

Intermodal Transport Systems as A Guiding Factor for Urban Development in The City of Baghdad Within the Framework of Modern Trends

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Abstract

Transportation systems represent the main part of the components of cities, and the basis for urban planning and design of the city, and each system consists of several parts that work together complementarily within its tracks and in a manner that is integrated with other transportation systems to improve the reality of the city and its positive role in sustainable urban development.

Major cities (especially Baghdad) are facing the effects of urban sprawl that supports the spread of private cars, and this has led urban researchers and designers around the world to adopt new urban development trends that included a review of the relationship between transportation systems and urban development in cities.

Based on this, the research discusses transportation systems as a guiding factor for urban development according to these trends and studies the possibilities of intermodal transport systems in order to identify the opportunities in Baghdad as one of the major cities that still faces the effects of central planning, design, dispersal, and the expansion of urban tissues directed to cars.

The research proposed a possible application strategy, as meeting the requirements of the contemporary city calls for innovative urban design approaches to promote a resilient and livable urban fabric, and transit-oriented development (TOD) is one of these approaches, as this concept increases the use of public transportation, adding value to the area and creates A sense of place and community cohesion, and it provides a dynamic mix of land use that meets the needs of the local population.

The research concludes with a set of findings and recommendations that clarify the importance of adopting this strategy to manage more balanced urban growth and develop socially, economically and environmentally sustainable urban societies.

Key Words: public transport system, intermodal transport, sustainable societies, urban design, transit-oriented development, urban development.

1- Introduction

Given the importance of the transport sector and the role it plays in supporting and achieving the general goals within the urban scope of the city, proper planning of transportation systems is essential and therefore it is imperative that this part of planning be effective and coherent with the rest of the sectors to maintain the strength of the transport system network in a way that guarantees the goal of establishing Networks.

The city contains various activities and functions, and it is a complex system with a dynamic spatially and temporally, and it expands and develops in different urban forms to accommodate the multiple human needs. Different areas as well as urban sprawl. The functional economic, social and environmental imbalance in urban agglomerations and major cities has reached a point that necessitates a review of previous urban design practices and a review of the relationship between public transport systems and urban development.

Each transport system has features that are an indication of its adoption in other locations in the city, in line with the actual need for transport systems with a specific capacity, and this determines the effectiveness of the region (commercial, residential, industrial.. etc.), as well as the building densities, population, traffic and other indicators , And that the public transport systems that work in an integrated manner are the basis for providing ease of access, making place, and developing economically, environmentally and socially sustainable urban communities to meet the requirements of the vibrant city.

The TOD concept aims to create vibrant communities that enhance walkability and provide attractive employment, housing and transportation options to enhance the quality of life and

the local economy. The research will address the applicability of the TOD concept in framework of the proposed future vision of the city of Baghdad, with its population of 8 million, and its expected population of 11 million by 2030. The city suffers from inadequacies in providing a livable and efficient urban landscape, urban sprawl, slums, excessive use of private cars, and a combination of inappropriate land use and a lack of well-designed urban spaces around transportation hubs. See Figure No. (1)

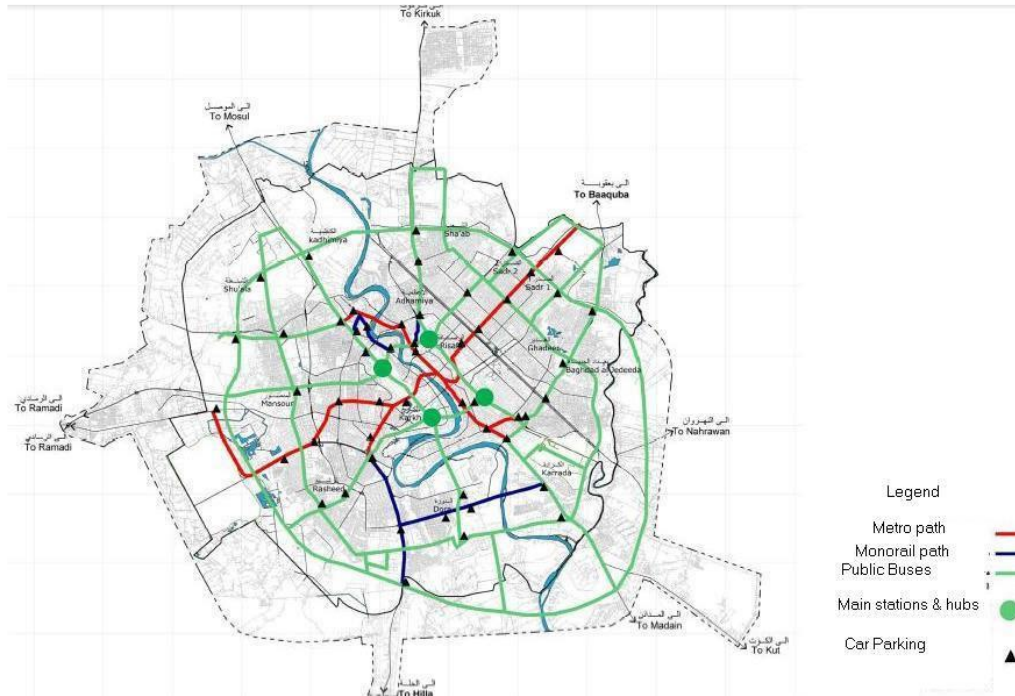


Figure (1): Baghdad transportation network and main stations and hubs. Source: Baghdad Comprehensive City Development Plan 2030. [1]

Research Methodology:

The research followed the comparative approach by clarifying the importance of intermodal transport systems as a guiding factor in the trends of modern urban development, and proposing the possibilities and opportunities available in the city of Baghdad, to conclude the research to an urban development strategy that integrates with public transport systems and adopts modern-directional principles and a set of results and recommendations that support socially sustainable societies. Economically and environmentally.

2- Intermodal Transport System

The concept of intermodal transport is known as the transportation facility for the twenty-first century. This idea can be described in several ways. It can refer to the interaction between people, services, and various modes of transport. It can be clearly described as "the concept of transporting passengers and goods on two or more different modes. This method encompasses all parts of the transport process, including information exchange, linkage efficiency and coordination" [2]

The intermodal transport system consists of a network of infrastructure and associated services, as no single mode can operate in isolation, as it is intended to play a role in the integrated network, and the combination of the modes requires complementary services, because each situation is appropriate for different types of trips. In fact, the combination of private and public transportation in a intermodal system provides opportunities to take advantage of the strengths of the various systems, while avoiding their weaknesses [3]

The great interest in intermodal transport creates an increased sense of comfort, safety and security during use, and it will be a major factor in attracting additional users for intermodal trips. This is a way to reduce dependence on cars in developing cities where the comparison is

no longer between planning more for less travel, but between planning more for better travel. [4]

Among the features of intermodal transport:

- Serving the country's local economy and minimizing losses, as it is considered a mixture of spending time between different modes of transport as well as time added within station services, traffic and arrival routes, and because time according to the economic concept is money (Time is Money), So delay means loss, as it is estimated that there is a loss of more than 20 million dollars annually due to delays at Kennedy Airport [5]

- The diversity and integration of transportation modes and services allows people with different needs and with different income to deal with various types of services, as the efficiency of the interchange of multiple transport modes is essential, and for long-term success, transport stations must become points for the exchange of different transport modes more than just points. Arrival and departure.

- The integration of intermodal transport with other systems enhances the human experience of the traveler and the sense of familiarity of the place because it connects the traveler between the city on the one hand and it integrates with various activities (such as hotels, exhibitions, business centers ... etc.) on the other hand, in addition to that it may represent a transitional space paved for a building space Passengers at the terminals [6]

Adopting the concept of an intermodal transport system in cities by making them more complex, as more integrated jobs, increasing numbers of passengers, more stations in dealing with passengers, and a new way of life for people where full use of the waiting time for passengers by providing facilities and entertainment, and many more Major stations appear to be districts and shopping centers that have become sources of attraction for tourists, and within them are many urban functions [7]

Urban intermodal exchanges can benefit passengers by making public transport more attractive and thus more viable compared to private cars, as well as opening commercial and social opportunities at a large level of productivity. Interchange stations can be more vital to changing facilities for passengers [8]

Intermodal transport requires the simultaneous adaptation of the following elements: [4]

- 1) Geographical location.
- 2) Associated modes of transport.
- 3) Infrastructure (physical) and technological facilities.
- 4) System operation, including the collaborative schemes required for the interconnection of transport modes, operators, and system providers.

3- Integration of (public transport systems - land use) and its relationship to urban development in the city

Integrated transport provides the local government with a means to assess the real impact of applying transportation on society, understand the actors responsible for providing services, and deal with community issues on a larger scale. The integrated transport process can influence decisions to improve local outcomes, in line with the goals of the wider community. Maximizing the benefits beyond transportation requirements, including economic, environmental, health and social benefits. [9]

The integrated transport system adopted by passengers must have the following features:

- Make the exchange easier between multiple modes of transport.
- Enhancing the reliability of the public transport system through close and consecutive scheduling (buses, light rail, taxis, etc.).
- Improve safety for all users, and reduce competition and interference between modes of transport that cause intersections.

The integration of modes of transport and land use requires overlapping of local policies with established programs, as transport policies overlap with land use policies as they can be achieved through integrated street design frameworks, integrated developments, and Multiple uses, which enhance employment and livelihood in cities through urban streets in particular, and one of the most important modes used in integrated streets is public transport, due to its important characteristics related to sustainability on the one hand and the concept of (TOD)

on the other hand. [10] An integrated and well-designed street includes the following elements:

- 1) Intermodal (public transport, walking, cycling, and car driving).
- 2) Adaptability to the uses of the land and the multiplicity of activities.
- 3) The high quality of the beautiful public places.
- 4) Environmental quality (green strips, trees).

Integration of public transportation requires easy access to workplaces, services, activities, and people seek to reduce long distances to travel in better ways. While access to transportation is more important than mobility itself, both accessibility and mobility are essential indicators in public transport planning. Whereas, the integrated urban transport policy works to encourage the adoption of public transport, limit the movement of private cars as well as adopt a planning approach to land uses [9]

Among the features of integrated transport are:[11]

Economic: Promote efficient movement of goods and citizens to support sustainability in the economic sector.

Social: Promoting social inclusion by connecting remote and isolated cities by connecting them to public transport networks.

Environmental: Protecting the environment and developing the health system by building and investing in transportation systems that consume less energy and emit fewer pollutants.

Integrated: Promote effective, efficient and linked integration of transport systems with regional and urban plans at all levels (governmental and international).

Safety: Providing a safe transportation system that meets economic and social goals with the best possible protection for users.

Transparent: transparency in financing, financial deduction, equal access to transportation systems, and clear identification of all landmarks and destinations at which costs cannot be fully recovered.

The distribution of land use types affects travel patterns, transportation is people's demand for the motivation of reaching a specific location, and integrating land use and transportation planning is a means to achieve the goal of transportation within the function of land use planning, and in a way that leads planning goals to land use, which may include limitation. Of the negative impacts on the environment resulting from transportation and land use, as well as activities. [9]

Changing transport priorities in cities from a city infrastructure that relies on private cars to a sustainable public transport system is an essential step to achieving the goal of sustainable urban development. The urban expansion in the cities, in turn, decreases through the development and intensification of the necessary facilities that reduce the need for dependence on private cars [12]

1-3 Policies For Achieving Modern Trends In Urban Design For Cities That Depend On Public Transportation

Planning trends appeared in the late twentieth century and the beginning of the twenty-first century in an attempt to respond to the aspirations and needs of society, as it represented a revival of planning practices that respect the human scale and a reaction to the culture of urban sprawl, the use of private cars and the needs of the times, Therefore, the provision of intermodal public transport systems is one of the basic principles for achieving these trends, the most important of which are presented below:

3.1.1 The Urban Catalyst Policy

Jane Jacobs emphasized that the vitality of the neighborhood in the city depends on the overlapping of activities that the catalysts need to respond to the basic needs that people seek to satisfy in the urban space: rest, relaxation, active participation and discovery. By responding to these needs, an urban catalyst can offer a variety of uses and a greater potential for generating activity, and therefore catalytic projects with higher potential should be devised to generate interpersonal interaction to take advantage of pedestrian traffic and other modes of public transportation. This diversity will enhance the spatial and surrounding vitality as well. [13]

3-1-2 The Policy Of Urban Densification And Compact Cities

Urban densification represents the main strategy to achieve integration in cities, and helps to use urban lands more efficiently by increasing the intensity of development and activity. This process includes developing unused lands, redeveloping existing sites and buildings, and adding expansions to existing land use. [14]

Urban densification has been identified as an approach to create areas of higher density in relation to buildings, and to promote a safer urban environment by providing an efficient intermodality that is comparable to private transportation. [15]

3-1-3 New Urbanism Policy

The role of transportation systems is to encourage the social and economic activity of cities, as they are the paths that penetrate the urban structures, and which determine the course of future developments, as they are a framework that defines the city, and in light of sustainability, we find a diversity in the definition of the new urban concept as: (good infrastructure, high-performance buildings, Which is penetrated by sustainable public transport). And the integration between transportation systems (Buses, BRT, trains, metros, etc.), as well as functional land use activities, as they form an essential component of sustainable urbanization, and terms (density, diversity, design) have been used to describe urban environments that are permanent areas of mobility. It is a multi-use, built environment, and thus is pedestrian friendly according to the (New Urbanism) conference. [10]

3-1-4 Smart Growth Policy

In 1996 the US Environmental Protection Agency (US EPA) established a network of organizations dedicated to supporting the principles of smart growth, which represented a theory of land development that accepts that growth and development will both continue but encourages smart development by directing growth through a deliberate comprehensive plan to reduce urban sprawl, According to the ULI, one of its most important principles is the need to provide public transportation options and support urban development in the vicinity of stations and transportation paths. [16]

3.1.5 Urban acupuncture policy

The policy of urban acupuncture represents a social and environmental theory that combines contemporary urban design with traditional Chinese acupuncture, it focuses on small-scale tactical interventions in the urban fabric, the cascading effects and transformations of the larger urban object, by interfering throughout the urban context that results in a transformation In grand urban planning drawing on undulating influences [17]

6-1-3 Mixed Land Use Policy

There are many transportation systems within the city that are related to the land use on the one hand and the population density on the other hand, as well as the cost required to establish and operate this system with the infrastructure necessary for the success of its work, and each transport modes has specific characteristics, and plays a different role in meeting specific needs within the path Transportation system. [18]

The task of urban design by providing an intermodal transport system and mixed land use is to develop a comprehensive strategy using the best method and each method has its own role, and it is not excluded to establish or assume that all problems can be dealt with by a unified solution. [19]

3.1.7 Transit-Oriented Development Policy

The Transit-Oriented Development Center (CTOD) defined Transit-Directed Development (TOD) as “urban development of high building density, mixed, multi-use, and walking within it does not exceed half a mile (800 m) to the public transport station.” In these patterns, an increase is required. Efficient use of the site, so that people can walk, ride bicycles, adopt public transportation easily, work to reduce dependence on private cars and encourage the adoption of public transport, and an integral mix of housing, shopping and transportation, to ensure that a sense of place and safety is created, and that employers can easily reach All their work sites are far from overcrowded. [20]

4- Strategies For Achieving Interconnection Between The Public Transport System And Urban Development

The public transport system is the engine of urban life, which drives social and economic activities in cities day after day to development, and mobility and accessibility in the

transportation system play a fundamental role in forming the urban model of cities, and influencing the sites of social and economic activities, These are indicators of urban growth increasing in size and spread. [21]

4-1 Urban Design Strategy Related To Intermodal Public Transport

This strategy is considered a tool to achieve an integrated development within the framework of the intermodal transport system through an integrated transport plan and the production of urban patterns of 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 the success of any urban design process depends on the extent of his knowledge of all the elements of the interaction between preparation, transportation and the economy, which are elements that directly affect the urban design of mobility. Making public transportation systems accessible to all people is an important part of achieving an inclusive society, as one of the high political priorities in many countries is to design transportation systems that are accessible to all, and issues of social inclusion and mobility are improved in areas of interchange, which creates a friendly environment for all users. [4]

4-2 Place Making and Quality of Urban Space (Quality Of Life) Strategy

This strategy helps clarify the priorities of the places of development and the precedence of the sites according to the possibility and importance, and through this strategy the design process covers all areas to provide development opportunities on the largest scale.

Attachment to the place represents 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, safety and protection in it. A sense of place and a sense of belonging to the community is a prerequisite for enhancing psychological well-being and enhancing indicators of housing satisfaction, and satisfaction with the quality of urban life. Thus, the sense of well-being results from a sense of place and a close connection with it. And that is by satisfying psychological needs related to the individual's sense of well-being in a spatial framework with qualitative characteristics that can be perceived and imagined. [22]

5- The intermodal transport system and its role in urban development

The provision of an intermodal public transport system does not necessarily mean providing all modes of transport in the same physical area, but rather the integration of these modes over the entire area of the city to serve the efficiency of this system on the larger scale, A brief explanation of the most important internationally adopted pattern for providing a highly efficient public transport system will be presented, and its impact on urban development will be discussed:

5.1 Transit-Oriented Development (TOD)

5.1.1 Main features of the (TOD)

Transit Oriented Development is the rapid and growing trend in creating vibrant, livable and sustainable societies, and (TOD) can be defined as the trend towards creating pedestrian and bicycle use societies and the further uses centered around the public transport system and high-quality trains, This makes it possible to live a less stressful life, without completely relying on a private car for transportation. [23]

The TOD model is an alternative to low-density urban development and automobile-dependent land use patterns, by integrating urban design and planning with transportation, as development around path-based transport stations is a means of leveraging transportation investment to promote the creation of a relatively high density urban form and use mixed. The correlation of public transport investments and urban development is the basis of the TOD model, which is internationally recognized as an effective and sustainable form of urban development. [24]

TOD can be defined as a medium to high density compact mixed-use development, located within five to ten minutes (about 400 meters to 800 meters) from the main terminal of transit. TOD includes high-quality urban development with a mix of residential, employment and shopping opportunities, designed in a pedestrian-oriented fashion without excluding cars. A TOD can be a new construction, or redevelopment of one or more buildings that are easy to

design and direct using comfortable and sustainable modes of transportation, including active public transportation. [25]

The TOD can either be located within a single station clustering area or cover an entire area along a public transit route. Design and operation features as well as the quality of transportation service provided are critical factors for the success of TOD. Urban rail networks are suitable because they provide higher capacity, speed and frequency than buses. [26]

TOD is classified into three different categories in relation to the spatial scale of urban design: [27]

- TOD Single Node: located in urban or suburban areas served by urban rail systems or high capacity suburbs. The area it serves may extend between 400 - 600 m, where access is possible by walking, and up to 2-3 km if access is by bicycle.
- TOD Corridor: It is located in a densely populated urban fabric along high-frequency transmission lines (metro, tram and BRT). Urban development has a linear shape and the areas it serves in the stations overlap to form successive cells.
- Multi-node TOD: Consists of a group of single-node TODs. Urban development may have a circular or semi-circular shape around stations.

5-1-2 Successful TOD Projects Criteria:

[28] Suggests several categories of factors against which to evaluate the success of a TOD project. These categories are related to:

- a) Vision, policies, and guidelines for urban and transport planning at the national and local levels (political stability, planning coherence and consistency, state support).
- b) Framework for cooperation and local stakeholder relationships (single spatial planning entity, multidisciplinary approach to planning and implementation, citizen participation and consensus).
- c) Conditions, rules and tools for project implementation (specific criteria and measurable goals, a clear and stable investment environment, desire for new and innovative structural approaches).
- d) Design quality, attention to detailed, small-scale design and incorporation of TOD into existing urban fabric and local architectural style.

[29] Recommends several categories of standards, including:

- a) The economic activity of the region (public and private investment in housing and commercial uses);
- b) Urban environment and transportation (walking, traffic and parking management, spatial coverage of the transportation network, land use possibilities and vacant buildings);
- c) Institutional environment (TOD legislation and regulations);
- d) User perceptions (residents' opinion on the attractiveness of the area and the quality of life).

As well as the social dimension (diversity of urban jobs, the existence of educational institutions and administrative services, community vitality, affordable housing, and transportation).

5-1-3 Main Principles for TOD Projects:

All the principles that guide TOD design and implementation influence the urban pattern that includes the performance of activities and land use. Any development can be effective only if it is formulated with transit. TOD encompasses the entire area within a radius of 400 to 800 meters from a transit station.[25] The TOD zone of influence consists of three distinct and overlapping regions. The core area is the area surrounding public transport facilities that can extend up to 200 meters; the core is surrounded by a "central zone" that extends to nearly 400 meters and is surrounded by an external "edge zone" of up to 800 meters, thus forming a TOD zone of influence. See Figure (2).

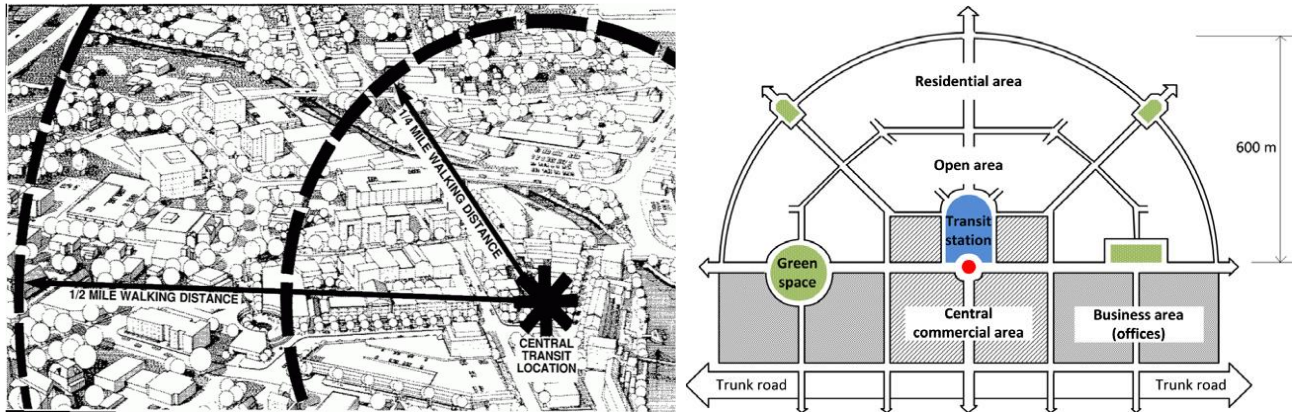


Figure (2) Influence of TOD Zone Source: [30]

(represented by TOD) are the basis for the success of the urban development process, indicators for the theoretical framework related to the principles of transit-oriented development were formulated below:

- 1) Walkability.
- 2) The intensity of development is higher than the prevailing one.
- 3) Dynamic and vibrant communities and community participation.
- 4) Mixed land use and compact environment.
- 5) Safe and reliable transportation.
- 6) Projected demand for TOD.
- 7) Economic prosperity

6- Comprehensive Development Of The City Of Baghdad

Khatib & Alami Consulting and Mebex Consultants prepared a technology proposal to guide urban development. The report was called "Baghdad City Comprehensive Development Plan 2030" (BCCDP 2030). The proposal examines urban planning and design issues in the context of the city of Baghdad [1]

Today, due to wars, sanctions, terrorism and rapid growth, the city of Baghdad faces challenges in providing necessary services to citizens, formulating and implementing effective and sustainable urban development strategies.

In the city of Baghdad and its environs, trends in demographics and increased urbanization have changed significantly since the 1970s. Therefore, it is necessary for the comprehensive development plan for the city of Baghdad to present sustainable urban development strategies to guide urban growth, encourage reinvestment, renewal and revitalize the city, and enhance many attractive and beneficial features of society. The purpose of these strategies is to positively link the changes to the current built fabric and future development. In all neighborhoods by creating an attractive and healthy city. [1]

6-1 Al-Sadr City Axis strategy (Al-Thawra Street) As a TOD Area

6-1-1 Al-Sadr City Description

Sadr City is located in the northeastern part of Baghdad, and is confined between the Army Channel that borders it from the southwest, and the dirt dam from the northeast, and is defined between two latitude (N33⁰26'-N33⁰21') to the north, and two longitudes (E44⁰30'-E44⁰25') to the east. And it occupies an area of (30) km². It is about 5.5 km from the city center of Baghdad.

Al-Sadr City was planned according to the grid pattern (Grid Iron) by the Greek planner Doxiades, employing the idea of the Super Block and adopting it as a standard unit (Module) to create the idea of the residential sector. This method of planning was adopted to accommodate the large size of the city's population in a manner that takes advantage of most of the available space, with a clear tendency not to encourage the movement of cars within the residential sector itself, and this is consistent with Doxiades's ideas in terms of separating car and pedestrian traffic. The housing units grouping pattern is distinguished by the continuous

pattern, as the housing units are connected to each other (Attached Houses), which has created a great rise in population density and housing.

Al-Sadr City has a population of more than (2.5 million) people, where approximately 33% of the population of the capital, Baghdad, has a population of nearly (8 million) people. Its spatial structure has changed dramatically since the beginning of the current century as a result of the rapid expansion and dispersion of development outside the planned areas. Today, Sadr City represents a compact built area with a high density, and the development is dispersed with all kinds of jobs and urban facilities such as housing, shopping centers, industrial uses, offices, education and entertainment. See (Figure 3).

Currently, the public transportation system in Al-Sadr City depends on the network of minibuses only and therefore the urban growth and expansion of the metropolitan area are completely dependent on cars. The Baghdad Metro, a major infrastructure project that has been under public discussion for more than 12 years, is expected to begin construction in 2022. It covers a fairly long distance with respect to the entire urban area and passes through the most densely populated area of Baghdad (Figure 4).

The Thawra Street axis has been selected to explore the possibility of converting the main transportation hub (Metro Station) into a successful future TOD area in al-Sadr City where the current function of the hub, multiple transportation modes, mixed land uses, the main medical hospital and a large public park within the central area of the axis (200 m - 400 m) in the city and the peripheral area (400 m - 800 m) containing the popular Mredy Market As elements in favor of this choice, as shown in Figure (3).

6-1-2 Analyze the main characteristics of the Al-Sadr City (Al-Thawra Street) axis as it relates to TOD:

- 1) Transforming the Sadr City axis (Al Thawra Street) into a functioning TOD area requires the formulation of a specific master plan that takes into account the faults of the area of influence. The future operation of the pathway-based situation is a conducive plan to attempting a major shift towards an integrated approach to urban design and transportation.
- 2) This type of zone can be developed as an integrated redevelopment / renewal project to attract new investments, stimulate the urban economy and achieve a sense of continuity with the existing urban fabric.
- 3) Land use intensity in general from medium to high density desirable for the required development of the TOD impact area.
- 4) The presence of a pedestrian-friendly traffic network, the absence of vehicle intersections as an obstacle to the pedestrian community.
- 5) TOD principles and development methods can provide a framework for creating a vibrant community within the center, however this has not been taken into "Baghdad City Comprehensive Development Plan 2030" (BCCDP 2030).
- 6) A compact urban structure and a high-quality pedestrian network will focus mainly on the relationship between the main metro station and the Mredy Market axis on the one hand and the rest of the activities on the other hand.
- 7) Economic activities within the TOD area promote the level of socio-economic improvement needed to revitalize this area.
- 8) The need for attractive urban design and place-making schemes to improve the richness of the diverse cultural and social opportunities that exist in the region. Where community participation focuses on competitive social interaction.

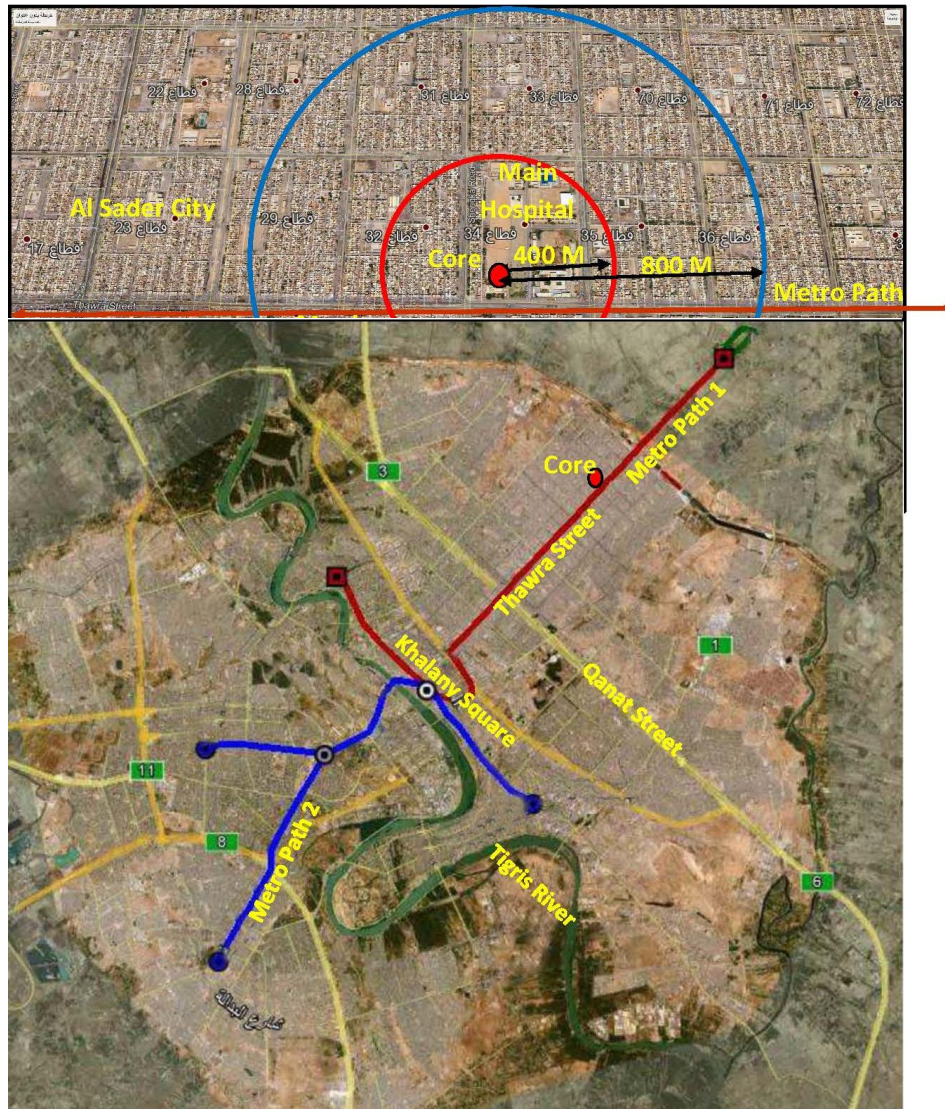


Figure (4): Metro path 1&2. Source: Author from Systra company study.

6-2 Evaluation Al-Sadr City Axis (Al-Thawra Street) As a TOD Area

The appropriate methodology for some of the principles of TOD has been identified, and the methods of achieving them and the positive effects of meeting each of them are clarified, which are integrated together to achieve the desired urban development strategy goals. The absence of adopting public transportation systems as a factor guiding urban development according to modern development trends will lead to the continued deterioration of the urban environment and the loss of economic and social development opportunities in the city. This, in turn, confirms the necessity of adopting a guiding factor that integrates with these principles based on the real needs of urban agglomerations.

The evaluation process consists in examining the transportation and mobility of this hub. A three-tier evaluation framework (high, medium and low) is used to measure the applicability of TOD indicators or principles. Where the overall score indicates medium applicability. This is a fairly promising outcome of adapting TOD as a viable strategy for urban development and revitalization of the urban economy and fabric in al-Sadr City. See Table No. (1).

Table No. (1) - Prepared by the researcher

TOD Principles	Method	Principle Effects And Its Applicability
Walkability	Focusing on the main pedestrian roads, and directly linking the patterns of	Convenient positioning of the new functions enhances

	movement, pedestrians and vehicles with the centers of commercial, cultural, social and entertainment activities.	accessibility, provides an intermodal transportation system, and encourages non-motorized mobility options such as walking and cycling. Its applicability is moderate.
The intensity of development is higher than the prevailing one	Ensure the provision of adequate services and the efficient use of existing infrastructure and services.	Reducing travel time and cost, and the distance traveled between different destinations, and its applicability is high.
Dynamic and vibrant communities and community participation	Providing a competitive business environment to promote strong growth. The competitive environment is linked to improving the quality of life of its residents and enhancing interaction between community actors and local authorities.	Show the dynamic urban image of the city and support a vibrant healthy lifestyle. Its applicability is moderate.
Mixed land use and compact environment	The mix of land use is a guarantee of a harmonious built environment. Where some jobs need more efficient spatial design.	Redeveloping and integrating land uses, providing job opportunities, and thus a balanced distribution of population densities. Its applicability is high.
Safe and reliable transportation	Establishing a comprehensive plan to solve many of the problems in the region through an integrated interaction between effective public transportation and urban development.	Reducing transportation costs and saving the costs of maintaining and operating the lines of the intermodal public transport system Its applicability is moderate.
Projected demand for TOD	Ensure the transformation of the region mixed and integrated land use in an environment that encourages pedestrian traffic on the street level and transit stations and shopping areas.	Saving housing costs and thus providing opportunities for different income groups in society. Its applicability is high.
Economic prosperity	Exploiting the opportunities available in the existing urban fabric by developing and redeveloping urban spaces and encouraging the participation of urban jobs.	Providing more job and housing opportunities through re-employment. Its applicability is low

7- Conclusion

An integrated approach to urban development and public transportation is undoubtedly a vital component of urban sustainability and resilience as it can enhance the compact city model and reduce car use. At the same time, it can encourage more efficient use of public transportation and in this context, a strategic TOD policy focusing on pathway-based models can be beneficial for environmental, economic and social reasons.

Developing cities are constantly looking for new ways to improve their urban form through effective interaction between space and users. The TOD concept offers a great opportunity to improve and develop economically, environmentally and socially sustainable urban communities, and to reconfigure the urban landscape to create a livable city.

The development of pedestrian and cycle paths in the area surrounding the transportation hub supports smooth mobility within intermodal transportation solutions. Where a balanced mix of residential and urban functions results in trekking attraction, thus enhancing the

attractiveness of the area and walkability. The creation of open public spaces and local gardens contributes to improving the environment and aesthetics, and improving the quality of life.

TOD Strategies for the Local context:

- Developing an integrated urban system for intermodal public transport and enhancing accessibility to terminal assembly areas.
- Classification of stations according to their readiness in order to: (a) determine the type and scale of interventions required to achieve the implementation of TOD and (b) arrange the stations in order of priority for the development of TOD within the framework of the urban strategic plan.
- Physical and functional integration of the new development areas with the existing urban fabric, and making full use of investment in public transportation.
- Focusing on local spatial characteristics and enhancing the urban identity of the areas surrounding the stations, by enhancing their dynamic, multi-use character for residential, economic, entertainment, cultural and social activities.

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