Demands and Feasibilities of Infill Development in Iranian Urban Areas- the Case Study of Tehran

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Abstract

Infill development could be categorized in the theoretical frameworks of sustainable urban planning and smart growth approaches. It is defined as "reuse or recycling of lands and buildings which are empty, vacant or are not used efficiently". It's most important goals are to prepare housing and other urban amenities in inner city areas. In this case, comparing to greenfield developments, the need for infrastructures and services will be reduced, the use of natural resources will be optimized and living condition in adjoining neighbourhoods will be improved. Iranian cities are still at rapid urbanization phase, thus urban sprawl is their common problem. Infill development concept might be applicable in reducing the problem. In this paper which is based on author's research project being done in Building & Housing Research Centre (BHRC), the theoretical position of infill development is discussed, and the relevant planning issues in Iranian cities (the case study of Tehran) are also introduced. The research shows that Iranian cities have both strengths and weaknesses regarding the potential use of infill development concept. Low population density and disconnected urban development are the potential for urban land reuse, while poor access to urban infrastructures, services and utilities are the key obstacles to successful infill development.

Keywords: infill development, sustainability, smart growth, Iran, Tehran
1. Definitions

Infill development in urban planning literature is interconnected with the terms of sustainability, smart growth and brownfields. As an introduction to the main debate, to make the idea more clear, some definition will be discussed here.

1.1 Infill development

Robert Cowan defines infill development as: “building on a relatively small site between existing buildings” (Cowan, 2005). A more detailed definition can be found in “Encyclopaedia of the city” by Rager Caves: “infill development refers to the use of vacant or under-utilized land parcels and existing buildings within the central city of a metropolitan area for the purpose of accommodating growth in lieu of the development of open space or farmland at the urban fringe. It is one tactic in a regional smart growth strategy. It typically involves one or more of three principal activities: the construction of new buildings on land that is currently under-developed or undeveloped; the rehabilitation of formerly unusable buildings; and/or the adaptive reuse of existing buildings” (Caves, 2005). Another definition can be found in on-line dictionary of Wikipedia: “Infill is the use of land within a built-up area for further construction, especially as part of a community redevelopment or growth management program or as a part of smart growth. It focuses on the reuse and repositioning of obsolete or underutilized buildings and site. This type of development is essential to renewing blighted neighbourhoods and knitting them back together with more prosperous communities” (Wikipedia, 2010).

A detailed list of the benefits of infill development is mentioned by Caves (2005), some of them are as follows:

1. It is less costly to local government because it makes use of existing physical infrastructures rather than requiring the construction of new roadway, water and sewer extensions,

2. It mitigates the loss of farmland and open space at the urban fringe by accommodating new growth in already developed areas,

3. It can provide new or rehabilitated housing in the central city, situated near cultural amenities and employment opportunities,

4. It helps to limit automobile usage and its related energy and environmental costs, by bringing people closer to jobs and sources of entertainment.
1.2 Brownfields

Brownfield lands are also defined in connection with infill development and as a contrast to greenfield (lands that have not been developed). Brownfields are previously developed land (Cowan, 2005) that actually are, or perceived to be, contaminated (Caves, 2005). They used to be industrial or commercial lands and need some interventions (such as cleaning) to be ready for the new use. Cowan mentioned that brownfield was defined by the US Department of Energy in 2001 as “an abandoned, idled or under-used industrial and commercial site where expansion or redevelopment is complicated by real or perceived environmental contamination; it has an active potential for redevelopment or reuse" (Cowan, 2005).

The motives for building on brownfield sites, mentioned by Cowan (2005) shows apparent similarity with infill development benefits:

1. It saves building on the countryside, which is valued for its own sake, and is agricultural land
2. Brownfield sites are suitable for relatively dense, resource-efficient, urban development compared to new development or Greenfield sites
3. Many of people who live in the countryside are vehemently opposed to further development

1.3 Smart growth

Smart growth is a term defined in parallel with sustainable development which becomes current in the 1990s. According to Cowan (2005), the following 10 principles of smart growth identified by the US Environmental Protection Agency: 1) mixed use, 2) take advantage of compact building design, 3) create a range of housing opportunities and choices, 4) create walkable neighbourhoods, 5) foster distinctive, attractive communities with a strong sense of place, 6) preserve open space, farmland, natural beauty and critical environmental areas, 7) strengthen and direct development towards existing communities, 8) provide a variety of transportation choice, 9) make development decisions predictable, fair and cost effective, 10) encourage community and stakeholder collaboration in development decisions.

Another definition by on-line encyclopaedia of Wikipedia, identifies similar characteristics for smart growth: “Smart growth is an urban planning and transportation theory that concentrates growth in the center of a city to avoid urban sprawl; and advocates compact, transit-oriented, walkable, bicycle-friendly land use, including neighborhood schools, complete streets, and mixed-use development with a range of housing choices. Smart growth values long-range, regional considerations of sustainability over a short-term focus. Its goals are to achieve a unique sense of community and place; expand the range of transportation, employment, and housing choices; equitably distribute the costs and benefits of development; preserve and enhance natural and cultural resources; and promote public health” (Wikipedia, 2010).
In both definitions it is emphasized that urban sprawl should be avoided and natural environment should be preserved. Compact urban growth is also advocated by smart growth. The same goals are followed by the infill development concept.

## 2. Design guidelines

Many books and papers are available with the subject of infill development design suggestions. In the current paper, suggested design guidelines prepared according to the content of two important books: “Planning & urban design standard”, by: Steiner and Bulter, and “Developing successful infill housing”, by Suchman. At the same time, some examples of local guidelines such as “Infill development strategies for shaping livable neighborhoods” by Municipal Research & Services Centre of Washington, and “City of Orange, infill residential design guidelines” by Orange City Council were studied. The results are summarized as design guidelines in table (1). However, there were no available guidelines specially prepared for developing countries. It seems that the concept of infill development is mostly used in West Europe and U.S.A. The reason might be that developing countries are still in the phase of rapid urbanisation, and the cities are expanding horizontally, creating an urban sprawl. Likewise, infill development is more time consuming and design oriented issue, while greenfield development is less complicated and faster. It is more convenient for the local governments and private developers to supply housing for the ever growing population on peripheral areas than in inner city lands.

### Table 1: suggested design guides for infill development (Author)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Design guide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site dimension</td>
<td>Big sites are economically sound and profit making, they are suitable for shaping a new identity, Small sites should be designed with more care to the surrounding architectural features and local character</td>
</tr>
<tr>
<td>Housing variety</td>
<td>Considering local income groups, different types of residency and ownership alternatives should be provided</td>
</tr>
<tr>
<td>Land use</td>
<td>Mixed use, neighbourhood scale uses such as retail shops could reinforce local livability</td>
</tr>
<tr>
<td>Open and green spaces</td>
<td>Modification of standards available for green and open spaces, according to limitation in inner city areas, Pedestrian oriented design</td>
</tr>
<tr>
<td>Density</td>
<td>Developing maximum density, while paying close attention to available urban infrastructures and services, Considering the relationship between land price and acceptable density</td>
</tr>
<tr>
<td>Land subdivision and built up area</td>
<td>Reduction of total area permitted for land subdivision, Harmony with local land subdivision character, Three dimensional harmony of built up area and plot size</td>
</tr>
<tr>
<td>Building</td>
<td>Harmony with existent buildings,</td>
</tr>
</tbody>
</table>
As mentioned before, most available literature in urban infill development and brownfield regenerations are produced in west Europe (mostly England) and USA. Therefore, terms, definitions and design solutions are compatible with urbanization characteristics of those regions.

Concerning infill development, three major issues can be found in Iranian cities which make them different from western cities,: rapid urbanization and land use changes, limitations caused by urban regulations, and insufficient urban services and infrastructures.

Process of formation and development of potential infill sites in Iranian cities has its own characteristics. Due to rapid urbanization in Iran, small villages and industrial lands which once located outside the city skirts, are gradually surrounded by residential areas and absorbed by the rapid growing city. The newly shaped urban areas which used to be allocated to different land uses, are now
incompatible with their surrounding residential areas. Urban planners tend to suggest different land uses for these areas. For example, in Tehran, there are vast lands which used to be airports, city jails, factories and the like. They are now located inside the city and according to the new comprehensive plan of Tehran, allocated to urban services, green areas and cultural-recreational centres.

Urban rules and regulations in Iran have its own characteristics and limitations. Some lands and buildings are vacant, because they have several owners, each living in different location and have no agreement considering what should be done with the mutual property. The reason is that according to Islamic laws, when the owner of a property dies, his/ her belonging should be divided among his/ her close relatives. This causes no problem, when the number of relatives is limited. In some cases, there are many inheritors that can not make a mutual decision. The problem become more complicated when during the quarrel, another death happens. Specially in old urban areas, some lands or buildings can be found which are vacant due to this problem.

Another problem caused by urban regulation is the negligence of infill development needs and characteristics in urban design guides. For example, in most city districts, for each housing unit, a parking space has to be provided. It is completely logical, because due to insufficient public transportation means and cheap access to oil products, usage of private cars is very common and in some cases each family member has his/ her own car. However, provision of parking space needs extra land, which is not always available in inner city areas. Another example is the limitation of plot size for land subdivision. The acceptable land area is more than 200 square meters, which can not be provided in many infill sites.

Many Iranian cities have poor urban infrastructures. The available amenities which, in many cases are insufficient for the present population, can not support more inhabitants. Due to lack of suitable public transportation means (such as subway, bus and trams), travelling by private cars and taxis are prominent. Transportation networks have limited capacity and are always congested by too many cars. A new housing project in an inner city area can add to the local traffic problems. Urban services such as schools, green areas and infrastructure networks such as water, gas and electricity lines are also insufficient for the current populations.

Concerning difficulties and complications following infill development, urban planners and managers prefer to find easier solutions to accommodate growing population. New towns developed around Tehran, are an example of this approach. During the last 2 decades, several housing complexes were established in suburban areas of Tehran. While considerable governmental founds allocated to develop these new settlements, they were not successful to absorb planned population. One important problem is the insufficiency of urban facilities and services. Also, they lack urban life and livability: they simply unable to provide community bonds and social life for the young generation. New towns are strongly depended on the mother city, and the inhabitants should commute for work and educational proposes. Considerable energy and natural resources were used during daily trips, while they add to pollution and congestion in the main city. New town development which may be considered as a competitor for infill development, is a land and resource consuming approach which also lacks social and cultural attractions. It can only provide housing, but not urban life.
Infill development has also its own obstacles and limitations. This study tries to suggest a hierarchical process to find potential sites appropriate for residential uses in inner city areas. In this regard, a three level process is suggested: city level, district level and site level. The study is process oriented and the method is more important than the results.

3.1 Identification of available lands for infill development in city level (Tehran)

In the present research, Tehran- the capital city of Iran- has been selected for the case study. The new comprehensive plan of Tehran, has been approved by the ministry of Housing and Urban Development, in 2007, according to which, detailed plans have been prepared for each of 22 districts of the capital\(^1\). These plans, which have been prepared by private consulting engineering companies and approved by the municipality, provide the data base of current research. According to the detailed plans, following land uses have first priority for infill development:

1. Industrial areas: small workshops, old factories and big mechanical repair shops,

2. Military sites: garrisons, city jails, training centres and hangars,

3. Warehouses: industrial warehouses, platforms,

4. Transportation sites: garages, old airports, obsolete transportation agencies and railroad stations,

5. Vacant lands: brick kilns, cemeteries, small or big empty lands,

6. Urban infrastructures: old power plants, swage filtration plants,

7. Residential sites: high and low density deteriorated fabrics

3.2 Identification of infill development potentials in district level (district 19)

Through the following criterion, infill development potentials of Tehran have been studied according to detailed plans of 22 districts of the city (figure 1):

1. vision statement of districts

\(^1\) - For more information about detailed plans of Tehran, see the following website (in Persian language):
2. existence of incompatible land uses

3. potentials to accommodate extra population

4. development plans for deteriorated areas

5. available urban services and infrastructures

Figure 1: Tehran map

The study shows that the peripheral districts which used to be outside the legal boundaries of the city, has best potentials for infill development, as the other districts were completely built up and have no extra spaces for more development. Even within the peripheral areas, lack of urban services and infrastructures is a serious obstacle. In this regard, district 19 which has the following characteristics has been selected to continue the study:

1. In its vision statement, accommodation of extra population, change of incompatible land uses, and integration of residential fabric have been emphasised

2. It is shaped by disconnected and phased development of previous rural areas, remaining vacant lands in the urban fabric

3. Available urban services and infrastructures to accommodate surplus population

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2 - Figure source:
A study on rules and regulations of detailed plan of district 19, reveals that a review on the following items can add to its potential for encouraging infill development:

1. The possibility of preparing subject plans for special areas
2. Land use change condition
3. Proportional relationship of residential buildings and street width
4. Size and dimension of plots subdivision
5. Land assembly condition
6. Possibility of shared parking provision
7. Permitted density, built up area and street width

Figure 2: District 19 land use plan and three selected sites (Original map: NAGHSHE-PIRAVASH Consulting Engineers, 2005)
3.3 Infill development potential in site level

Primarily site selection has been done according to proposed residential sites in the detailed plan of district 19. At first, three sites have been selected (figure 2), and then by using AHP\(^3\) method, and the criterion developed through literature review (table 2), site A has been selected as the best possible location.

Table 2: main and sub criterion for prioritization of available lands

<table>
<thead>
<tr>
<th>Main criterion for prioritization of available lands</th>
<th>sub-criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>location</td>
<td></td>
</tr>
<tr>
<td>Vicinity of incompatible land uses</td>
<td>Distance and influence of incompatible land uses</td>
</tr>
<tr>
<td>People tendency to live there</td>
<td>Social position and identity</td>
</tr>
<tr>
<td>Physical features and urban character</td>
<td>Building quality, access and urban amenity</td>
</tr>
<tr>
<td>Urban services</td>
<td></td>
</tr>
<tr>
<td>Educational facilities</td>
<td>Access, quality and quantity</td>
</tr>
<tr>
<td>Shopping and retail services</td>
<td>Access, quality and quantity</td>
</tr>
<tr>
<td>Commercial, recreational, cultural and sanitary services</td>
<td>Access, quality and quantity</td>
</tr>
<tr>
<td>Accessibility</td>
<td></td>
</tr>
<tr>
<td>Access to public transportation</td>
<td>Distance to main stations and main lines of public transportation</td>
</tr>
<tr>
<td>Access to transportation networks</td>
<td>Permeability and emergency services</td>
</tr>
<tr>
<td>Characteristics of potential residents</td>
<td></td>
</tr>
<tr>
<td>Household-income levels</td>
<td>Variation of dwelling types</td>
</tr>
<tr>
<td>Needs of potential residents</td>
<td>Household formations, life styles</td>
</tr>
<tr>
<td>Number of potential residents</td>
<td>Estimation of housing needs</td>
</tr>
<tr>
<td>Site dimension</td>
<td></td>
</tr>
<tr>
<td>Big projects: potential improvement of local image, shaping a new identity, economic advantages</td>
<td>More than one normal urban block</td>
</tr>
<tr>
<td>Small projects: short time profits, rapid results</td>
<td>Less than one normal urban block</td>
</tr>
<tr>
<td>Ownership</td>
<td></td>
</tr>
<tr>
<td>Multiple ownerships</td>
<td>Inherited lands</td>
</tr>
<tr>
<td>Unidentified owners</td>
<td>Inaccessible owners</td>
</tr>
<tr>
<td>Ownership types</td>
<td>Illegal possession or occupation</td>
</tr>
<tr>
<td>Infrastructure</td>
<td></td>
</tr>
<tr>
<td>Capacity of existent infrastructure</td>
<td>Suitable for the extra population</td>
</tr>
<tr>
<td>Quality of existent infrastructure</td>
<td>Expenses and time needed for possible repairing or extension</td>
</tr>
<tr>
<td>Available infrastructures</td>
<td>Existing network potentials</td>
</tr>
</tbody>
</table>

\(^3\) - Analytic Hierarchy Process
4. Conclusion and discussion

Infill development apparently supports sustainable and smart urban growth through avoidance of urban sprawl and advocating compact design. The supporters believe that it contributes on energy conservation through optimum usage of available urban utilities and infrastructures. However, developing countries have different conditions. While potentially reusable lands can be found in many cities; poorly developed urban services, congested access roads and insufficient utility lines, make their optimum use difficult. One reason that prevents compact and denser growth of urban areas in developing countries, is the lack of appropriate technology and financial supports to develop main infrastructures. In this paper, with the emphasis on situation in Tehran, a method is developed to identify suitable lands and parcels for infill development. It is a starting point in theorizing a process oriented approach for infill development in Iran. More in depth studies should be done to develop practical suggestions for sustainable development of inner city areas through infill and brownfiels development.

References


