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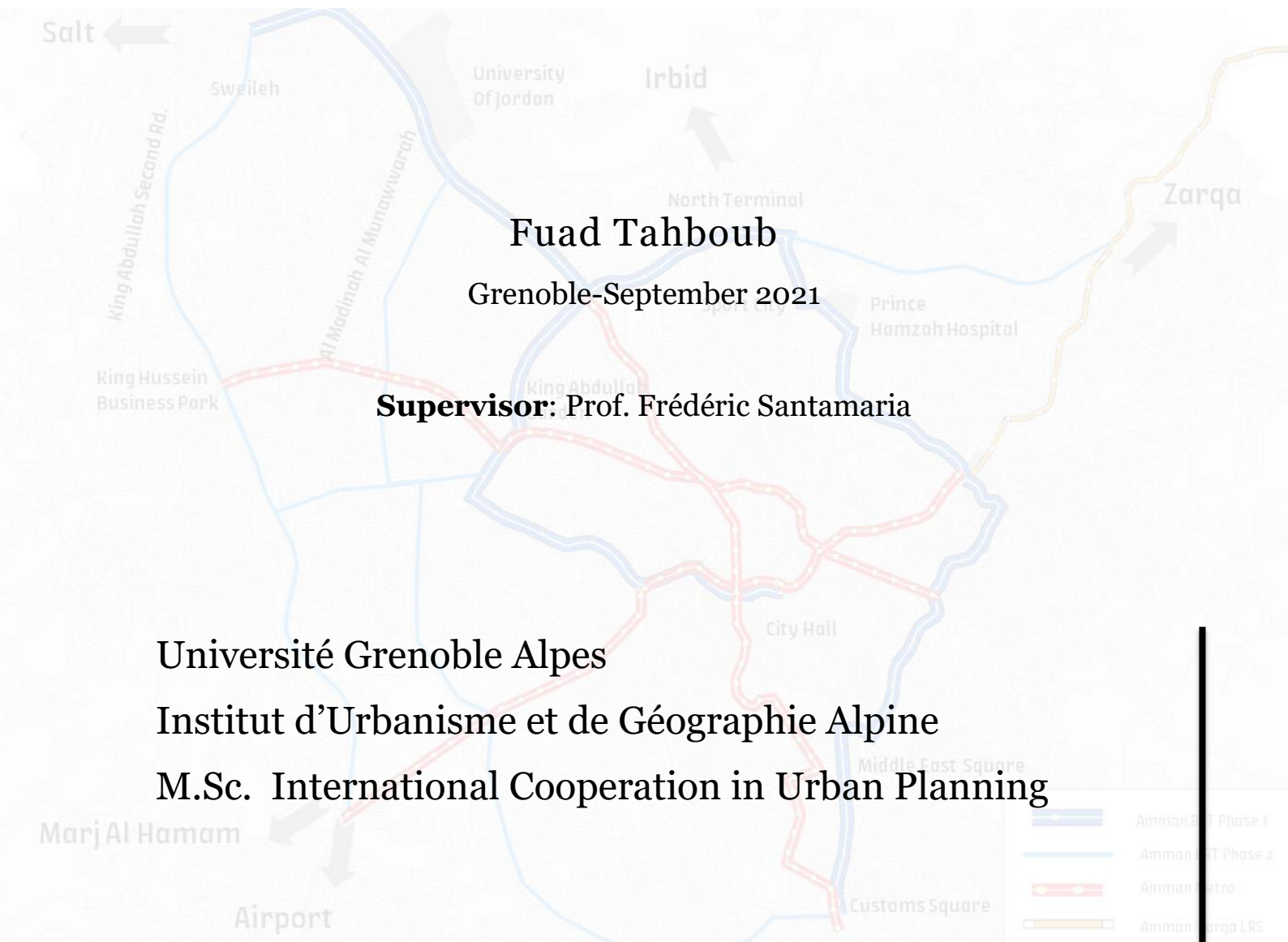
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Towards sustainable urban mobility in Amman: an overview of the Amman BRT project

"Impacts and Expectations"



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Grenoble-September 2021

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International Cooperation
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Fuad Tahboub

Abstract

The repeated neglect of the already dilapidated public transportation system in Amman by successive Jordanian governments, as well as their focus on road and infrastructure projects geared toward private vehicles, has exacerbated people's commuting suffering, contributing to the increased economic burden on their daily life. As many of them resorted to stressful loans to buy cars because they had no other choice. This, in turn, has resulted in a significant increase in the number of automobiles on the streets particularly in recent years, as the city has witnessed irregular growth patterns as a result of humanitarian asylum waves from neighboring countries such as Syria and Iraq.

In an effort to develop the city's mobility system, the Greater Amman Municipality has started a comprehensive review of urban development plans, particularly with regard to public transportation, and issued the Amman City Growth Plan in 2008, which outlined the city's priorities in terms of infrastructure, mobility, and public transportation strategy in the capital. The Greater Amman Municipality launched the Amman Resilience Strategy in 2017 with a set of goals to improve the city's mobility system, increase walking capacity and pedestrian movement, and transform Amman into an environmentally active city making Amman the first Arab city to implement a climate plan, with a focus on changing transportation modalities and energizing the city. The first result of these strategies and planning was the Amman Bus, which was the city's first subsidized public transportation system in 2019, followed by the Amman Rapid Bus Transit (BRT), which began trial operation in July 2021. Amman's Municipality places high importance on this project to improve public transportation's existing situation.

This study addresses the main mobility challenges in Amman, as well as the potential impact of the Amman BRT on improving the challenging reality by restoring people's trust in their public transportation system and laying the groundwork for future sustainable mobility in the city. The study also explains the impediments that have accompanied the project from its inception to the present, as well as a perspective of the project's different expectations among its stakeholders and public opinion based on a long history of disappointments.

Résumé

La négligence répétée du système de transport public déjà délabré d'Amman par les gouvernements jordaniens successifs, ainsi que l'accent mis sur les projets routiers et d'infrastructure orientés vers les véhicules privés, ont exacerbé les souffrances des gens dans leurs déplacements, contribuant ainsi à l'augmentation de la charge économique sur leur vie quotidienne. Beaucoup d'entre eux ont eu recours à des prêts stressants pour acheter des voitures parce qu'ils n'avaient pas d'autre choix. Cette situation a entraîné une augmentation significative du nombre d'automobiles dans les rues, en particulier ces dernières années, car la ville a connu une croissance irrégulière en raison des vagues d'asile humanitaire en provenance de pays voisins comme la Syrie et l'Irak.

Dans le but de développer le système de mobilité de la ville, la municipalité du « Grand Amman » a entamé un examen complet des plans de développement urbain, notamment en ce qui concerne les transports publics, et a publié le plan de croissance de la ville d'Amman en 2008, qui décrit les priorités de la ville en termes d'infrastructures, de mobilité et de stratégie de transport public dans la capitale. La municipalité du « Grand Amman » a lancé la stratégie de résilience d'Amman en 2017, avec un ensemble d'objectifs visant à améliorer le système de mobilité de la ville, à augmenter la capacité de marche et les déplacements piétons, et à transformer Amman en une ville active sur le plan environnemental. Amman est devenue la première ville arabe à mettre en œuvre un plan climatique en mettant l'accent sur le changement des modalités de transport et la dynamisation de la ville. Le premier résultat de ces stratégies et de cette planification a été le Bus d'Amman, qui a été le premier système de transport public subventionné de la ville en 2019, suivi du « Rapid Bus Transit » (BRT), dont l'exploitation expérimentale a débuté en juillet 2021. La municipalité d'Amman accorde une grande importance à ce projet pour améliorer la situation actuelle des transports publics.

Cette étude aborde les principaux défis de la mobilité à Amman, ainsi que l'impact potentiel du BRT d'Amman sur l'amélioration de cette réalité difficile en restaurant la confiance des gens dans leur système de transport public et en posant les bases d'une future mobilité durable dans la ville. L'étude explique également les obstacles qui ont accompagné le projet depuis sa création jusqu'à aujourd'hui, et donne une perspective des différentes attentes du projet parmi ses parties prenantes et l'opinion publique, basée sur une longue histoire de déceptions.

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Acronyms

DOS	Department of statics in Jordan
GAM	Greater Amman Municipality
BRT	Bus Rapid Transit
AFD	Agence Française de Développement, in french ‘Agence Française de Développement’
MGP	Metropolitan Growth Plan of Amman city
BOT	Build, Operate, and Transfer
ERBD	European Bank for Build and Development
MENA	Middle East North Africa
IRI	International Republican Institute Center for Insights
JD	Jordanian Dinar
JU	Jordan University recently changed to the University of Jordan
PSD	Public Security Directorate in Jordan
GHG	Green House Gas Emissions
GIZ	German development agency, in Germa, Gesellschaft für Internationale Zusammenarbeit
GDP	Gross Domestic Product
WEF	World Economic Forum
CSBE	Center Study of Built Environment in Jordan
AC	Air Conditioning system
PWD	Persons With Disabilities

Introduction

The Rapid and uncontrolled urban growth jeopardizes transportation systems and emphasizes the need to design new urban mobility systems, particularly in developing cities. Indeed, the local demand for public transportation far outstrips the capacity of facilities and, at times, collides with the incompatibility of the urban structure. In Amman, Jordan's capital and economic engine, population growth have not been accompanied by public investments in public transport over the past two decades. The middle eastern city has no reliable public transport system. *"The car is a necessity because there is no public transport or the public transport is very poor,"* as indicated by a participant in the report "Past, Present and Future Mobility challenges and opportunities in Amman" (Clemence Cavoli, Tarawneh and Rahahleh, 2017)

On the other hand, Amman has made little progress in terms of vehicle restrictions, new technologies, privatization, and other interventions. The city must activate public participation and institutional management while also shifting toward public shared transportation solutions rather than private motorized vehicles. Developing a long-term urban transportation system in Amman will require strong political will. The statehood should generate a sustainable urban mobility model that is feasible, socially acceptable, and environmentally friendly, which can be replicated across the country.

According to the most recent census from the Jordanian Department of Statistics (DOS¹), which was released in late 2020, The Jordanian capital was estimated to have 4.536.500 inhabitants accounting for approximately 42 percent of Jordan's total population 10806000 (Department of Statistics (Jordan), 2020a). The city faced a significant influx of immigrants due to the Iraqi war in 2003 and the Syrian crisis in 2011, which added extra pressure on the already old exhausted infrastructures designed to serve 1.7 million in 2004 and had to serve 4.5 million in 2020. Amman needs a major makeover, especially in terms of urban mobility. Commuting has been challenging in recent decades, especially for vulnerable individuals, due to the poor status of Amman's current public transit networks, which primarily comprise large buses, minibusses, and shared public vehicles. Worse, rather than being run by the government, the majority of these buses and cars are run by private companies. In 2017,

¹ DOS: Department of statics in Jordan

Amman had 655,323.000 registered vehicles, according to CEIC Data. (Clemence Cavoli, Tarawneh and Rahahleh, 2017)

Population of Amman

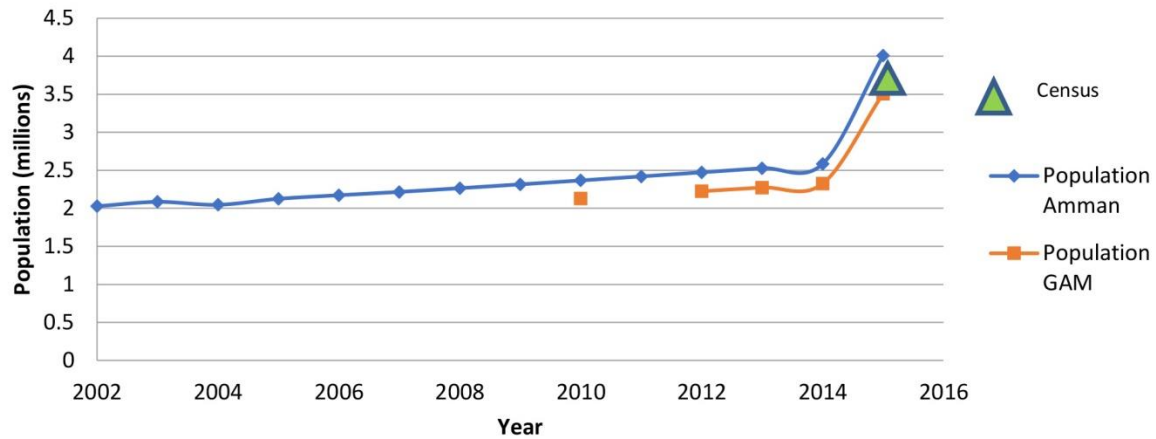


Figure 1: Population growth in Amman within 14 years Source: Amman city report, DOS 2017

Amman faces enormous challenges when it comes to urban mobility and needs urgent solutions; most of the solutions provided by the government were temporary and insufficient and led over time to create enormous challenges at the city level. As a result, Amman today is in urgent need more than ever to find sustainable mobility solutions to reach the concept of a resilient city. All of that requires a clear national public transport strategy supported by a political decision. Several facts would summarize the reasons for selecting the topic of mobility in Amman as a research topic. Beginning with the fact that Amman is a developing city with numerous social, political-cultural, economic, and planning challenges. *"collective transport was perceived by public authorities as a commercial activity and not as a public service."* (Clemence Cavoli, Tarawneh and Rahahleh, 2017).

Amman has long been regarded as a haven for refugees. According to GAM, one out of every four people in Amman is a refugee. However, the city experienced a significant influx of immigrants, particularly following the Iraqi war in 2003 and the Syrian crisis in 2011, putting additional strain on the city's already overburdened infrastructure, which was designed to serve 1.7 million people in 2004 but had to tolerate 4.5 million people by 2020. Amman has reached a critical infrastructure stage due to its steady and rapid growth over the last fifteen years, particularly in the public transportation sector. (Ababsa *et al.*, 2020). *"Amman is the only city in the Levant Region that is growing, and with a population of roughly 4 million, there is no adequate public transportation system in the city."* (Nieberg, 2017).

There has been an urgent need for public transportation in the last ten years. Still, the city has been unable to fund large-scale projects such as metros or trams because they are considered costly, and the government cannot afford to finance projects of that scale due to a lack of funds. In terms of planning, The Great Amman Municipality (GAM²) created a comprehensive master plan for the city in 2008, with a target date of 2025. GAM concentrated on some major infrastructure projects that required urgent development in this master plan. Such as the Amman ring road, which connects the capital with other cities without passing through it, and the Bus Rapid Transit system (BRT³), to position the project as the core element of all public transportation plans. (Ababsa *et al.*, 2020)

In 2009, a new idea emerged, proposing the creation of a Bus Rapid Transit project in Amman to serve as a public transportation model for the city. This project was designed to connect the city's most important intersections and, if prosperous, can be expanded to cover all of the city's central neighborhoods. The successful reputation of this model in various cities around the world, such as Istanbul and Jakarta and some cities in Latin America, raised the hope for a proper public transportation system for Amman residents that can solve their daily mobility challenges.

According to the American Federal Transit Administration, The definition of the Bus Rapid Transit is: *"A high-quality bus-based transit system that delivers fast and efficient service that may include dedicated lanes, busways, traffic signal priority, off-board fare collection, elevated platforms, and enhanced stations."* BRT differs from regular buses in that it has its lane separate from the car lanes, making it faster, more efficient, and time-efficient, in addition to the environmental benefit of using environmentally-friendly electric buses. *"The buses shall travel at intervals of no longer than 3 minutes to and from modern fully integrated terminals"* (Amman BRT).

GAM, the project's planner and overseer, continues to promote the BRT concept as a long-term answer to all of the city's public transit issues. This project is described as a flexible form of transportation that will be integrated with other modes of transportation in the city to serve residents of Amman with a safe and timely service. (GAM-website) The new BRT project, according to GAM, is groundbreaking. Other phases will follow, covering all of the city's communities and giving cost-effective options that may encourage people to rely less

² **GAM:** Greater Amman Municipality

³ **BRT:** Bus Rapid Transit

on their cars, resulting in shorter travel times and fewer traffic worries. Commuters in the city may need more than one mode of transportation to travel from one place to another under the current scenario, as there is no substantial network serving most of the city's major points. This initiative is planned to function in conjunction with a larger network of ordinary buses or small vehicles to get passengers to the nearest rapid transit station as quickly as possible, eliminating wait times and delivering a seamless and comfortable service.

GAM authorities claim that by establishing a modern public transit system, they want to ease the capital's traffic difficulties, particularly because public transportation riders have been subjected to substandard service for many years. Overcrowding on buses, long wait times, buses that do not follow certain timetables and routes, traffic congestion, pollution, and poor traffic safety are all legitimate causes for people's dislike of public transit.

Research questions

To reduce reliance on private motorized vehicles in Amman, the government should invest more in public transportation. The city must revise its mobility strategy by prioritizing mass transit in future projects. Keeping in mind that convincing people to abandon their private vehicles takes time and can only be accomplished if a good alternative is provided.

This study looks into Amman's present mobility issues and the impact of the upcoming BRT project on the city's urban mobility scenario. The study also examines the project's expected outcomes as well as its role in modifying and improving the city's transportation scene. Following the literature study, which focuses on the city's key mobility difficulties, public transportation deficiencies, and GAM's Efforts to Improve the transportation sector, we arrive at the main research questions that need to be addressed in order to better understand the current situation.

- 1. To what extent could the Amman BRT project improve the city's current mobility situation and lay the foundation for a sustainable public transportation system?**
- 2. What are the expected results from the decision-makers from this project, and how can they justify their expectations**
- 3. Will this project persuade people and motivate them to rely more on public transportation instead of their private cars?**

Hypothesis

The steady increase in population caused by successive waves of refugees put additional strain on an already overburdened public transportation system, which could not meet the increased demand.

The Amman BRT project, according to GAM, will have a magical influence on the city's present public transit scenario. It will also make people's life easier by giving them a choice. People, on the other hand, have little faith in the municipality and do not feel that a single transportation project will improve the city's existing poor mobility status.

That leads to the following hypothesis: **“Amman BRT will only be successful if it is integrated into a comprehensive mobility system that takes into account social, economic, and infrastructure demands and is backed by a strong political will to change.”**

This hypothesis has been inspired by what has been written in the literature as well as what has been witnessed on the ground. Although GAM claims that this project will increase public transportation use by 26%, from 14% now to 40% once the project is completed, GAM recognizes that this project alone may not be able to achieve this goal unless it is integrated with a comprehensive public transportation system that covers the majority of the city neighborhoods. Also, economic, social, and cultural variables all influence people's propensity to use public transit. These elements must persuade others that the initiative is beneficial and will save them time, effort, and money.

Overview over the chosen methodology

In terms of research methodology, a comprehensive literature review was conducted to have a better understanding of urban mobility systems in general and the case study of Amman in particular, and the BRT project in specific. The study aims to highlight the impacts of the BRT project on the public transportation sector in Amman and looks into its future repercussions on the city's urban mobility scene and its potential to help transform the city.

This study has adopted several research instruments that involved structured and semi-structured interviews and field observations. The methodology section of the research study is divided into two parts: the first one is to comprehend the current urban mobility situation in Amman based on ongoing literature review through secondary data obtained from books, published journals, recommended papers, and interviews, statistics from the Department of Survey in Jordan and recommended online reports from local and international sources such as GAM, the World Bank, and other international organizations. Another aspect of secondary data was to access several interviews on national television and online, which were conducted with shop owners whose businesses were severely harmed as a result of the BRT construction, especially when their customers had difficulty getting there because there were no places for them to park their cars or, in some cases, even walk.

The second part takes place in the field, where primary data is collected and analyzed to answer the study questions. This part of the methodology consists of two phases: The first phase involved gathering primary data through structured interviews with key stakeholders such as the Great Amman Municipality and the French Development Agency. A series of questions for the project's stakeholders was developed during these interviews, which was important to acquire a better understanding of their perspectives on the project and to clarify some issues that were missing from the literature review. The list of questions can be found in the appendix section. Also, Several semi-structured interviews were conducted with transportation sector-related groups that will be directly or indirectly impacted after the operation stage. The first category is the Minibus and shared public cars drivers, who might modify their routes or change them as the BRT operates in their work areas and influence. The second category consists of taxi and Uber drivers who will face indirect competition from the BRT and would suffer as a result. The goal of these semi-structured interviews is to

understand the impact of the BRT on the private transportation sector and what are the solutions that will be provided by the government.

The second phase entails developing an observation plan to collect data for some of the busiest intersections along the BRT lanes at various times of the week, in order to study and analyze the project's current situation and the way people use the space at different times of the day. Keeping in mind that, according to GAM officials, the Amman BRT is still in the testing phase and will not be fully operational until 2023. These collected data were important to study the impact of the BRT project on the city before and after the operational trial.

The Amman BRT operating trial was scheduled to begin on July 27th, so the fieldwork was divided into three site visits, from which two of them were one week earlier, on Wednesday the 21st because it's a working day and streets are normally crowded, and Saturday the 24th because it's the weekend. The third visit was one day after the official operation trial and took place on Tuesday the 28th. More details about the timetables of these visits and the visual images will be explained in the appendix section.

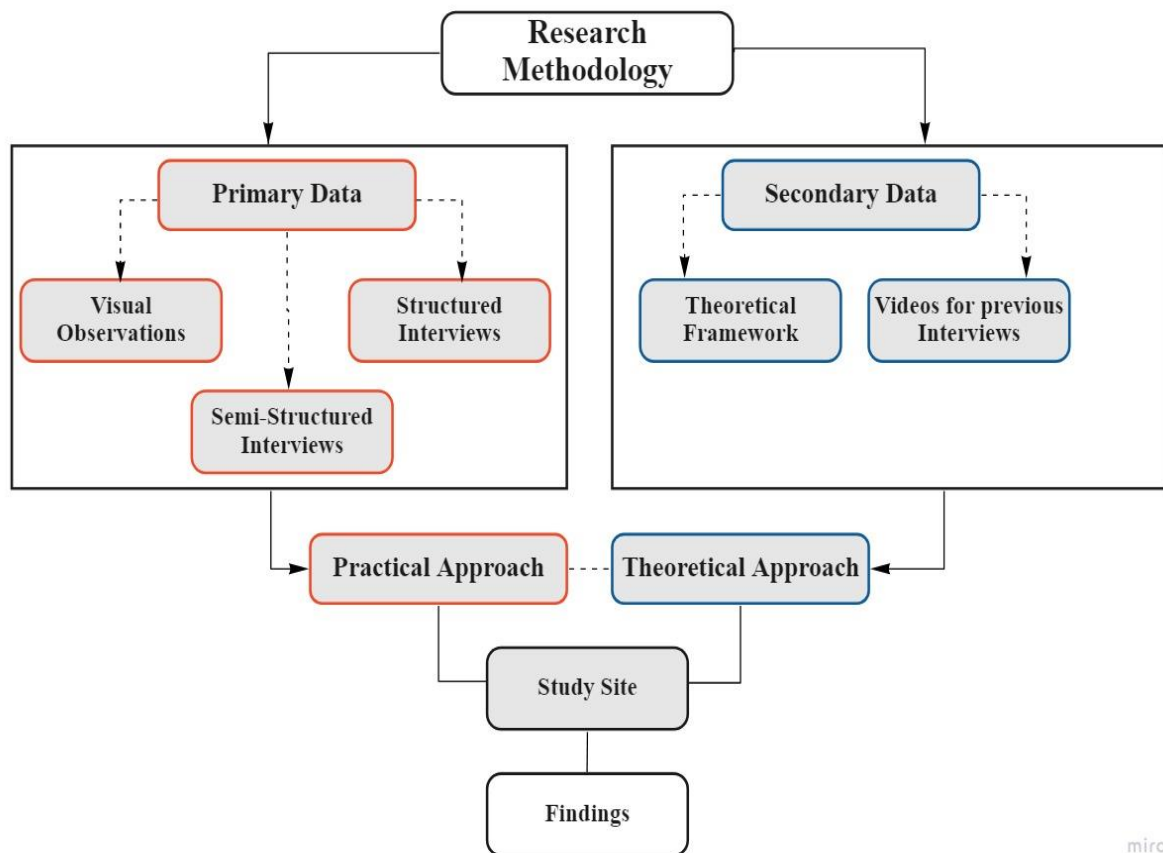


Figure 2: The methodology diagram of the study. Source: Author, 2021

Limitations of the study

Despite the rigorous planning and execution of the research, some restrictions hindered the study's ability to analyze the subject in a broader context. It was found that it had two constraints.

The time frame was the initial constraint in the study. The fieldwork in Amman in July 2021, during the difficult sanitary COVID-19 crisis, coincided with the beginning of the BRT operational pilot. As a result, developing a clear picture of the economic, social, and environmental impacts of Amman BRT on the city's mobility future requires more time and exceeds the timeframe allotted for this thesis.

The second constraint can be described as the social desirability bias, which is defined as a systematic inaccuracy in self-reporting measures caused by respondents' desire to avoid discomfort and portray a positive image to others. (Fisher 1993). According to King and Bruner (2000), social desirability bias is an essential threat to the validity of research employing multi-item scales. In this case, The representatives of GAM, Buses, minibusses, uber, and taxi drivers could impact the study's validity.

Contribution to Knowledge and Purpose of the study

This study will add to our understanding of a vital subject such as urban mobility and transportation challenges in Amman, a developing metropolis in a geopolitically sensitive region. The findings of the study will expand on previous research and go deeper to assist better understand the issues of urban mobility in Jordan, as well as serve as a platform for future research in this subject.

The overarching goal of this research is to investigate Amman's current mobility challenges and the potential effects of Amman BRT as a sustainable pilot project that could change the city's future mobility system.

Plan of the thesis

This thesis is divided into five sections. The first section (Introduction) explains why the study topic was chosen as well as the scope of the research. It contains the problem statement, research questions, study hypotheses, and the methodology of this study, which describes the data collection and the chosen approach. The second section reflects on the most recent theories and discussions relating to current mobility challenges in general and Amman in particular and presents the research topic's state-of-the-art and theoretical framework based on a literature review. The third section discusses the effects of the Bus Rapid Transit project on Amman, including pros and cons, facts, and ambitions. It also covers all of the project's social, economic, and environmental aspects. The fourth section examines the social dimension in terms of what should be taken into account in the future of the city. The research findings and conclusions are presented in the fifth and final section.

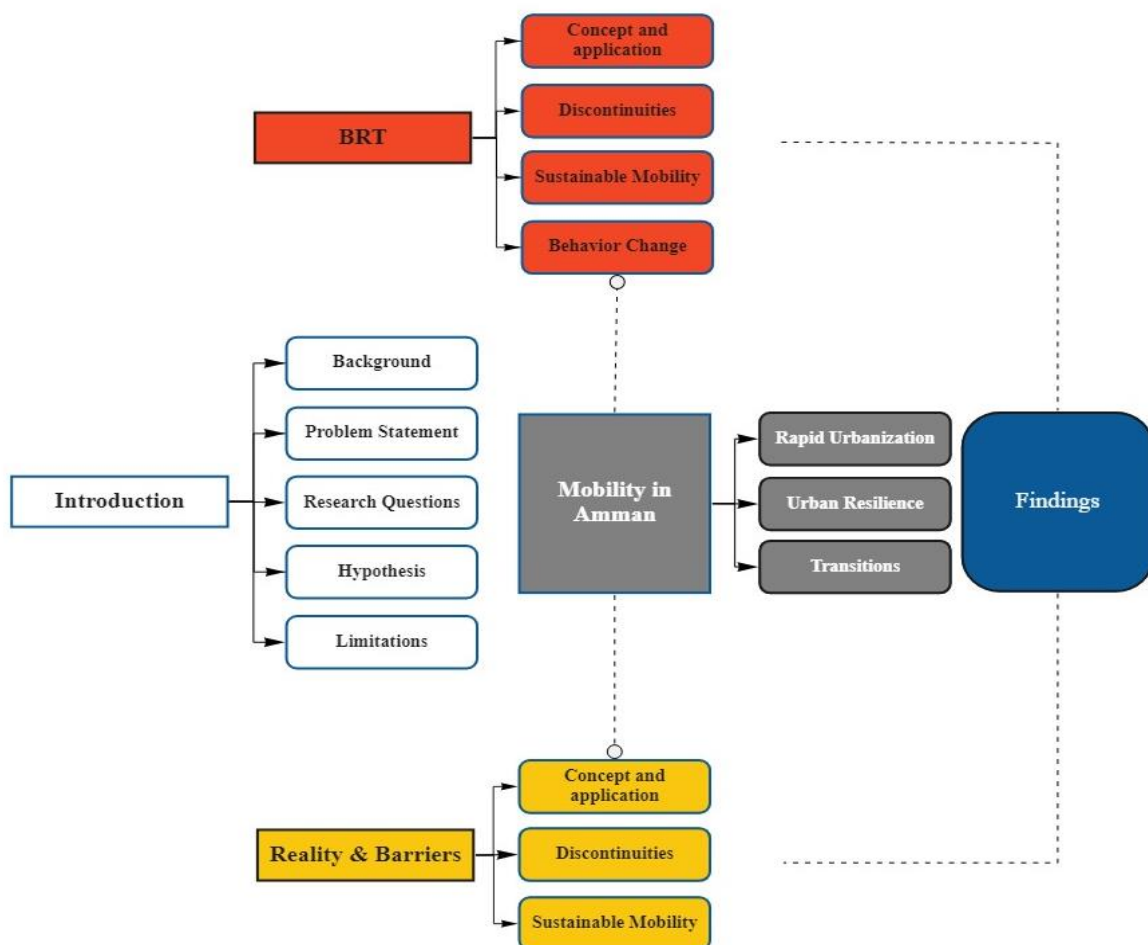


Figure 3: Plan of the thesis Diagram

Chapter 1: Mobility in Amman: from complex reality to the prospect of sustainable solutions

1.1 Amman: a city in a state of rapid urbanization

In Jordan, a relatively small country in the Middle East that gained independence from the United Kingdom in 1946, the geopolitical location has had a long-term impact on its economic and social aspects. Amman, Jordan's political, economic, and cultural capital, is home to more than 40% of the country's 10 million residents, has been particularly vulnerable to waves of refugee seekers. The capital is the country's economic engine. The economy of Amman is valued at more than \$30 billion, accounting for over a quarter of Jordan's \$42 billion GDP in 2019. (Ababsa *et al.*, 2020)

According to Amman comprehensive climate plans report, issued by the world bank, "Amman has utilized urban growth scenarios proving that densification and improve public transport would allow the city to absorb its population increase by 2030." However, Unemployment is a significant issue for Amman residents of both genders, and a lack of dependable public transportation exacerbates it. (Ababsa *et al.*, 2020)

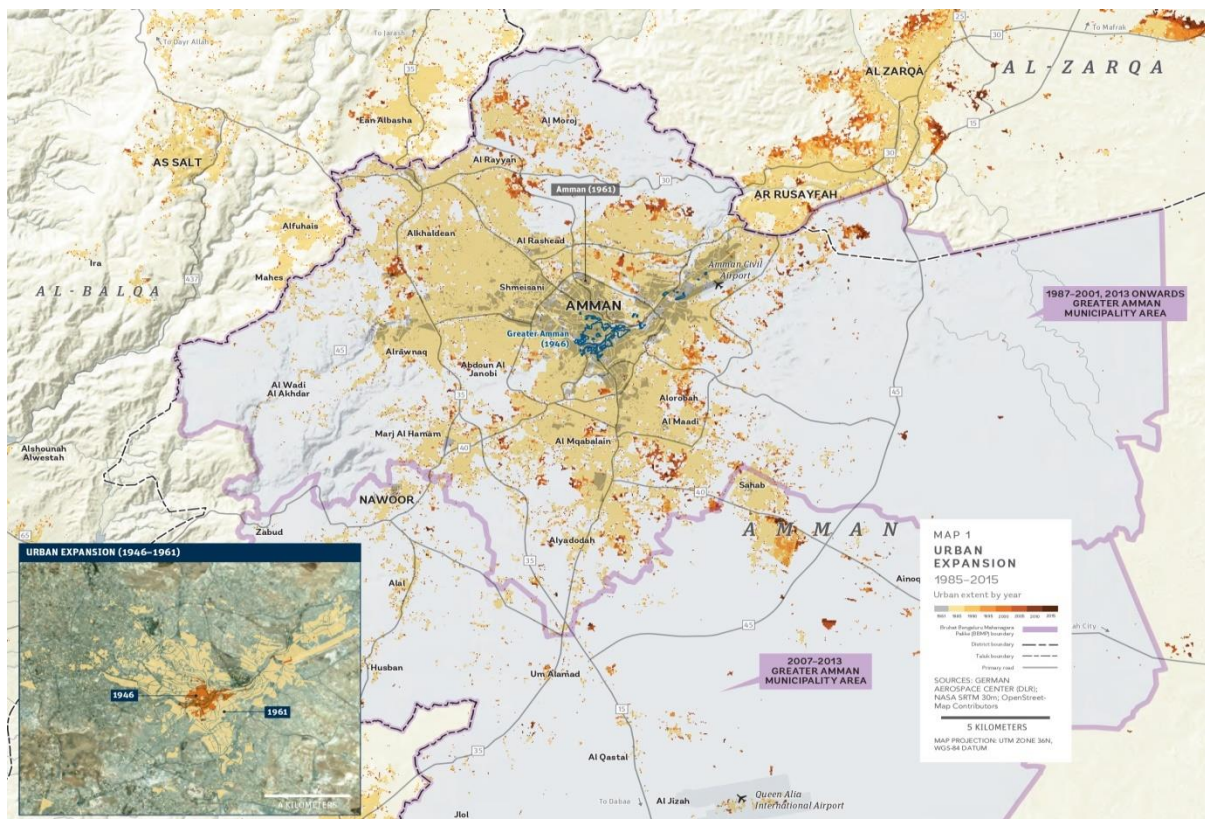


Figure 4: Amman urban expansion (1985-2015) Source: Amman comprehensive climate plans, the world bank, 2020

Since the country's independence in 1946, Amman has seen six waves of refugees. As a result of the first Israeli-Arab war in 1948, the city received its first wave of 70,000 Palestinians, divided between UNRWA refugee camps and some of the city's neighborhoods. Amman was able to absorb the first wave of refugees, who were easily integrated because Palestinians and Jordanians share much social and cultural heritage. Jordan annexed the West Bank of the Jordan River at the request of the Palestinians in 1950 and was renamed the Hashemite Kingdom of Jordan. (Ababsa *et al.*, 2020)

Seventeen years later, the Israeli army attacked Jordan, Syria, and Egypt in 1967 in what was known as "The Six-Days War," resulting in the occupation of the West Bank and the arrival of another 300,000 Palestinian refugees to the Jordanian capital. 24 years later, and particularly in 1991, Amman received 350,000 Jordanians expelled from Arab Gulf countries due to Jordan's political stance during the Second Arab Gulf War. Jordanians who worked in countries like Kuwait and Saudi Arabia were forced to leave these countries in less than a month and come back home. Following the fall of the Iraqi regime in 2003, Amman experienced the fourth wave of 200,000 Iraqi refugees who settled in Amman because it provided them with a haven not far from their homeland. (Ababsa *et al.*, 2020)

The most significant influx of refugees into Jordan took place between 2011 and 2015 due to the Syrian civil war close to the country's northern borders. According to (UNHCR 2019), more than 435,000 registered Syrian refugees have settled in Amman since 2011. However, if we consider the number of refugees who have fled to the capital but have not been registered by international organizations or housed in refugee camps, the actual number of Syrian refugees will far outnumber the registered number. (Ababsa *et al.*, 2020)

The last refugee wave that reached Amman was from Yemen in 2014. Despite the fact that Yemen is geographically distant from Jordan, more than 27,000 Yemenis who fled their country's civil war came to Jordan because it did not impose strict entry conditions, unlike some other Arab countries that have taken stringent measures regarding the issuance of visas and entry permits. (Department of Statistics (Jordan), 2015, 2020b; Ababsa *et al.*, 2020)

Refugees in Amman live in various settings; some are housed in camps, while others live in informal areas, particularly on the city's central and eastern outskirts. The remainder has been dispersed throughout the city. A refugee's status has evolved for political, financial, and social reasons. Most Palestinian refugees obtained Jordanian citizenship, which gave them

access to Jordanian government or UNRWA civil service jobs, public schools, and medical services. (Ababsa *et al.*, 2020).

Jordanians who returned from the Arab Gulf countries had substantial financial savings that enabled them to invest and develop the city, and thus they are no longer considered as an economic burden. Other refugees later changed their status; for example, Iraqi refugees who arrived in Amman following the Iraqi war had suitable financial means and invested their cash flow in the local market in order to obtain an investor residency permit, particularly in the housing sector. On the other hand, Syrian refugees couldn't have a better condition in Amman. According to the Jordanian department of statistics (DOS 2015) and the Amman comprehensive climate plans report issued by the World Bank, "*Syrian refugees face difficulty accessing school for their children (only 50 percent of Syrian children are attending school) and finding decent jobs. Moreover, the Syrian refugees compete for jobs with 390,000 Egyptian workers and 140,000 Asian domestic workers*". (Department of Statistics (Jordan), 2015, 2020b; Ababsa *et al.*, 2020)

Density issues have accompanied Amman's population growth. With a density of 13,600 inhabitants per square kilometer in 2019, the city has an uneven density between its districts. It is considered to have one of the highest urban densities in the world. (Ababsa *et al.*, 2020). The city's population has overgrown, putting excessive pressure on resources and infrastructure such as education, medical care, employment, and transportation. Furthermore, spatial and social inequalities afflict the city. The western part of the city is the most developed and considered the wealthiest, whereas the eastern and central neighborhoods in the same city include neglected informal poor affluent areas. (Ababsa *et al.*, 2020)

Amman's infrastructure has lagged behind the city's demographic and urban growth rates. The city cannot keep up with the rapid growth of its population, posing numerous challenges in terms of infrastructure services, transportation, and urban sprawl. The city suffers from traffic jams due to many private vehicles and the lack of public transit; additionally, the lack of public parks and gardens contributes to the city's increased air pollution. (Ababsa *et al.*, 2020)

In 2008, The Greater Amman Municipality released its Master Plan vision for 2025, or what is known as the Metropolitan Growth plan of Amman (MGP)⁴, which it is still considered as the primary guiding vision for the city's mobility and mass transit projects, such as the main highways, ring roads, and public transportation network including the BRT vision. This vision also explained the urban sprawl control policy as well as the potential use of development corridors to direct urban expansions in various scenarios. (Ababsa *et al.*, 2020)

The Amman plan defines national planning policy, which includes Amman's visions and aspirations and its metropolitan growth plan and area and community growth plans. As illustrated in Figure 4, this broad Planning Framework reflects individual Amman Plan components and categorizes the tools to put them into action.

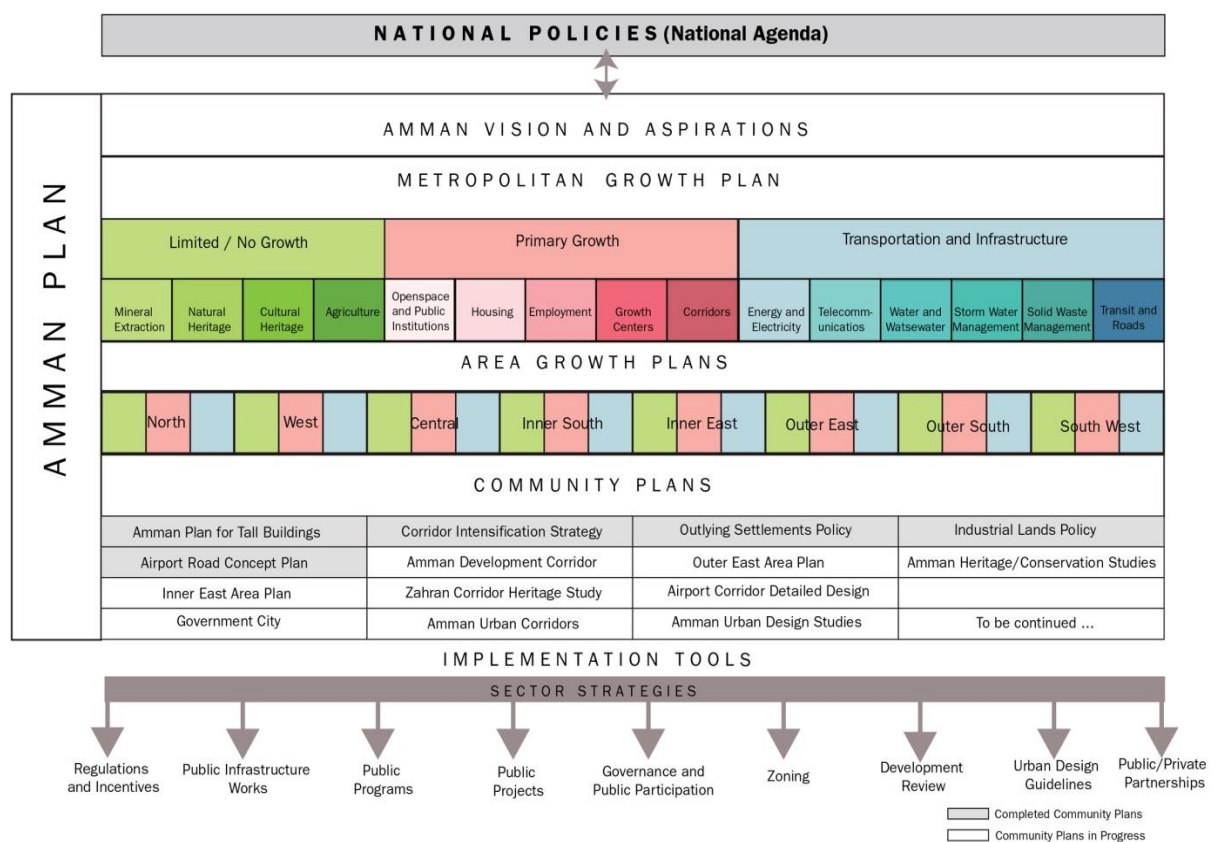


Figure 5: MGP planning framework, Source MPG, 2008

The Amman Metropolitan Growth Plan aimed to promote direct growth in existing built-up areas and encourage mixed land use, mainly residential and commercial, to foster a diverse economy. Moreover, Increasing public transit use and improved pedestrian accessibility were prioritized by developing a comfortable pedestrian environment integrated with other mass transit systems. (Greater Amman Municipality (GAM), 2008)

⁴ MGP: Metropolitan Growth Plan of Amman city

As for the Amman Metropolitan Growth expansion plan, the objective was to select one of three scenarios developed to address the issue of urban sprawl and city expansion in Amman in response to expected population growth by 2025. In the first scenario, as shown in figure 3, The city continues to expand in the same manner it has for the past 15 years, mainly through outward growth on undeveloped land. The second scenario proposed expanding the city by combining existing built-up areas with external expansion onto undeveloped land. In the last scenario, the city expands through a greater reliance on densification, resulting in less perimeter growth. The final decision was to implement a combination of the second and third scenarios, in which the city integrates land requirements with an emphasis on intensification and densification policies. (Greater Amman Municipality (GAM), 2008)

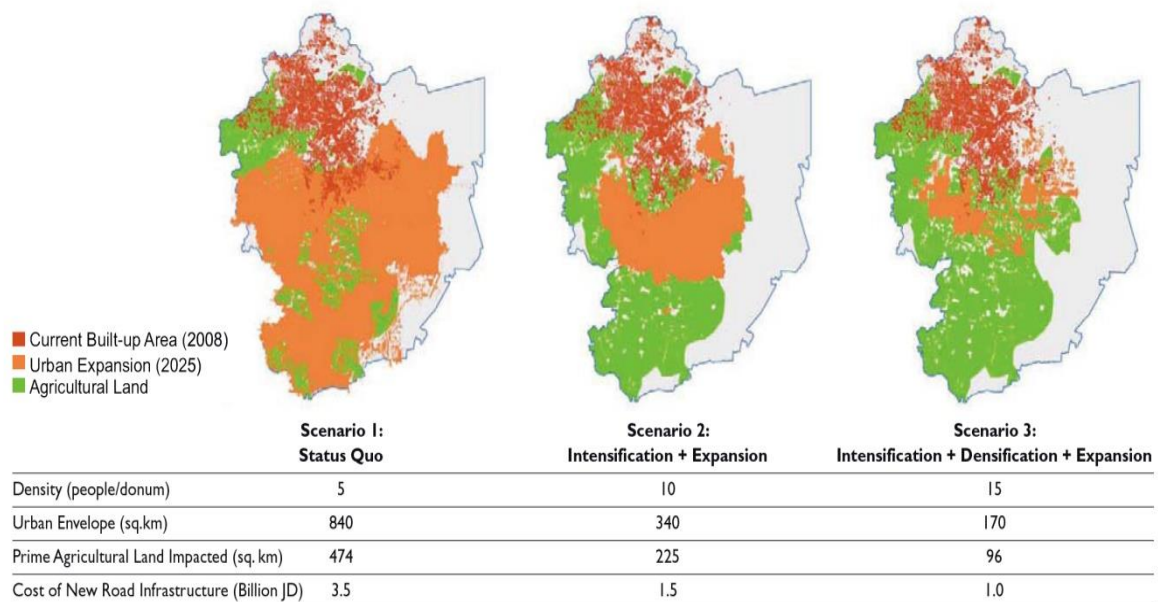


Figure 6: Amman Metropolitan Growth Scenarios Source: *The Greater Amman Metropolitan Growth Plan Summary Report, 2008*

MGP devoted a significant portion of its metropolitan plans to the city's transportation and transit vision. Its transportation policy takes a holistic approach to land use, transportation, and infrastructure development to promote integrated urban development and a shift away from using private vehicles and toward public transport and pedestrian mobility.

According to GAM, the MGP identifies various levels plan of roads that specifies the location, interconnectivity, technical, and operational features of each type of roadway. (Greater Amman Municipality (GAM), 2008). *"The road hierarchy elements and network designated in the MGP includes Motorway, Rural Highway, Urban Expressway, and Major Arterial Road"* (Greater Amman Municipality (GAM), 2008)

The MGP prioritized urban expressways in its planning for future substantial investments in highway infrastructure developments to boost traffic flow and, as a result, relieve capacity issues at roadway junctions where appropriate. Furthermore, traffic control signals are installed at road intersections to enable secure and convenient traffic and pedestrian crossing operations. (Greater Amman Municipality (GAM), 2008)

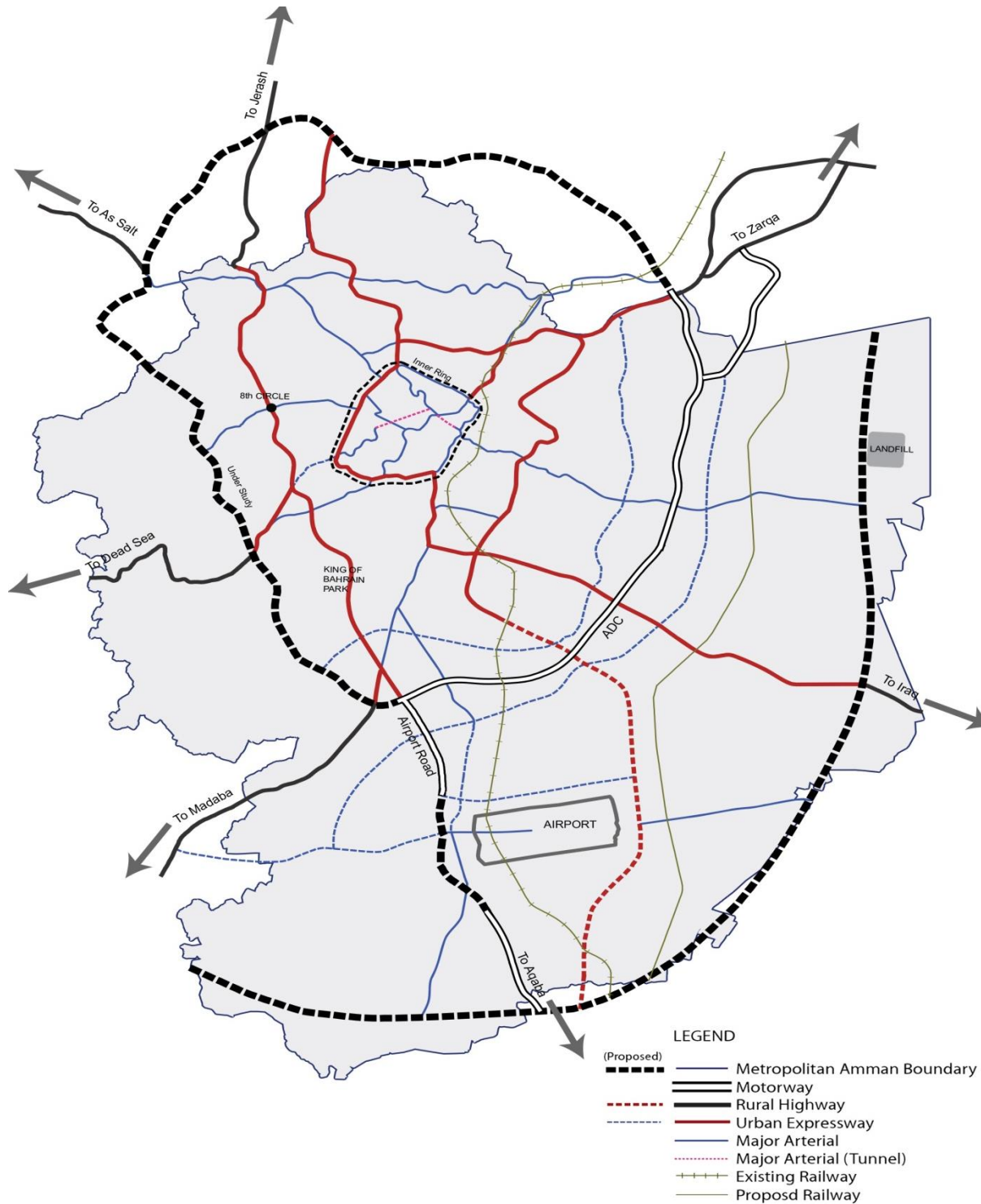


Figure 7: Elements of the road hierarchy according to the metropolitan growth plan of Amman city).
 Source: The Greater Amman Metropolitan Growth Plan Summary Report, GAM 2008

The MGP sought to significantly improve Amman's transit service, maximize transit capacity, and attract diverse citizens. The MGP classified the transit system into five service levels: High Order Transit, Major Bust Transit, and regular bus as public mass transit in the first three levels, followed by private taxis and pedestrian transit in the fourth and fifth levels. (Greater Amman Municipality (GAM), 2008)


Transit Service	Transit	Service areas
High-Order Transit	Metro, Light Rail, and Bus Rapid Transit	<p>Medium and high-density mixed-use development areas.</p> 

Figure 8: Futuristic Tram proposal in Amman, Source: C40 cities, 2019





Major Bus Transit	Qualified modern buses	<p>Dedicated corridors with appropriate transport high-density and mixed-use development. These dedicated corridors will improve bus efficiency by utilizing special transit lanes, queue jump lanes, and bus traffic light priority.</p> 
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Figure 9: Amman BRT, Source: Jordan-news, 2021

Regular Bus Transit	Qualified Large buses	<p>The service will be provided on regular routes with mixed traffic with covered bus stops.</p> 
	<p><i>Figure 10: Amman BUS, Source: Sama Jordan,2019</i></p>	
	Qualified Minibuses	
	<p><i>Figure 11: Minibuses, Source: Al-Rai Newspaper,2019</i></p>	

Public Shared cars	Service Taxis	<p>Service taxis⁵ will continue operating within designated areas to supplement regular and significant bus services.</p>
		
<p><i>Figure 12: Shared cars, Source: Jordan-news, 2021</i></p>		

⁵ **Service Taxis or (White cars):** Are public shared cars that follow specific routes in the city of Amman. It is considered part of the public transportation system, despite the fact that it is not owned by the government but rather by private individual


Pedestrians	Pedestrians	<p>New pedestrian wide-ranging sidewalks to promote pedestrian mobility and access to transit services.</p> 
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Figure 13: Pedestrian in Amman, Source: CSBE⁶, 2017⁷

Table 1: The hierarchy of the transit system service levels in Amman Metropolitan Growth Plan, Source: The Greater Amman Metropolitan Growth Plan Summary Report, 2008

In many ways, the Greater Amman Master Plan 2025 was groundbreaking. Given the city's continuous state of rapid growth, it was the first time GAM reflected its vision when it came to futuristic urban growth scenarios. Second, GAM defined new major metropolitan corridors and growth centers in the city for the first time, prompting additional investments in the future. MGP also encouraged public participation and stakeholder engagement in the planning and design of new Amman features through face-to-face sessions and public awareness campaigns. Finally, the Amman BRT concept took shape concurrently with the publication of the Masterplan to become a reality. (Greater Amman Municipality (GAM), 2008)

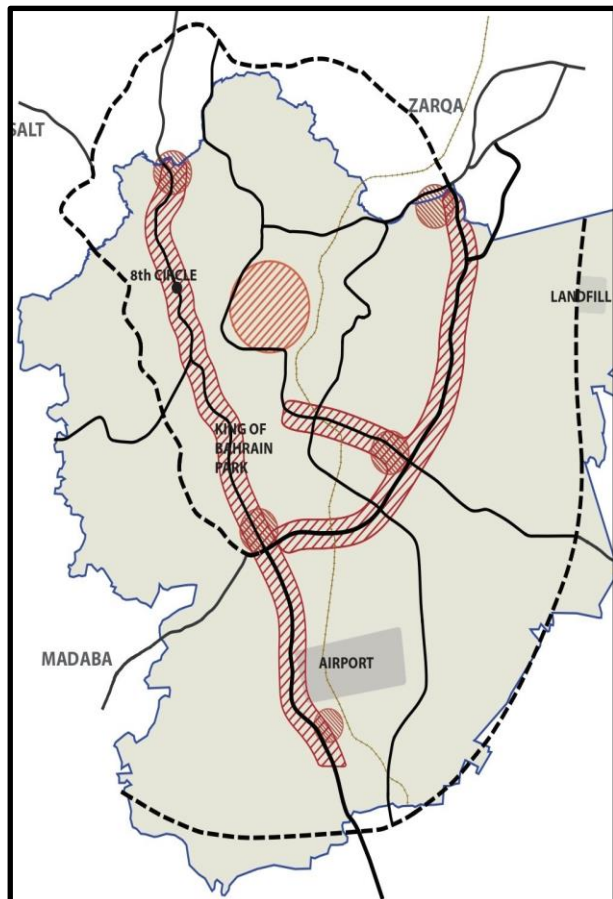


Figure 14: Amman Metropolitan corridors and growth Centre. Source: The Greater Amman Metropolitan Growth Plan Summary Report, 2008

⁶ CSBE: Center of Sustainable Built Environment

⁷ Reference:(The Center for the Study of the Built Environment (CSBE), 2017)

1.2 Amman: a city full of mobility challenges

Commuting in Amman is a combination of an overburdened public transportation system made up of shared public vehicles and medium and large public buses that do not cover the entire city. This public transportation system is intended for all city residents. Still, only the lower class use it, as the upper and middle classes primarily use private motorized vehicles (the most common way of commuting in the city). Most of these motorized vehicles, whether public or private, work on fossil fuel systems, which significantly impact the produced amount of carbon in the city. Over the past ten years, the number of private motorized vehicles has increased dramatically in Amman as population and GDP have risen. According to the most recent census data from the Jordanian Department of Statistics, the number of licensed cars in Amman has increased from 1,583,300 in 2017 to 1,680,200 in 2019. (Department of Statistics (Jordan), 2019)

In a survey study conducted by the UCL Centre for Transport Studies in Amman in 2017 aimed to discuss Amman's urban transportation's current and future challenges, the participants represented a diverse team of experts. All of them demonstrated a thorough understanding of Amman's mobility challenges. According to one of the participants, "*many people now have more than one car per household, even if they are not economically well-off.*" (Clemence Cavoli, Tarawneh and Rahahleh, 2017) A large portion of a household's income is spent on purchasing a new or used car and other expenses such as maintenance and annual insurance. "*People will spend all their time and money on buying a car.*" The demand for and reliance on automobiles use has resulted in severe congestion as a result of lacking a well-structured public network in the city. The availability of free parking and the lack of a well-organized public transportation system throughout the city encourages people to rely more on their private motorized vehicles. The city's streets are becoming "*a giant car park,*" As one participant pointed out. (Clemence Cavoli, Tarawneh and Rahahleh, 2017).

The city report that The UCL Centre conducted for Transport Studies city identified mobility challenges in Amman over time by explaining the old, current, and future mobility challenges in the town, which were, according to the study, an inevitable outcome of poor planning, socio-economic reasons, in addition, to the lack of political will. (Clemence Cavoli, Tarawneh and Rahahleh, 2017)

Amman's first urban mobility challenge is attributed to planning issues. The report made it abundantly clear that Amman had suffered from a lack of a strategic urban planning vision

for decades before the Metropolitan Master Plan of Amman was revealed in late 2008, which was insufficient to cover all comprehensive aspects of land use and transportation in the city. It was limited at best, lacked proof, and an assessment process. As a result, Amman's westward and northward growth has not been accompanied by no transportation planning policies coordinated with land use policy. As a result, wealthy citizens can build in low-density areas without following any urban sprawl-reduction guidelines.

Furthermore, most commercial activities in Amman are concentrated in the city center presents a new challenge. The majority of busy streets with public or private institutions are focused on a specific area, resulting in a high number of trips per inhabitant, which may require the development of new "city centers" that will transform the city into a Polycentric city. (Clemence Cavoli, Tarawneh and Rahahleh, 2017)

Another issue that has emerged is that planning policies have not been adapted to extreme demographic changes. The city has been unable to cope with the massive increase in population that has doubled in less than a decade. The city lacked a planning vision that considered the additional strain on infrastructure services such as water, electricity, transportation, and housing. The city's urban planning policies have not been updated since the Greater Metropolitan Master Plan of Amman was released in 2008. In addition to the fact that the state does not own the majority of the city's lands is a significant impediment to the planning process, placing an additional burden on the government, which lacks the financial resources to purchase these lands for public projects. Also, The city's current planning policies indirectly lead to more horizontal growth and urban sprawl due to the shortage of integration between transportation schemes and land-use planning. (Clemence Cavoli, Tarawneh and Rahahleh, 2017)

Planning a city should be done with the needs of its citizens in mind, which is not the case in Amman. The city was designed to be a car-friendly environment by promoting individual transportation over collective one, and this is evident when the government devotes the majority of its transportation budget, and the international investments, to the construction of roads and highway networks that primarily serve private vehicles in the city without considering that investing in other transportation projects such as trams, metros, or light rails would encourage people to use collective transportation and thus reduce traffic congestion. (Clemence Cavoli, Tarawneh and Rahahleh, 2017)

The effects of poor planning in Amman have significantly been exacerbated since the announcement of Amman BRT in 2008, which demonstrated that the street planning system is mainly designed to accommodate private vehicles and hasn't taken into account the need to widen the streets and add extra lanes for future public transportation projects. Furthermore, if the city had been well-planned from the beginning, it would have facilitated the process of integrating public collective vehicles into the mobility system without the need to re-plan the city and start all over again, potentially saving years of effort and financial burden for both the state and the citizen. Amman also has a scarcity of pedestrian and cycling infrastructure. The city lacks a walking culture for various reasons, including dangerous and difficult-to-use sidewalks, limited transit options, and other factors contributing to people's reluctance to use public transportation. Thus, a comfortable pedestrian setting must accompany the presence of an efficient public transportation network. (Clemence Cavoli, Tarawneh and Rahahleh, 2017)

Modern and sustainable urban planning does not confine urban mobility to collective modes of commuting only; instead, new modes of individual yet sustainable commuting, such as walking, cycling, and Micro-mobility⁸, and the last one has recently been used in many cities around the world. But, unfortunately, the Municipality of the capital ignores the fact that providing more alternatives will give people better options than using their private vehicles.

Amman's second mobility challenge is directly linked to the socio-economic and cultural changes of its citizens. Over the last two decades, there has been a state of social and cultural development and increased awareness of the importance of women's role in society. The labor market is no longer a man's monopoly. Instead, women have become an integral part of production sources, whether at the family or community level, and women's work has become increasingly important. As a result, women have more reasons to commute, whether looking for a job, attending university, or picking up their children from school. Naturally, this increased the number of women who obtained driver's licenses to reach their destination. Unfortunately, for social, cultural, and safety reasons, the majority of women prefer to drive their cars to the current inadequate public transportation. (Clemence Cavoli, Tarawneh and Rahahleh, 2017)

⁸ **Micro-mobility:** Personal transportation using devices and vehicles weighing up to 350 kg and whose power supply, if any, is gradually reduced and cut off at a given speed limit which is no higher than 45 km/h. Micro mobility includes the use of exclusively human-powered vehicles, such as bicycles, skates, skateboards, and kick-scooters. Resource (International Transportation forum-2020)

One of the most significant obstacles to mobility in Amman is cultural differences. The prevalent notion currently circulating in people's minds is that the transition from private cars to public transportation is challenging. This is the last, not the first, option for getting around in a city like Amman, where the presence of a car is unavoidable. This is a widely held belief among many people, particularly those of the current and older generations. On the other hand, spreading awareness of the importance of mass public transport and stimulating behavior change is still possible, particularly for younger generations, provided that the state is willing to offer a well-organized public transport network that can emulate the hopes and aspirations of young people. Another social reason for Amman's reliance on automobiles is that owning a car symbolizes social status and accomplishment. Thus, most Amman residents want to own a car, even if it is beyond their financial means, as long as it gives a sense of social satisfaction. (Clemence Cavoli, Tarawneh and Rahahleh, 2017)

The third mobility challenge in Amman is related to political issues. The will of the state represented by Great Amman Municipality is a key factor in improving the mobility situation in the city. The state does not entirely own the city's public transportation network; instead, most of it is owned by private operators who have contracts with GAM, making it difficult for GAM to engage and regulate their networks. The control of private operators' lobbying on specific routes in the city is a significant impediment to future state-run public transportation projects. It is worth noting that a new law was passed in GAM in 2017 that required private and individual operators to merge within five years or sell their routes to the Municipality. However, this was criticized because five years is considered a long time, and faster steps can be taken within this time frame. (Clemence Cavoli, Tarawneh and Rahahleh, 2017)

Another issue in the city is car parking since people can almost park anywhere in the city because there is no law requiring them to pay for parking in the city, as in some European cities, and this encourages people to drive, especially if they are not required to pay parking fee. Furthermore, some drivers are unconcerned about violating the law by parking in front of a residential parking entrance or blocking sidewalks. Others, especially Minibus and taxi drivers, exceed the speed limit and commit serious traffic violations, and the government must address that through comprehensive intervention strategy and stricter traffic laws. (Clemence Cavoli, Tarawneh and Rahahleh, 2017)

1.3 Sustainable mobility as an urban resilience strategy

The concept of "resilience" has gained popularity in recent years in both academic and policy debates. However, its definition is still ambiguous and may vary slightly in its comprehensive understanding of different scientific disciplines.

According to Richard J.T. Kleina, Robert J. Nicholls, and Frank Thomalla in their paper "*Resilience to natural hazards: How useful is this concept?*" according to, the term resilience derives from the Latin word *resilio*, which means "the act of rebounding or springing back" (Klein, Nicholls and Thomalla, 2003). The definition of resilience is malleable, allowing researchers and policymakers to collaborate around a shared vocabulary without agreeing on an official definition (Fridolin Simon Brand, 2007). In their paper "Defining urban resilience: A review," Sara Meerow, Joshua P. Newell, Melissa Stults proposed their definition of urban resilience "*Urban resilience refers to the ability of an urban system and all its constituent socio-ecological and socio-technical networks across temporal and spatial scales to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change and to transform systems that limit current or future adaptive capacity quickly.*" (Meerow, Newell and Stults, 2016)

Amman recognized the significance of implementing an urban resilience strategy. In 2014, the city was selected to participate in the Hundred Resilient Cities (100RC) program, where it received technical assistance and resources to develop and implement a city resilience strategy. This program's significance stemmed from Amman's ability to share and exchange knowledge and lessons learned from other cities worldwide. GAM addressed a set of actions and plans that would assist its inhabitants in adapting to various social and cultural shocks such as the recent influx of migrants, economic shocks such as lack of natural resources, and environmental shocks such as climate-related challenges by releasing the Amman resilience strategy in 2017. (Ababsa *et al.*, 2020)(Greater Amman Municipality (GAM), 2017)(Shamout, Boarin and Wilkinson, 2021). The Amman resilience strategy aimed to outline a vision for a resilient Amman by developing a set of actions and evaluating potential future shocks, stresses, and potential scenarios affecting city assets based on a thorough understanding of the city's current resilience status. (Greater Amman Municipality (GAM), 2017)

The Amman resilience strategy is founded on five main pillars, which are considered the city's resilience strategies cornerstones. Each pillar has its own set of goals that must be met through a variety of actions. Figure 6 depicts how the five pillars led to the development of 16 goals and 54 actions. The first pillar describes the vision of Amman as a smart city that promotes walking while maintaining a reliable transportation system. The second pillar establishes Amman's perspective as an environmentally responsible city that responds to climate change challenges by investing sustainable energy resources and managing water more effectively. The third pillar portrays Amman as a prosperous and innovative city. A city promotes entrepreneurship and fosters a better investment environment, resulting in lower unemployment and more job opportunities. The fourth pillar corresponds to the concept of Amman as a city that supports young people and treats them equally without prejudice. The fifth and final pillar envisions Amman as a cohesive and proud city that promotes public participation and solidarity. (Greater Amman Municipality (GAM), 2017)

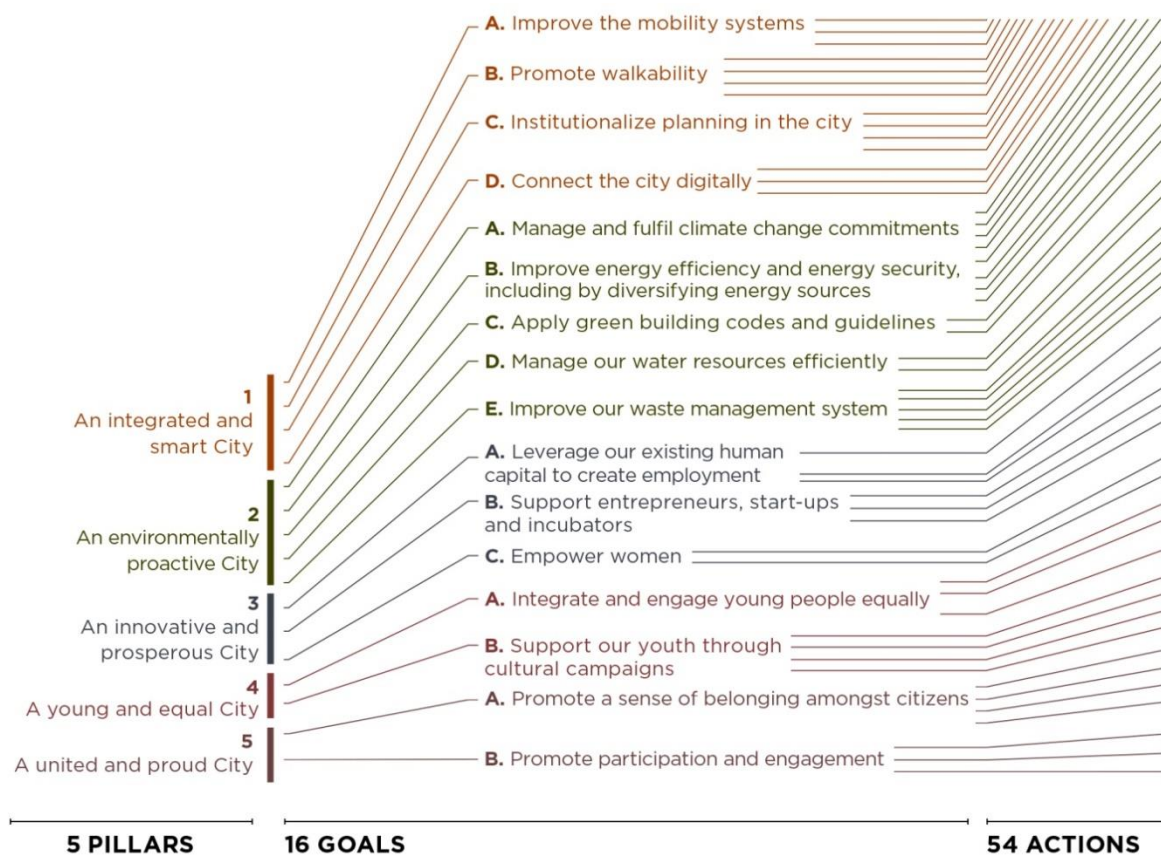


Figure 15: Amman Resilience Strategy, pillars, goals, and actions. Source: GAM Amman resilience Strategy, 2017

Improving mobility systems was the first goal of the first pillar of Amman's resilience strategy, demonstrating the importance of this goal in the city's overall planning. Amman's mobility situation is precarious in the face of impending shocks. The city's mobility system desperately needs sustainable solutions; the lack of reliable public transportation forces people to rely on private vehicles, resulting in increased traffic congestions and longer commutes, thus losing time and effort. (Greater Amman Municipality (GAM), 2017)

The strategy set up a set of actions that must adhere to its goal of creating a sustainable motility system, commencing from the fact that promoting a sustainable and reliable mobility system involves coordinating land-use and transportation planning within a comprehensive planning framework. This integration in planning will motivate both pedestrians and drivers and prepare them for behavior change and thus, using collective transportation the culture of walking will become dominant likely to result in not only reduced traffic jams but will also result in lower CO2 levels, thus improving air quality. (Greater Amman Municipality (GAM), 2017)

Another action included in Amman's resilience strategy is the development of a Bus Rapid Transit system, which is inspired by Bangkok's integrated mass transportation system plan. The development of a BRT system in Amman aims to create an economically viable project that is simple to build and can provide residents with an alternative mode of transportation. Amman BRT will be made up of high-capacity buses that will travel in exclusive and separated lanes. Buses will operate every three minutes within a strict timing schedule. The initial network will consist of three major routes that connect city neighborhoods from north to south and east to west. The system will eventually be expanded to cover all of Amman's neighborhoods. This action entails developing all technical aspects of the project, including bus types, bus stops, and terminal stations, traffic and transportation solutions. The Amman BRT will have the potential to provide an efficient, competitive, and modern public transportation system, thereby reducing reliance on automobiles and giving people more affordable options for getting around the city (Greater Amman Municipality (GAM), 2017)

In terms of future actions, the Amman resilience strategy recommends the construction of a metro line as another long-term solution to improve the city's mobility system. Due to the high cost of metro projects, the action proposes a promising business model, BOT, which has

proven its competence all over the world.⁹ In this model, the municipality conducts a feasibility study, allowing the investor to build the metro line. Following that, the investor will run the project for several years to recoup its initial cost and profit. When the contract expires, the project will revert to the ownership of the municipality. This will improve citizens' access to public transportation while also assisting Amman in meeting its goals of becoming a healthy, efficient, and sustainable city. (Greater Amman Municipality (GAM), 2017)

Another recommendation for future action was to establish an urban observatory dedicated to smart data collection, information exchange, and urban mobility expertise. It will also serve as a mass transit command center, monitoring and controlling the city's mobility network systems. This observatory will collaborate with multiple disciplines including traffic, ambulance, and fire services to provide emergency access in exceptional cases. In the meantime, people will be warned to avoid any potential traffic jams along their routes, and they will be directed to less congested roads. (Greater Amman Municipality (GAM), 2017)

Developing sustainable mobility systems must always be accompanied by a climate-change mitigation strategy. The 2017 resilience strategy set a precedent by making Amman the first city in the Arab world to implement a climate action plan. The action emphasizes the importance of having sustainable and clean public transportation that is more reliant on renewable energy sources like electric vehicles. Furthermore, creating public transit-oriented walking corridors and improving pedestrian safety, particularly at intersections with BRT stops throughout the city, will also promote city walkability. (Ababsa *et al.*, 2020)

This can be regarded as the beginning of an urban resilience ideology in Jordan, at least in terms of urban policy and decision-making. In the strategy, resilience shocks are classified as continuous burdens. Many of these challenges, such as limited energy resources, scarcity of water, and a lack of dependable transportation systems, can also be perceived as sustainability issues; thus, these shocks highlight the interdependence of resilience and sustainability. However, what is worth noting is that the term resilience appears 360 times in the strategy while the term sustainability appears only 38 times. (Shamout, Boarin and Wilkinson, 2021)

⁹ **BOT: Build, Operate and Transfer:** is a method of financing a project involving two or more parties. The term is most common with large infrastructures of real estate companies and public-private partnerships (PPPs) for government infrastructures. Source:(Outsource Accelerator, 2021)

1.4 Transition strategy towards a more balanced mobility systems

A well-developed infrastructure is regarded as an important factor in the emergence of cities and the development of their economies all over the world, and an important component of this structure is the ease of movement of civilians, implying the need for an effective public transportation system. (Al-Habahbeh *et al.*, 2018) However, Jordan's public transportation has been plagued by several issues that have hampered both its ability to transport people and the extent to which citizens use these modes of transportation for decades. Among these issues are mismanagement of public transportation facilities, noncompliance with dates and stopping places, and route randomness. (Obaidat and Mujalli, 2016) All of this prompted Amman to adopt some mobility policies aimed at achieving a citywide mobility transition that is balanced, sustainable, and cheap.

Amman's resilience strategy and climate action plans were two crucial components in establishing the city's sustainable transitions features. Sustainability transition is defined as a *“radical transformation towards a sustainable society, as a response to a number of persistent problems confronting contemporary modern societies”* (John Grin, Jan Rotmans, 2010) It is critical to stress that making the mobility transition would necessitate simultaneous efforts on numerous tracks, as focusing solely on one track and ignoring the others may have undesirable consequences. For example, switching from private motorized automobiles to electric vehicles may cut pollution, but it will not, by itself, reduce the number of cars on the road or the amount of traffic congestion. (Ronja Schiffer, Deyala Tarawneh, Ahmad Zeyad, 2020) Yet It is critical to stress that making the mobility transition would necessitate simultaneous efforts on numerous tracks, as focusing solely on one track and ignoring the others may have undesirable consequences. For example, switching from private motorized automobiles to electric vehicles may cut pollution, but it will not, by itself, reduce the number of cars on the road or the number of traffic jams.

In Amman, the percentage of car ownership has increased significantly, and while public transportation is a minor component of the city's mobility system, limited to specific groups who are financially unable, taxis and private cars are regarded as the city's dominant components. The lack of accessible and affordable transportation options is the main reason for the low use of public transportation. This prompted people to purchase more private vehicles in the city, resulting in increased emissions, air pollution, and traffic congestion. (Ronja Schiffer, Ali Attari, Mohamed Hegaz, Hazem Zureiqat, Rami Semaan, 2019) Aside

from its consequences on the economy and household expenditure, the car-dominated mobility system has had a significant impact on the environment, both in terms of pollution and greenhouse gas emissions.



Figure 16: Persons per vehicle in Jordan *Source: Mobility transition in Mena Region, 2019*

Jordan has experienced a substantial increase in the usage of hybrid and electric vehicles in recent years. People are getting more interested in owning electric vehicles, especially since the government has provided them with tax and customs benefits. According to a study on the mobility transition in the MENA¹⁰ region done by Friedrich-Ebert-Stiftung in 2019, “the total number of registered electric vehicles in Jordan was 16,000 according to a statement by the Minister of Transport at the time. Both the government and GAM have also replaced a portion of their own car fleets with electric vehicles.” (Ronja Schiffer, Ali Attari, Mohamed Hegaz, Hazem Zureiqat, Rami Semaan, 2019)

Despite its potential, Jordan's electric vehicle sector faces several obstacles. People are still wary about relying on electric vehicles as their primary source of mobility. This is primarily due to the lack of charging facilities throughout the country. Moreover, the battery limits the lifespan of an electric vehicle, and due to government restrictions on battery imports, replacing batteries is currently not an option in Jordan.

Jordan has recently made attempts to improve public transportation, particularly in Amman. GAM introduced a new bus network called "Amman Bus" in 2019, which, unlike most of the other buses that operate primarily on a commercial basis, follows a set of timetables and adheres to specific quality service, as well as accommodating to disabled people. Despite its small network, Jordan's Amman Bus is widely recognized as the country's first standards-

¹⁰ **MENA:** Middle East North Africa

based, subsidized bus service.(Ronja Schiffer, Ali Attari, Mohamed Hegaz, Hazem Zureiqat, Rami Semaan, 2019)

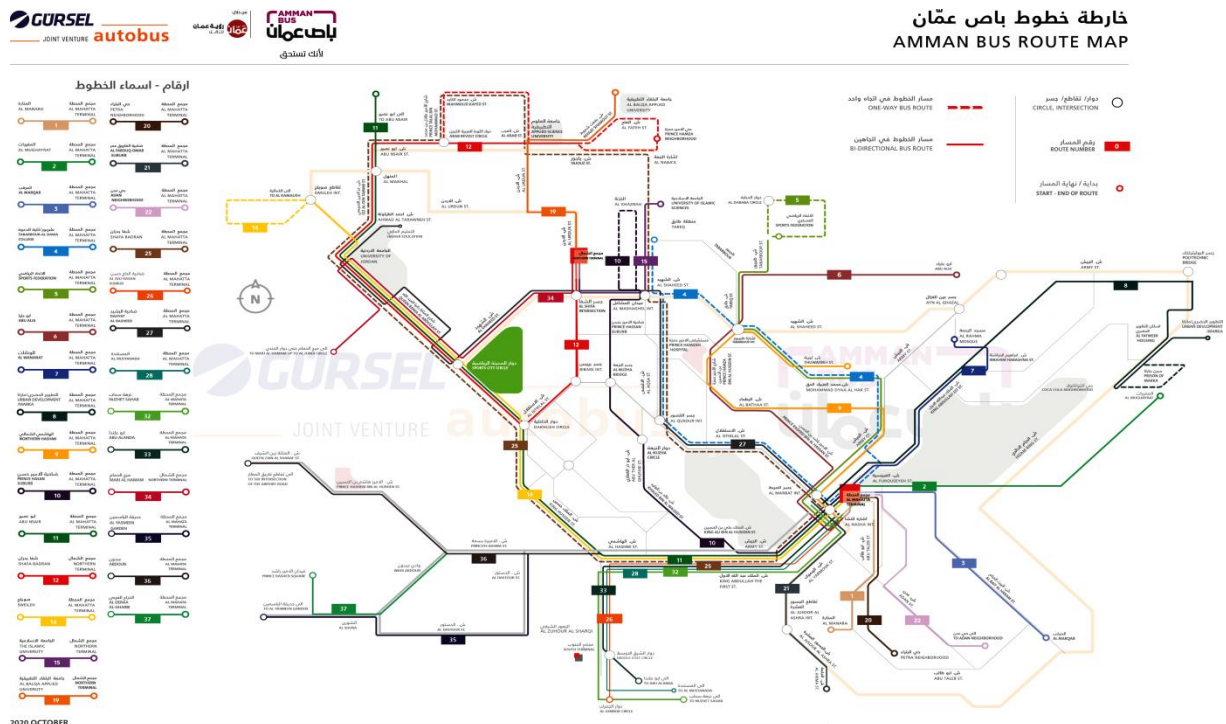
According to GAM, the mission of Amman Bus is to improve public transportation in the city at a time when public buses in Jordan account for only 14 percent of total daily trips. Officially, it began when the Greater Amman Municipality established a fully owned company in the name of "Amman Modern Vision Company for Transportation" to handle the Amman Bus Project. The operating bid was awarded to a Jordanian-Turkish consortium for the management and operation of the Amman bus. (Omar Faris-Hiber, 2019) The project was funded by a 12-million-euro EBRD¹¹ loan to GAM to finance the purchase of 151 buses, 136 of which are diesel Euro V buses and 15 of which are electric zero-emission buses. This project is considered as GAM's first major step toward developing the urban mobility system, and it is expected to significantly improve the city's transportation services. (European Bank for Reconstruction and Development (EBRD), 2019)

In Amman, the project was carried out through 55 bus stops and 33 terminals. Operating 135 buses on 27 routes on a regular and frequent schedule, as well as providing a better transportation environment through comprehensive information systems, an electronic payment system, and advanced security measures. Meanwhile, consideration is being given to special access for disabled and elderly passengers. (Greater Amman Municipality (GAM), 2019) Nevertheless, anyone who rides the Amman bus will notice no difference between it and any other form of public transportation; the same old issues remain, there are no set dates, and the bus does not stop at the designated stops on the track. The main distinction is that the bus is clean, easy to board and exit, and has air conditioning.

The Amman Bus operates under a subsidized operating contract, which is not the case for other private operators of collective transportation such as minibusses, shared taxis, and large buses. Despite Amman Bus's new business model, the current transportation system as a whole has several flaws, as it does not cover all the neighborhoods in the city and only covers some of them. The Amman Bus reshaped the city's transportation map by intersecting its lines with those of private transportation companies. Many private sector operators objected to placing the Amman Bus route in their work areas, which was one of the controversial points in the Amman Bus project. The Amman Municipality explained that the service provided by these private companies has deteriorated and that residents in those areas

¹¹ **ERBD:** European Bank for Build and Development

have expressed their dissatisfaction. In addition, some buses violate the terms of their operating contracts and licenses.



2020 OCTOBER
Figure 17: Amman Bus map. Amman bus Source: Ammanbus. jo, 2019

GAM has introduced the "Amman Bus Rapid Transit-BRT" project, the city's second standard subsidized service, in another attempt to improve public transportation and support and integrate with Amman's bus network. This project will be discussed in greater detail in the following chapter.

Along with Amman Bus, and Amman BRT, The Ministry of Transport has developed and adopted a code of conduct for public transportation operators and customers as part of a World Bank-funded program. (Ronja Schiffer, Ali Attari, Mohamed Hegaz, Hazem Zureiqat, Rami Semaan, 2019) Despite these efforts, the city requires a comprehensive mass transit plan that includes the development of an integrated transportation network that monitors and coordinates between the Amman bus, private minibusses, shared taxis, and the Amman BRT to reach every neighborhood in the city.

Chapter 2: Amman BRT, a Jordanian experience towards sustainable mobility

2.1 Project birth and expected results

After providing a general image of the mobility system challenges in the Jordanian capital in the first chapter, The second chapter focuses on the practical steps that were implemented by GAM to provide better public transportation services in the city.

Major investments in roadway infrastructure, particularly in the previous two decades, have failed to alleviate traffic congestion, at a time where public transportation options are insufficient, unreliable, and underutilized. The prevalence of private transportation in Amman can be attributed to a combination of the relatively low cost of using private automobiles in Amman and the current lack of good public transportation services. Therefore, GAM's strategy to develop the Amman BRT system was a vital step in upgrading the mobility system from its present level to that of other major global cities. (Greater Amman Municipality (GAM), 2010)

In Amman, the percentage of people who use public transportation does not exceed 13%, which is very low when compared to cities such as Hong Kong (90%), Cairo (75%), and even Beirut (30%), which is known for its abundance of cars and traffic jams. (Sawsan Zaydeh-Amman Net, 2011) The city's population has steadily increased in recent years, necessitating an urgent need for a modern, integrated public transportation system. As part of its Amman 2025 vision as a modern, sustainable, and environmentally friendly city, GAM insists on achieving one of its most important strategic goals, promoting public transportation and boosting its operational capacity by increasing the number of users from 14 percent to 40 percent. As a result, the decision was made to establish a modern, efficient, and low-cost bus network that runs in designated lanes and does not interconnect with other vehicles in the city. The new bus network, also known as the Bus Rapid Transit BRT network, differs from other networks in that it is comprised of large-capacity buses that run and stop at fixed frequencies every three minutes, allowing passengers to avoid long waits for the next bus. (Greater Amman Municipality (GAM), 2021)

Several cities around the world have implemented BRT systems as part of their mobility networks. Bogota, Colombia, served as a major inspiration for the Municipality of Amman, which listed it as a global case study on its website. The example of the Bogota BRT system,

also known as the “TransMilenio Bus Rapid Transit System”, provides a small glimpse of the project's potential. According to the Urban sustainability exchange¹² website From 41 kilometers in 2000 to 207 kilometers in 2015, the TransMilenio network has grown dramatically. It is currently home to the world's largest BRT network. Many vehicles and taxi drivers are drawn to the new system because of enhanced fuel efficiency, transportation times, as well as increased safety, reliability, and comfort, which results in better traffic flow in the city. This was a powerful motivator for GAM to take on such a project. (Urban Sustainability Exchange (USE), 2014)

The Amman BRT was announced in 2009, with the groundwork beginning in 2010. However, its implementation stalled in the following years for a variety of reasons, including a recommendation to the Jordanian Parliament to halt it and refer it to an international company for evaluation due to its high cost. The Jordanian government resumed work on the project in 2014, but it was not officially re-implemented until 2018. The operational pilot phase of the project began in 2021 and it is scheduled to be fully operational in 2023.

The project's first phase consists of two tracks totaling 25 kilometers in length, as well as 140 modern buses that will transport up to 315,000 passengers per day to the city's busiest areas, providing users with a quality of service comparable to that of a subway or trams. (French Development Agency (AFD), 2018)

Following the operational pilot for the first phase In July 2021, Amman Mayor Dr. Yousef Al Shawarbeh announced the start of technical studies and feasibility studies with the world bank for a fifty-kilometer trail that will serve other areas of the city as the project's second phase. (Al Ghad Newspaper, 2021) The French Development Agency provided a soft loan of \$166 million for the BRT project, with \$127 million set aside for infrastructure improvements, \$7 for an e-operating system, and approximately \$14 million set aside for administration. The loan's maximum interest rate was 6.5 percent, not including the cost of the buses. (Imad al-Rawashdeh-Amman News, 2012)

¹² **Urban sustainability exchange:** is an online platform dedicated to promoting sustainable urban development. It showcases successful programs, projects, and policies and connects city makers.



Figure 18: Amman BRT map. Source: GAM, 2015

The project is divided into three packages that run from north to south across the capital and connect the city's major intersections. As shown in Figure 8, the street is divided into two lanes in the middle for buses, two islands for passenger parking, three lanes for cars on each side, and two sidewalks for pedestrians. (Greater Amman Municipality (GAM), 2015) (Amman net)

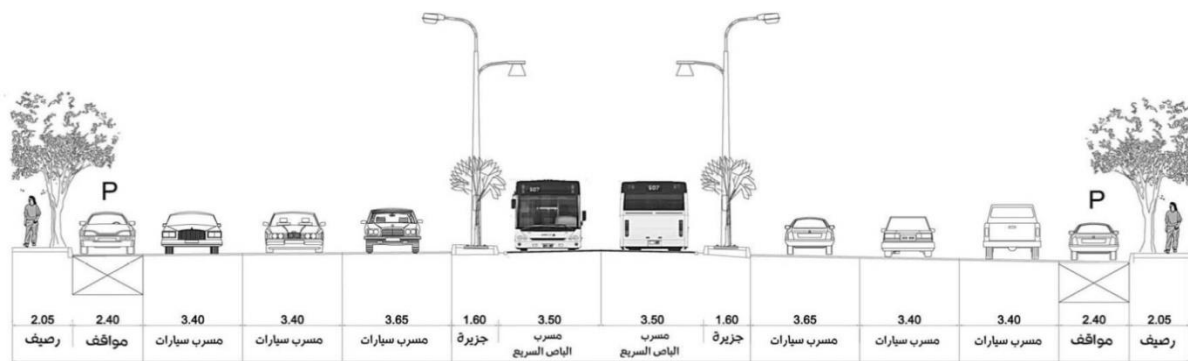


Figure 19: Cross-section for Amman BRT project, Source: GAM, 2015

According to GAM's Amman BRT website, the BRT system will have a positive environmental impact on the city by saving 85 million kilometers of distance traveled by private vehicles and 12 million kilometers of distance traveled by taxi, resulting in lower CO2 emissions. Furthermore, at least 4000 native trees will be planted in the middle islands that separate the bus from cars lanes. (Greater Amman Municipality (GAM), 2021)

2.2 Discontinuities in the project assembly

Following the announcement of the project in September 2009, financial negotiations with the French Agency for Development began to secure a soft loan for the project. In April 2010, GAM finalized the feasibility and technical studies for the Amman BRT and received approval from the relevant government authorities to begin construction. During the first five months, Marouf Al Bakhet's government made no observations, until the Parliament unexpectedly decided to form a committee to investigate the project. (Greater Amman Municipality (GAM), 2015)

In May 2011, the Parliamentary Committee submitted its report to the Prime Minister, demanding that the project must be halted permanently and asking him to form an audit committee to hold those responsible to account. The committee justified its request by claiming that Amman does not require such a project, as well as its high cost of 166 million dollars at a time when GAM is experiencing a financial deficit and that this loan will increase GAM's economic burdens. In June 2011, and based on a parliamentary recommendation, The government formed a special committee to investigate this project, and the decision was made to suspend the project. (Greater Amman Municipality (GAM), 2015)

In its report issued in August 2011, the Audit Bureau concluded that the project is not economically, socially, or environmentally feasible and that GAM carried out the project without conducting the necessary engineering, social, environmental, and economic studies. In September 2011, the government made the final decision to temporarily halt the project until it could be evaluated by an international professional consultant. One year later, in September 2012, the government submitted the evaluation to a Spanish advisory coalition, demonstrating the pervasiveness of bureaucracy and neglect in government performance. (Greater Amman Municipality (GAM), 2015)

In February 2013, the Spanish consultant completed its audit report, stating that the project is important for Amman City and that it is possible to implement with some modifications, for which the Amman Municipality has already provided solutions. A project road map was created, including revised project implementation and financing plans. In December 2013, the government agreed to resume the project. (Greater Amman Municipality (GAM), 2015)

The project's back in action began in June 2015, when construction work was moving at a relatively slow pace. However, these efforts gained momentum following the election of Dr.

Youssef Al-Shawarbeh as Mayor of the Greater Amman Municipality in 2017, who closely monitored the project's progress until its trial operation in July 2021.

The project, which began in 2010, lost steam after a three-year hiatus, demonstrating that the presence of grants, loans, and financial aid is insufficient to support the city's public transportation network in the absence of an effective political will, which takes citizens' issues and concerns seriously. The most pressing issue is the establishment of a modern public transportation network that connects the city's parts and relieves the burden on citizens who suffer in their daily exhausting trips and have no other choice. Furthermore, the project's long suspension raised suspicions of corruption, which tarnished the project and those in charge and gave them a negative image ahead of time, causing the project to fail before it even began. The overlapping of political interests and special economic pressure groups, including ministers, parliamentarians, businessmen, and media professionals, had a negative impact on the project, as they conspired to obstruct the project and mislead the public.

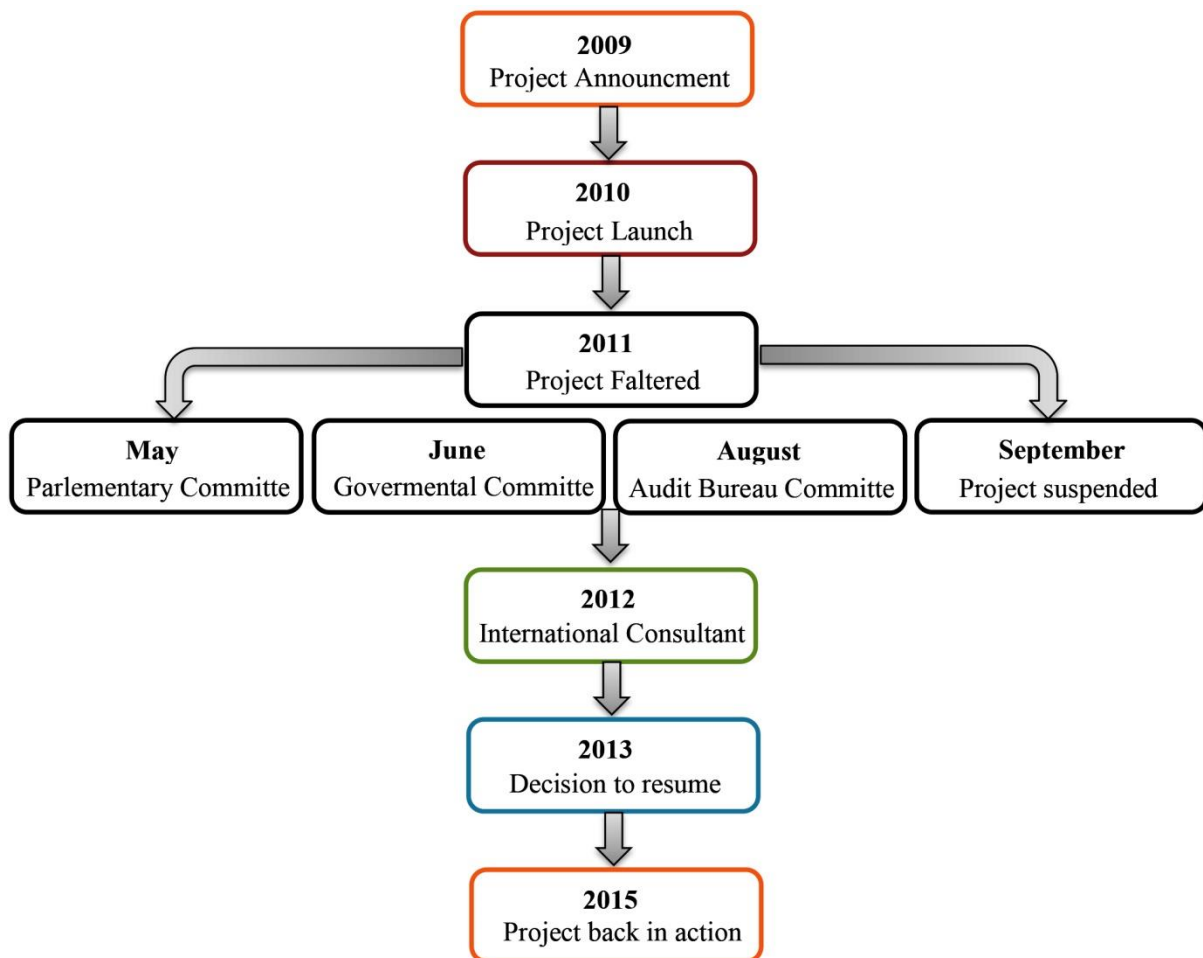


Figure 20: Amman BRT stumble stages. Source: Author, 2021

2.3 Between sustainable mobility and political will

Residents of Amman have long complained about bad public transportation, and what irritates them is that the city is developing, its population is growing, but the city's public transportation remains the same. The great majority of GAM and Ministry of Transport spendings have gone into transportation infrastructure that serves private automobiles, while initiatives to improve public transportation have received little attention. Until the inauguration of Amman Bus in 2019, Amman, the capital of Jordan which celebrated its centennial in early 2021, lacked a truly public subsidized bus network and had to rely on the private sector to serve the city.

GAM announced that public transportation in the city will no longer be a challenge for the city's residents once their new BRT project is opened. The Municipality raised the bar of its expectations to this project and promised the Jordanians that they will finally get the decent public transport that has been looking for. However, People have little faith in neither the Municipality nor the government, and they do not believe that all of the financial aid provided by international organizations has been put to good use. Another source of dissatisfaction is a lack of public participation; residents of the capital do not feel involved in the decision-making process when it comes to most public projects, and they do not believe Amman BRT is an exception. According to survey research conducted in 2018 by International Republican Institute¹³, more than 50% of Jordanians believe that they do not influence decision-making. (International Republican Institute (IRI), 2018)



Figure 21: International poll reveals that Jordanians remain frustrated with the economy and Government. Source: IRI, 2019

¹³ **IRI:** International Republican Institute Center for Insights

The fact that this project has been partially opened for operational trials after more than 11 years and still needs two years more to be fully operational demonstrates confusion and reluctance in the government's handling of the project, highlighting a lack of genuine political will and a deficiency in decision-making regarding vital and urgently needed projects.

What made matters worse was that the BRT project's three-year suspension put the city in a precarious position. Excavations were everywhere, roadways that used to be wider were narrower as GAM employed about half of them for project infrastructure, and residents were stuck in traffic for nearly the whole day. Excavation work not only caused traffic congestion, but it also harmed many business owners whose stores were close to the excavations work; their customers couldn't reach them because most of the streets were ruined for infrastructure construction, and they had to travel a long distance to get there. According to the Jordan Times, in their interview with Bilal Maswadeh, head of a committee of impacted traders of the BRT project in the Tabarbour area, the construction work for the Amman BRT is expected to effects 82 out of 230 businesses in the Tabrbour intersection area and will cause around 12 million JD¹⁴ in losses within only two years. (Bahaa Al Deen Al Nawas-The Jordan Times, 2019)



Figure 22: Constructions works on Tabrbour intersection, Source: Jordan Times, 2019

The head of the committee stated that no one was informed about the construction project before it started and that the GAM failed to provide advance notice to business owners so that

¹⁴ **JD:** Jordanian Dinars. 1 JD = (1.41 USD), (1.21 Euros)

they could prepare. *“If the municipality warned traders at least a couple of months beforehand, losses could have been mitigated. Many have bought stocks assuming they will still be working normally, some gyms for example had their members demanding their subscription money back, and wedding halls are canceling reservations because no one wants to have a wedding in a dug-up street,” Maswadeh said.*” This indifference and lack of coordination between the Municipality of Amman and the local community is clear evidence that public participation is absent and that there is no political decision to involve the people in the decision-making process. Therefore, if this project reaches its end, assuming that it will succeed, the percentage of its damages will have exceeded its benefits. Therefore, the strategy for establishing a sustainable mobility system must take into account the importance of community participation from the initial stages of project establishment, to avoid any damages that cause setbacks to the people or the project. This brings us to the conclusion that if the Municipality of Amman wants to see its public initiatives thrive, it needs to collaborate and consult with the local community, especially since the project's target group is city inhabitants who desire a sustainable public transit system.

“The construction work for the Amman BRT is expected to affect 82 out of 230 businesses in the Tabrbour intersection area, causing around 12 million JD in losses in only two years.”

To create this sustainable system, the city must adopt policies that involve the local community in the decision-making process especially for transportation projects, and establish specific regulations that prioritize public transportation and land use planning by adequately funding them. The Municipality of Amman can launch an awareness campaign in collaboration with stakeholders from the local community, to explain the impacts of the BRT system on the daily lives of the capital's residents and to convince them that the alternative is there. All of that requires a strong political will that can -if found- implement a sustainable mobility system.

2.3.1 Realities and prospects

This component of the study attempts to answer the research first question, by looking at possible impacts of the Amman BRT project on the current mobility situation in the city.

Jordan's public transportation culture is being hurt by a slew of issues that are tarnishing its image. Poor transportation infrastructure management, delays and timetables, route and line randomization, absence of bus stations, and unstable daily fluxes in the number of buses for each route are just a few of these issues. (Obaidat and Mujalli, 2016)

The weak transportation system in Amman generates issues such as traffic bottlenecks and long passenger wait times, wasting time, money, and effort. As a result, sustainable public transportation has become a critical requirement, particularly in light of the deteriorating global environment and climate change, the escalation of the energy crisis and high oil prices, and the city's residents' economic difficulties. (Obaidat and Mujalli, 2016)

In July 2021, GAM announced the launch of the Amman BRT pilot operation and that it will run officially at maximum capacity in 2023. People in the city were not enthusiastic about this project, which could be attributed to the fact that there were suspicions and took a long time to complete. The most important question will be whether or not this plan will improve public transportation. Why is this initiative different from others, and does the fact that it has been successful in other places throughout the world mean that it will be effective in Amman, taking social, economic, and cultural variables into consideration? A research study conducted in 2018 at the University of Jordan (JU)¹⁵ about the optimum transportation system for Amman, recommended that BRT (especially if electrical busses were used) and monorail systems are the best transportation solution for Amman. (Al-Habahbeh *et al.*, 2018)

What is agreed upon between most people, is that the overall scene of the mobility system needs to be changed. A public comprehensive and integrated transportation system should be established to provide people with alternatives. On the other hand, people are aware that change will take time. It will be gradual and will not happen overnight. One initiative will not change the difficult reality, but it may assist to better things if people believe the Amman Municipality is serious about change. According to Engineer Riyadh Al Kharabsheh¹⁶ the

¹⁵ JU: Jordan university, recently changed to University of Jordan

¹⁶ Riyadh Al Kharabsheh :Director of Public Transport and Transport Infrastructure projects in the Greater Amman Municipality

Director of Public Transport at GAM, *“The BRT system is the first step and cornerstone for public transportation in the city”*. One project will not change the difficult reality, but it may assist to better things if people believe the Amman Municipality is serious about change. To be accurately evaluated, the Amman BRT must be viewed as part of a larger network.

The public mass transit system is built gradually in the cities, and it takes decades for a city to reach sustainability in its urban mobility systems. If Amman BRT is going to be the cornerstone of sustainable urban mobility, why have the government waited all these years to do that? If successive governments had invested decades in establishing public transportation projects like BRT, metros, or trams Amman's streets would not have been choked, and traffic crises would not have drained all this time, effort, and resources. The Municipality of Amman should have thought about offering the people of Amman a reliable public transportation network that connects its neighborhoods and streets, pushes people to dispense with their cars for their transportation, and sets the pace of life smoothly a long time ago before reaching this critical point, where a single project is tasked with easing challenging circumstances and bearing all of the burdens associated with improving them.

The residents of Amman are paying for the poor urban planning for their city. One of the important reasons for the population growth in the city-beside the refugee crisis- is domestic immigration, A lot of people moved to Amman because it was hard for them to stay in their cities while working in the capital. Establishing a trains network between cities could have managed to keep a lot of people in their cities, especially that Jordan is a small country in terms of land size, and the longest distance between the city of Ramtha in the north of the country on the Syrian borders and Aqaba in the south on the red sea does not exceed 400 Kilometers.

During this study, several interviews have been conducted to understand how this project will change the current public transportation situation according to the stakeholders of the project's point of view. When asked about the main reason that made GAM chose o to implement the BRT as its first option over other systems is the low cost of the project and the city can afford to do it.

This point of view was in line with the deputy directeur of AFD who is the primary financier of the Amman BRT in Jordan Mr. Kassim Shayan who thinks that the BRT model suits Amman in many aspects. He clarified *“I think that Amman BRT as a mobility model suits Amman in different aspects, it's a low-cost project will be much feasible than other*

transportation projects like metros or light rail (trams) especially because the cost will include buses and roads equipment. also, the geographical terrain of Amman will be better served by bus than the light metro”.

The Amman BRT will have both direct and indirect implications for the city's future urban mobility. The bus will save time in the short term, which is an important reason for people to use this bus. Many people in Amman avoid using public buses because they do not adhere to timetables, do not trust the current situation, and cannot risk arriving late. Besides that, Amman BRT is made up of a network of frequent buses that arrive every three minutes at each stop. The availability of these buses will give people more confidence to use them, or at the very least to try them out and evaluate their efficacy. Moreover, Amman BRT would vary from conventional buses in that it will run in its dedicated lanes to its destinations. When opposed to a regular bus, which shares the road with all other cars, it will not be trapped in traffic and will save time.

In terms of cost, public transportation systems are designed to be a cost-effective means of transportation for individuals. On a social level, Amman BRT will provide customers with more affordable rides than they would get in their own cars, and on a national level. GAM, described Amman BRT as a low-cost project that can be afforded by the state as explained by Engineer Riyad Al Kharbsheh, *“We can't build a metro or light rail system because we have limited financial resources for the entire country, not just Amman. The only way for us to proceed would be to build dedicated bus lanes alongside the new streets; the infrastructure costs will be minimal because they will be the same as regular roads; you only need to consider bus lanes. This model fits our state capacity.”*

When compared to driving, the increased number of people using Amman BRT would boost their safety, which is a crucial factor to consider. In 2019, Jordan has 1,677,061 registered vehicles, accounting for 15% of the total population, with one out of every six Jordanians having a car, the highest level of car ownership in decades. Jordan has had issues with road safety for quite some time. According to a report by the Jordanian Public Security Directorate (PSD)¹⁷, there were 61,511 accidents in Jordan in 2019, with 643 persons killed in road accidents, resulting in a fatality every 13.6 hours on average. Besides that, the total cost of traffic accidents was estimated at 324 million JD. The annual cost of car accidents has

¹⁷ PSD: Public Security Directorate in Jordan

increased by 4.5 percent during the last five years. (Jordanian Public Security Directorate (PSD), 2019)

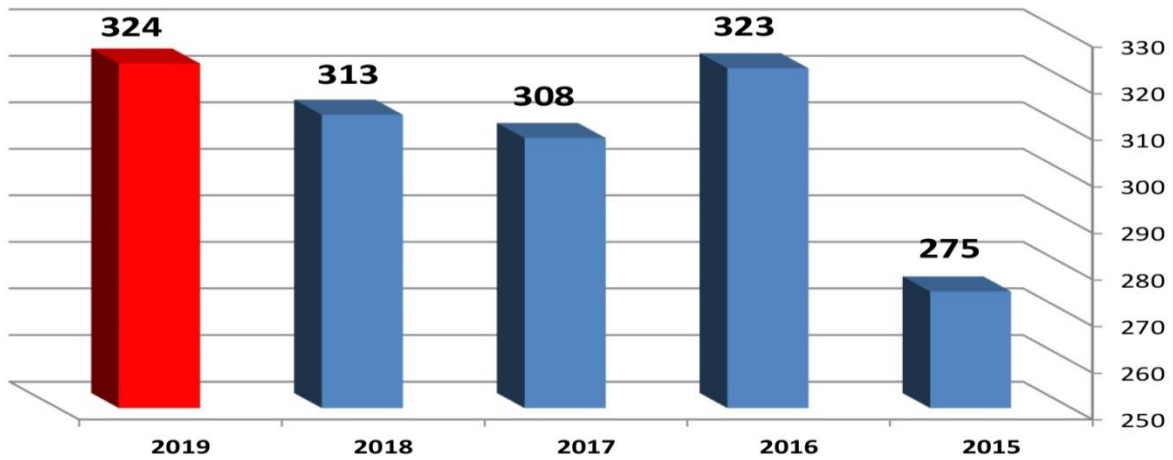


Figure 23: Jordan's traffic accident costs over the last five years (figures in millions)

Because a mass transportation system carries a large number of people, it offers them a single means of transportation rather than requiring them to use several means, saving them time and money while also helping the environment. On the other hand, when we compare the public transportation system to private automobiles in terms of environmental impacts, we can see that private vehicles have negative environmental consequences in terms of air pollution and greenhouse gas emissions. In Jordanian cities, vehicle traffic accounts for 50-90 percent of air pollution. (Ronja Schiffer, Ali Attari, Mohamed Hegaz, Hazem Zureiqat, Rami Semaan, 2019) As a result, public transportation is a viable option for environmental preservation and preventing global warming. Although the type of buses to be used in the Rapid Bus project has not been determined, the Greater Amman Municipality has purchased 15 electric buses with the help of a loan from the European Bank for Reconstruction and Development.

To conclude, Amman BRT was not designed to work alone, and it will only be effective in the city when it is incorporated into an integrated public transport network. The passenger might need more than one ride to reach the BRT stop. Therefore, the municipality should provide a wide network of feeding services such as Amman buses, minibusses, or shared cars that can connect people to BRT stations connected with well-organized pedestrian equipment, to make this project practical and attractive for people. Furthermore, if GAM has the will to prioritize mass transportation, this project will serve as the groundwork for long-term mobility.

2.3.2. Various aspirations, different expectations

This component of the study attempts to answer the research second question by looking at how individuals view the project and how stakeholders justify their expectations.

To have a better grasp of the project's genuine impacts, we must accept that our expectations must be reasonable and that ambitious objectives require time to achieve. Any successful project, whether in the transportation industry or elsewhere, is built on a foundation of several pillars that are essential for any project's long-term stability. In the case of the Amman BRT, expectations were high from the beginning, the political level was not aware that implementing one project cannot address all mobility issues. However, in the future, it could serve as a springboard for several projects that, when combined, could lead to a move toward sustainable mobility.

The political level, specifically the Jordanian government and the Municipality of Amman, touted this project as a magical stick that would not only provide efficient transit but also reduce traffic congestion. Despite the fact that Jordanians do not have much faith in their political class in general, yet they had no reservations about a bus project in the capital. This, in particular, kept their hopes for adequate public transportation alive, but only for a short time. As previously stated, the project was halted five months after its launch, and the reasons for the sudden stop are still ambiguous.

Many committees were formed, each blaming the other, but in the end, the project halted for three years, and people were fed up. GAM, on the other hand, is certain, that once the project is completed, the faith of Jordanian citizens in state institutions will be restored, as well as the government's ability to move forward with other development projects. Also, it will boost international donors' and foreign and domestic investors' confidence in Jordan's institutions' ability to manage and implement large-scale projects Moreover, GAM believes that this project will help to increase the employment rate for young people, particularly those with low incomes who have difficulty getting to work due to the current state of public transportation, and at the same time, it will contribute to increasing women's labor-force participation by providing a convenient and safe mode of transportation. (Greater Amman Municipality (GAM), 2015)

Another important factor to consider is that most individuals in Amman buy cars not just for work but also for personal excursions and recreation. Amman is a landlocked city with a tough topographical landscape due to its construction atop seven mountains. As a result, in the absence of other options, people are compelled to rely on their automobiles.

People lost faith in this project a long time ago, and that's normal when the city takes 11 years to construct two lines of buses. That explains why they are expecting in the future. During several semi-structured interviews conducted in this study, with buses, Minibusses, shared car, taxi, and Uber drivers, most of the participants addressed three main Challenges for this project, the first challenge is accessibility. 75% of the participants were convinced that this project will not attract new people who already have their private cars, because the bus network doesn't cover large areas and covers only two main lines in the city. Therefore, people will need a secondary network of buses that provide access to reach the BRT line, especially in the residential areas.

The second Challenge is that the bus stops are far from each other and there must be more stops to reduce the time to reach each stop. The third challenge is that Buses in the city don't adhere to timetables. Even the Amman bus that was announced that it will follow a strict schedule failed to do that, as a result, they are not expecting Amman BRT to be the exception. On the other hand, GAM promised the residents of Amman that they will have soon a modern, cheap and eco-friendly public transportation system that will cover all the neighborhoods of the city. According to Engineer Riyadh Al kharabsheh, BRT will be integrated with the Amman bus, to reach more neighborhoods in the city, and added "*As demand increases, the current transportation lines will be restructured based on the existing bus facilities, and there will be other areas where new lines will be launched*" and when asked about the private operators such as private buses, minibusses and shared cars that will be directly impacted from the new network, he said "*Our strategy is a win-win formula; we won't let them lose their business, they will be integrated into the network.*" These answers give the impression the GAM has a sustainable strategy that takes into consideration the comprehensive integration between all public and private transportation sectors to achieve sustainable mobility. But if that is the case, what are your solutions? GAM doesn't offer a clear answer.

GAM considers that having delays in public transportation projects is expected everywhere, and the residents of Amman have exaggerated in their judgement of this project, and the fact that this project 11 years as not as worse as it looks if compared to other countries. In his justification, Eng. Riyadh Al Kharabsheh stated that *“Take the Riyadh BRT project as an example; it began at the same time as ours, but it has yet to be completed despite Saudi Arabia's enormous potential; it began in 2008 and will be completed in 2023”*. This explanation for delaying a significant national project for 11 years when it could have been completed in five years at most is not objective, and it reflects a lack of sincerity in delivering essential public transportation projects.

Mr. Kharabsheh believes that Jordanians have wide aspirations, and they were frustrated that the major element of this project is but, they are expecting large projects like metros and trams to be achieved in a limited resources city like Amman. And he added *“Jordanians' aspirations and expectations are not limited to their geographic location. Although Jordan is a financially modest country functioning on a short budget, they want Jordan to be the best country in the world”*.

To conclude, Stakeholders of this project find the BRT system very efficient and practical, easy to execute (which is very ironic considering the time taken to complete it), and most importantly low cost and achievable. According to AFD, the project will be able to carry 315,000 passengers per day. On the other hand, people still have doubts, they will not run to the project once it's opened as the government expects. And unless they find that the government changed its usual approach, and established a modern mobility system which they can rely on, a network that is independent and sustainable and designed to serve every one starting from disabled people, women and children, covers the rich and poor areas, and reach people on time, the project will not achieve its goals.

2.4. A reason for behavior change

This component of the study attempts to answer the research third question by looking if the project will attract more people to use the public transport, and slight motivate some of them to depend on it more than their vehicles.

People in Amman, are like most of the people in any other city around the world, who dreams to have cheap and fast transportation that they can depend on, Nobody will like to pay an extra cost, but when there is no suitable alternative, people manage to do what most suit them according to their social status. In Amman, the social urban context categorizes people into three main classes like most other cities around the world. When thinking objectively about people who use public transport in the city. We can say that most people who use public transportation are most likely low class with a less percentage from the middle class. The rich class in the city, that can afford to have several cars, won't use public transportation for two reasons, the first one has do the fact that people who use public transportation in the city are regarded as poor people, and the second reason is that the public transportation service provided in the city is very poor according to their standards. What is interesting though is that a lot of rich people who travel to European cities, use public transportation there, but they won't use it in their city. Those who are in the middle class might use public transportation on certain occasions, but most likely they manage to buy cars even if it is going to cost them above their financial capabilities, and for those of them who don't own cars, they would use private taxis or Ubers especially women, who feel more secure compared to using public transport. That leaves the poor people, as the most class that uses public transportation n the city. This class doesn't only include poor Jordanians but also refugees who live in the city. International workers came mainly from Egypt, Serilanaka, and the Philippians. class doesn't have the option and must adapt to the current situation. In 2019, the Amman Bus initiative was a big step for the public transportation sector in the city but still not enough. GAM aims that Amman BRT will raise public transportation use from 14 to 40 percent. That means more than 35 percent.

The strategy of increasing this percentage in Amman is not clear, yet behavior change plays a big role. People must believe that this project is different from other projects, they must believe that it's feasible for them to use public transport than their cars. First of All, they must be convinced that this project will save their money. When asked about the possibility of behavior change when it comes to public transport in the city, Eng. Riyadh Al kharabsheh

explained *“This is known as the natural growth theory; I believe that the negative consequences of car ownership will drive people to use public transportation. The paradigm shift does not occur as a result of marketing, but rather as a result of natural growth in people's thinking about mobility and transportation in the city.”* And when asked about the negative consequences of car ownership that will motivate people to depend less on cars, if there was a good public transportation system in the city, he said *“Cars are more than just a mode of transportation; they also come with a slew of expenses such as gasoline, insurance, licensing, and maintenance, in addition to the daily hassles of traffic and accidents.”* These expenses, from his point of view, are enough to shift people towards the collective transit project. On the other hand, the social urban context in the city is not ready for this shift, the BRT project is still not enough for a lot of people, and the extra financial costs of car using will not prevent people from using them, even if the Amman BRT is there. Yet, Eng, Riyad was more convinced that this shift will happen sooner or later, as he commented *“ While some people have the luxury of having multiple cars at home; this is far from the norm. Jordanian families do not have the financial means to provide multiple cars for their children. We must be logical when it comes to car use. It makes no sense for a family of five to own five cars; I believe that one car per family is adequate.”* That way of thinking reflects the GAM bias point of view. People will not care for what GAM wants, people will do what makes them feel comfortable, and for the time being, the Amman BRT is not showing and difference, but maybe with time, people will see that difference, and only then, the behavior can change, because behavior change needs time and only happens when people feel that the foundation of this change is ready.

Observing the first day of operation and reading people's comments on the Amman BRT pilot operation was part of the study observation strategy. Almost a month before the initial operation, GAM launched a massive public awareness campaign to promote the new Amman BRT. The implementation of the awareness campaign was evident in the streets of Amman, where enormous banners with photographs of random people who symbolize Jordanian society and are delighted to use the Amman BRT were installed, as shown in figure 16. This campaign was intended to encourage and reassure the public that what they had been waiting for had finally arrived, and that their municipality had kept its promise to its inhabitants. Despite the extensive advertising, many people were unaware that the BRT bus would begin service in Amman on the 27th, and what was even more remarkable was that

when people saw the bus driving in its lane, they were not very enthusiastic. Instead, there were multiple traffic jams on the roads, with some blaming the Bus for the gridlock.



Figure 24: On the left (Khalid, an employee who tries to avoid traffic jams by using Amman BRT) on the right (BRT Operational trial map section), Source: Author, 2021

On the first day, there was a significant sense of skepticism in the government, and as a result, in the Municipality, with the overriding feeling that nothing the government could do could would result in genuine solutions. Many individuals doubted that this project would alleviate traffic congestion, forgetting that the project's principal goal is to offer mass transit service, not to reduce traffic, and that traffic will be reduced only when people begin to use public transportation and rely less on their vehicles.

The first day of the trial run had very contradictory feedbacks, whether on news, journals, or social media. Some people were supporting this project, and they were enthusiastic that finally, Amman sees a reliable public collective project, and that coming late is better than not coming at all. While others were disappointed as they thought that the project might look different and not just a conventional bus running in its lane. But a lot of people were criticizing how private cars used the bus lane, and how a lot of them didn't give any traffic priority especially when the bus gets out of its lane in some intersection and share the main road with the other vehicles. That was very shocking, GAM announced that any vehicle use

the BRT will be directly heavily fined and the driver's license will be withdrawn directly. GAM also decided to assign policemen to the main intersections to keep track of any traffic violations. It is also important to mention.

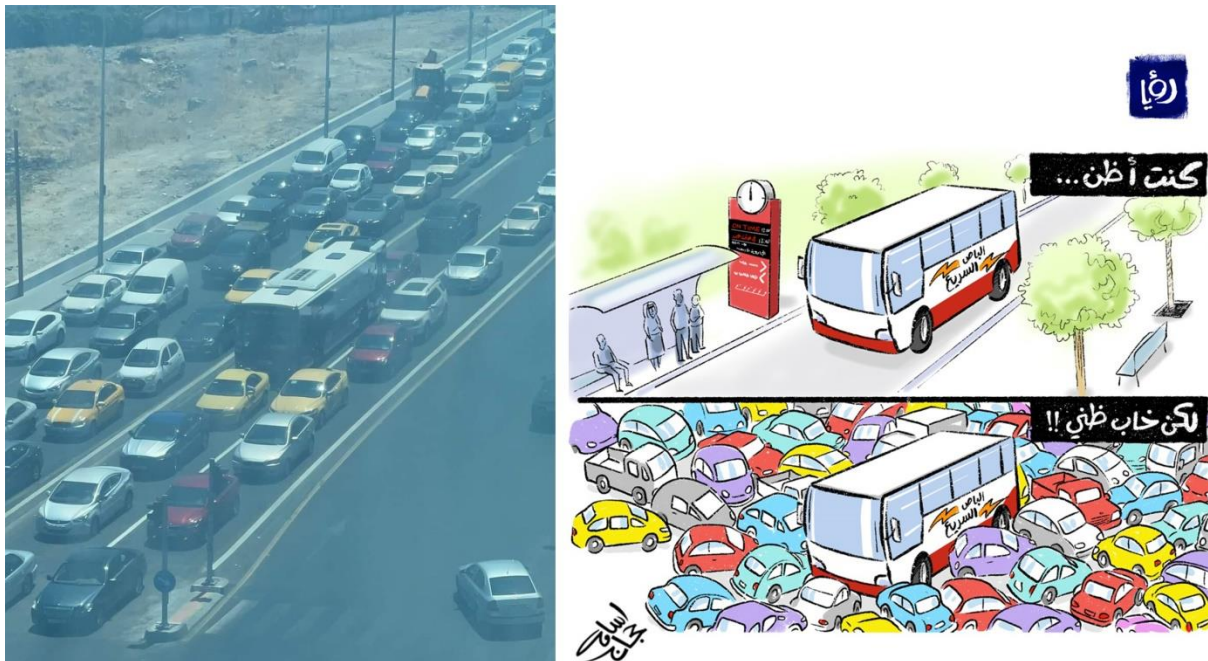


Figure 25: Left (Amman BRT stuck in its lane in its first of operation). Source: BBC News, 2021. Right (Cartoon translated from Arabic- What I thought, But I was disappointed). Source: Roya News,2021

Here comes the cultural aspect, a lot of people didn't feel concerned that this project has been made for them, and that if even they are not interested to use it, they should be supportive and they should give the priority. A lot of people have been blaming the government for not offering a lot of public transportation projects, but at the same time, they should think that mobility in the city needs full cooperation from all aspects of the society, whether drivers, pedestrians, or police traffic. People need time to adapt and once they do and it will be part of their lifestyle.

People in Amman rely mainly on their vehicles, while those who utilize public transportation rely on Minibuses, shared cars, and the Amman bus, which has been available since 2019. Although the Amman bus has been operating for two years, it is still considered new, especially because transportation in Jordan has been used less since the COVID 19 crisis, during which Jordan was placed under a complete lockdown for months, and thus some people are still unfamiliar with the modern way of using public transportation.

The most major reason is that current conventional modes of transportation, such as minibusses and shared vehicles, do not commit to stopping at stations or sticking to timetables, and most customers pay the driver cash and tell him to stop anywhere on the street. As a part of the study observation strategy.

The author participated in the second day in a full ride between the two main terminals of the project, the main purpose of this ride was to collect data and to study and identify the first social reaction for this project in the field and to reach a better understanding that can answer some of the research's questions. Within that frame, much interesting observation was marked such as some passengers reached the driver and asked him to stop. The driver refused, explaining that he is not permitted to stop anywhere, and is only permitted to stop at designated locations.

A lot of passengers were also unaware that there was a stop button in the bus that they could press once they are close to their stop station, so they kept asking the driver to stop. Moreover, GAM announced a long time ago that paying to ride the Amman BRT is only possible through the Amman bus card and mobile phone application. However, A lot of passengers kept arguing with the driver that they didn't buy the card or they don't have the application and they can only pay by cash, the driver told them that he is not authorized to accept cash and that unfortunately, he can't let them in. It's important to mention that using the average speed of the Amman BRT is 50 Kilometers/hours, and sometimes some people cross the BRT lane without even looking to see if a bus was coming or not, which kept the bus driver stressed during the whole trip. It is interesting to mention that the Amman BRT bus has run over a pedestrian on its first day. According to Roya News, a second run-over accident has been registered on the 1st of August. (Roya Newspaper, 2021)

To conclude, The social and cultural factors play an important role in the success of the urban mobility sector. In the case of Amman, the city didn't receive the Amman BRT project as was expected by GAM. Yet that doesn't mean that the project will not succeed. What is agreed upon, is that people need time to accept anything new, and once they feel that this project is providing them with what they need, they will adopt. People need to feel safe. They should feel and see the change.

Chapter 3: Between challenging reality and social barriers

3.1 Pedestrian mobility as a social paradigm shift

Public transportation may not be the only concern in Amman, as residents rely on private vehicles for the everyday commute; walkability may also be an issue for Jordanians in their capital. People in Amman realize that walking is beneficial for their health since it boosts physical activity, helps them to get fresh air, improves their mental health, and reduces GHG¹⁸ emissions in the city when they park their cars and go for a walk. The city's sidewalks structure, on the other hand, is weak and unreliable, discouraging people from strolling in the city since it has become risky, unsafe, and less walkable.

The issue of sidewalks has long hampered pedestrian mobility, and it's important to keep in mind that establishing a comprehensive public transportation system must be accompanied by a good pedestrian mobility infrastructure, which includes comfortable sidewalks, pedestrian traffic lights, zebra crossings, and pedestrian tunnels or bridges to help them cross. According to a research paper published in 2020 by Dr. Deyala Tarawneh¹⁹ on Amman sidewalks issues, five key obstacles need to be addressed in order to encourage people to walk more in the city. The first challenge that any resident of Amman will face is that many trees are planted in the middle of the sidewalk, obstructing pedestrian movement. This is because factors such as tree morphology, height, and spatial structure are not taken into account when selecting planting options for sidewalks, resulting in trees becoming physical impediments rather than features.(Al-masri and Al-Assaf, 2018) Misplaced litter bins are another physical annoyance that pedestrians in Amman encounter on a regular basis, which adds to the discomfort of their outings, especially when we consider the pungent smell, rodents, insects, streets cats, and stray dogs that seem to make them their home.(Al-masri and Al-Assaf, 2018) Another indirect impediment to pedestrians in the city is the lack of clarity in several land-use restrictions. According to Amman city legislation, the area between any roadway and private land is considered public property. The legislation is silent, however, on who owns the space if it is converted to a walkway. Because of the confusion of who owns the sidewalk, some landowners have taken advantage of specific sidewalks in a way that obstructs the movement of pedestrians and hinders their circulation.(Al-masri and Al-Assaf, 2018) Another issue that

¹⁸ **GHG:** Green House Gas Emissions

¹⁹ **Deyala Tarawneh:** An architect, urban planner, and geographer and currently an Assistant Professor at the Architecture Department and the Assistant Director for the Innovation and Entrepreneurship Center at the University of Jordan.

the sidewalk in Amman faces is general deterioration, whether as a result of a lack of care and follow-up or as a result of excavation or public works. Therefore, the quality of the sidewalk prevents pedestrians from various gatherings, such as children, the elderly, and people with disabilities, from securely using the sidewalks, contradicting the main goal that was designed for it.(Al-masri and Al-Assaf, 2018) Finally, in Amman, people will constantly struggle to find street chairs, small garbage bins, or tree guards, as well as insufficient lighting, which discourages many people, particularly women, and diminishes their sense of security.(Al-masri and Al-Assaf, 2018)



Figure 26: Sidewalks in Amman, an obstacle for pedestrian mobility. Source: Deyala Tarawneh- Sustainable Development and social responsibility, 2020

The Greater Amman Municipality has always attributed the city's infrastructure challenges, such as its lack of public transportation and dilapidated sidewalks, to a lack of funding, and although there are a lot of projects funded by international agencies, this is not enough to improve the current situation. In the city's disadvantaged and crowded districts, GAM developed a green infrastructure initiative. By connecting restored informal areas to BRT lines via stair rehabilitation, this project enhances walkability and increases pedestrian safety. The 5-million-euro effort, which began in 2017, is being implemented by the specialized German development agency (GIZ)²⁰ in partnership with GAM and Jordan's Ministry of Environment. GAM, on the other hand, in its resilience strategy, has allocated a special section for promoting walkability through reviewing and producing a streets manual that represents urban contexts in its first action of improving walkability. This guidebook is

²⁰ **GIZ:** German development agency, in German “Gesellschaft für Internationale Zusammenarbeit”

intended to assist city planners in the creation of safe, high-standard streets, as well as improvements to existing streets, and the creation of more people-oriented streets, and the provision of a safe urban environment. Moreover, GAM plans to and create a walking plan by using the new 'Street Manual, develop a walkability app as well as public awareness efforts to encourage walking as a healthy means of transportation. (Greater Amman Municipality (GAM), 2017)

As a result, improving pedestrian mobility must be a top priority for the city, in order to integrate with current and future public transportation initiatives such as the Amman BRT. This enhancement should be based on a comprehensive planning framework that takes into account new urban policies that regulate the current situation of land use and sidewalk conditions, as well as urban design strategies that prioritize pedestrians in the city through in-depth studies of the urban landscape, street structures, and social awareness to promote walkability and pedestrian mobility.

In addition to its poor pedestrian structures, another vexing issue for Amman inhabitants is the paucity of public open spaces, public parks, and gardens particularly for vulnerable populations such as children, elderly people, and individuals with impairments. According to the GAM, There were 143 public Gardens in Amman in 2019, (Roya Newspaper, 2020) which means there is one garden per 31.947. This percentage is very low when compared to other cities across the world, and when combined with everyday traffic congestion and poor pedestrian infrastructure, the Amman BRT became the option for many families in the city years before its introduction, thanks to a social spontaneous movement.

As a practical application for the famous proverb “Necessity is the mother of invention,” the residents of the capital reused the stalled project to their advantage; it is through a unique and spontaneous social initiative in which people started using Amman BRT lanes as public space, where it became common to see people going for walks or participating in other sports, families bringing their children for picnics, hawkers selling grilled corn, and young people riding their bikes around. This social initiative drew a large number of people because it provided a comfortable environment that relieved daily stress. As a result, this empty space was transformed into a stress-relieving island in the heart of the city. People's use of this location has expanded dramatically after the COVID-19 outbreak, especially since citizens' curfew hours have been reduced.



Figure 27: Amman residents using BRT lane a space of leisure activities.

On the other hand, people were not happy to leave their leisure zone once GAM announced that the trial operation for the Amman BRT. The residents of the capital realized that having an open public space is an urgent necessity and not an option. Moreover, GAM should do extra effort to provide public spaces as that is their basic right to reduce their daily life pressure at a time when Jordan is suffering from a difficult economic crisis, and people are already suffering from harsh living conditions, prices are constantly rising, employment is at its lowest level, and the COVID-19 pandemic is exacerbating the situation. People respond to GAM's announcement and campaigns weren't very smooth, and since the trial operation for the Amman BRT starts from six in the morning till ten in the evening, some people are still using the space even if to a lesser degree.



Figure 28: Sarcastic cartoons criticize the people of Amman for not respecting the Amman BRT lane on its first day.

3.2 Social justice and planning for everyone

Mobility is a fundamental and necessary aspect of people's everyday lives, and it contributes significantly to a country's cultural and economic resurgence. A public transportation system is considered an essential component of any mobility system, especially for vulnerable and marginalized populations like the poor, those with disabilities, and the elderly.

Despite the fact that Jordanian society's attitudes about women have changed and evolved, and women's education has become a key priority for any Jordanian household, women's labor force participation remains low when compared to men. One of the most significant barriers that women experience in their job search is public transportation. Women's increased use of public transportation will contribute to overall economic and social development. According to some estimates, achieving gender equality in employment would increase Jordan's GDP²¹ by \$8 billion. (Tzannatos, 2016)(Sahar Aloul, Randa Naffa, 2018)

Despite Jordan's increasing female education percentage and low illiteracy rate (less than 10% of women over 15 are illiterate), women's involvement in the labor force has remained below 18% over the last decade. (48.2 percent). (Al Rai Newspaper, 2017)

This significant decline in women's labor-force involvement, as well as the widening gender gap in employment and economic participation, led to Jordan being at the bottom of the WEF's²² list of countries with women's economic participation, where it was ranked 138th out of 144. (Sahar Aloul, Randa Naffa, 2018) According to a 2018 study conducted by SADAQA²³ and Friedrich–Ebert–Stiftung (FES), 80.5 percent of those polled believe that public transportation is critical for women's economic participation. (Sahar Aloul, Randa Naffa, 2018) Despite economic challenges, the findings show that the difficulties that female commuters face when using public transportation are a significant barrier to entering the labor force. According to the study, 47 percent of those surveyed said they had rejected job opportunities because of the poor state of public transportation. The most huge impediment in this regard was having to commute to work via multiple modes of public transportation which costs extra time, effort, and money.

²¹ **GDP:** Gross Domestic Product

²² **WEF:** World Economic Forum

²³ **SADAQA:** (In Arabic means friendship), is a non-profit company established in Amman in 2012, to support the working family and encourage women to enter the labor market by creating a friendly, and sustainable work environment.

To achieve social justice in mobility systems, planning policies must recognize that achieving gender equity in public transportation is a priority and that planning for sustainable mobility necessitates a comprehensive understanding of all the social challenges associated with public transportation in the city. In Amman, women face the majority of the social challenges associated with the city's public transportation, which is widely regarded as the primary impediment to equitable mobility. Harassment in public transportation is regarded as the most serious challenge for women in the city, whether verbal or physical, and it is the primary reason that many women avoid using it. Women's concerns about safety and harassment on public transportation can have an impact on how they commute. Many women avoid taking public transportation in congested areas, especially late at night, or use it only if accompanied by someone. (Babinard *et al.*, 2010) A study carried out by Hollaback and Cornell University found that 80-90 percent of women had experienced public harassment. This research included 16,600 interviews from 22 different countries. (Sahar Aloul, Randa Naffa, 2018) . In Amman, women avoid taking public transportation in the evening because many buses do not serve residential neighborhoods, forcing some of them to walk to their homes, which can be frightening, especially if the street has poor lighting. And that is the reason why a lot of women who don't own private vehicles prefer to take a taxi or an Uber for their night commutes so that they can feel safer, which means the extra financial cost to them compared to men who don't have the same fears. According to a study conducted by CSBE²⁴, women in Amman who use public transportation frequently prefer buses to shared cars because they can sit next to other women and the bus provides more personal space than shared cars, which typically have a capacity of 5 passengers. This feature is not always available in shared cars because they are sometimes forced to sit next to a man, where they frequently use their bags as a buffer zone between themselves and the person next to them, and this is especially true when men take advantage of the seating arrangement and sit too close to any woman. (The Center for the Study of the Built Environment (CSBE), 2015) In that matter, Amman BRT should provide women with a sense of security. GAM announces the bus schedule, which will run from 6 in the morning till 10 in the evening and will be equipped with monitoring cameras on the inside. (The Jordan Times, 2021)

The second issue is affordability; everyone, particularly vulnerable groups, wants low-cost and inexpensive public transportation. Commuting costs can eat up a significant portion of a family's income and become a financial burden in low-income households. Amman BRT

²⁴ CSBE: Center Study of Built Environment in Jordan

could be a new step forward in providing low-cost services to all people, especially if it is well integrated with other networks, particularly for women who currently use taxis or Uber and pay a high price for their daily commutes. It can also encourage those who rely on private vehicles to save money on insurance, maintenance, gas, and other expenses by providing a cheap and safe alternative. When it comes to urban mobility, affordability is closely linked to people's financial situations, particularly for vulnerable and poor groups who live in the suburbs and may need to commute multiple times per day. As a result, their mode of transportation is heavily influenced by their financial situation. Women from low-income families are more likely than those who drive privately and live in cities to be affected by insufficient public transportation. (Sahar Aloul, Randa Naffa, 2018) In the case of Amman, the currently under construction Amman-Zarqa BRT²⁵ project could serve as a good starting point for connecting more people, particularly vulnerable groups, in the suburbs and the city of Zarqa to Amman, thereby providing better and more efficient public transportation.

The third issue is travel patterns. Women's commuting patterns are more complex and varied than men's, especially in lower and middle-income societies. The different duties of men and women, on the other hand, influence their commuting plans. Furthermore, women's traditional social and cultural role and responsibilities as caregivers for their children and, in some cases, their parents, influence their travel patterns; they prefer faster trips, particularly when accompanied by children for school or medical reasons. (The World-Bank, 2016)As a result, good public transportation can help women avoid these various patterns, save time, and get home in less time and effort. (Sahar Aloul, Randa Naffa, 2018)

As a result, Improving public transportation in Amman by providing modern, safe, and low-cost services to all segments of society based on social justice and gender equity will have several economic, social, and cultural ramifications, as well as improve residents' livelihoods.

²⁵ **Amman Zarqa BRT:** Bus rapid transit project that connects Amman with the city of Zarqa to provide direct connection between the two cities and help those who live in the suburbs to have a better mobility alternative, the project is implemented by the Ministry of transport and is still under construction.

3.3 BRT & future mobility

In the last two years, Amman has witnessed some improvements in the city's public transportation, especially with the official launch of the Amman bus in 2019, and the trial run of BRT in July 2021, yet these two projects are still not enough to serve the city's four and half million residents but they could be the foundation for sustainable mobility culture in the city. Tackling the main challenges of the mobility system in Amman could lead to finding sustainable solutions for them. Amman BRT is already a good start and a step forward in the right direction that could improve the public transportation sector and have social, economic, and environmental impacts.

The table below describes the city's key mobility difficulty before Amman's BRT is put into service, forecasts the project's implications, and suggests future needs to maximize the benefits.

	Mobility Challenges before Amman BRT	Amman BRT Effect	Future Needs
Planning & Infrastructure	<i>Poor public transportation</i>	BRT with Amman Bus can enhance the current situation for public transportation in the city.	Integrating BRT with other networks to cover the whole city.
	<i>Poor connection between cities</i>	Amman Zarqa BRT will connect Amman directly to Zarqa and the suburbs.	Amman Zarqa BRT transit model could be applied to connect, between other cities in the country.
	<i>Traffic Congestions</i>	BRT will motivate people to shift away from using private vehicles to avoid traffic congestions.	Expand BRT network to attract more people all over the city to public transportation.
	<i>Poor streets sidewalks and lightening</i>	BRT has a well-developed infrastructure(road and sidewalk) that can attract people to use it.	Amman needs comprehensive maintenance for all streets, bus stops, sidewalks, and street lighting.

Environment & Climate change	<i>Vehicle exhaust causes environmental pollution</i>	BRT will motivate people to shift away from using private vehicles to reduce pollution.	Awareness campaign about the harm of vehicles to the environment and climate change.
	<i>High GHG emissions</i>	BRT is using light diesel Euro diesel V + Electrical Zero-emission buses.	Shift all the BRT fleet to Electrical Zero-emission buses.
	<i>People suffer from bad ventilation in current buses</i>	BRT fleet provides AC ²⁶ to guarantee better ventilation and provide clean air and a healthy in-bus environment.	All buses Must provide AC for better ventilation and clear air for passengers.
Society & Gender Equity	<i>Vulnerable groups and especially women feel unsafe and less secured in public transport</i>	BRT is equipped with cameras to improve the feeling of security.	Cameras must be installed on all public transport vehicles. Increase police presence in stops & stations
	<i>Accessibility for people with disabilities</i>	BRT is equipped with tools for handicapped people.	Considering PWD ²⁷ in buses, stops & circulations.
	<i>Roads accidents and injuries</i>	BRT provides safer trips as it runs in its lane and has a lower risk of accidents compared to cars	BRT and all forms of mass transit must have priority in traffic. Traffic regulations must be very firm
Economy & Awareness	<i>Private vehicles high maintenance cost</i>	BRT provides very low-cost public transportation service	Low monthly subscriptions will motivate people
	<i>Women's unemployment</i>	BRT provides safe, direct, and comfortable trips for women & vulnerable groups	Planning for safe and wide networks that make it easy for women to reach work.
	<i>Time, effort, and cost lost in traffic</i>	BRT avoids traffic and saves time and money for its passengers	Traffic solutions must be considered while giving priority to mass transit.

Table 2: Mobility challenges in Amman between BRT effect and future needs Author,2021

²⁶ AC: Air Conditioning system

²⁷ PWD: Persons With Disabilities

Sustainable mobility in Amman is dependent not only on government-funded megaprojects, but also on people's social awareness, sense of responsibility, and belonging. The premise behind community travel is that individuals share one vehicle rather than numerous, saving money, time, and the environment. There are numerous initiatives that, in addition to public transportation, can improve the city's current mobility sector and reduce reliance on automobiles. Carpooling with coworkers to get to work is regarded as an efficient way to reduce the number of vehicles on the road, particularly during morning and evening rush hours. As a result, people can drive to work in one car rather than several. Another practical initiative is walking. For those who live close to their workplace, walking appears to be a very sportive and healthy way to start their day, especially since they will save time by not having to look for a parking spot. Working from home became a realistic choice after the COVID-19 crisis, especially for those whose jobs do not require them to be physically present at their workplace. Another mode of transportation that should be encouraged in Amman is cycling. Amman lacks bike infrastructure, and many consider the city's steep terrain to be a barrier to the widespread adoption of this mode of transportation, which is also considered a leisure sport. (Ronja Schiffer, Ali Attari, Mohamed Hegaz, Hazem Zureiqat, Rami Semaan, 2019) GAM can expand its bike infrastructure by building dedicated bike lanes in non-hilly portions of the city as a pilot project to attract more people, especially with the rapid spread of electric bikes.

Despite all of these proposed initiatives and assuming that public transit in Amman improves, the usage of private vehicles will remain prevalent until people begin to switch to other modes of transportation. Switching from private motorized vehicles that use fossil fuels to hybrid and electric vehicles, on the other hand, can have a substantial environmental impact and lower the percentage of GHG generated by motorized vehicles. The use of hybrid and electric vehicles has increased significantly in Amman over the last five years. The Ministry of Transport (MOT)²⁸ announced that over 16000 electric vehicles were registered in 2018. (Ronja Schiffer, Ali Attari, Mohamed Hegaz, Hazem Zureiqat, Rami Semaan, 2019) Although the government provided these vehicles with generous tax breaks, people are still hesitant to rely on electric vehicles as their primary mode of transportation due to their limited charging capacity, the city's limited number of charging stations, and the high cost of replacing its battery if it fails.

²⁸ **MOT:** Ministry of Transport in Jordan.

Results & Discussion

This study answers the research questions based on the existed literature review that tackled profoundly the main mobility challenges in the city, on social, political, economic, and environmental levels. The theoretical framework also clarified the main specifications for the Bus Rapid model as a mass transit model and explained its advantages in terms of time, cost, and environmental protection through many examples around the world. Also, the study conducted a series of structured and semi-structured interviews, with the project's stakeholders, and public and private transport, representatives in addition to a visual observation plan to answer the research questions.

In response to the first question, the study finds that Amman BRT will have a positive impact on the urban mobility system in Amman. However, the amount of this impact depends on several social, political, economic, and environmental factors. The study finds that this project can't function in isolation from its surroundings and it needs to be integrated into a large public transportation network that serves the city's major neighborhoods. the project's results will take time, and the more GAM invests in the infrastructure that supports the BRT or other mass transit projects, the more people will be drawn to it. As a result, the impact of BRT will vary over time.

In response to the second question, the study finds that stakeholders of the project have legitimate expectations for this project. However, the magnitude of these expectations is exaggerated and does not match reality, because they are usually theoretical expectations that look at the project from one perspective without considering that there are key attributes that must be available to serve the project if it is to succeed as expected, such as the fact that the lack of a pedestrian infrastructure will not be an attractive factor for people.

In response to the third question, the study finds that people can only change their behavior if they believe their surroundings are also changing. People's lifestyles cannot change from day to night simply because a new public transportation project has opened in the city. People will gradually return to mass transit if they regain trust in it and find alternatives that provide a safe, modern, and clean mode of transportation. As a result, this study supports the main hypothesis that Amman BRT will only be successful if it works with a comprehensive mobility system that considers social, economic, and infrastructure demands and is supported by the strong political will to change.

Conclusions

It is commonly portrayed that the issue of mobility in developing countries is solely due to a lack of funding, when in fact, funding is not the only significant impediment. Amman's inability to absorb the additional pressures on transportation infrastructure caused by population growth was due to sluggish government performance and a lack of long-term planning policies that did not keep pace with demographic changes. The Amman BRT is the best example in this case, as the project has been funded by the French Development Agency since its inception, but government indecision, poor planning, and a lack of political will have hampered its work and delinquency, causing it to be delayed for nearly a decade at a time when the city needed it the most.

The intervention of the GAM to establish a modern public transportation network came at a very late stage. GAM did not have a long-term vision of how the mobility system would function in the future, and it only began to study the city's needs after these challenges began to emerge. Worse, the project that was supposed to improve the city's public transportation (The Rapid Bus), was not rapid at all. and took more than 11 years to come to fruition. During these years, the city has experienced irregular growth as a result of both normal growth and the refugee crisis. This lack of vision is apparent, as the project designed in 2009 to serve the city's mass transit system will not be adequate to serve the expanded city in 2021.

To conclude the findings of this study, Amman is on its way to a more sustainable mobility future. However, this march is too slow and does not meet current needs, so the city must adopt new and sustainable urban mobility policies that take into account the city's social, cultural, economic, and environmental aspects. These policies must be implemented not only for the present but also for future generations. Furthermore, these policies must prioritize mass transit, improve existing infrastructure for public transportation and other services such as streets and sidewalks, and attempt to innovate new solutions in the city such as cycling paths and micro-mobilities. This must be done in conjunction with public awareness campaigns to promote public transportation and encourage people to rely less on their automobiles.

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Appendix



Appendix 1.1: Amman BRT map with the location of study areas as per the observation plan.





Appendix 1.2: Amman BRT phase one map.

Observation plan Schedule					
Location	Date	Day	Reasons to chose this date	Time	Reasons to chose this time
Study Area 1+2	21-07-21	Wednesday	A full business day before BRT	08-10 a.m.	The regular time for people to leave for their work.
				05-07 p.m.	Employees and workers especially those who live outside that city return home.
	24-07-21	Saturday	The official weekend is Friday and Saturday, yet not all businesses are closed on Saturday	01-03 p.m.	Some people who work for a half-day usually finish the afternoon.
	Amman BRT official trial operation inauguration on the 27th of July, 2021				
	28-07-21	Wednesday	A full business day after BRT	08-10 a.m.	The regular time for people to leave for their work.
				05-07 p.m.	employees and workers especially those who live outside that city return home.
Study Area 1 (University of Jordan)		The location was chosen because this stop is very vibrant in the city as a lot of pedestrians especially students use it a lot.			
Study Area 2 (Fifth Circle Area)		Location was chosen because BRT lane intersects with regular road and it was vital to investigate the bus's movement while sharing the road with other Vehicles.			
The study investigated the BRT trip route between the two terminals in both directions.					

Appendix 1.3: Study observation plans' Schedule.

Appendix 2: Structured and Semi-structured interviews samples.

Kassim Shayan			
Directeur pays adjoint pour la Jordanie et l'Irak.			
The Agence Française de Développement (AFD) group is a public institution that implements France's policy on development and international solidarity. Climate, biodiversity, peace, education, town planning, health, governance			
Site Amman			
Entretien/Interview	By: Fuad Tahboub	20/07/2021- 14h00 -Amman	
Before the interview: Do you mind if I publish the data recorded in this interview in my dissertation? And do you mind if I mention your name and your institution?			
YES			
1. How would you describe your involvement in the Amman BRT project? Are you involved only in the financial part of the project?			
In the time being, we don't have a lot of involvement as the project is reaching its final stage, but as stakeholders of the project we are not only responsible for the financial part, but the technical and feasibility studies. There is a mobility department in the AFD that is specialized in technical studies and offers French expertise in international projects such as Amman BRT which is managed directly from Paris.			
Author: Do you participate in the decision-making process with GAM?			
2. To what extent could the BRT project in Amman change and improve the current mobility situation in the city?			
3. Do you think that Amman BRT will serve as a base point towards urban sustainable mobility strategy in the city?			
4. Since AFD plays a significant role in this project, what are the expected results from your part (Since you are part of the decision-making process) for this project and how can you justify your expectations?			
5. From your point of view, how can we change the mindset of people to change their behavior towards private motorized vehicles in the city of Amman?			
6. From your point of view, what are the expected challenges that will emerge after the opening of the project?			
7. My current master's program is international cooperation in urban planning, how do you think that your projects such as BRT can improve this international cooperation.			

Appendix 2.1: Structured interview with Deputy Director of AFD in Amman

Riyad Al Kharabsheh



Executive Director of Public Transport and Transport Infrastructure Projects in the Greater Amman Municipality.

Site Amman

Entretien/Interview

By: Fuad Tahboub

25/07/2021- 12h30 -Amman

Before the interview: Do you mind if I publish the data recorded in this interview in my dissertation? And do you mind if I mention your name and your institution?

YES

1. **To what extent could the BRT project in Amman change and improve the current mobility situation in the city?**

This project is the first step and cornerstone for public transportation in the city; other international cities with sustainable and respectful transportation were built more than 150 years ago, whereas Amman began only ten years ago. We are a city with millions of people, similar to Paris and London.

2. **There are many concerns about the city's BRT network's coverage, as well as the fact that the project only covers a portion of the city's major intersections, which is insufficient, and that BRT must be fed by another network.**

Author: What about the private bus owners?

3. **How does this project serve as a base point towards a sustainable urban mobility strategy in the city?**

4. **Is it true that China offered to build a metro system in Amman? Would you consider any international initiatives to improve the city's current public transportation?**

5. **What are the expected results from the decision-makers from this project and how can they justify their expectations?**

6. **When are you expecting to operate Amman BRT?**

7. **How can we change the mindset of people to change their behavior towards private motorized vehicles in the city of Amman?**

Author: As you know, having a car right after getting a job is a priority for Jordanians, even if they don't have sufficient means, do you think that Jordanians prefer to use private cars even after the BRT begins operating in the city because those without cars are regarded as socially awkward?

Author: As a final point, many areas are not served by regular or BRT buses; what are your plans for these areas?

Appendix 2.2: Structured interview with Executive Director of Public transport AFD in GAM

Semi-Structured Interviews



Amman BRT Project

Site Amman (14/7-20/7), 2021

Semi-structured interviews were conducted with 18 people in Amman between the 14th and 30th of July 2021 targeting individuals working in the mobility sector in Amman. The interviews consisted of a series of questions about their opinions and expectations from the Amman BRT project.

The study included Bus drivers, Minibuses drivers, Taxi and Uber drivers, and BRT Driver.

1. What do you think about this project and do you think that it will succeed and will improve the urban mobility scene of the city?

The answer to this question varied, with more than 75% of the answers had doubts about the results of this project. The participants in these interviews were convinced that this project will not attract new people to use public transport and people will remain using their private cars and the reason is that the BRT network doesn't cover all the areas in the city and that people will still need their private cars to reach the closest BRT stop.

2. What are the expected Challenges of the project once it becomes operational?

3. Do you think that you will use the BRT bus to mobilize in the city?

4. From your point of view, how can the Amman municipality make this project successful?

5. Do you think that this project will encourage the resident of Amman to reduce their dependence on their private car and use the Amman BRT for daily commuting?

Appendix 2.3: Structured interview with Executive Directo of Public transport AFD in GAM

Appendix 3: Photos are taken for the Amman BRT project in two main intersections, The University of Jordan and the 5th Circle, before and after the operational trail.



Appendix 3.1: BRT in its lane in the University of Jordan, Source: Author.28 July 2021



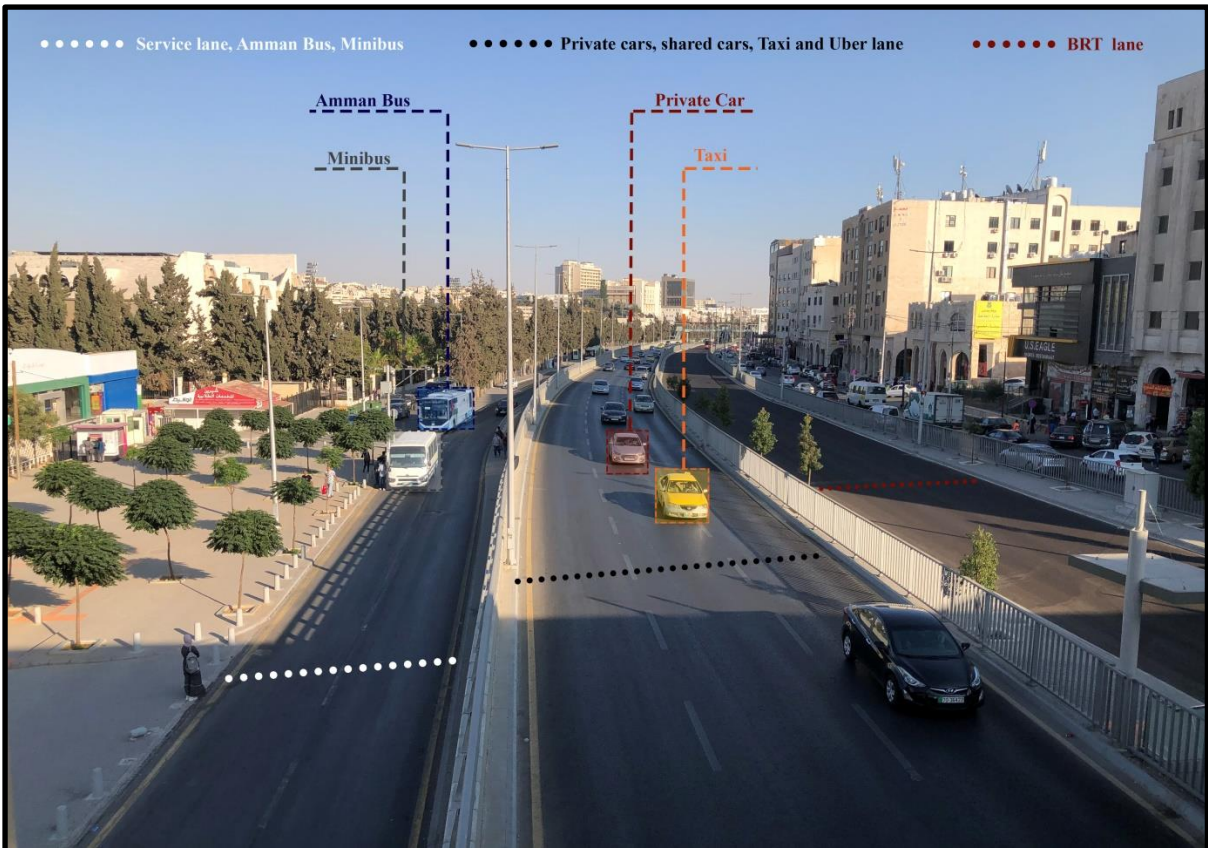
Appendix 3.2: BRT Stuck in Traffic, 5th Circle area. Source: Author. 28 July 2021



Appendix 3.3: BRT Pedestrian Bridge, JU Intersection. Source: Author. 24 July 2021



Appendix 3.4: BRT Pedestrian stop 5th Circle. Source: Author. 24 July 2021



Appendix 3.5: JU intersection Mobility system components. Source: Author. 21 July 2021



Appendix 3.6: Spot for people with disabilities in Amman BRT. Source: Author. 28 July 2021



Appendix 3.7: Amman BRT equipped with cameras, route map, and AC.

Source: Author. 28 July 2021