies are implemented to meet the needs of marginalized populations. The organization of the 2030 World Cup provides a distinctive opportunity to redefine mobility priorities by integrating a robust social dimension into development plans.

4. RESULTS AND DISCUSSION

The results of the analysis of urban mobility in Morocco demonstrate that the country is undergoing significant changes, situated at a pivotal point where rapid development and structural challenges converge. Notwithstanding the considerable progress made, particularly in terms of modern infrastructure and the growing commitment towards sustainable mobility, Morocco still faces significant challenges in achieving its objectives, especially in light of the 2030 World Cup. The results presented here offer a more nuanced understanding of the intricate challenges currently facing urban mobility in Morocco, while also providing insights into potential future developments. They underscore the crucial role of structural reforms in enhancing urban mobility.

On the one hand, the analysis of transport infrastructure demonstrates that Morocco has made significant investments in the development of more sustainable modes of transport, including trams and Bus Rapid Transit (BRT). The tram networks in Rabat and Casablanca, as well as the BRT in Agadir, serve to exemplify this modernisation effort. However, the data indicates that these efforts remain inadequate to meet the growing demand for mobility, particularly in large urban areas where urban density continues to increase. To illustrate, Rabat, Casablanca, and Marrakesh continue to experience chronic congestion, particularly during peak hours, despite the introduction of new infrastructure. This paradox between the progress made and the persistent challenges underscores the necessity for a more integrated approach, particularly in the planning and optimization of existing infrastructure (METLE, 2023).

The acceleration of urbanization in Morocco, a phenomenon observed over the past two decades, has resulted in a notable increase in pressure on transport networks. A review of the most recent population and housing census data reveals that the urbanization rate reached over 60% in 2014, in comparison to less than 30% in 1960 (HCP, 2014). This sustained process of urbanization has resulted in a significant increase in the demand for mobility, particularly in major cities where a substantial proportion of economic activity is concentrated. The results also demonstrate that urban sprawl, in conjunction with a notable surge in motorization, serves to exacerbate the mobility challenges that have emerged. Indeed, the current motorization rate of 65 cars per 1,000 inhabitants continues to rise at a steady pace, thereby increasing the dependence on individual modes of transport, especially cars, to the detriment of collective or soft modes (Benmoussa et al., 2020).

Excessive motorization and resulting congestion have significant adverse effects on the urban environment and the quality of life of citizens. The findings indicate that Casablanca, the most populous city in the country, is among the most polluted urban centers, with elevated levels of air pollution attributable to road traffic. Greenhouse gas (GHG) emissions and fine particulate matter, which are primarily linked to thermal vehicles, represent a significant public health concern. Recent studies have estimated that respiratory diseases related to urban air pollution, particularly in Casablanca and Rabat, are becoming more prevalent, with a significant impact on vulnerable populations (CESE, 2021). In this regard, the adverse externalities of urban mobility extend beyond air pollution to encompass noise pollution and persistent traffic congestion, which collectively impede the productivity of cities.

Nevertheless, Morocco is striving to rectify these imbalances through the implementation of national policies and strategies that are designed to advance sustainable urban mobility. The National Urban Mobility Strategy (SNDU), which was adopted in 2008, represents a significant shift in transport management thinking in Morocco. The national programme, in collaboration with the World Bank, has devised a framework for mobility projects, comprising four key pillars: governance, financing, the enhancement of public transport, and the management of traffic and parking (METLE, 2019). The implementation of this strategy resulted in the establishment of the Urban Mobility Organising Authority (AODU) in Casablanca, as well as the formulation of urban mobility plans for 13 additional cities. Nevertheless, the results demonstrate that progress remains constrained, in part due to the fragmentation of governance and the absence of effective coordination between the diverse actors within the sector, including local authorities, local development companies, and public authorities.

Furthermore, efforts to develop greener mobility are impeded by obstacles related to the energy transition. The results demonstrate that, despite the implementation of multiple initiatives to promote electromobility, including the introduction of electric buses in Marrakesh and the gradual increase in the share of renewable energies in the national energy mix, the adoption of electric vehicles remains exceedingly limited. In 2023, less than one percent of vehicles in circulation in Morocco were electric or hybrid, indicating that the objective of decarbonizing the transport sector

remains unmet. This low rate is largely attributable to the high acquisition costs and the dearth of adequate charging infrastructure in urban areas (Cohen & Kietzmann, 2022).

Furthermore, the findings underscore a significant obstacle: the absence of an integrated vision and a long-term urban mobility strategy. Notwithstanding the existence of several mobility plans, including the Urban Mobility Plans (PDU) developed for certain major cities, the absence of an official adoption of a clear national roadmap represents a significant obstacle to the effective implementation of necessary reforms. This absence of a unified vision directly impacts the performance of public transportation and the accessibility of urban services, particularly for low-income populations, who remain marginalized by transportation modes that do not meet their needs (Berrahou, 2018).

Ultimately, an examination of prospective scenarios in the context of preparations for the 2030 World Cup indicates that this event has the potential to catalyze transformative changes in urban mobility in Morocco. Investments in sustainable transport infrastructure, such as the expansion of tram and bus networks across the country, coupled with technological innovations such as smart traffic management systems, offer a unique opportunity to modernize the urban transport system. Nevertheless, to fully capitalize on these opportunities, it will be necessary to establish closer coordination between local and national authorities, as well as to ensure the active involvement of private sector actors (Flamm & Kaufmann, 2020).

In conclusion, the findings of this study demonstrate that, despite notable advancements in infrastructure and governance, the urban mobility system in Morocco continues to confront significant challenges. These results underscore the necessity for comprehensive reforms and an integrated strategy to equip the country with the capacity to meet the challenges of a future where sustainable mobility will be a pivotal driver of urban development in Morocco, while ensuring social inclusion and environmental protection.

5. CONCLUSION

The analysis of urban mobility in Morocco reveals both considerable progress and persistent challenges. The development of modern infrastructure, exemplified by the introduction of tramways in Casablanca and Rabat, as well as Bus Rapid Transit (BRT) systems, evinces a resolute commitment to the modernization of urban transport systems and the fulfilment of the growing mobility needs of urban populations. These initiatives form part of a broader transformation towards more sustainable and inclusive mobility, supported by ambitious national strategies such as the National Urban Mobility Strategy (SNDU) and the National Energy Efficiency Strategy. These strategies have twofold objectives: firstly, to enhance accessibility to public transport services; secondly, to reduce the sector's ecological footprint through the integration of innovative solutions, including the electrification of transport and the promotion of more eco-friendly modes of transport.

Nevertheless, despite these developments, several deficiencies persist, impeding the comprehensive realization of the aspirations for sustainable mobility. The accelerated urbanization process, which has resulted in a dramatic increase in the urban population, has intensified transportation issues, particularly in major cities such as Casablanca and Rabat. The existing transport infrastructure, although modernised in some areas, is unable to meet the growing demand. Furthermore, the expansion of urban areas intensifies this demand, resulting in longer commutes and a heightened reliance on private vehicles. This, in turn, exacerbates the negative externalities associated with urban mobility, including congestion, air pollution, and the deterioration of urban quality of life.

Despite the reinforcement of the institutional and regulatory framework through the introduction of new legislation and mechanisms, it remains inadequate in addressing the intricacies of the challenges at hand. The plethora of actors, governance levels and financing mechanisms inherent to the system serves to render the implementation of an integrated and coherent mobility policy a challenging endeavour. Moreover, the absence of effective coordination between local and national authorities frequently gives rise to overlapping competencies and fragmented efforts, which ultimately diminishes the overall impact of the implemented policies.

The future also presents new challenges, including the need to adapt to emerging technologies and transition to smart mobility. Although initiatives such as Mobility as a Service (MaaS) and Intelligent Transport Systems (ITS) are beginning to emerge, their integration into Morocco's transport system remains in its infancy. The advent of the digital revolution and the ascendance of technologies based on artificial intelligence present novel opportunities for the optimization of transport management. However, this will necessitate the establishment of a robust digital infrastructure and the implementation of coordinated governance between the public and private sectors.

The preparations for the 2030 World Cup in Morocco provide a distinctive opportunity to surmount these challenges and expedite the transformation of urban mobility systems. The global event will necessitate the rapid upgrading of transport infrastructure to meet the mobility requirements of an expanded urban population and an influx of international visitors. This necessitates considerable financial investment, coupled with a reorientation of mobility policies to encompass sustainable and resilient solutions.

To achieve this vision, Morocco must adopt a more integrated approach, combining technological innovation, institutional reforms and active citizen participation. Improved coordination among the various actors involved, the incorporation of sustainability into each phase of the planning process, and the harmonization of mobility priorities with

economic and environmental development objectives are crucial for the creation of urban mobility solutions that align with the demands of the 21st century. The findings of this study demonstrate that the realization of such a transition necessitates not only a long-term strategic vision but also a robust commitment to addressing the immediate needs of citizens while anticipating future challenges.

In conclusion, although Morocco has already initiated significant transformations in the field of urban mobility, there is still a considerable distance to travel before the standards of truly sustainable, inclusive, and intelligent mobility are reached. The transition to sustainable urban mobility must be regarded not only as a necessity to enhance the quality of life in urban areas but also as a pivotal instrument for the country's economic advancement and international appeal by 2030 and beyond.

REFERENCES

1. Benmoussa, R., et al. (2020). La Mobilité Urbaine Durable au Maroc : Défis et Perspectives. Revue Internationale de la Science et Technologie.
2. Benmoussa, A., Cohen, B., & Kietzmann, J. (2020). Innovation in Urban Mobility: From Global Trends to Local Practices. Springer.
3. Berrahou, K. (2018). La Tarification des Services de Transport au Maroc : Un Enjeu d'Accessibilité et d'Équité. Centre d'Études des Services Publics au Maroc.
4. Boiteux, M. (2001). Transports : Choix des Investissements et Coût des Nuisances. Rapport pour le Commissariat Général du Plan.
5. Buisson, C., & Lesort, J.-B. (2010). Congestion and Capacity: The Fundamentals. In Transport Theory and Planning. Routledge.
6. Caubel, D. (2006). Les Mobilités Urbaines : Enjeux et Problématiques. Presses Universitaires de France.
7. CESE (2020). Rapport sur les Externalités Négatives du Transport Urbain au Maroc. Conseil Économique, Social et Environnemental.
8. CESE (2021). Rapport Annuel sur la Qualité de Vie Urbaine au Maroc. Conseil Économique, Social et Environnemental.
9. Cohen, B., & Kietzmann, J. (2022). Mobility as a Service (MaaS): The Road to Sustainable Urban Mobility. Journal of Urban Mobility Studies, 7(2), 33–47.
10. Cohen, B., & Kietzmann, J. (2022). Digital Technologies in Urban Mobility: Smart Cities and the Rise of Mobility-as-a-Service (MaaS). Urban Studies Journal, 59(5), 1120-1140.
11. Cohen, B., & Kietzmann, J. (2022). Urban Mobility Transitions and the Role of Technology. Urban Mobility Review.
12. Crozet, Y., & al. (2001). L'Automobile au Cœur de la Mobilité Urbaine. Éditions de l'Aube.
13. Cucu, R. (2012). Urban Mobility and Social Inequalities. Journal of Urban Mobility Studies.
14. El Allam, Z., & Abdouni, A. (2021). Urbanization and Mobility in Morocco: A Decade of Change. Revue Marocaine d'Urbanisme.
15. El Moujaddidi, M. (2017). Les Défis de l'Urbanisation au Maroc et Leur Impact sur la Mobilité Urbaine. Revue Africaine des Sciences Sociales.
16. Garreton, M. (2013). Mobilités Résidentielles et Mobilités Quotidiennes : Stratégies et Arbitrages des Ménages Urbains. Espace Géographique, 42(3), 19-32.
17. Haddad, R., & Zouiten, A. (2022). Urbanization and Transport Infrastructure in Morocco: Challenges and Prospects. Revue Internationale des Sciences Sociales, 25(3), 100-121.
18. Kaufmann, V., Jemelin, C., & Guidez, J.-M. (2001). Motility: Mobility as Capital. International Journal of Urban and Regional Research.
19. METLE (2018). Ministry of Equipment, Transport, Logistics, and Water: Annual Report on National Transport Policy. Rabat, Morocco.
20. METLE (2019). Stratégie Nationale des Déplacements Urbains. Ministère de l'Équipement, du Transport, de la Logistique et de l'Eau.
21. METLE (2023). Moroccan Ministry of Transport, Logistics, and Energy: Energy Transition Report 2023. Rabat, Morocco.
22. Petiot, R. (2002). The Economic and Social Costs of Urban Sprawl. Journal of Urban Economics.
23. Shaheen, S. A., & Cohen, A. P. (2019). Shared Mobility: The Evolution of Shared Modes: Potential, Usership, and Impacts. Elsevier.
24. Vanco, A. (2011). Transport and Spatial Exclusion: A Challenge for Modern Cities. Urban Research Publishing.
25. World Health Organization (WHO). (2021). Global Air Quality Guidelines. WHO Press.
26. Zhao, F., et al. (2022). Smart Cities and the Future of Urban Mobility: AI, Big Data, and the Internet of Things (IoT). Journal of Urban Technology, 29(1), 55–68.
27. Zhao, L., et al. (2022). Smart Mobility and the Rise of Data-Driven Urban Transportation: Opportunities and Challenges. Journal of Transportation Technology, 48(1), 44-63.
28. Zhao, X., et al. (2022). Smart Mobility Systems and the Future of Urban Transportation. Springer.