



Strategic Planning for Development of Public Transportation Sector in Riyadh City

Prepared by:

Ahmed Mohammed Ahmed Al- Shamer 'Group Leader'

Anas Mohammed Al- Tuwaim

Munirah Al- Katheri

Naif Al- Dogish

Ammar Ayed Al- Raddadi

Husam Saeed Ali

Bander Ibrahim Asiri

Muhannad Mohammed Al-Ghamdi

Ebthaj Mohammed Al-Anazi

Sayyar Naif Al- Shammari

Supervised by

Dr. Waleed Suliman Sadduq

Dr. Fatma Mostafa

2022-20023

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1-1 Introduction:

Riyadh City is the capital of KSA and the biggest city in respect of population and area ,it is inhabited by 8.2 million (Gastat 2017) the latest official census which represents 25.2% of the total population of KSA. It is one of the fastest growing cities in the world in expansion, it expanded in the last five decades from 1800 to 3115 square kilometers. Riyadh is the center of political and economical development all, Government Organizations are in Riyadh as well as all headquarters of banks and companies . The GDP of the city is estimated to SR 60 billion, 23% of the labor force is concentrated in Riyadh.(Gastat 2017)

Riyadh is distributed in 16 municipalities composed of more than 167 residential haras” quarters “

The city is managed by two entities Riyadh city Municipality and Royal High Commission for Riyadh City. One of the features of Riyadh is high density of population it is about 2379 people per square kilometer and lacking of public transportation (Riyadh investment report 2019) In the light of the above information the population is depending on private cars for transportation which resulted in higher crowds of cars , more than 92 % of the population are depending on their own cars due to the high standards of living.

This percentage is very high compared to the global rate which is about 60% .This high dependence on private cars resulted in many problems such is crowding on roads traffic congection high rate of car accidents, late arrival to destination , as well as negative effect of traffic safety and high environmental pollution. These facts convinced concerned authorities to look for practical solutions for these problems , taking into consideration the best practices in similar cities , these government organizations have made strategic sustainable transportation systems that will serve the sustainable development requirements in the kingdom with special referral to Riyadh.

The socio economic impact of this situation creates willingness to both the government and the public to implement integrated multimodal transportation systems as well as adoption of transportation demand management and infrastructure development in order to achieve the objectives of the kingdom vision 2030 especially a vibrant society through development of better environmental services to enhance the public health and sustainable transportation systems.

1-2 Research Problem:

Riyadh City is rapidly expanded and heavily populated which creates series of transportation problems, such as traffic jams, environmental pollution that needs provision of sustainable reasonable transportation system that suits the culture of the Saudi society , and to look for financing such big project as well as the capable management system that guarantees the success of such strategic plan for development of the public transportation system that will be of the important projects that cope with ambitious strategic plan of the Riyadh city. The main issue is how to build up strategic transportation development plan that establishes practical and integrated public transportation projects.

1-3 Research Importance:

The importance of public transportation strategies in Riyadh City derived from the rapid development in expansion of area and population which resulted in the need of effective regular internal net work of public transportation. The public transportation system will reflect the impacts of rapid urban and architectural development in the city , this strategy will be a model to be adopted in other big cities at national level . The development of public transportation sector will contribute effectively in initiating new concepts of strategic planning that take into consideration three dimensions of sustainable development economically, socially and environmentally.

1-4 Research objectives:

The main objective of the research is to examine the strategies of public transportation plans on how to develop and implement performance of the safe and efficient transportation systems, policies and procedures and their impacts on sustainable economic, social and environment activities development in Riyadh City.

Sub objectives derived from the above one are:

Enhancing the level of roads net work utility as well as other transportation activities.

- Expansion of implementation of traffic safety rules, procedures and policies in order to reduce the fatal accidents.
- control of of environmental pollution elements related to using of transportation modes such as private cars.
- Implementation of strong management of transportation measurement as well as development of efficient models of land use to control horizontal development .
- introduction of efficient and integrated transportation systems
- Enhancement of the qualifications and quality of the labor force that manage and operate the public transportation systems .
- Enhancement of efficient utility of transportation resources and services.

1-5 Research Questions:

- What are the best and reasonable transportation systems economically, socially that satisfy the needs of the fastest expanding city like Riyadh.?
- what are the suitable modes of transportation to be used through development of required sustainable transportation system?
- what are the measurement to be used to improve the sidewalks for pedestrians all over the city?
- How to implement the modern technology to raise the efficiency of performance and reduce the cost of operations of transportation systems ?
- -what are the measurement and standards that govern the relationship between land use and different urban activities that will help in achieving the integration with the strategies objectives?
- How to qualify the capable human resources that will be able to run, review and assess the performance of the public transportation systems and recommend modifications that cope with the present and future requirements of expected expansion of the city?
- What are the requirements and measurements to be done to reduce pollution resulted from modes of transportation?
- -How to enhance the contribution of the private sector in financing the projects of the transportation sector in Riyadh?

6-1 Study Organization:

The study will reorganized in in that chapters and conclusion:

1- Chapter one: introduction chapter composed :

1-1 Introduction

1-2 Research Problem

1-3 Research Importance

1-4 Research objectives

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1-6 Research organization

Chapter two composed of

2-1 Previous studies

2-2 Comments on previous studies

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Chapter three ; composed of

3-1 The current situation of the public transportation in Riyadh city.

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3-4 Assessment of the project

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Chapter Two

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Previous Studies:

The reaches has successfully found fourteen studies and researches related to this research, most of them are examining the experience of the kingdom in general in developing the transportation sector with special reference to Riyadh , below is reviewing them:

1. The study of (Yusuf and others 2018)they studied economic and social effects of the current transportation system in Riyadh City and comparing it with integrated systems showing that it's highly populated urbanized city, depending on private vehicles for transport. This phenomenon resulted in traffic congestion, accidents , constrained parking and high environmental pollution. They compared the socioeconomic impacts of this transport to multimodal systems. The study showed high economic cost of transportation which made the citizens willing to limit the impacts on the economy and the environment. It recommended integration of multimodal transportation systems, adoption of transportation demand management and development of infrastructure in order to achieve sustainable transportation development and better environmental services to enhance public health and sustainable transportation system.

2. The Study of (KPMG2022):

The study analyze the traditional public transport services and how they have been challenged as never before . The public transport has traditionally been provided by subsidized public sector bodies operating discrete/ siloed transportation modes. Today new market entrants are changing the last mile equation through enhanced services and convenient new offerings. Disruptive transport technologies are on the horizon . Frictionless services interaction in other sectors have raised customers expectations

of public transport. priorities are shifting as decision makers listen to the voice of public and look beyond the operation of transport infrastructure, fleets and workforce to consider the advantages of a connected 21st Century ecosystems. They listed the signals of change as follows:

- Evolving customer and community expectations for connected personalized services will require organizations to be more responsive.
- public transport can be a key enabler of sustainable economic growth and equitable access to opportunities.
- The need to minimize environmental impacts and urban congestion are becoming central to future plans.
- New public transport modes, entrants and technologies are poised to change how services are delivered.
- The pace of innovation is accelerating and exceeding the rate at which regularity systems can adapt. Regulations will need to be dynamic amidst ongoing innovation.

Lifestyle and reliance on public transportation systems remain to be seen how demand for services may evolve many citizens embrace hybrid work models or replace urban lifestyles with more affordable suburban settings.

Public transport organizations should take time to pause, reflect and map out a new future of enhanced customer experience and integrated services along with decarbonizes and digital operations while securing stable financing.

3. The Study of (Al Rashidi 2018):

The researcher is trying to identify the role of coordination between the executive sectors related to traffic safety in achieving the required safety on roads . He conducted field survey through questionnaire distributed to all concerned people in the general directorate of traffic, the municipalities and the ministry of transportation. The key findings of the research are :

Requirements of realizing coordination between executive entities relevant to traffic safety.

How to bridge the organizational gaps through identifying the role and specialties of entity, then to make strategic steps to phase out the boundaries of the coordination between the different entities. In fact the traffic accident is usually resulted from defect in one or more element of the traffic safety components which are roads, vehicles or drivers, each of this components may have reasons that caused accidents. Therefore it is very important to set up strong strategy and clear policies to integrate the coordination between all concerned authorities putting into consideration all aspects related to traffic safety such as architectural, organizational, policies and procedures and the role of acculturation of the society about the importance of implementation of all safety measures in order to reach the goals of zero accidents.

4. The Study of (Alalwan 2013):

The research is targeting to analyze the main factors of architectural planning that cause traffic congestion in Riyadh City as well as the their impact on roads, and suggestions of how to remedy the consequences. the study results are showing that the important causes are the rapid increase in population growth due to migration of people from rural areas looking for better jobs , scarcity of public transport and the heavy dependency on private car as well as small number of parking areas, and slow

response towards accidents and damaged cars on main roads. Many of the respondents said that the traffic congestion have negative economic, social , environment and health impacts. The study suggested some solutions that may contribute towards solving the problem of traffic congestion in Riyadh City. The first one of them is provision of integrated public transport modes with high standards and efficiency, organizing the times for trucks inside the city, improving and expanding the roads net work as well as implementation of architectural solutions for the traffic flow through traffic signals and quick implementation of the comprehensive transportation plan , provision of more organized parking areas, provision of trustful school transportation systems that provide more secure and safe services.

5. Study of(Muhitur Rahman and others 2022):

The study is trying to understand the causes and effects of road accidents and how they are critical for development of roads and action plans in KSA. The hypothesis elucidate how accidents occur? And analyzing them to reach how to prevent and manage safety programs. Driving behavior is the main factor to consider when determining the causes of traffic accidents. The study is using Al Ahsa City as a case study, the study examined the driving behavior to measure the uncertainty associated with accidents outcomes. The analysis showed that intentional and unintentional driving behavior that caused types of accidents and accident severities. The results showed 26% of the accidents because of speeding when the driver is alone ,33% of the accidents are collision due to brake failure. Three issues traffic, accidents and pollution are becoming increasingly prominent problems in urban areas in KSA. The study showed that the accidents increase when both speeding and brake failure were taken into account.

6. The Study of(Al Husainy and Al Hussain 2021):

The public transportation project in Riyadh City is aiming to help in reducing the traffic congestion and reduce the pollution as well as decreasing the fuel consumption. The study is using geographical information system(GIS) to measure arrival possibilities to public transport stations which are under development in Riyadh City. The study depend on counting the residential units which are covered by the services and individuals can reach the station within 5-10 minutes walking on foot . The study covered 85 proposed bus stations the results showed that 34-74% of Riyadh City population may drive their own private cars to reach the bus or metro station between 5-10 minutes. 5% to 14% may reach the metro station in a period between 5-10 minutes walking 53% to 76% of the population may reach the bus station in a period between 5-10 minutes walking on foot.

The possibility of arrival time to the station is essential because it evaluate to what extent the public transport project will succeed, it will help in future opportunities for development of directive projects surrounding the transportation station

7. The Study of (Okail and Mohsin2021):

It's estimated that the proposed public transport system using metro supported by bus will cover more than 30 % of the present car travels . The challenges that architectural transformation and land use in Riyadh City the horizontal expansion which resulted in low density and heavy dependence on private car and consequently more investment in infrastructure development as well as increase in fuel consumption. This will also contribute to pollution of the environment. The study will reflect how the public transport project will contribute effectively in reducing the use of private car in traveling inside the city as well as reducing the demand for taxi and limousine. When people shifted to public transport

will reduce the number of daily travels of the individuals, and to solve the three challenges that face Riyadh City policy makers which are the horizontal expansion, dependence on private car and the personal choice of residence. The dependency on private car may be reduced through applications of penalties on cars that affect the atmosphere and implementation of parking fees. Beside that the metro and the bus fees may be sold at reducing cost for long periods and free parking areas near the metro and bus stations.

8. The study of (Arriyadh Development authority 2002)The study based on papers of work shop related towards development of safe and secure public transport system in Riyadh City putting into consideration the rapid growth of the city in area and population at that the population exceeded 4 million . 93% of the daily travelers were by private cars and only 2% were using public transport. The study showed that the city will expand in both area and number of population which will result in increase of traffic movement and consequently traffic congestion that necessitated looking for practical solutions and the most important of them was public transport system and to look for how to be managed and how to finance it through participation of the private sector, the workshop suggested a pilot project using one mode of transportation in one area of Riyadh City.

9. The study of(Riyadh Chamber of Commerce 2020):

The study was concentrated on the public transportation activities and the different modes putting into consideration that the industry of transportation was the main pillar on which most of the development programs were depending. The study aiming to study the current situation of the public transportation sector and the activities indicators and highlighted the most important projects in the sector, and trying

to improve the investment environment to attract both the local and international investors to effectively contribute to sustainable development in public transportation systems

The study showed the development and indicators of all transportation sector activities and their contribution in the GDP as well as the budgets for development projects related to each transportation activity.

10. The study of (Almogarry 2022): The study is comparative one showing differences and similarities between King Abdullah Ben Abdul Aziz public transport project in Riyadh City . The city rapidly expanded In population(6.5 million 1439 h) the daily travelers were about ten million, the public transport was only 2% . Royal High Commission of Riyadh estimated that the daily travelers will reach fifteen million by 1445H.

In the year 1433 the concerned authorities approved the proposal of king Abdulaziz public transport project in Riyadh City. The study summarized its main components of metro and buses network , then choosing twelve international cities around the globe which have quick efficient public transportation systems and compared them with what is supposed to be in Riyadh City in respect of urbanization criteria, specialties in metro network and number of passengers. The comparison showed that the beginning of project services will be very strong due to the big volume of the project that composed of six lanes supported by bus network covering all Riyadh districts . The transportation system will be provided with latest technology in transportation industry, the project was giving special consideration to the norms and traditions of the saudi society when designing the metro cars putting into consideration the desert atmosphere and the intersection time. The study highly recommended the acculturation of the society the advantages of using public transportation and encouraging them to use

it instead of using private cars. The study recommended studying the tariff of tickets that commensurate with the income of the majority of the society and their financial standards.

11. Study of (Al Saeed 1999)

The study discussed the public transportation issue in Riyadh City and concentrated on its importance and necessary implementation of public transport services and to work hard for its success. The study recommended that it was high time to give the public transportation the necessary facilities when planning for city expansion such as provision of special lanes for transportation modes and footpaths as well as traffic light signals and traffic safety procedures and special parkings at side roads , provision of necessary equipment at operational sites and maintenance provision of necessary licenses to private sector to build passenger facilities. The study recommended that it was necessary to organize and introduce new modes of transportation according to public services law and bylaws.

12. Study of(Alsaeed2001):

This study concentrated on the importance of public transportation in Riyadh City showing the reasons for bad services provided by SAPTCO and the dominance of private cars for daily travelers in Riyadh.

13. The study of (Al Jumaa and others 1997): The study discussed in details the experience of SAPTCO in many cities in the kingdom with special consideration of Makkah Mukarrama during Hajj and Umrah seasons, the study showed that there was misunderstanding of the concept of public transport and conflict of rules and regulations that govern the activities, therefore it's necessary to review procedures and rules and improve them to encourage people to invest in this important sector. The study recommended that it's important to plan for effective safe and secure public transport services in the new development plans for cities

expansion as well as necessary coordination between concerned authorities and the public transportation company.

14. The study of (Riyadh Economic Forum 2022):

The study concentrated on the railroads sector as one of the most efficient transportation mode , and it is expected to connect most of the kingdom big cities through three main lines , northern train for cargo transportation with length of 1550 kilometer started from Jameed , Al joyf, Qaseem up to Ras Alkhair at the gulf coast in the eastern region .Northern train passengers from Riyadh to Al Hadeetha at northern boarders passing through Qaseem and Hail regions. Eastern railway connecting Riyadh and Dammam it transported passengers and cargo from Dammam port to Riyadh Dry Port. The railway system is the main mode to achieve the the requirements and the objectives of the development plans. Therefore the kingdom vision 2030 targeted this sector and develop its infrastructure to transform the kingdom to international logistic hub .and Riyadh City is railway junction for all railroads for both activities passengers and cargo trains.

2-2 Comments on the previous studies:

The previous studies have concentrated on the public transportation issue in Riyadh City and discussed in details the present situation and the problems and challenges . All specialists have raised the questions of traffic congestion, environmental pollution and traffic accidents as well as the question of traffic safety standards in general. Most of the studies suggested solutions for these problems and challenges is to prepare strategic comprehensive plans , the most important of them is the strategy for public transportation to be supported by other strategies such the national strategy for roads safety and Riyadh architectural strategy and environmental strategy.

The concerned authorities at very high levels in Riyadh Municipality and the Royal High Commission of Riyadh have taken in to consideration the results of these studies and adopted the recommended solutions.

2-3 Methodology of the research:

In this study the main method is office research which will be discussed and analyzed through analytical description methodology and comparative methodology will be used in describing the present situation of the transportation system in Riyadh City and identify and analyze the problems arising from the used modes of transportation . Look at the solutions that have been suggested for the problems and challenges which have put in the different strategies to remedy the transportation problems.

- The information will be collected from the previous studies and the strategies and the annual reports of the government concerned authorities related to the public transportation sector, the information will be discussed and analyzed to describe the present situation and to find out the implementation of the strategies and to what extent they have contributed to solve the problems which have been raised in the research questions, and how they are contributed in achieving the objectives and goals of the kingdom vision 2030 as well the goals of the research.
- No field survey have been conducted to support the discussion and results of this research because of shortage of time as well as expected difficulties to reach the proposed respondent who are the high executives in related government entities.

2-4 Theoretical framework of the research :

The kingdom of Saudi Arabia is one of the pioneers in the development of the development of the transportation sector, the sector importance derived from the fact that the kingdom is a large country area wise it's more than 2.1 square kilometers, with low density of population 15 people/ km. Riyadh is a capital of the kingdom inhabited by 8.2 million people representing more than 25% of the total population(GStat2017) . This big number of population and the absence of public transportation modes created a number of problems and challenges that needed quick and effective strategies to solve these problems . Three major issues are observed in Riyadh traffic congestion , car accidents and environmental pollution due to cars gases. These facts convinced the concerned authorities to work together, firstly diagnosis the problem then look for the solutions through studying the cases, identifying the problems and challenges, designing the strategic planning of transportation and other related sectors and finally how to implement these strategies to achieve sustainable solutions . The strategies have put into consideration the challenges that face policy makers from the traffic congestion, across land uses , operational and institutional problems to economic and social aspects at all levels . These authorities have been convinced to design strategies for public transportation strategy, Riyadh architectural strategy, national environmental strategy, national roads safety strategy using dynamic programmed systems within the potential resources and the future predictions that will help in sustainable development and concentrate on the sustainable goals and objectives that will enhance the possibility of competitiveness with other cities, and make the concerned management in all entities able to control the future goals , take the best decision in the right time, improve the performance of all related sectors, and to face the challenges with practical solutions instead of defending or justifying the factual situation. These strategies have set up specific goals that cope with the kingdom vision 2030 for

achieving vibrant society ,a thriving economy and ambitious nation ,(Royal High Commission of Riyadh, Tatweer 2020)

The strategies plans the most prominent goals in different sectors such as effective public transport services to all people in Riyadh, reduce road accidents and deaths caused by accidents, optimization of road life cycle cost and improving the performance , reducing traffic congestion and environmental pollution. The strategies goals of Riyadh City are matching with the vision goals in respect of sustainability and development, the capabilities of existence and optimization, adaptation with the components of the internal and external environment, adaptation with management behavior and the notion of changing and improvements during the implementation process.

At least and not the last the set up strategies are designed for achieving goals of the kingdom vision and the SDG goals at national level including the answers of what should be done? Who will do what? and when where and how? The research will try to answer all raised questions in the theoretical part.

Using the defined methods, techniques and organizations activities that clearly defined the role of every entity , organization or individual and the ways of how to concentrate on performing the defined responsibilities of each one of the above.

Chapter Three

- 3-1 The current situation of the public transportation in Riyadh city.
- 3-2 The modes of the transportation in Riyadh city.
- 3-3 King Abdul Aziz project for public transportation in Riyadh city.
- 3-4 Assessment of King Abdul Aziz project for public transportation in Riyadh city.
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References

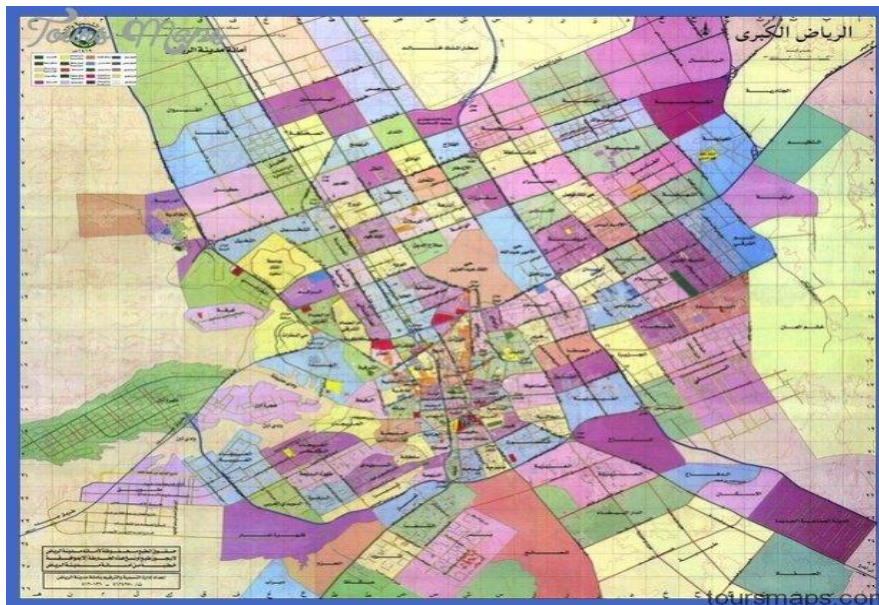
3-1 The current situation of the public transportation sector in Riyadh City:

This section of the study will discuss the current situation of the public transportation sector in Riyadh City during the period from 2016 up to date showing the factual details of the sector , the challenges the problems and the remedial steps taken to reach sustainable solutions for them.

Riyadh City is the capital of the kingdom of Saudi Arabia, the third city in the Arab World in respect of number of people, it is inhabited by 10.5 million people (GStat 2021) according to estimates based on 2017 census of GStat which showed the rate of growth at 4% . It is situated in the middle of the kingdom , the total urban area is about 3115 square kilometers. Riyadh City urban area is divided into 167 districts managed by 16 municipalities. The city affairs are governed by two entities , Riyadh Municipality which was established 1375 (1955) it is responsible for every and each municipality activity and look after the daily work of the 17 municipalities, one of the major responsibilities is to organize the city districts and issuing of building licenses, look after environmental services , the market development, organizing the internal transport services and coordinating with other government entities to maintain safety and security to create sustainable peace in the city. Arriyadh Development authority (ADA) established in 1394(1974) to look after the development projects conducted by different government entities, it was reformed in 1440 and changed to Royal High Commission of Riyadh to look after all national big projects under the supervision of board of directors chaired by HRH the crown prince Mohammed Ben Salman . The city was rapidly expanded after the first oil boom in the seventies and early eighties of the last century . Big number of migrants from rural areas and expatriates came to Riyadh looking for jobs , almost more than 40% of the population were migrants. This situation created crowded areas at the skirts of the city and traffic congestion on roads due to absence of efficient public transportation. This factual position convinced the authorities to find effective solutions . The

Saudi public transport company was established in 1399(1979) it started its operations in Riyadh City to solve the problem of traffic congestion and provide efficient safe mode of transport , but the experience was not fully successful due to social cultural norms and some other economic factors . Recent study conducted by Arriyadh Development Authority showed that all Saudi citizens who are more than 55% of Riyadh population are using their own cars due to the high income estimated SR11,250# and each family which composed of 5,7 people are owning more than two cars (ADA 1430) This situation convinced the authorities once again to look for sustainable solutions for this increasing challenges.

(See Riyadh Districts Map)



In 1421 Arriyadh Development Authority conducted series of workshops and round table discussion groups to develop safe and efficient public transport in Riyadh , these workshops discussed the following issues:

- The public transportation system in Riyadh City.
- The challenges,

- The potential opportunities in the public transportation sector
- Suitable mode of transportation.
- Management Organizations that will look after operations.
- Possibility of having private sector contribution.
- Possibility of initiating pilot project of public transportation using one of the suitable transportation modes at certain parts of Riyadh. The workshops recommended the necessity of preparation of strategic planning at national and local levels to solve the problems and tackle the challenges that face the public transportation sector.

In 1423 (2002) the ministry of transportation conducted the first national strategy of transportation in the kingdom in three phases:

Phase one : the current situation and the strategic framework.

Phase two: the issues and challenges.

Phase three : policies and programs ,the strategic planning targeted the following:

- Quality and efficiency.
- Social and economic development.
- Safety.
- Environmental issues,
- Public security,
- Transportation during pilgrimage season,
- Integration of public transportation systems between the main cities.

In the light of what have been achieved in the eight development plans from 1970 to 2010 the asphalted roads and paved length was about 184 thousand kilometers. The budget amount for implementation of the three faces was SR14,5 billion . (the 8th development plan 2004) The plan was giving special consideration to Riyadh City as Capital and center for future opportunities of economic development programs.

Recent studies home of the increase in population, traffic congestion and environmental pollution during the period from 2015 up to date., this period have vast transformation of administration planning in the kingdom during the era of The custodian of the two holy mosques, King Salman Ben Abdulaziz .

Riyadh City population was exceeding 6.1 million people , the population density was 2379 people/skm and it is expected to reach 2664 people/ skm 1450 (203o) at the city rate of growth at 4%, the main transport mode in Riyadh is private car which estimated at more than two million cars most of them are owned by Saudis at least two cars for each f family, also the expatriates can afford to buy cars because of the high income the per capita income for non Saudi is about SR42 thousand which means SR3.5 thousands per month.

3-2 The modes of transportation in Riyadh City:

1. Private cars:

The inhabitants of Riyadh City are heavily depending on their ownprivate cars for traveling inside the city about 93% of the inhabitants of Riyadh are making about 10million trips per day which expected to reach 15 million trips in1445(2030)

2. SAPTCO bus Services :

The public transportation services by provided SAPTCO represent only 2% of the daily passengers in very small limited areas.

3. The remaining 5% is served through limousine and taxis services such as Uber and Kareem .

But still other modes of land transportation is affecting Riyadh City searches:-

- **Trucks:**

The trucks number in KSA is more than 750 thousand trucks ,expected to reach 1.2 million by 2020(Argam 2015)these trucks are making 67 thousand trips per day

- **Passengers buses:**

The licensed buses to travel within the kingdom cities are more than 100 thousand vehicles, 30 thousand vehicles are for students transportation. The ministry of transportation report 2017 about vehicles trips showed that Riyadh City ranked first in daily entrants of vehicles.

- Qaseem entrance, 80 thousand vehicles per day entered Riyadh City .
- Dammam entrance, 60 thousand vehicles daily,
- Taif entrance, 50 thousand vehicles are daily entered Riyadh City.

Looking at this heavy traffic in the city will reflect the real problems and challenges the people of Riyadh are slow traffic movement less than 50 kilometers speed, car accidents, late coming to work or back home , spending averagely 4 hours in car for one or trips in a day beside increase in gas emissions which will affect the environment and work negatively in deteriorating the the purity of wind and weather, this heavy traffic congestion will raise the cost of roads due to reduction of road lifecycle.

The other sectors and activities affected by public transport activities:

1. Traffic safety:

The formal statistical data during the period from 2018 to 2020 showed that the number of injured passengers was 30579, 23069 and 2561 during the years 2018, 2019 and 2020 respectively. The number of fatalities during the same period were 5787, 5754 and 4618 deaths respectively. (Ministry of Health Year Book 2020) the total number of car accidents during the same period was 518,795 the number of accidents in Riyadh was 147,508 accidents representing 28.4% of the total (Gastat 2020)

2. Environmental pollution:

The transportation modes are the main cause of the pollution due to gas emissions from types of vehicles, the international reports showed 27% of the global warming caused by transportation modes since 1990.

The gas emissions will have direct effects through noise and carbon emissions, this phenomenon will directly affect the health of people, the purity of air, water and soil. This pollution will contribute to erode the ozone level which will allow ultraviolet (UV) to reach the earth and have bad effects such as acidic rain which will harm all plantations, jungles, crops and grass.

3. Roads maintenance:

The transportation modes when misused the roads through extra weight exceeding the limited speed and traffic congestion will affect the safety of the roads and the decrease this will result in the lifecycle of the road which creates more cost on maintenance.

3-3 King Abdulaziz project for public transportation in Riyadh City

Apart from the above discussion the concerned authorities take necessary steps to evaluate the situation and started preparing the recommended strategic planning for the public transportation project and other strategic planning for relevant projects in order to have practical comprehensive solutions for all possible problems and challenges that may face the project in the future:

1. King Abdulaziz project for public transportation:

It is the main important project suggested by the Royal High Commission of Riyadh which have been approved by the council of ministers in the year 1433(2012)to use public transport modes trains and buses to solve the chronic transportation problems in Riyadh City. The project based on the components of the national strategy for public transportation and feasibility studies, workshops and round table discussion groups results and recommendations it is also achieving the goals and initiatives of the national transformation program and the kingdom vision 2030 as well as the united nation SDG.

2. The comprehensive architectural vision for development of Riyadh City 1440:

The strategy and the executive plan prepared by the Ministry of Municipalities and Rural Affairs that transferred the strategic plans to projects appropriate for execution according to the expected urban transformation in respect of economic, social, architectural and environmental aspects. The plan identified three executive policies:

- The first executive policy, establishing comprehensive and integrated public transportation system that improve the integration between all modes of public transportation .

- The second executive policy, establishment strategic urbanization centers at the areas of public transport networks and formation of new urban centers.
- The third policy , connecting the natural elements with developing areas and establishing green public areas that suits the natural environment.

3. Strategy of protection of environment in Riyadh City:

The executive plan for implementation of this strategy is looking for quality and purity of air, waste management, purity of water resources and soil, management of natural resources, sustainable management of environment and development and consideration of weather changes.

4. Strategy of traffic safety :

Consideration for all plans ,programs , traffic law and all precautionary measures that lead to prevention of traffic accidents and to guarantee safety of human beings and their properties as well as maintaining state security and its human, economic resources. Implementation of traffic law at land roads to have secured and safe driving of all vehicles and secure the safety of passengers from being harmed or injured due to traffic accidents.

3-3-1 King Abdulaziz project for public transportation in Riyadh City:

The project composed of two major modes of transport, trains and buses to have integrated transportation systems according to the comprehensive plan of the Royal High Commission of Riyadh targeting provision of public transportation for all citizens, aiming to reduce the use of private cars. The project is expected to provide other benefits such as economical, architectural , social and health. The project cost about SR 22 billion the project aiming to transform Riyadh to one of the biggest 10 economic cities in the globe, to increase the number of population to 20-25 million people and have

about 40 million visitors by the year 2030. It's targeting to raise the percentage of inhabitants who are using public transportation from 5% to 20%. The project two modes of transportation are as follows :

3-3-2 Riyadh Metro Project :

The metro project is the backbone of the public transportation system in Riyadh . The trains are designed to work automatically from central control room at very high level of automatic operation system.

The project will be executed by three international consortiums :

The first consortium is Bacs which composed of five companies, two Saudi companies, two Americans and one German company.

The second consortium is Arriyadh New Mobility composed of eight companies, two Saudis, two Italian , one Canadian, one British, one Indian and one Spanish.

The third consortium is Fast which composed of seven companies two Spanish, two French, one Saudi, one Korean and one from Netherlands.

These companies are supposed to finish the project in four years from 2018 to 2021.

The project composed of six main lines length of which is 176 kilometers with 85 stations covering most districts with heavy density of population and serving the government entities and commercial, educational and health services activities. The metro is connected to King Khalid International Airport, King Abdullah Financial City and city center, the six lines are colored as follows :

First line (blue) from Olaya via Batha to Hair, length 38 kilometers.

-second line (red) King Abdullah road, length 25,3 kilometers.

Third line (orange) Madina Munawarah road to Prince Saad ben Abdul Rahman the firsts road, length 40,7 kilometers.

Fourth line (yellow) King Khalid International Airport road , length 29,6 kilometers.

Fifth line (green)King Abdulaziz road, length 12,9 kilometers.

Sixth line (olive) Abdul Rahman Ben Auf to Hassan Ben Hussain Ben Ali, length 30 kilometers.

Arriyadh development authority

60% of the railway is surface lines and 40% are under ground , the number of train stations that will serve the public are 85 out of them 4 stations are junctions which have been designed as commercial centers with all facilities including parking areas and well equipped with all safety systems including cameras and fire safety systems. The train, are fully automated and to be operated from one operation center. The four junctions have been chosen at highly populated areas and will be as gathering and connect centers for the trains as well as buses.

- The first station is in Qasr Alhukm area where line 1 and line 3 are joined.
- The second station is at King Abdullah financial center where lines 1,4and 6 are joining.
- The third station is Olaya station where line and line 2 are joined.
- The fourth station is the Western station in Alsuwaidy area where line 3 is joined with the buses main station supported by 1000 car parking's

The train lines and central stations have been designed observing the following criteria:

- Heavily populated areas,
- Areas where traffic jams are observed at present.
- Fulfilling the expected aspects of transportation and traveling requirements at present and in the future.

3-3-3 Riyadh Buses Project:

The buses network is considered as the main supplier of the train network, because the buses are the main transportation mode, only buses will be allowed to enter the train station areas and they are safe carriers of passengers from their residential areas to the train station.

The buses services is the second part of king Abdulaziz public transport project to be integrated with the metro services to compose the efficient safe network of the public service in Riyadh City.

The buses network will composed of three levels:

- Level -1, buses with special routes:

This level composed of three routes, length 160 kilometers for each returning trip, containing 108 stations, the bus length is 18 meters.

- The first route length is 42 kilometers,
- The second route length is 24 kilometers ,
- The third route length is 12 kilometers.
- Level-2-Ordinary bus routes: This network will connect districts with each other through 19 routes of Total length 904 kilometers return trips using different roads in the city.
- Level-3- Feeding buses routes: This level is the most important one because it feeds the trains with passengers at very high efficiency and speed, the length of this level is 825 kilometers.

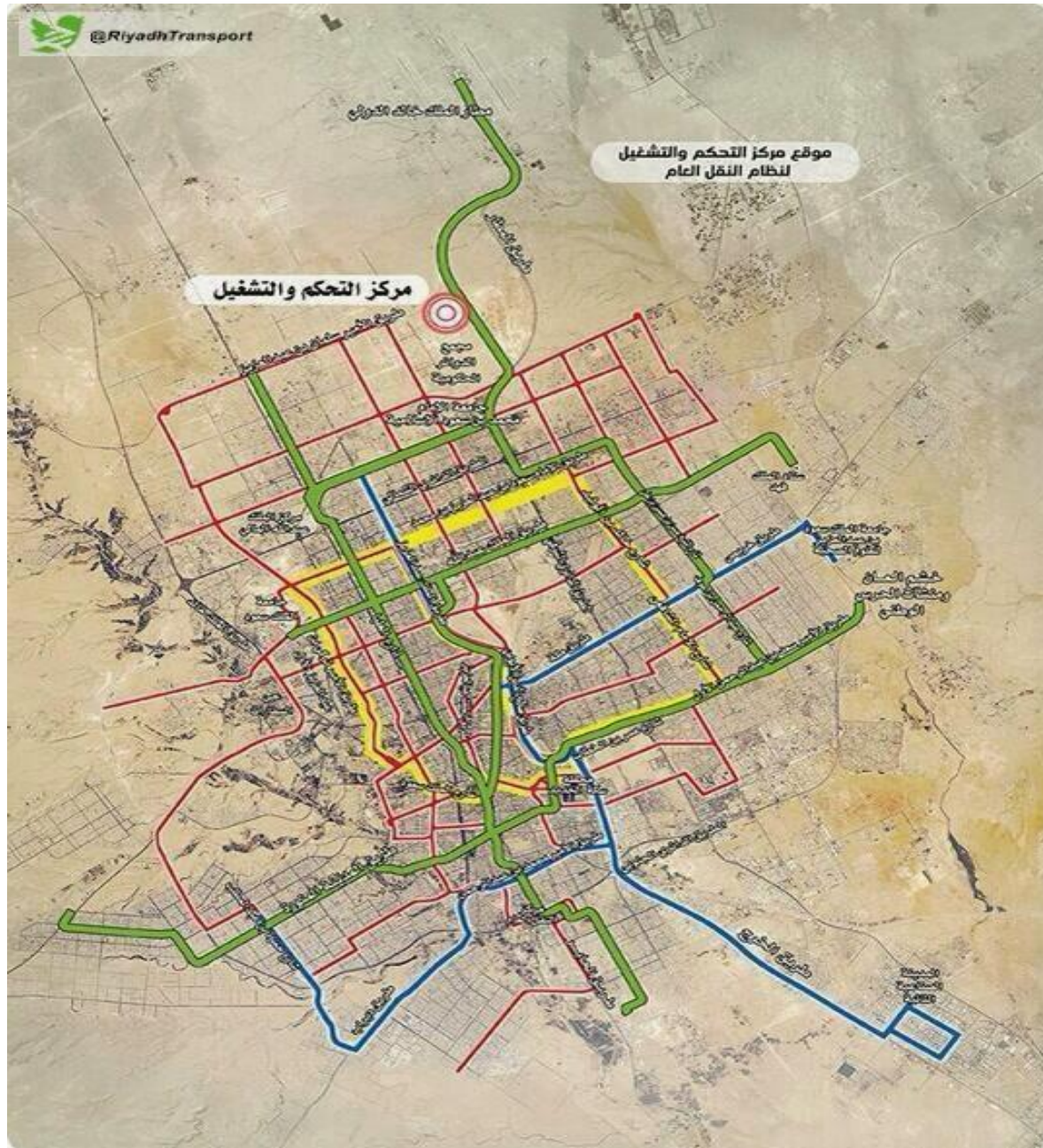
The project includes 4 types of stations one for each level beside the central stations.

Operation of the project:

The project will be operated by newly established company ,named public transport company as joint venture between SAPTCO and RATP Dev French company ,

The company signed an operation contract with Royal High Commission of Riyadh for SR7.86 billion for ten years to import more than 1000bus of different kinds and capacities and at very high international standards (Arriyadh Development Authority 2012)

(Riyadh Public Transport Operation Map)



3-4 Assessment of King Abdul Aziz project for public transportation in Riyadh city:

This project is considered as one of the biggest projects of the National Transformation program that will achieve the goals of the kingdom vision 2030 and fulfilling the UN SDG , specifically SDG 3 Ensure healthy lives and promote well-being for all at all ages and SDG 11 make cities and human settlements inclusive, safe , resilient and sustainable.

- provide transportation services for all people.
- provide diversified , safe and efficient transportation modes and services in the city.
- Reduce the use of personal cars , at least 40% of the population will the new pattern of transportation.
- Establishing transportation system that coped with the ambitious development of Riyadh City to be among the first ten cities in the globe.

- To enhance the economic development and make Riyadh attractive economic center to raise its economy from SR40 billion to SR65 billion.

-Reduce the carbon dioxide emissions by at least 50% as well as reduction of emissions of all other gases that affect the environment.

- Reduction of traffic congestion and consequently reducing the numbers of accidents
- The expected daily passengers about 1.6 million passengers per day at the beginning of the operation and expected to reach 10.6 million within ten years.
- Provide optimal explanation of land use in the city.
- Reduction of fuel consumption by 40- 55% which will be refelected in new investment activities, the daily reduction will be about 450 Million liters.

- Use of solar energy to provide most of the stations with electricity that will have positive effect on the environment.

King Abdulaziz Public Transportation project started in 2013 with the strategic planning to be completed in four years time , the project delayed for another four years . This raise many big question about strategic planning and implementation of the plans .

This delay will result in increase of the cost of the project and delayed the payback period of the invested capital.

The traffic congestion was more worse than before because of long closure of roads and the divergence of roads because of train routes and stations construction. This closures extended for about nine years , which have negative impact on the people and the environment , due to stress of car drivers that will raise the possibility of making accidents. These questions have been raised and should have logical answers when scientific assessment of the related strategic plans will take place .

The concerned high officials in the ministry of transportation and logistics services and the chief executive officer of the Royal High Commission of Riyadh tried to answer these questions and explain the factors that caused this situation. They stated that between 90-92% of the construction work of the project has been completed .

The Covid-19's was affected the follow of work due to closure for more than two years which caused the delay in delivery at scheduled times , this was the excuses given by the contractors, consequently the delay of payment took place which created some disputes between the Owners of the project and some of the contractors .

More than 180 trains have been received and making pilots trips on some completed routes, also the SAPTCO buses are making trial trips on their proposed roads to see and identify the exact time that the trip will take.(Sabq.org/saudia)

3-5 Conclusion:

The study of the strategic plan of King Abdulaziz public transportation project results are showing that the continuation of the present situation of transportation in Riyadh City which heavily dependent on private cars will create series of challenges and problems such as traffic congestion, car accidents and environmental pollution .

The project is about to be operated and it will achieve the main objectives of the strategic plans of the vision of 2030 to have Riyadh city as an attractive environment for sustainable business and global economic center. Development of the transportation infrastructure and planning for sustainable safe and efficient suitable integrated transportation modes which will absorb the expected rapid expansion of the city to become one of the ten big cities in the globe. The metro transportation will help in maintaining the quick arrival of people to their work place and saving time which will be reflected in raising the productivity of all people. The project will help in reducing the number accidents that caused deaths and injuries and consequently have positive effects on health budgets and car maintenance cost . The project will help in achieving the goal of the quality of life program in form of reduction of pollution, reduction of expected risk of weather through using of the train and buses stations as safe shelters during the changing weather. It has economic and social benefits at personal and national level because of the low cost of travel, and saving of fuel , car insurance and car maintenance expenses .

Despite the fact of long delay of this project , its fully financed by the Government, and the best way for remedial steps is to call the local private sector to contribute to the operation, in same sort of partnership, and also the public through some responsible. Arrangement.

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