Urban Optimization of Transit Oriented Development in Baghdad City

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Abstract
Meeting the demands of the post modern metropolis requires innovative urban planning approaches to promote a livable and resilient urban fabric. Transit oriented development (TOD) is one such approach with a promise to add value to all public and private stakeholders. The concept maximizes transit usage, create a sense of place and community, and provide a vibrant mix of land uses catering to existing and future residents. In general, TOD aims at creating walkable, sustainable communities for residents of all ages and incomes, as well as providing more transportation, employment, and housing choices.

In its theoretical background, the paper attempts to outline the benefits and principles of TOD, as well as highlighting a number of case studies of cities implemented the concept successfully. An overview of the cumulative results achieved by these cities to enhance the quality of life, and the local economy is presented.

The research work also tackles the applicability of TOD to the proposed future vision of the city of Baghdad. The city with its six and half million inhabitants, and a forecasted population of eleven million by 2030, has a number of shortcomings in providing a livable and efficient urban landscape. Transit, sprawl, excessive use of private cars, inappropriate land use mix and densities, and lack of well designed urban spaces around transit hubs are among the pressing issues. Research hypothesis stress the need to explore TOD as an urgent planning alternative to address such quandaries. The paper presents an overview of the pending "Baghdad Urban Development Plan 2030", and submits a multi parameter evaluation of the vision outlined in the plan with regard to transit and circulation problems, and solutions. Preliminary outcome of the evaluation process indicates an evident deficiency in optimizing future urban movement proposals through the limited or nonexistent utilization of TOD.

Key words: TOD, urban design, socio-economic growth, urban planning, comprehensive development.

1. Introduction:
Transit oriented development is one of the innovative concepts of urban planning. It has been applied in many cities around the world, especially in North America, Europe and South East Asia during the last few decades. The concept aims at minimizing the use of the privat car thru the development of pedestrian friendly zones, thus mitigating the severity of traffic congestion, and emission of pollutants. A healthy environment can be created as a result, and consequently achieve the best return from public transport, provide a climate promoting economic activities and employment opportunities. All that can be easily accessed, thereby adding value to surrounding areas and urban fabric of such centers.

Transit-Oriented Development (TOD) projects depend on good urban design to coordinate transportation types, mix land uses, and create an appealing public space, all in a limited area. In its most basic terms, TOD is a strategy to integrate public transportation investments and land-use practices in order to create walkable, diverse neighborhoods in both central and suburban settings. (Jacobson, 2008, P51)
American Architect Peter Calthorpe codified the concept of Transit-Oriented Development (TOD) in the late 1980’s. Sacramento County (State of California) hired Calthorpe in 1989 to propose a “Pedestrian/Transit Oriented Development” along the County rail stations, and it was then the first official use of the TOD term came about. Consequently TOD became a fixture of modern planning when he published “The New American Metropolis” in 1993 (Carlton, n.d. P17). The TOD concept was an extension to Calthrope’s earlier work on the design of sustainable communities and neighborhoods which he referred to originally as "pedestrian pockets".

2. **TOD Definition:**
TOD focuses on compact growth within an easy walk of transit stations, thus bringing potential riders closer to transit facilities, as well as promoting increased ridership by making riding transit that much easier. TOD can be defined as “Moderate to higher density compact mixed-use development, located within an easy five to ten minute (approximately 400m to 800m) walk of a major transit stop. TOD involves high quality urban development with a mix of residential, employment and shopping opportunities, designed in a pedestrian oriented manner without excluding the automobile. TOD can be a new construction, or redevelopment of one or more buildings whose design and orientation facilitate the use of convenient and sustainable modes of transportation, including public transit and Active Transportation. (Joshi, 2011, P6)
The State of Florida statuettes regards TOD as those designated areas which shall be compact, moderate to high density developments, of mixed-use character, interconnected with other land uses, bicycle and pedestrian friendly, and designed to support frequent transit service operating through, collectively, or separately, rail, fixed guide way, streetcar, or bus systems on dedicated facilities or available roadway connections.” While many developers and governments consider TOD in terms of fixed-rail service, that is not always the case. (Shinkle, 2012, P3)
Peter Calthorpe conveys the basic themes of TOD to be “a mixed-use community within an average 2,000-foot walking distance of a transit stop and core commercial area. TODs mix residential, retail, office, open space, and public uses in a walkable environment, making it convenient for residents and employees to travel by transit, bicycle, foot, or car” (Carlton, n.d. PP21-22).
All definitions seem to share a common vision and emphasize the idea that a successful TOD will reinforce the community’s economic prospects, and transit system. Reinforcement emanates from a multitude of factors, most notably the creation of mixed use activities that are within close proximity to satisfy nearly all needs, easily accessible, thus promotes activity around the clock.

3. **Benefits of TOD implementation:**
Experience from cities in North America has demonstrated that implementing TOD can have significant benefits to individuals, communities and regions. Coordinated investment in transportation and land use projects promotes many aspects of Complete Communities and improves the quality of life for citizens. Recently, interest in TOD has broadened beyond the possibility of financial return. Increasing evidence now exists that transit-oriented development can yield many more benefits than merely increased land value. The last decade saw subtle but promising shifts in the landscape of transit and development, with the convergence of a number of trends: growing transit ridership, increased investment in transit (even in traditionally auto-dominated cities like Los Angeles and Dallas), frustration with congestion and sprawl, the smart growth and new urbanism movements, and a generally greater recognition of the advantages of linking development and transit. (Belzer et al, 2002,P6)
Implementation of TOD can offer and support a variety of lifestyle choices; providing opportunities for people of all ages, and enhance abilities to live, work, shop, learn and play in close proximity to one another; reducing the need for travel and creating shorter journeys; providing easier and safer access to jobs, schools and services; supporting more efficient
use of the land and existing infrastructure; and maintaining the environmental benefits of compact development. The extent to which this progress is made depends largely on the type and quality of transit service available as well as the primary characteristics of the TOD. (Joshi, 2011, P10)

Affordable housing often has a prominent place in TODs—households with low or moderate incomes are attracted to transit access and are likely to own fewer cars and occupy more space efficient dwellings, meaning that they can take full advantage of the transit orientation. (Jacobson, 2008, P54).

The motivation to use public mass transit has increased significantly as a result of increased mobility choices. By creating “activity nodes” linked by transit, TOD provides much needed mobility options. A 2003 study of TODs across California found that residents were up to five times more likely to commute via transit compared to non-TOD areas. In the San Francisco Bay Area, Cervero (1994) found that, on average, residents living near stations were five times as likely to commute by rail transit as the average worker living in the same city, and in some cases as much as seven times as likely”. Decreasing the use of private vehicles is a by product of increasing land use mix and transit utilization. Frank and Pivo have indicated that employment density and land-use mix were both significantly related to percent single occupant vehicles (SOV) use, percent transit use, and percent walking. (Frank and Pivo 1994, P51). Another study of 103 TODs across twelve regions in America found that on average, residents were 2 – 2.5 times more likely to commute on transit compared to the average resident of the region (Renne, 2009, P118). Utilization of public transit will contribute toward increased health benefits. TOD promotes a healthy lifestyle by making it convenient to walk and by providing the infrastructure that supports walking and biking. (Joshi, 2011, P8). Reduced air pollution and energy consumption rates are achieved by providing safe and easy pedestrian and cyclist access to transit. Increased Land value is a noticeable economic advantage to TOD, which tends to encourage higher densities, and ultimately foster higher growth rates and economic incentives. Significant Increase in land values can be observed in areas close to transit hubs compared to areas away from transit stations. Urban land use is greatly enhanced due to the compact, sustainable urban form. TOD often uses infill, Greenfield and Brownfield sites to redevelop and intensify existing urban areas. A byproduct of this process is enhanced local economic development. TOD is increasingly used as a tool to help revitalize neighborhood main streets and mature neighborhoods, along with more efficient sustainable infrastructure. Depending on local circumstances, TOD can help reduce new infrastructure costs significantly.

4. TOD Principles:

Almost all principles guiding the design and implementation of TOD zones directly influence land use, circulation, urban form and overall performance of a place. It is not enough for development to be near transit; it needs to be shaped by transit so as to be a TOD. It is more than an individual parcel or development project. TOD includes the entire area surrounding transit, between 400 to 800 meters from the transit stop (Joshi, 2011, P16). The Area of Influence of a TOD is comprised of three distinct but overlapping zones. The "Core Zone" is the immediate area surrounding public transit facilities that can extend up to 200 m. The core is surrounded by a “Central Zone” extending to nearly 400 m, and encircled by an outer “Edge Zone” up to 800 m, thereby constituting the TOD Area of Influence. Figure (1) illustrates the concept.

Each TOD may look different and have a different function, but each successful TOD will have applied some or all the core principles in a manner unique to the nature and urban fabric of the place. Design features of efficient TOD projects may include some or all of the following principles:
A: Medium to High Density Development Greater than the Community Average

Density matters in TOD: Generally, cities which have higher population and development densities have proved the wealthiest, most dynamic, innovative, diverse and ecologically sustainable. (Roberts, 2007, P721). The density-dynamism duality, however, is not universal, and should be deliberated on case by case basis. Density is all about scale, with the goal being to create a compact walkable district. Density within TODs raise the bar and achieve a higher net average resulting in greater ridership, both within the TOD district and within a 5 minute walk of transit. (Joshi, 2011, P17).

B: Walkability: In considering walkability, the street pattern in the surrounding area determines not only whether residents and workers can access rail and bus transit, but also whether they can access the shopping, jobs, and services that might be located in their immediate neighborhood. (Thorne, 2011, P21)

C: A Mix of Uses: Creative mix of uses within close proximity is vital to attract riders and community in general. TOD is often referred to as “place-making” or the creation of “transit villages”—livable places where people reside, work, shop, obtain services, go to school, use the library, and have fun. The full menu of activities need not be found at every station. But a lively mix of uses strengthens the link between transit and development. (Metropolitan Atlanta, 2010, P10)

D: Future Demand for TOD and Vibrant Communities: New development is a fundamental way to improve the vibrancy of station areas and corridors, but the potential to attract private investment is clearly predicated on both neighborhood market conditions and regional market demand for more compact housing types. (Thorne, 2011, P21)

E: Compact, High Quality Pedestrian Oriented Environment: Vibrant communities, with or without transit, are convenient and comfortable places for pedestrians. Subtle factors, focused on a pleasant environment for the pedestrian, encourage people to walk. Streets can be “calmed” by reducing traffic speeds to make them inviting for walking. (Joshi, 2011, P21)

F: An Active Defined Centre: Transit is particularly successful in communities and neighborhoods that have defined centers, creating an 18-hour place by offering multiple attractions and reasons for pedestrians to frequent the area throughout the day and evening. Having a dense mix of uses near transit is important to creating a centre, but it must also
have a sense of place and community so that people choose to gather there. (Joshi, 2011, P23)

G: **Safe, Reliable Transportation:** Residents in communities with reduced auto-dependence own fewer cars and use them less. This yields multiple benefits, including: More stable transportation costs, Higher household disposable incomes, A reduced need to expand freeways, Healthier residents as a result of more physical activity, A more stable and sustainable source of transit ridership. (Thorne, 2011. P25)

H: **Innovative Parking Strategies:** Parking to reflect the impact of transit is one of the most challenging aspects of any TOD. By creating a more managed parking supply and moving parking from surface parking lots to on-street parking and parking structures, residents, shoppers and employees are encouraged to use transit to get to the TOD and walk within the TOD. Parking in a TOD should consider four fundamental components: size, location, design and management. (Joshi, 2011, P25)

I: **Economic Prosperity:** Expansive, integrated transit networks and transit-supportive development provide more diverse economic opportunities than individual transit lines, and can therefore support upward mobility. Recent trends indicate that workers increasingly prefer to live near where they work and enjoy a higher quality of life that is free from the strains of traffic and congestion, making jobs and housing near transit an increasingly popular choice. (Thorne, 2011. PP21-22)

J: **Public Leadership:** Public leadership is essential for the success of transforming an area into TOD. The leadership is need in the planning and implementation phase of the process. The leadership role should continue throughout the life span of process in order to meet challenges presented by numerous stakeholders. Public-private partnerships are especially useful for leveraging private investment in transit-oriented development; they are more flexible than joint development arrangements. (Reconnecting America, 2013, P13)

K: **Aesthetic Zoning:** Physical form and beauty of a city are defined by the sum of its public spaces, Emphasizing form over use to create human-scale places most U.S. cities regulate conventional codes, focus on the development through architectural and urban “form” of the conventional or Euclidean built environment, and regulate key zoning, the primary purpose of aspects such as building heights and which is to segregate incompatible land uses and accommodate the movement and storage of vehicles. (Reconnecting America, 2013, P11)

L: **Community Effort:** Following the lead of community-based organizations community development land around the station, building or corporations can use rehabilitating 1,000 housing units and a transit-oriented development to new “green” station building that houses bring about comprehensive and lasting revitalization in neighborhoods and increase affordability because families that use transit spend less money on transportation. (Reconnecting America, 2013, P5)

### 4.1 Location determinants of TOD hubs

The process of Selecting transit hubs to be developed as TOD zones hinges on the existing as well as proposed urban development schemes. The potential of a successful selection depends to a great extent on the indigenous characteristics of the transit station’s immediate and surrounding area.

Getting the most out of transit-oriented development, conceptual station area plans should be developed to determine what public infrastructure is needed around transit stations or along the desired mix of uses. There is some variation in what these plans contain, but they all lay out the basics, including zoning, design standards, parking requirements and information about transit access, bike and pedestrian. (Reconnecting America, 2013, P3)

A Station Area Plan can provide the vision and guidance for building a walkable community. It should be created early in the planning process and set a clear vision, with guidelines, roles and responsibilities for implementation. The elements of the Station Area Plan should include: Community vision. Land use, including mix and intensity, Transportation, including circulation and parking, urban parks and open spaces, urban design, including guidelines, By-law amendments to support the Station Area Plan, and implementation strategy, including roles and responsibilities for implementation.
When determining the most appropriate location for a new walkable community that supports transit, the size of the TOD as well as the specific location need to be considered. The following list is intended to provide questions for thought when considering the placement of new walkable communities within 400 to 800 meters of the transit station: (Joshi, 2011, P33) - What is the function of the station in relation to the other stations on the transit line (i.e., is it a Central Business District, end-of-line station, etc.)? - How does that function support the increased density and a walkable community? - What land uses, beyond the proposed station area, exist to support the higher density mix of uses? - Does a higher density mix of uses complement or compete with other land uses within walking distance? - Are there key opportunities for redevelopment around the proposed station? - What is the market for increased development in the area? - Does the existing street network support a walkable community? - Are there major physical barriers that hinder access to and within the area, including to and from the proposed transit station?

### 4.2 Nature of Projects within TOD

When reviewing a potential project within a TOD, it should be assessed against the TOD Station Area Plan to ensure consistency. The following tool is intended to guide communities in reviewing proposed projects, and as a basis for constructive dialogue. Within an easy walk of a major transit stop [e.g., 400 to 800 meters], key sites must be designated for transit friendly uses and densities (walkable, mixed-use, not dominated by activities with significant automobile use). It is preferable that transit friendly land uses permitted outright and not requiring special approval. Another issue to be considered is whether higher densities are allowed near transit facilities as well as multiple compatible uses permitted near such facilities. It is highly recommended that first floor uses are “active” and pedestrian oriented with a mix of uses generating pedestrian traffic and concentrated within walking distance from transit. Auto oriented uses are permitted but somehow discouraged with access limitations. A final consideration is the zoning status of the proposed TOD. Incase pre zoning is implemented, the path is paved for a go ahead. (Joshi, 2011, P34)

### 5. Successful TOD Projects:

One TOD may yield a high transit mode share but lacks social diversity. Another might be deficient in shopping and entertainment choices but provides affordable housing on reclaimed Brownfield. Moreover, a myriad of goals for TOD obfuscates success. A recent study found that planners in Perth felt TOD was important towards increasing transit ridership, spurring economic development, increasing housing choice, relieving traffic congestion, reducing sprawl, creating a diverse community, improving neighborhood quality, and increasing political support for transit. With so many goals for TOD, measuring success becomes a matter of perspective. (Renne, 2009, P117). Nonetheless, a number of case studies of urban centers which utilized TOD were investigated to draw lessons as well as to probe the validity of the concept.

Experience from numerous cities demonstrates that implementing TOD can result in significant benefits to individuals, communities and entire regions by improving the quality of life for people of all ages and abilities to live, work, shop, learn and play. (www.nhhsrail.com)

Fruitvale (California) exemplifies the pivotal role that transit can play in revitalizing an economically depressed area. Fruitvale was once one of the city of Oakland's poorest neighborhoods, following a familiar pattern of urban disinvestment and decline in the 1960s and 1970s. Fruitvale Transit Village, a $100 million, 20-acre development project received praise as an example of how to integrate transit concerns with community and economic development (Jacobson, 2008, P68). The development is centered on the Fruitvale "Bay Area Rapid Transit" station with neighborhood retail, affordable housing, and places for community interaction on land that had previously been parking lots.
Rosslyn (Virginia) is another example of successful economic transformation made possible by the choice to build around transit. The original goal behind the Rosslyn Sector Plan was economic development, and transit became the basis of the plan not because of its potential to improve air quality or mitigate metropolitan sprawl, but for its economic possibilities. Capitalizing on the Metro system allowed for greater densities, and thus higher returns from commercial property taxes, than would have been possible if, for example, a quarter of buildable land been reserved for thoroughfares and parking. (Jacobson, 2008, P62) The village of Arlington Heights, west of Chicago (Illinois), has seized upon TOD as an integral component of the city’s award-winning strategy to revitalize its historic downtown. The village has created a virtually new town center that includes a new Metro station, a performing arts center, high-density housing, commercial uses, and public parking decks. In 1980, 350 residents lived in the downtown in 150 units. By 2000, the numbers jumped to 2,200 residents and 1,500 units. Since 1997, public investment of $27 million has leveraged some $225 million in private investment. (Transit-Oriented, www.nhhsrail.com) Other cities in the United States such as Denver (Colorado) and Portland (Oregon) have provided further evidence that TOD is an excellent tool to revitalize their communities. Portland is a national model for providing diverse transportation options to local citizens. (Thorne, 2011, P 25). Transit has leveraged large-scale redevelopment in downtown Portland. The streetcar was built to connect two large parcels of vacant industrial land north and south of downtown. The city struck a deal with the owner of 40 acres parcel: the city would build the streetcar past his property if he would up-zone his property from 15 dwelling units per acre to 125 (Du/A). This was in the early ‘90s when there was no market for this kind of development, but today it is the city’s densest neighborhood, and at build-out it will be home to 10,000 residents and 21,000 jobs. The streetcar now runs to the second vacant parcel, the South Waterfront, where an even more ambitious redevelopment effort is underway. (Center for Transit, P.14, 2007). The innovative and successful implementation of mixed land use development in TOD projects is best illustrated in the city of Denver. Up to 2004, ten years after opening its 20-mile starter rail system, there was still really only one TOD “project” – a strange and wildly successful one -- out of the ground. The 10-acre Englewood City Center, in a suburb several stops out of downtown, was built to accommodate a good mix of usual TOD ingredients including 450 residential units, as well as a City Hall, library, museum, park, open space, and a street grid, plus a Wal-Mart department store and other big box retail, and it was parked at almost suburban ratios. As unlikely a combination as this was, somehow it worked, and it was nationally celebrated for having revived a lower-income community using the site of what had been a dead shopping mall. (Ohland, 2004, P12)

6. Baghdad Comprehensive City Development Plan 2030:
In response to the request of the Mayoralty of Baghdad, Khatib & Alami consulting firm / Mebex Consultants has prepared a technical proposal to guide urban development for the next fifteen years. The report is termed the “Baghdad Comprehensive City Development Plan 2030” referred to in rest of article as “BCCDP 2030”. The proposal examines urban planning and design issues in the context of Baghdad. (Qateb & Alame,2014, P1) Baghdad has many comparative advantages. Historically, the City was one of the leading cultural centers in the region, and has for centuries been the centre of Iraq’s commercial and financial operations. It is rich in historical sites and natural resources. However, due to wars, sanctions, and rapid growth, the local authorities today are challenged to provide the much needed services to citizens and investors, as well as formulating and implementing effective sustained urban development strategies. The City of Baghdad and surrounding areas have changed significantly since the 1970s. Demographic trends, scope and pace of urbanization, urban fabric and services, trends in commerce and industry are some of the aspects of community that have changed significantly since the implementation of Baghdad’s previous master plan [Polservice 1973]. The timeframe of the last plan expired in the year 2000.
It has become more essential than ever that BCCDP 2030 should present sustainable urban development strategies to guide urban growth, encourage reinvestment, regenerate and revitalize the City, ensure its prosperity, and enhance the many attractive and beneficial attributes of the community and its neighborhoods. (Qateb & Alame, 2014, P1)

The purpose of these strategies is to relate changes in a positive way for the existing built fabric and for the future development throughout all neighborhoods in the city by creating an attractive and healthy city to see and live in. These will be closely coordinated with the economic analyses to ensure the financial success of the plan. (Qateb & Alame, 2014, P26).

6.1 Evaluation of “BCCDP 2030” as it relates to TOD principles:
Each community needs to define their own goals for TOD. If multiple goals exist, they should be ranked. Some communities might encourage TOD primarily from a mobility perspective while others see it as a driver of economic development. Other communities might use TOD as a way to encourage location efficient affordable housing. Without specific prioritized goals for TOD, it becomes very difficult to define success. (Renne, 2009, P146).

The future vision of Public transportation in Baghdad is ambitious, and requires extensive and costly infrastructure. The BCCDP 2030 outlined a number of transit modes to cater for the growing demand of Transit. An underground subway system, elevated trains, and a rapid bus system are all proposed, and yet to be implemented in a manner to complement each other. The public transit stations will be served in certain locations by park and ride facilities. The proposed integrated transit network is outlined in Figure (2).
<table>
<thead>
<tr>
<th>TOD Principle</th>
<th>Baghdad Comprehensive City Development Plan 2030 Guidelines</th>
<th>Level of conformity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium to High Density Development Greater than the Community Average</td>
<td>Livable committed to ensuring that citizens and residents have a healthful and dignified living standard; that provide systems for adequate housing, transportation, health care, education, and other services for households; to ensure the provision of sufficient services for all residents and visitors, and ensuring the efficient utilization of infrastructure and public services already in place.</td>
<td>Moderate</td>
</tr>
<tr>
<td>Walkability</td>
<td>The study of circulation focuses on the Major pedestrian ways, as an ease, efficiency, and facility of getting around once one is there. Moreover, the variety of modes of circulation, pedestrian, vehicular, and the synergy between them can be directly linked to the level of activity in the domains of commercial centers, as well as cultural, social and recreational activities.</td>
<td>Low</td>
</tr>
<tr>
<td>A Mix of Uses</td>
<td>Promote a balanced mix of land uses to ensure a harmonious and conforming built city. These policies will preserve property values, maintain the low tax burden, provide quality public services, preserve and enhance local resources, provide diverse, quality jobs, and ensure that housing and employment options are affordable, accessible, and sufficient for all residents.</td>
<td>Strong</td>
</tr>
<tr>
<td>Future Demand for TOD &amp; Vibrant Communities</td>
<td>Baghdad shall be transformed into a metropolitan city with an integrated mixed land use to contain office and residential buildings, parking, retail and such other appropriate uses in a setting that facilitates pedestrian movement at street level among office/residential buildings, parking garages, transit stations and shopping areas.</td>
<td>Moderate</td>
</tr>
<tr>
<td>Compact, High Quality Pedestrian Oriented Environment</td>
<td>Distribution and alignment of existing and proposed routes; trip generation factors for present and potential major land uses along the route, as compared to present capacity; land use limitation; and the requirements for implementing new linkage corridors (i.e. Right of Way).</td>
<td>Low</td>
</tr>
<tr>
<td>An Active Defined Centre</td>
<td>It will analyze the suitability of the existing points of access to the city such as Baghdad International Airport, as well as the suitability and efficiency of access points on the national/local scale such as existing and planned city gateways on the existing road network, train station location, etc.</td>
<td>Low</td>
</tr>
<tr>
<td>Safe, Reliable Transportation</td>
<td>Managing the transportation network as an integrated system that provides alternative means of transportation to, from and throughout the City while minimizing the impacts related to through-traffic and that provide parking where necessary to support the needs of residents and local businesses. Develop a comprehensive transportation management strategy in close coordination with land use policies, and the stratification of transportation needs. Create an integrated and efficient transportation network to provide access for all residents and businesses.</td>
<td>Strong</td>
</tr>
<tr>
<td>Innovative Parking Strategies</td>
<td>Vehicular, pedestrian and transit options will be investigated along with the various alternatives studied. Parking shall be so planned and located so as to provide a linkage to the economic benefit of the City. Parking needs and desirable locations for major facilities.</td>
<td>Low</td>
</tr>
<tr>
<td>Economic Prosperity</td>
<td>Promote and maintain the economic sector related to commercial and industrial activities that contribute to Baghdad’s quality-of-life and suit the city’s social and physical environment. Stable growth in economic development sectors that focus on Baghdad’s foreseen role on a national, regional and international stage.</td>
<td>Moderate</td>
</tr>
<tr>
<td>Public Leadership</td>
<td>Competitive business environment providing a supportive framework for productive firms, to promote buoyant, broad-based growth of employment, incomes and investment. The international competitiveness of Baghdad today is directly bound to the improvement of the quality of life of its inhabitants, ”Well governed and managed” with strong capacity of local government to fulfill public responsibilities based on knowledge, skills, resources and procedures that draw on partnerships, and foster interaction between local government and residents in participatory planning and budgeting.</td>
<td>Low</td>
</tr>
</tbody>
</table>
Aesthetic zoning

Strategies include organization, protective regulations and means to increase funding for open space, river banks, as well as a consideration of existing dead zones in the city.

Baghdad should also protect and enhance the quality of its diverse cultural and historical resources and emphasize the important role they play in defining the City’s character and quality-of-life. Various emblematic buildings that can contribute and encourage the social and cultural centrality of the metropolis as well as improve its external image and appeal will be explored.

Community Effort

City housing policies should ensure that a full range of housing options exist for all Baghdad’s residents regardless of income level, physical ability and age. These should satisfy both quantitative and qualitative necessities of the metropolis’ population. Preservation and improvement of the existing housing stock, to maintain supplies of affordable units, and to upgrade living conditions and property values.

Table (1) Analysis of BCCDP 2030 guidelines conformity to TOD principles, (Authors based on Qateb & Alame, 2014)

6.2 Evaluation of Al-Alawee Hub as a TOD Zone

To further explore the possibility of transforming major transit hubs into a future TOD zone within the city of Baghdad, Al-Alawee hub is selected in order to investigate existing potential to meet location determinants and criteria for a successful TOD hub. Current function, multiple transit modes, and mixed land uses are elements in favor of this selection. As shown in Figure (3).

Figure (3) BCCDP 2030 Proposed public transit modes

Source: Baghdad Comprehensive City Development Plan 2030, (Qateb & Alame, 2014)

Al-Alawee hub is envisioned by the BCCDP 2030 to be a major urban and regional transportation node serving Baghdad city as well as major urban centers in mid and southern governorates of Iraq. Within the core zone (0 m - 200 m) of this hub, the largest train station labeled the “International Station” is situated providing rail lines to the north and south of Iraq. At some time in the past, the station ran rail service to Istanbul, Turkey. The Alawee core is also the current location for two regional intercity micro and mini bus stations serving southern urban centers. The National Museum, government administrative offices, a medical hospital, and a portion of the largest public park in Iraq (Al Zawra’a) can all be found...
within the central zone (200 m - 400 m) of the hub. The edge zone (400 m - 800 m) contains a multifamily housing complex, a large portion of Al Zawra’a Public Park, a portion of a large vacant land parcel which was once part of the old airport, and an old neighborhood consisting mostly of dilapidated housing units. An aerial view of Al Alawee TOD Zone of Influence can be seen in Figure (4).

Figure (4) Zone of Influence of Alawee TOD main hub in Al Karkh and reflection of TOD principles
Source: Authors based on Google map

Analysis of Al Alawee main hub characteristics as it relates to TOD pinpoint a number of indicators:

- Land use density in general is below the desired medium to high density development required for a TOD zone of influence.
- Pedestrian friendly circulation network is not in place. Numerous Vehicular junctions constitute an obstacle to promoting a walkable community.
- Proposed future land use mix within the hub’s zone of influence provides for a multitude of functions and can be an asset to any TOD. Land use functions including commercial, residential, recreational, administrative, medical, central bus station, metro station, museums, and religious uses can all be found within the hub. Some functions are in need of efficient spatial design as well as more intense utilization.
- Introducing TOD principles and development approach can provide a framework to create livable and vibrant community within the hub. However, it was not taken into consideration. Proposed vision of this hub is below TOD standards.
- Compact urban structure and high quality Pedestrian network focus mainly on the relationship between main train station and main bus station, and neglect the pedestrian streets and allies in surrounding urban fabric.
- An active hub centre is not defined. The boundaries of the historic district adjacent to the hub are also not clearly defined in order to avoid areas of conflict between historic preservation and new development.
- Safe, Reliable Transportation systems may present a plan to solve many problems in the area through integrated transportation and urban development interaction.
- Innovative Parking Strategies should be developed to comply with the fundamental design criteria of non intrusive automobile usage.
- Economic activities within the zone of influence do not promote desired level of socio-economic improvement needed to revitalize this area.
- Public Leadership is crucial to achieve effective urban management so as to realize the full potential of TOD implementation. Current leadership structure should be developed to encourage public private partnerships.
- Aesthetic zoning of hub is underdeveloped and does not reflect sound principles of attractive spatial design and place making. Proper urban design schemes are needed to optimize the richness of the diverse cultural and historic opportunities present in the area.
- Community Effort focuses on competitive social interaction, and neglects the cooperative community characteristics which the traditional urban community was based upon.

Transforming Al Alawee hub into a functioning TOD area requires the formulation of defined Master Plan, which takes into consideration the drawbacks of the zone of influence. The development of a planning matrix focuses on issues of priority, and concentrates on pressing issues and planning objectives. It provides measures to achieve these objectives based on the unique characteristics of the area. Table (2).

<table>
<thead>
<tr>
<th>TOD Objective</th>
<th>Program</th>
<th>Project</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased Land Use Density</td>
<td>Rezone Hub As A TOD Zone</td>
<td>High Rise Residential Blocks</td>
<td>Prepare Area Land Use Master Plan</td>
</tr>
<tr>
<td>Diverse Land Use Mix</td>
<td>-Special Zones For Housing, commercial, Educational, Cultural, And Health Facilities</td>
<td>-Use Land Portion Of Old Airport As High Rise Residential</td>
<td>Incorporate New Land Uses Into Area Master Plan</td>
</tr>
<tr>
<td>Defined TOD Core Zone</td>
<td>Placement Of Transit Stations And Commercial/Housing Uses In Core Zone</td>
<td>-High Rise Housing Buildings</td>
<td>Rezone Core Area To Allow All Day/Night Activities</td>
</tr>
<tr>
<td>Aesthetic Spatial Design</td>
<td>-Develop Green Open Space System</td>
<td>-Create Green Park At Center Of Core</td>
<td>Allocation of leisure static public space land area</td>
</tr>
<tr>
<td>-Incorporate Place Making Design Principles</td>
<td>-Create Central Plaza Connecting Transit Stations</td>
<td>-Create Green Shaded Walkways And Seating Areas</td>
<td></td>
</tr>
<tr>
<td>Innovative Parking Strategies</td>
<td>-Distribution of parking facilities throughout TOD Area</td>
<td>-Multi Story Car Parking Connected To Transit Stations</td>
<td>-Close Core Area To Private Cars</td>
</tr>
<tr>
<td>-Introduce smart underground parking facilities</td>
<td>-Develop underground parking below Public spaces</td>
<td>-Develop underground parking below Public spaces</td>
<td>-Utilize underground space beneath central plaza to incorporate smart parking facility</td>
</tr>
<tr>
<td>Integrated Transit Modes Within Zone Of Influence</td>
<td>Close Proximity Of Transit Stations Within Core Area</td>
<td>-Link Tod zone with street level tram system</td>
<td>-Redesign Circulation Network</td>
</tr>
<tr>
<td>Promote Walkability</td>
<td>-Establish Continuous Pedestrian Side Walk network</td>
<td>-redesign Side Walk to prevent cross circulation</td>
<td>-Redesign Circulation Network In Favor Of Pedestrians</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Elevated And Underpass Walkways</td>
<td>-Incorporate Complete Street Design Principles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Link Core To Al Zawra Park With Elevated Pedestrian Walkway</td>
<td></td>
</tr>
</tbody>
</table>

Table (2). Planning objectives achievement matrix (Al Alawee Hub), (Authors)
7. Conclusion
Metropolitan cities are in constant search of new approaches to optimize the urban form through efficient interaction between space and community. TOD presents an opportunity to optimize existing assets of the community, and reconfigure the urban landscape to create more livable cities. For transit facilities, they should be designed to be welcoming to the public and well connected to surrounding community, especially for Baghdad city. Well planned and designed transit facilities can be instrumental in positively shaping a community’s future. They can set the stage by being a catalyst for implementing the community’s vision and creating economic value. Fitting transit into the community sometimes may require breaking the mold of generally accepted transit design. TOD design perspective seeks to enhance transit system operation, passenger requirements, community fit and future development opportunities, and Baghdad development needed in multi levels. It assumes that it is possible to meet user requirements and maintain cost-effective service while capturing synergies with station areas that exhibit TOD potential, encouraging environmentally friendly practices, and creating lively community spaces to visit and not just travel through.

The analysis of one of the main transit hubs (Al Alawee) in Baghdad, it became evident that this area is suitable for development as a TOD despite the fact that future development plans neglected to incorporate this vital tool into the city’s future vision. Indicators point out that certain intrinsic characteristics of the area are in line with TOD design principles, while others need to be developed further to optimize the urban form of the city.

8. Recommendation
Transit Oriented Development concept is a viable tool to promote smart growth especially for Baghdad city’s future development. Creating integrated transit hubs will provide Baghdad with a much needed transformation of its current urban form. From an economic perspective, implementing TOD will broaden the tax revenue base, expand investment opportunities, create much needed jobs, and increase disposable income by means of savings to residents via efficient proximity and land uses diversity. These hubs will be a catalyst for bringing back life to central districts restores all day activity, controls and limits urban sprawl. Cities such as Baghdad may not, and should not continue to do business as usual. Explosive population forecasts indicate that the city’s infrastructure and community assets are about to reach their carrying capacity. The future vision of Baghdad as articulated in the BCCDP 2030 has provided a conceptual framework to overcome some of the quandaries facing the city, but neglected to utilize TOD as an approach to attain smart growth. Cities do not prosper by good infrastructure alone, but rather by creating a livable, attractive, and resilient urban fabric. TOD can open a window toward reaching such an ambitious vision.

References:
• Joshi, Deepak, 2011 Transit-Oriented Development Handbook, City of Winnipeg, PB’s Place Making Group, Planning Executive Advisory Committee (PEAC).
• Ohland, Gloria, 2004, Transit-Oriented Development in Four Regions, the Great American Station Foundation, April.
• Qateb & Alame, 2014, Baghdad Comprehensive City Development Plan 2030, Fourth stage, Mayoralty of Baghdad, Baghdad, Iraq.
• Reconnecting America on behalf of the Local Initiatives Support Corporation, 2013, Encouraging Transit Oriented Development, phoenix-sgia-case-studies, Phoenix.
• Renne, John L. 2009, Evaluating Transit-oriented Development Using a Sustainability Framework: Lessons From Perth’s Network City, PTA – Public Transport Authority; DPI – Department For Planning And Infrastructure, Perth Australia, N.D.
• Thorne-Lyman, Abigail, 2011, Transit-Oriented Development Strategic Plan / Metro TOD Program; Portland, USA.