

Applications Of Sustainable Urban Transport In Global Experiences And Lessons Learned For The Urban Development Of Iraqi Cities - Sader City

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ABSTRACT

Cities are among the most complex products of human initiative and activity, and they provide us with enormous examples of the diversity of physical forms, economic foundations, and functional models within the framework of urban development and many cities suffer from urban expansion and urban sprawl and change their urban structure (relationships and elements).

This makes the provision of a sustainable urban transport system the main challenge and objective faced by those in the transport sector, Because of its role in resolving pivotal issues related to urban growth, land use, energy consumption and climate change. This is evident in third world cities, especially in the city of Baghdad, as there is a common demand to make public transportation integrated and attractive, with a long-term impact to improve the quality of life in cities.

This research studies the experience of the Brazilian city of Curitiba as a global model for solving problems related to urban transport in developing cities. It can serve as a reference case in the planning of the integrated transport policy and the realization of a practical, efficient and cost-effective transport system, Which was based mainly on the integration of land uses with the public transport system and the road network and the strengthening of the relationship with the administration and the participation of the private sector.

KEYWORDS: Sustainable Transport, Bus Rapid Transit, Land Uses, Integrated Transport, Curitiba City, Baghdad, Sader City

1- Introduction

The transportation world is rapidly changing, and its future course is uncertain. We know that mobility will increase as more people and goods move through cities and around the world, and that meeting the growing aspirations for sustainable mobility has the potential to improve the lives and livelihoods of many people – their health, environment and quality of life – and help reduce the effects of climate change. However, the future of mobility could also go in another direction: it could generate massive disparities in economic and social progress, encourage the use of fossil fuels and thus degrade the environment.

The current transportation systems in some countries do not achieve the conditions of sustainability, where the demand for transportation services in cities has increased steadily as a result of urban expansion, population growth, and the rise in revitalization and revitalization of the standard of living. This has resulted in an increase in the number of vehicles and an excessive dependence on private cars for transportation, which contributes to an increase in energy consumption, and leads to the emission of harmful gases, especially Greenhouse Gases.

In the midst of these problems, some countries have realized that urban transport should be given top priority, which prompted them to reconsider their priorities. To face the social, economic, environmental and institutional challenges, and improve public transport and give it priority over private transport, within the framework of plans and strategies that achieve urban transport. The public transport systems in the Brazilian city of Curitiba are among the most successful implemented systems in achieving sustainable transport, as the World Bank classified it as a successful model for the application of rapid public transport systems. [1]

The importance of the research stems from following a good urban planning and design policy to achieve integration between the transportation system and land uses in cities. The research aims to benefit from the experience of Curitiba and study its applicability in the case of Sader City as a model for one of the successful applications of sustainable urban transport in the development of plans and strategies that have achieved the integration of land use with the sequencing of the sequencing, and the sequencing of the growth system. And

the possibility of its application in Sader City, Baghdad. The research emphasizes the vitality of contextual studies and strategies for integration and implementation in achieving sustainability in the urban scale, and to what extent the principles of sustainability in the city can be adapted to other contexts.

2- Sustainable urban transport and urban development

The transportation system is the engine of urban life, which pushes day after day social and economic activities in cities to develop, and the decision of the access and movement mechanism in the transportation system has played a key role in shaping the urban model of cities, and influencing urban development, which are indicators that are constantly growing. In terms of size and spread. Accessibility is one of the most important factors for both households and businesses, and thus is a self-reinforcing driver of urban development. [2]

Public transport is an essential part of sustainable urban transport, which can be defined as “modes of transport that meet today’s mobility needs, do not pose a threat to public health, or ecosystems, and combine accessibility consistent with the sustainable use of the resources used and alternative resources, without compromising ability of future generations to meet their needs. [3]

It is also known as the multimodal planning approach, which includes a set of planning tools such as the integration of transport planning, land use planning, urban planning, travel demand management and others, which indicates a significant shift in focus within transport planning, towards a more sustainable approach within the strategy Transportation planning, while at the same time reducing the costs borne by the community. [4]

As a result, sustainable urban transport is transport that serves the general vision of economic and social development in urban areas, and provides access to all groups in society. Therefore, it is a prerequisite for protecting and improving the quality of life and increasing the welfare of the population in cities. This requires a different way of thinking about city structure, and a new approach to both land-use and transport planning.

The integrated public transport policy has several advantages, including: [5]

1. Integration of different modes of transport by creating reliable communications, secure exchanges, and common electronic cards.
2. Make transportation policies consistent with objectives in the areas of urban design, land use, economics, environment, health and society.
3. Social integration and institutional and administrative integration.

3- Strategies to achieve the interconnection between the sustainable public transport system and urban development:

3-1 urban design strategy associated with multimodal public transport

This strategy is a tool to achieve integrated urban development within the framework of the sustainable public transport system through an integrated transport plan and the production of urban patterns and a diverse population movement.

Any attempt to understand the relationship between urban expansion and mobility calls for studying the transportation system as part of the urban design system of the city, and that the success of the urban design process is linked to the elements of interaction between development, transportation and the economy, which directly affect urban design for mobility, as making sustainable public transportation systems in Access to all people is an important part of achieving an inclusive society, as in many countries it is a high priority to design accessible transportation systems for all. [6]

The basic theory of the relationship between urban land use and transportation systems explains that it is related to a relationship and a cycle of interconnection in urban areas. Urban land use is at the root of urban mobility needs and provides the structure and basis for city mobility. The level of actual operation of the transport system affects the urban spatial structure and urban development, affecting urban land use and in particular accessibility, which has a critical role in economic activities and urban development. [7]

3-2 Place-making strategy and urban space quality (quality of life)

This strategy helps to clarify the priorities of development places and the priority of sites according to possibility and importance, and through it the design process covers all areas, to provide development opportunities on a larger scale.

Urban design is primarily about place-making. There are no abstract places, but human activities and events that make place-making possible. Thus, successful urban spaces must combine quality in three essential elements: physical space, sensory experience, and activity. Where we can leverage the components of place to devise a set of principles and prerequisites for creating successful urban spaces. [8]

Attachment to place is one of the basic human needs, as it comes at the third level of Maslow's hierarchy and after the need for safety, which indicates that a person does not feel belonging to a place until after he feels stability, security and protection in it. A sense of place and a sense of belonging to the community are a prerequisite for enhancing psychological well-being and enhancing indicators of housing satisfaction, and satisfaction with the quality of urban life. [9]

Urbanization is affected by transportation systems, and the uncontrolled growth in urbanization raises serious concerns about the sustainability of transportation systems. Car-based mobility has become one of the fundamental dynamics of contemporary societies. The main challenge to the success of the above strategies is to encourage change in the habits of travelers, and the ability of cities to educate people about the needs of balancing environmental and social issues for more harmonious cities and mobility for all.

3-3 Transport investments as a tool to achieve urban development strategies

Sustainable public transport is a type of public service provided to citizens. It is planned and designed to meet the needs of urban travel. Many new generation public transportation systems such as metro, light rail (LRT) and bus rapid transit (BRT) systems have been built in the world in order to meet the demand for mobility. In general, these systems are planned as a tool to solve the transportation, land use and environmental problems associated with extensive vehicle use. [10]

There is a growing need to provide efficient transportation systems, as cities grow into urban areas with the concept of city area. Rail systems remain the most efficient way to transport large numbers of people over long distances at high speed. [11]

Bus Rapid Transit (BRT) is a flexible mode of transport that does not have a fixed infrastructure. Its construction and maintenance cost is lower compared to metro or light rail systems. Investment in it has recently gained increasing popularity and great interest in cities to develop new means of rapid transport, and therefore it is used as an important tool for the realization of urban plans. They are systems with separate lanes, enclosed stations, and high-capacity buses that have the potential to affect property values and land uses. [12]

Transport investments can achieve urban form and land use modifications by enhancing access, usually in the form of more compact TODs. These shifts in the built environment can in turn affect the demand for public transportation, with higher densities leading to higher levels of ridership. However, density is only one dimension of the built environment that affects travel. Other variables that shape travel demand are diversity, design, accessibility and distance to transit. [13]

Transportation technologies and investments significantly affect the urban form of cities, and therefore public transportation systems are very important as they can be used as a tool for realizing and shaping urban development schemes.

4- Integration of sustainable public transport and land use

Cities in developing countries are growing at an unprecedented rate, and as incomes rise, the urban population will expand out of cities, following the car-dependent path of expansion in developed countries. This trend must be reversed to make significant progress in increasing the economic competitiveness of cities through energy and time efficiency improvements and to promote social equity by taking action to prevent urban dwellers from following this path. [14]

Urban designers have for years sought to identify and document more effective strategies for transportation and land use integration. Preferred strategies include compact growth, pedestrian and bicycle friendly designs, full streets, traffic calming, transit-oriented development, and urban design that brings these strategies together. Particular emphasis was placed on accessibility as a concept linking transport and land use, where access can be achieved through mobility (transportation) or through reduced distance (land use). [15]

Integration of transit and land use is one of the most promising means of reversing the trend of car-dependent expansion and putting cities in developing countries on a sustainable path. BRT systems deserve special attention, as the majority of future urban growth is expected to occur in medium-sized cities with limited

financial capabilities. . These systems, which are less expensive than other forms of mass transit, can meet the demand for traffic in these cities. Promoting transit-oriented development will be particularly important. [14]

For decades, urban planners and designers have advocated better integration of transportation and land use as a way to improve urban sustainability and livability. They emphasized that the sustainability and livability of communities should be a priority goal, as best practices have been identified based on global experiences as ways to move forward with integrated and transit-oriented development and a relative interest in measuring transport efficiency and land use integration. [16]

5- Integrated Transport System - The Brazilian City of Curitiba Experience:

5.1 Brief on the city of Curitiba

Curitiba is the capital of the Brazilian state of Parana. It was founded in 1530 as a gold-mining camp and officially became a city in 1812. Its present metropolitan area includes 26 municipalities with a total population of 3.4 million. The city has an area of 432.17 km². This city is characterized by having the largest percentage of private cars among the Brazilian cities. [17]

Curitiba is one of the most famous cities for its sustainability achievements which can be categorized into integrated themes: integrated urban planning, efficient public transportation system, local environmental awareness, pedestrian and public priority in the city, and a focus on social justice. [18]

5.2 The role of urban planning in achieving sustainability for the city of Curitiba

The first urban plan for the city was drawn up in 1943, this plan assumed the dominance of cars, and this approach was adopted as a basis for realizing large investments in infrastructure, such as ring roads and other roads. However, this plan was not implemented due to financial difficulties and the pressure of rapid population growth, and in 1964 the government developed the Master Plan. The idea worked on developing the city along linear roads to increase the efficiency of spread and distribution of services, and suggested investing in the infrastructure in an orderly manner. Then the public transport system (BRT) was activated in 1974, whereby the plan has been developed since that time based on the main objectives of the city to meet the requirements of regulating the regions and the economical land uses of the commercial-accounting lands. [19]

Curitiba's experience is one of the distinguished global experiences that adopted public transport-oriented development to reach a sustainable and integrated urban transport system that achieves sustainability to enable the city to meet economic and social challenges with limited financial resources. In addition to being a practical, efficient and cost-effective system. [20]

The (BRT) system was introduced in Curitiba in 1974, as part of a package of transport and land-use planning reforms, replacing a chaotic system of irregular roads. This resulted in a 2.36% annual increase in bus sponsorship, and a 30% reduction in road traffic within the first 30 years of operation. As the system is financially self-sufficient. [21]

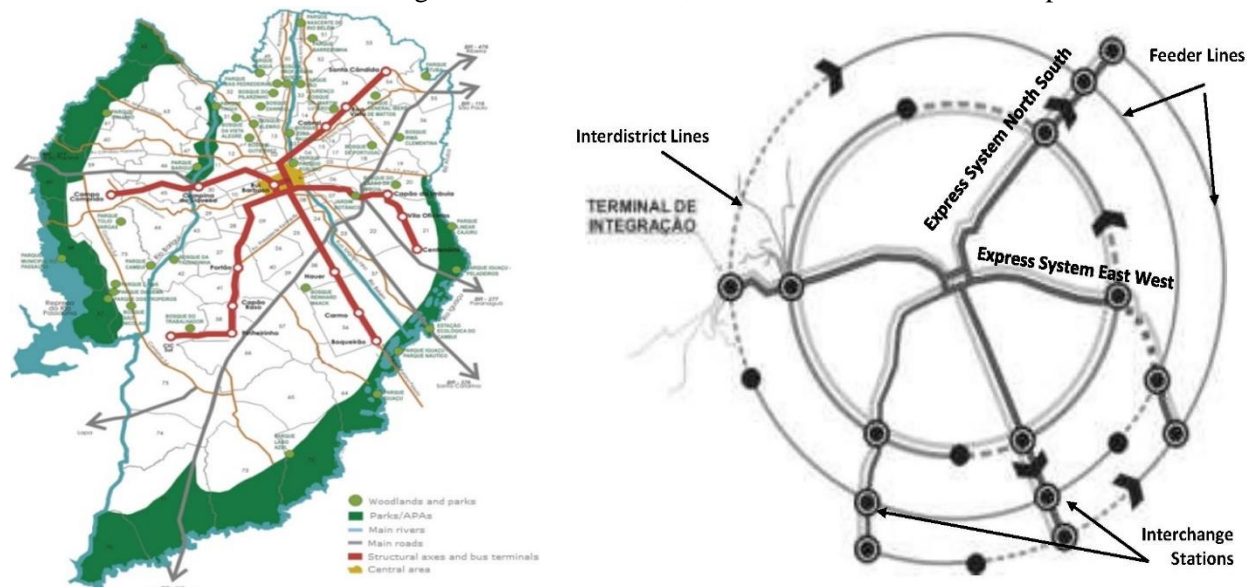
5-3 Efficiency of the urban transport system in the city of Curitiba

In the late 1960s, the Curitiba government began to take different approaches, viewing land use, road network and transport planning as the main tools for directing and coordinating growth. The planners designed five main routes out of the city centre, using pre-existing streets and making only small modifications to them. These lanes function as high-density corridors for both transportation and urban growth. [22]

The BRT system has been known as the Integrated Transport Network in Curitiba, as it connects the city center with the residential neighborhoods through exclusive traffic lanes. These lanes allow the higher average speed of the bus. The public transport system consists of three tiered and integrated levels of service, and these three levels of the public transport network can be represented by the diagram shown in figure (1). These three levels are: [22]

1. Express System: It constitutes 58 km of lines for buses that pass through the city in an intersecting network along its northern, southern, eastern, western and southwestern axes. They are direct, fast, and high-density lines, traveling radially outward from the city center.
2. Feeder Lines: Complete 270 km of structural axes, traverse residential neighborhoods and provide easy access to the system in less dense areas.

3. Interdistrict Lines: The total length of which is 185 km, connected with the axes of express and Feeder lines by



means of stations, allowing transportation between remote areas without passing through the city center.

These three axes, if all of them are added to the traditional ways, the urban transport system in Curitiba covers the entire municipality (local), and its network is integrated with 10 cities of the region (province). [19]

The BRT system buses are characterized by being (flexible, and high-performance), which combine a variety of physical operating elements and systems, which leads to a permanent integrated system with the impression in users' memory of being of unique quality and characteristics. [23]

5-4 managing a sustainable urban transport system and the integration between transport planning and land use

The management of a sustainable urban transport system belongs to the Land Use and Transportation Planning Unit. (URBS) (a governmental institution owned by the city of Curitiba and responsible for planning and management). It relies for its work on the strategic planning carried out by the Curitiba Institute of Urban Planning and Research (IPPUC). The institute is the auxiliary body to the city government's executive authority, and is not only responsible for the plan but also works on testing solutions. This responsibility was the basis of his success as it led to plans accepted by the community and implemented quickly, and the residents seemed to trust the ideas of the Institute and this trust was responsible for making changes in the city as the community came to support the ideas of the urban transformation of the city, suggesting improvements and demanding amendments. [19] See figure (2).



Figure (2) Bus routes in Curitiba, where the focus is on accessibility and connectivity rather than just transportation. Source/ (kenchucuritiba.weebly.com/bus-system)

Mixed use of high-density apartment buildings along with transport hubs is allowed. Determining the density of the area directly depends on the availability of public transportation in it. The linear development along the "arteries" road leads to a significant reduction in the need for downtown movement as well as providing new opportunities for commercial industries to be placed near highways. [24] See figure (3)

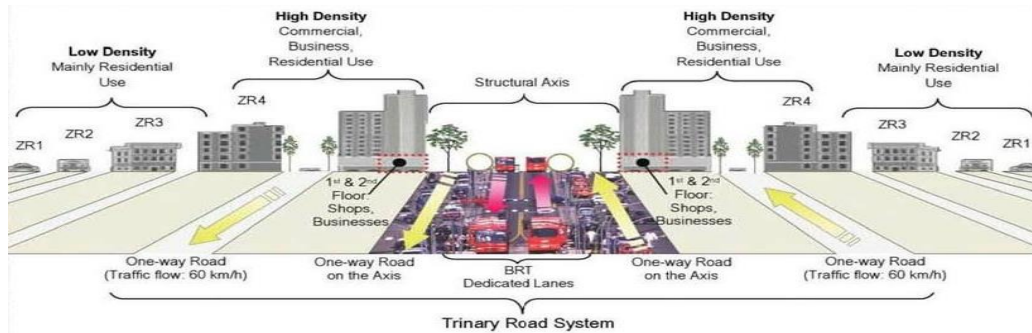


Figure (3) Mixed use of high-density apartment buildings along with transport hubs

6- AL SADER CITY

6-1 History of Al-Sader City and Its Urban Transportation System

Sader City is located in the northeastern part of Baghdad. It is sandwiched between the Army Canal, which borders it to the southwest, and the earth dam to the northeast, and occupies an area of (30) km². It is about 5.5 km away from the center of Baghdad. It is linked to the city center of Baghdad by three transport routes representing exits and direct entrances to the city. Therefore, these main roads, their directions, and the traffic on them made them characterized by vitality; Because it is linked to market centers, population centers, and important areas in the city of Baghdad, and the availability of easy access to them, and at the same time it gives locational advantages to the city. [25]

The population of the city is (2.5 million) people, and 33% of the population of the capital, Baghdad, its spatial structure has changed significantly since the beginning of the current century as a result of the rapid expansion in the suburbs and the dispersion of development outside the planned areas, and today it represents a compact area with a high density, and the dispersion of development with all Types of urban jobs and amenities such as housing, shopping malls, industrial uses, offices, education and entertainment. [25]

It was planned according to the Grid Iron pattern from the Greek plan Doxiades, employing the idea of residential blocks (Super Block) and adopting them as a standard unit (Module) to create the idea of the residential sector, to accommodate the large size of the city's population in a way that utilizes most of the available space with a clear orientation to discourage the movement of cars inside The residential sector, and this is in line with Doxiades' ideas of separating the movement of cars and pedestrians, and the pattern of housing units' assembly is characterized by the connected style, (Attached Houses), which created a significant increase in population and housing density. See figure (4)

Figure (3) High-density apartment buildings along with transportation hubs. Source / (ippucweb.ippuc.org.br)

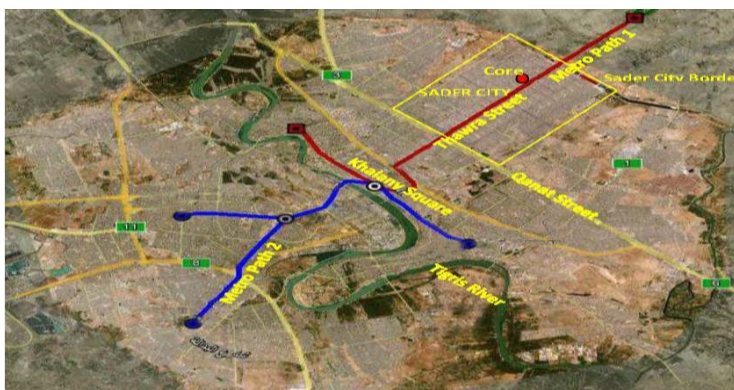


Figure (4) Sader City Border and Metro path 1&2. Source: Authors from Systra company study.

The urban transportation system in Sader City is currently dependent on private minibuses and automated transportation with cars and therefore, urban growth and expansion of the urban area is completely dependent on cars. Baghdad Metro, a major infrastructure project under public discussion for more than 12 years. It covers a fairly long distance with respect to the entire urban area and passes through the most densely populated areas, including Sader City. [25]

6-2 Comparative description

To compare the similarities and differences between Curitiba and Sadr City in terms of some basic urban and transportation characteristics. The two cities appear to be similar in urban and population density, and similar in having slums. However, Curitiba has better numbers in the elements related to sustainability, green spaces, and public transportation use.

6-3 An integrated transportation system for Sader City

Sader City's transportation system needs to be equipped with rapid mass transit modes such as the BRT system. Moreover, activating the construction of the metro to reduce traffic congestion and meet the high demand for transportation in the entire city. Through these two systems, the access streets will be linked through two lanes of its main roads, consisting of express buses, in addition to the metro system in the city center. Every major street in the city will be supported by two slow-moving lines, along with express buses. Priorities must change due to the contextual, social and environmental specifics of the city. Focusing on the main points related to the integration of urban planning and the implementation of effective measures for the use of land therein. See Figure (5)

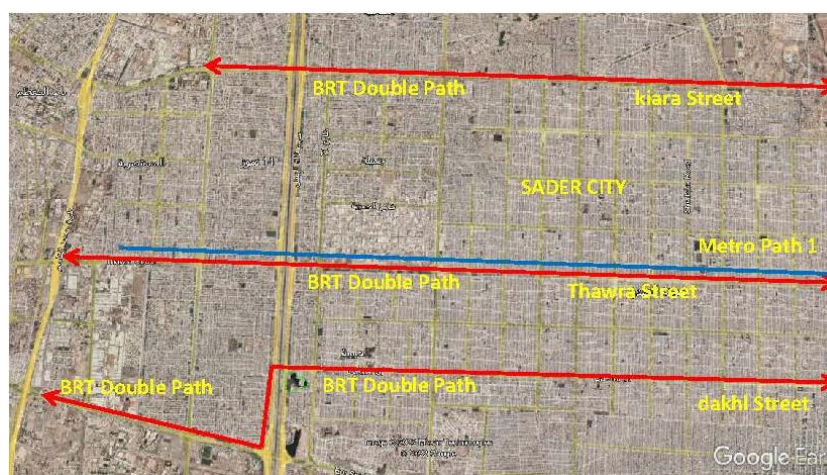


Figure (5) Suggested Bus Rapid Transit Routes in al-sader city. Source: Authors.

6-4 Pedestrian-Oriented Urban Design

The development oriented towards public transportation is the rapid and increasing trend in the creation of vibrant, livable and sustainable communities, as the establishment of communities dedicated to pedestrians and bicycles by centering the farthest uses around a high-quality public transportation system, and this makes living life less stressful, and without complete dependence on cars to navigate. Sader City suffers from some problems with its daily transportation service. Due to the constraints of private ownership as well as financial constraints and poor planning, moreover, the pervasive growth patterns acted as an incentive to use private cars more. So pedestrian- and cyclist-oriented strategies are a viable long-term solution. Orientation towards pedestrian mode in the city represents a great opportunity for citizens to reconnect with each other, their eco-identity and cultural activities and to be safer, more beautiful and more comfortable.

7- Conclusion

- Urban planning for cities needs inspiration from many successful precedents and contextual opportunities. Every urban environment has its own opportunities and limitations, but there are many things that can be learned

from other cities. Successful principles are investigated based on precedents, analyzed with regard to their local context, and modified for application in other contexts. The principles behind Curitiba's success stories are described as related to urban planning strategies.

- The sustainable transport system has impacts on the environment, the economy and society and thus on the quality of life and urban development in the city of Curitiba, as a result of the city's active participation in transport planning and management, as transport is an important and cost-effective tool. Only one element and it is preferable to consider it among the basic elements of an integrated toolkit that includes land use controls, transport network planning, housing, and development. The results of this integration are visible in Curitiba in a number of areas, including environmental, economic and social.
- The sustainability of cities can be achieved by balancing several integrated factors, including: sustainable decision-making, sustainable society, sustainable environment, sustainable economy and sustainable transportation. The balance between these factors is entirely related to the potential of the urban context at the local and global levels.
- The sustainable transport system in Curitiba has brought many benefits and this is the essence of a sustainable urban transport system. It is the first city in the world to implement the (BRT) system and has become a reference case for many cities in the developing and developed countries in the world. It is a pilot experiment and a model for planning an integrated transport policy aimed at restructuring bus systems that use more energy, reduce congestion and air pollution, and reduce air pollution. As for Sader City, which is very crowded, this system can be very convenient and efficient, because of its relatively acceptable costs and its provision of services of high quality and high capacity, similar to your comparable light rail systems.
- The public sector has the most important role in setting regulations and legislations for the establishment and operation of public transport systems, while the private sector has the largest role in operating public transport systems as it is more effective in performance if it is provided with sufficient support from the public sector.
- The necessity of defining a future vision for the sustainable transportation system in Iraqi cities, which sets a global standard for effective services with integrated technologies and innovative policies. This vision includes broad outlines of objectives and strategies, in addition to the results that are hoped to be achieved once the transportation vision is achieved on the ground.
- The necessity of coordinating between transportation planning and land use planning in Sader City in order to achieve transportation and developmental, economic and environmental goals, thus promoting public transportation-oriented development, as well as encouraging non-motorized transportation modes such as walking and cycling, by raising awareness and providing dedicated lanes for that.

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