TeMA

Journal of
Land Use, Mobility and Environment

The Special Issue the Tema Journal of Land Use, Mobility and Environment, collects the proceedings of the Joint workshop, which is to be held by Center for Technology of Society (ZTG) of Technische Universität Berlin (TUB) and Road, Housing and Urban Development Research Center (BHRC) in Tehran on Feb. 29, 2016, under the title "Transit-Oriented Development (TOD) in Iran: Challenges and Solutions".

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TRANSIT-ORIENTED DEVELOPMENT IN IRAN
CHALLENGES AND SOLUTIONS

SPECIAL ISSUE 2016

print ISSN 1970-9889 e-ISSN 1970-9870
University of Naples Federico II

TeMA Journal of
Land Use, Mobility and Environment

Special Issue (2016)

TRANSIT-ORIENTED DEVELOPMENT IN IRAN

CHALLENGES AND SOLUTIONS

Published by
Laboratory of Land Use Mobility and Environment
DICEA - Department of Civil, Architectural and Environmental Engineering
University of Naples "Federico II"

TeMA is realized by CAB - Center for Libraries at “Federico II” University of Naples using Open Journal System

Editor-in-chief: Rocco Papa
print ISSN 1970-9889 | on line ISSN 1970-9870
Lycence: Cancelleria del Tribunale di Napoli, n° 6 of 29/01/2008

Editorial correspondence
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TeMA Journal of Land Use, Mobility and Environment

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TeMA
Journal of
Land Use, Mobility and Environment

TeMA TOD in Iran: Challenges and Solutions | SPECIAL ISSUE | 35-46
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/3923

review paper received 15th May 2016, accepted 12th October 2016

Transit-Oriented Development in Iran: Challenges and Solutions

Road, Housing and Urban Development Research Center (BHRC)
Tehran, 29 February 2016

How to cite item in APA format:
Mirmoghtadaee, M. (2016). Challenges of transit oriented development (TOD) in Iran. The need for a paradigm shift. *Tema. Journal of Land Use, Mobility and Environment*, 35-46. doi:http://dx.doi.org/10.6092/1970-9870/3923

CHALLENGES OF TRANSIT ORIENTED DEVELOPMENT (TOD) IN IRAN

THE NEED FOR A PARADIGM SHIFT

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ABSTRACT

Transit oriented development (TOD) has gained popularity as a means to address urbanization problems such as traffic congestion, air pollution and affordable housing strategies. It simply refers to integration of urban development and public transportation facilities, together with some other characteristics such as "intensified land uses near TOD stations", "landownership and car-ownership variety", mixed use, "lower car dependency", compact form, mass transit stations, open spaces, walkability, etc.
The major contention of this paper is to discuss the general concept of TOD, its benefits and challenges in Iranian urban context. It is discussed here that TOD has several positive outcomes considering the existing urbanization trends in Iran. It may be used as a practical instrument to deal with a rapidly urbanizing country in which the motorization rate is increasing and air pollution is a serious cause of human loss of life. However there are several challenges to be faced. The need for an Iranian version of TOD, which re-visits the theory according to local situations, is the first challenge. A paradigm shift in the government, shifting the priority from housing schemes to mass transit systems is the second challenge needed to be taken into consideration. The third challenge is the overlapping and parallel institutions dealing with mass transit systems in urban and regional transportation planning and insufficient planning instruments. The integrated transportation and urban planning system is necessary here, and there is an urgent need to develop national TOD guidelines with the potential to develop local versions for each city.

KEYWORDS
Transit oriented development, Iran, challenges, paradigm shift

1 INTRODUCTION

Transit oriented development (TOD) has gained popularity as a means to address urbanization problems such as traffic congestion, air pollution and affordable housing strategies. It simply refers to integration of urban development and public transportation facilities, together with some other characteristics such as "intensified land uses near TOD stations", "landownership and car-ownership variety", mixed use, "lower car dependency", compact form, mass transit stations, open spaces, walkability, etc.

Rapid urbanization in Iran coupled with socio-economic changes in recent decades and the apparent need to improve public transportation system has caused strategic shifts from housing construction to improvements in public transportation facilities. As one of the approaches for enhancing urban life quality, TOD has recently gained importance thanks to the Iranian government. The major contention of this paper is to discuss the general concept of TOD, its benefits and challenges in the Iranian urban context. It is divided into three parts: in the first part a brief literature review on TOD and its common characteristics will be introduced, in the second part, the positive outcomes of TOD to solve the problems of rapid urbanization and socio-economic changes in Iran will be discussed; and in the third part, the challenges to realize TOD in Iranian cities will be introduced.

2 WHAT IS TOD? A BRIEF LITERATURE REVIEW

A very rich and extensive literature is available on TOD. The term has been most often associated with North American urban planners and originates from concepts such as new urbanism, smart growth, infill development and affordable housing (Ratner & Goetz, 2013).

However, there are strong arguments referring to its origins in the ideas behind the development of streetcars, underground and commuter railway routes and urban forms, dating back more than a century to a period which predated private car ownership (Pojani & Stead, 2014; Knowles, 2012).TOD generally raises the concept of more intensified development near mass transit stations. Calthorpe has defined the concept as: "A mixed-use community within a typical 2000 feet (around 600 meters) walking distance of a transit stop, and core commercial area" (Calthorpe Associates, 1992). The term generally refers to the process of focusing compact, pedestrian and cycle-friendly urban development with public and civic spaces together with housing and activity sites; around existing or new transit stations (Pojani & Stead, 2014; Knowles, 2012; Chisholm, 2002). The design, configuration and mix of uses emphasize a pedestrian-oriented environment and reinforce the use of public transportation, rather than the private automobile (Calthorpe Associates, 1992; Atkinson-Palombo & Kuby, 2011).

In an official document published by the "Institute for transportation and development policy 9ITDO" the following eight key principles were introduced to guide the development of TODs (ITDP, 2014): 1)Walk: develop neighborhoods that promote walking, 2)Cycle: prioritize non-motorized transport networks, 3) Connect: create dense networks of streets and paths,4)Transit: locate development near high-quality public transport, 5)Mix: plan for mixed use, 6)Densify: optimize density and transit capacity,7) Compact: create regions with short commutes, and 8) Shift: increase mobility by regulating parking and road use.

TOD may appear in several scales and in different conditions. Calthorpe Associates classified TODs according to their prominent functions as: "Urban TODs" located at primary transit points with an orientation to commercial and job development; "Neighborhood TODs" located close to the primary transit system with an orientation to housing, retail and services; and "Secondary Areas" of lower-density housing, schools, community parks, and commercial and employment uses, which surround TODs and are located within hiking distance of the TOD transit stop (CAAMA, 2011).

A similar classification made for the TOD strategic plan in the City of Denver introduces the following types of TOD: downtown, major urban center, urban center, urban neighborhood, commuter town center, main street, and campus/ special events station (Atkinson-Palombo & Kuby, 2011).

TOD projects have been experienced in different countries. As the concept is based on a multi-disciplinary approach integrating urban development and transportation planning, collaboration of related intuitions is very crucial for translating the theory into planning policy. At the same time, planning instruments should be adopted to be able to fulfill the planning concept. The example of Amsterdam indicates that this complex planning concept cannot be transferred in its entirety and only adoptable parts will be relevant (Pojani & Stead, 2014). The case of Copenhagen, on the other hand, shows an early TOD experience which started with the famous Finger Plan of 1947, and was continued by Orestad New Town in 1995: The Master Plan which focuses development around stations on a new driverless light rail mini-metro system, considered to be sustainable development with the Metro at its core and limited possibilities to use private cars (Knowles, 2012). TOD has gained increasing interest in the US. There are many new projects under way, especially near rail transit systems. This growing demand for walkable, mixed-used transit neighborhoods close to transit systems has been mostly due to the factors such as demographic change (changes in family structure: more single-person households, young professionals and empty-nesters), traffic congestion caused by motor vehicles; high gasoline prices; new focus of federal, state, and local policy supporting rail transit systems (Ratner & Goetz, 2013). The cities of Denver and Phoenix are examples of two recent TOD practices in US. In both cases a special planning system was adopted to realize TOD projects. In Denver, approval of a new rail transit program called "FasTracks" ran parallel with land use planning with focus on TOD principals. The City and County of Denver completed a new land use and transportation plan called "Blueprint Denver" in 2002 that changed the zoning in transit station areas to allow higher-density and mixed use development. The following planning documents have also been prepared: 1) overall TOD Strategic Plan; 2) station area plans; 3) TOD station Typology. This project is supported by local institutions and authorities responsible both in urban and traffic planning. Covering different scales from individual station areas to an entire region is another important issue (Ratner & Goetz, 2013). "Overlay Zoning" is another policy instrument which has been developed to encourage TOD in Phoenix.

According to the overlay zoning ordinance of Phoenix, a list of land uses which are prohibited, conditionally allowed, and explicitly allowed have been developed. Overlay zoning is used to achieve TOD design principles such as higher density and mixed-use environments which are walkable and pedestrian-friendly (Atkinson-Palombo & Kuby, 2011). In addition to planning and policy instruments, there are other influential factors leading to the success of a TOD project. Thomas and Bertolini (2017) have shown that "political stability at the national level, relationships between actors in the region, interdisciplinary teams used to implement TOD and public participation" are crucial factors for a successful TOD project. The results indicate that in a sectoral planning culture of some developing countries (such as Iran) in which the policies and priorities of central government depend on the choices of individual decision-makers, it is not easy to achieve TOD goals. In another word, an institutional structure is a critical factor to achieve successful TODs. Institutions may work both as an obstacle and facilitator of TODs: formal institutional barriers are complexity in governance due to multiple stakeholders with different viewpoints and unclear roles; and informal barriers are identified when there is no commitment or ambition to achieve the goals (Tan et al., 2014).

3 POSITIVE OUTCOMES OF TOD FOR IRAN

3.1 RAPID URBANIZATION AND SOCIO-DEMOGRAPHIC CHANGES

Iran is an emerging country, still encountering development challenges. The country's demographic and socio-economic situation has drastically changed in recent decades. Once an agriculture-based society with most of the population residing in rural areas, during the last decades of the 20th century, Iran changed into a more urbanized country with a shift from agriculture to a market economy and the resultingd creation of a modern but oil-dependent urban sector. Recent national census data (2011) show that the share of the population living in urban areas has grown up to 70% and the number of cities has increased from 201 in 1956 to 1331 in 2011, amongst which eight cities now have more than one million inhabitants (SCI, 2011). Figure 1 indicates the prominent share of urban areas and urbanization in the population distribution and lifestyle which will also lead to the need to improve and develop sustainable transportation systems.

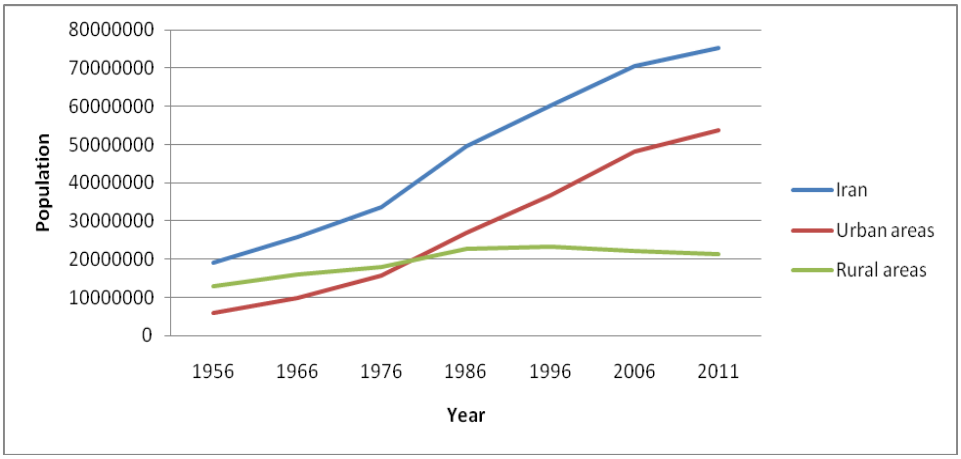

Fig.1 Urbanization trend in Iran

Changes in family size and aging are among other socio-demographic trends: statistics show a shift from extended families to nuclear ones, with recent changes to even smaller family size: the average household size (in both urban and rural areas) decreased from 5.02 in 1976 to 3.55 in 2011 (SCI, 2011). Although the relationship between household size and travel demand is very complicated and needs to be studied in every society, it is logical to claim that the smaller the household size (tendency everywhere as income rises) the higher the trip rate per capita, and as the income also affects travel choices, there is a higher propensity to use private motorized modes. Studies show that as household incomes increase, so do the number of trips that household members make (TFL, 2011). The drastic changes in the demographic situation of the country together with rising participation of women in economic activities will affect the need for mobility, and should be taken into account in transportation planning.

3.2 GROWING MOTORIZATION

Gradual growth of motorization rate is a common phenomenon which may affect modal split. Some previously done research shows that "of personal characteristics, car ownership is the most important variable to explain modal choice: If people own a car, they use it" (Dieleman et.al., 2002). However, this should be evaluated together with other variables such as travel behavior and access to public transportation facilities. Recent data of the Central Bank of Iran shows that while average household size in urban areas decreased from 4.09 in 2005 to 3.44 in 2014; car ownership rate for each urban family increased from

28.8% in 2005 to 45.8% in 2014 (CBI, 2014). This is the average data for urban areas. Yet the critical issue is that the figure is much higher in metropolitan regions: recent data of the Tehran Municipality published in 2014 indicates that the car ownership rate per 1000 inhabitants is 400 (TTO, 2014). A study of the number of registered vehicles in Iran also shows the considerable difference between the number of registered cars and mass transit vehicles.

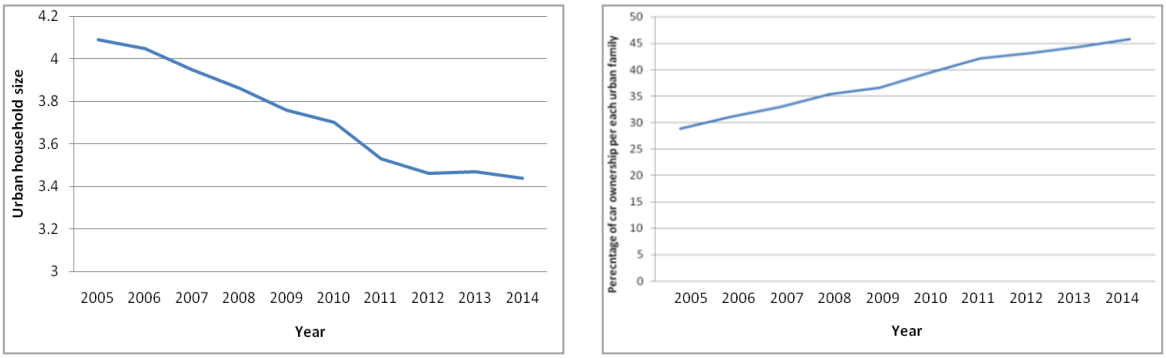

Fig.2 Decreasing size of urban households (on the left) and Increasing car ownership rate (on the right)

Although there are some improvements in the development of public transportation systems- mainly bus, BRT, "shared taxis" and metro- especially in big cities, Tehran Municipality data demonstrate that the share of public transportation in Tehran has only slightly increased from 49.3% in 2005 to 58.2% in 2014 (TTO, 2014). The increasing motorization rate alone, is not considered to be a serious threat: in several industrialized countries (especially in Europe), the car ownership rate is much higher than in Iran, and at the same time, the share of public transportation in daily trips is comparably bigger. The main issue is the coincidence of motorization growth and insufficient public transportation facilities. TOD can be introduced here to deal with the problem. It has been defined as a measure to encourage use of mass transit modes, walkability and decrease car dependency. By integrating urban development and public transportation, it may work as an instrument to reduce car dependency (Chisholm, 2002).

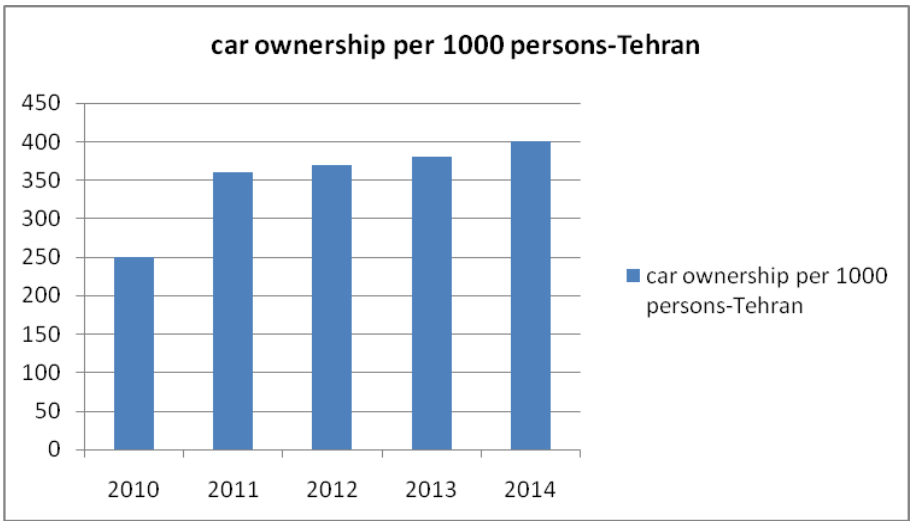

Fig. 3 Increasing car ownership rate in Tehran

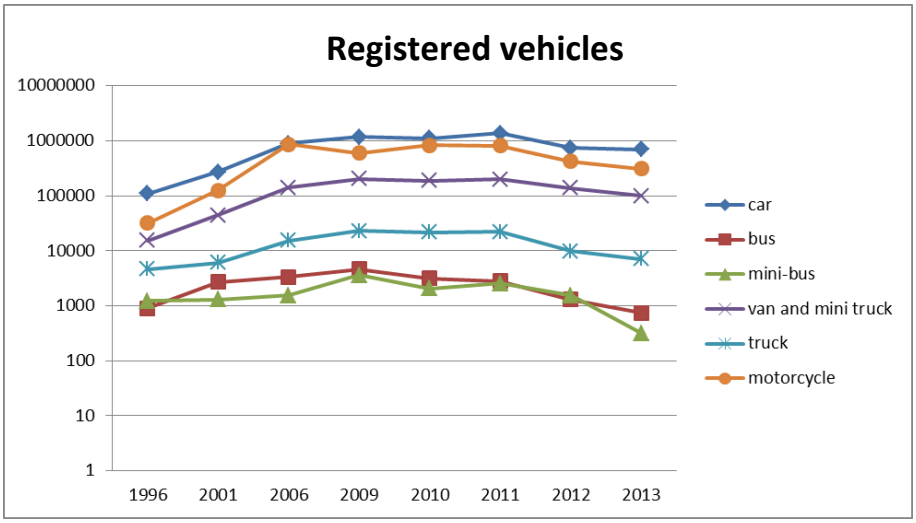

Fig. 4 Registered vehicles

3.3 AIR POLLUTION

Insufficient public transportation is not only an issue in newly developed settlements: it is also a cause for concern in large and small cities alike, especially in metropolitan areas. So-called car-oriented development has other consequences: the most serious is air pollution and environmental degradation which is now a serious problem in metropolitan areas and considered to be the main reason for cardiovascular diseases and death in big cities. According to Abbaspour and Soltaninejad (2004): "the vehicle fleet and motorization, with a large number of old and poorly maintained vehicles as well as growing domestic vehicles, are responsible for much of the recognized pollutants discharged into the atmosphere in metropolitan areas of Tehran. Transportation-related pollutants are carbon monoxide (CO), reactive and non-reactive hydrocarbons, nitrogen oxides, (NOx) sulfur oxides (Sox), and lead (pb)". The annual report of "Air quality control company" of Tehran also indicates that mobile sources of air pollution, such as private cars, shared taxis, motorcycles, vans, trucks, bus and minibuses, are responsible for 85% of annual air pollution (AQCC, 2015). Each year due to severe air pollution which causes serious health risks for the inhabitants, there are several days off in which kindergartens, schools, factories and even state offices are closed. This unexpected situation has serious economic consequences, specially in Tehran which is responsible for more than 70% of the country's economic turnover (Eghtesadonline, 2016).

World Health Organization data shows that cardiovascular diseases are the most important cause for health factors such as "the sum of years of life lost due to premature mortality" (YLL) and "years of healthy life lost due to disability" (YLD) in Iran. According to the same data, "Ischaemic heart diseases" were the leading cause of death, killing 97.7 thousand people in 2012. Road injury is also the cause of death for 32 thousand people in 2012 (WHO, 2012).

Development of mass transit systems has proved to be the best solution to control air pollution. The existing literature indicates that TOD as a traffic management strategy would reduce air pollution (Wu, 2014). Cervero and Sullivan (2011) claim that: "Carbon emissions and energy consumption of Green TOD can be nearly 30% less than that of conventional development". The improvement of transportation infrastructure as the most important means to reduce air pollution, needs considerable investment by public and private sectors. It is argued here that it is worth the cost, considering the savings in terms of life, time and quality of the living environment.

4 THE CHALLENGES OF TOD IN IRAN

4.1 TOD AND MOBILITY AS NATIONAL PRIORITIES

A critical review of the current situation in Iranian cities indicates the serious need to improve public transportation systems: it would reduce air pollution and traffic congestion, decrease car accident risks and finally improve the quality of life for the rapidly urbanizing society. The importance of the transportation sector in Iran can also be discussed from other viewpoints: a vast country with a privileged location at the crossroads of international trade routes; a mountainous land in which settlements are separated with long distances, needs an interconnected transportation system (World Bank, 2005).

The new Iranian government faces the challenges inherent from hurriedly taken decisions by previous governments to provide housing units for the population without sound plans for the provision of related urban services and infrastructures. In an attempt to tackle the issue, one of the main strategies of the new government is "urban mobility" and "rail-based urban development" mentioned frequently in the speeches of the Minister of Roads and Urban Development (Akhoundi, 2016). Although this is not a very novel policy and has its roots in the history of urbanization dating back to the early days of the industrial revolution; it shows a devotion and apparent shift in national policies toward more sustainable planning. However, paving the way to achieve transit-oriented or "rail-oriented" urban development will not be achieved easily and there are several barriers which should be overcome.

In the present paper, the main obstacles regarding the development of TOD in Iran will be discussed. They have been recognized as the following:

1 The need for an Iranian version of TOD
2 Low priority in national housing strategies
3 Overlapping and parallel institutions and insufficient planning instruments

4.2 THE NEED FOR AN IRANIAN VERSION OF TOD

The general concept of TOD has been initially raised as a solution for American cities. Therefore the whole idea has a so-called "western" orientation. Although there are some similarities between American and Iranian cities especially in the case of scales, climatic and geographical variations, long distances between cities and car-dominated urban growth, there are also several mismatches in urban governance, land speculation, legal and institutional structure, etc. Therefore a more localized TOD concept should be developed in Iran. As was discussed in the literature review, successful TODs are the direct outcome of formal and informal institutions responsible both in urban planning and transportation systems. Each planning culture has its own specific institutional context which may support or delimitate TODs. A "Copy and Paste" approach to transfer a concept from one country to another does not work and complex planning practices cannot be transferred in their entirety. Iranian planners should develop the concept according to local planning instruments and institutions.

The available literature on TOD in Iran shows the lack of a comprehensive approach which encompasses different aspects. However, several challenges have attracted the attention of researchers. These include "dissatisfaction of local residents (near subway stations) due to a lack of standard facilities and weak social activities" (Abbaszadegan et al., 2011), "different effects of opening metro stations on the value of properties in southern (poor) and northern (rich) areas of Tehran, a positive effect on the south and negative effect on the north" (Kheiroddin et al., 2014), and "the possibility of an increase in the economic value-added of properties near metro stations" (Soltani, et al., 2011).

Another subject which has been very seriously considered in both the literature and in practice is the need to develop commercial complexes near metro stations. These multi-functional high-density buildings, mainly

managed by the municipalities, have already been planned near some metro stations in cities like Tehran, Shiraz and Mashhad, and are claimed to be a safe solution to finance further development of metro system (Montazeri, 2012). A review of the current approaches shows that the high value of land and property in metropolitan areas has affected research and practice of TOD in Iran and there is even the danger of its misuse as a "scientific" justification for land speculation by the private sector or even municipalities. Realization of TOD projects needs a multi dimensional and comprehensive approach considering its multiple aspects both in theory and practice. Cutting down the subject and focusing on its individual aspects will lead to dissatisfaction. As an example although TOD has been proved to reduce air pollution, one case study in the impact of BRT system in Tehran, shows that BRT by itself cannot control air pollution and traffic congestion (Asadollahfardi et al., 2016). It indicates that development of a mass transit line without considering other aspects of TOD will not lead to the expected goals. In the case of this study the negligence of walkability as a TOD principle was the main reason for being unable to achieve the expected results. For a comprehensive local approach, the roles of different stakeholders and local authorities should be considered. Land prices, the legal and social limitation of increasing densities near transit stations, and the danger of a narrowed down definition of TOD in which other aspects such as walkability, green and open spaces have been neglected, should also be taken into account.

4.3 LOW PRIORITY IN THE NATIONAL HOUSING STRATEGIES

Drastic demographic and socio-economic changes have visible impacts on all development issues. The need for provision of more housing units for the fast growing, young population has been a national priority in recent decades. The government initiated many housing schemes for middle-low income social groups, the development of New Towns in the suburban areas of big cities and the MEHR Housing Project, considered one of the most important. Growth of residential areas has been so rapid, leaving no space for the parallel development of urban infrastructures. What is apparent now as the result is the emergence of residential quarters with very limited public services, apparently inadequate public transportation facilities. As an example, the development of new towns, as a strategy to absorb the surplus population of big cities, to provide housing for low-income groups, and accommodate employees of industrial sectors, was started in the 1990s (Ziari & Gharakhlou, 2009). However, after more than 20 years from their establishment with thousands of residents all around the country, the regional railway system to connect them to the main cities is still in progress.

New Town	Approval of comprehensive plan	Target population estimated for 2036	Estimated time for the operation of regional railway*
Parand	1998	700000	2015
Hashtgerd	1993	500000	2014
Golbahar	1993	530000	2016
Baharestan	1993	320000	2015
Fouladshahr	1994	350000	2017
Sahand	1998	450000	2017
Pardis	1995	560000	2017
Sadra	1995	550000	2017
Majlesi	1993	140000	2017
Binaloud	2002	160000	2017

Tab.1 Estimated operation time of regional railways for some of the Iranian new towns
***plans are behind schedule and the dates are only estimation**

There are some debates supporting the positive role of private investments in the improvement of mass transit systems. However, the current situation does not provide a safe and secure environment for private investment: Ambiguity on relationship between State and the private sector, lack of security and monetary rewards for private suppliers, and interference of political decisions are among major issues raised to indicate the weak role played by private companies in mass transit system development (World Bank, 2005). When compared with safe and profitable investment in housing projects, the logic behind unbalanced development of mass transit systems and residential development becomes clear.

4.4 OVERLAPPING AND PARALLEL INSTITUTIONS AND INSUFFICIENT PLANNING INSTRUMENTS

Parallel and overlapping tasks of public and private institutions constitute a general barrier in the efficient fulfillment of national strategies in Iran. The transportation sector is also affected by this trend. Currently and after the merger of two ministries of "Roads and transportation" and "Housing and urban development" and the establishment of the "Ministry of Roads and Urban Development", the separate tasks of those ex-ministries have been diverted to the new one. The new ministry is now in charge of the whole transport sector excluding urban transport which is under the Ministry of the Interior and the City Councils (World Bank, 2005). Although urban transportation planning is mostly down to the municipalities, parallel sub-institutions are responsible for different transportation modes (metro, shared taxies, buses, etc.). Some recent research has emphasized the importance of an "integrated transportation approach" as a holistic strategy which integrates different levels such as management (users, stakeholders), function and land use planning in transportation sector of Iran (Soltani & Fallah Manshadi, 2013). Integrated approach should be applied also in the bigger scale of regional planning. Inner city transit networks should be connected to the regional access ways e.g. national railway network. In this way, public transportation system will be integrated in the whole country. This approach needs even higher level of integration, as at least tasks of two ministries and several sub- level institutions should be harmonized. Recently there are discussions on moving the central railway stations out of the cities and locating them in suburban areas. This idea which has been raised by Tehran Municipality considered being incompatible with the integrated transportation approach. The "Ministry of Road and Urban Development" expressed its serious disagreement on this idea and supports the integration of national railway network with inner city transportation to achieve more integrity in regional level (Hanachi, 2016).

Another obstacle to realize TOD projects is insufficient planning instruments. Iran has a centralized planning system in which traditional "Comprehensive plans" and "Detailed Plans" are main local level planning instruments " (Rasoolimanesh et al., 2013). Standard instruction has been developed to guide preparation and approval of these legal documents which is also valid for the whole country. This uniform content leaves no place for any amendment or changes. As it has been seen in the case of US planning experiences, special land use and transportation plan has been developed for the City of Denver to allow TOD requirements such as special zoning and higher density. Or in the case of Phoenix, "overlay zoning" has been used as a planning instrument to support TOD projects. Iran should also develop its own planning guidelines according to its local context. Considering the geographic, cultural, economic and social variety of the country and the cities, a uniform TOD guideline couldn't cover the requirements of the whole country. Thus, it is suggested here that a general guideline should be developed in national level and each city should prepare its own localized version according to its unique physical and institutional context.

5 RESULTS AND DISCUSSION

The current paper presents a brief overview of both positive outcomes of TOD for Iran and the actual challenges considering the existing situation in the country. TOD may be applied as a policy to solve several critical problems especially in metropolitan areas of Iran. Transportation is a very serious issue in the cities and its inadequacy cause critical problems: the urbanization rate is increasing and rural migration will lead to empty villages and overpopulated urban areas. The gradual decrease in family size combined with the increasing motorization rate will bring even more cars to the existing streets and highways. More cars mean more air pollution, more congestion and also more car accidents. The loss of lives, health, time and working hours can be easily calculated and transferred to numbers to demonstrate the economic consequences.

Now it is time for a paradigm shift. The starting point here is the need for local theories supporting transit oriented development. TOD as a western model for integration of urban development and public transportation may work well for some countries, but not definitely for Iran. Recent local practices even demonstrate the danger of "narrowing down" the concept and using it as an instrument to increase densities and profit making. TOD should be re-visited according to the Iranian planning and economic system. Its principles addressing density, open space, walkability and less car use should be thoroughly considered and translated into Iranian standards and norms.

Another urgent need is to shift priority from housing projects to public transportation. Although mass housing schemes have been a priority for the Iranian government for a long period, now it is the time for a strategic shift and focus on public transportation provision in the cities and regions. In so doing, there are numerous challenges to be faced: a shift from housing provision to public transportation is not easy. There are many public and private investors supporting housing projects, due to the secure and promising market. Similar investments in public transportation cannot be as safe and secure. The government should support investors with new economic models and strategies.

Strategies cannot stay on paper; they should be transferred to the real world and practiced there. Here the need for an efficient institutional model is apparent. Parallel institutions and several ministries are now responsible for public transportation inside and outside cities. They have overlapping and even contradictory tasks which cause disharmonized outcomes. It is not easy to put different institutions together to fulfill an identical goal; however, this is the only practical solution to achieve an integrated transportation system. Available planning instruments in Iran do not fit into TOD requirements. The need for a national TOD guideline with the potential to develop local versions for each city is very crucial and should be considered in national urban and transportation planning priorities.

Paving the way to achieve TOD in Iran is not easy. Looking at the serious risks which an inadequate mass transit system will create in cities should raise urgent attention by the decision makers. Long-term plans are needed to deal with the pressing problems. Knowledge dissemination and awareness raising are other instruments to fulfill the tasks.

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IMAGE SOURCES

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Fig. 1: SCI (Statistical Centre of Iran), 2011

Fig. 2: CBI (Central Bank of the Islamic Republic of Iran), 2014

Fig. 3: TTO (Tehran Traffic Organization), 2014

Fig. 4: SCI Yearbook, 2013

Tab. 1: New Towns Development Company, Retrieved from:http://ntoir.gov.ir/index.aspx?fkeyid=&siteid=1&pageid=189

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