

# The Evaluation of Environmental Hazards of Urban Squatter Settlements Based on Gis, The Case Study: North Squatter Settlements of Tabriz City, Iran

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## Abstract

In the past few decades urban areas of Iran have grown very rapidly. According to statistics bureau of Iran, in 1996, 61.31% of the population lived in 614 urban centers-some 36 million. By 2020, this figure is estimated to rise to 80 %. This rise in urban population has resulted in continuous creation and growth of squatter settlements and in spreading of civil services until the breaking point. Serious shelter shortages, overcrowding, decreasing of the standards of public health and sanitary services, deterioration in the quality of living are the bitter fruits of the urban expansion in Iran. In this article based on a broad field study, we try to show some of physical environmental bitters which informal settlements in Iranian cities are faced with, especially in *Tabriz city* as a fourth biggest metropolitan area based on GIS analysis. This research is prepared in 3 parts: Part 1 the case of *Tabriz city*, Part 2: physical and man-made hazards, Part3: Evaluation of land tenures and dwellings.

**Keywords:** Environmental Hazards, Squatter Settlements, GIS, Tabriz City, Iran.

## 1. Introduction

One of the most enduring manifestations of informal settlements, and one that has attracted the most attention, is squatter housing. Squatter settlements are settlements established by people who have illegally occupied an area of land and built their houses on it, usually through self-help processes. Terms associated with this type of spontaneous settlement in the UNECE region are shanty towns, peri-urban settlements and slums. Terms in other languages include baracas, favelas, bidonvilles, gecekondu, chabolas and novostroiki, (United Nations, 2009:19).

And also a squatter settlement can be defined as a residential area which has developed without legal claims to the land and/or permission from the concerned authorities to build; as a result of their illegal or semi-legal status, infrastructure and services are usually inadequate (Srinivas, 1991).

Hundreds of millions of urban poor in the developing and transitional world have few options but to live in squalid, unsafe environments where they face multiple threats to their health and security. Slums and squatter settlements lack the most basic infrastructure and services. Their populations are marginalized and largely disenfranchised. They are exposed to disease, crime and vulnerable to natural disasters. Slum and squatter settlements are growing at alarming rates, projected to double in 25 years (World Bank & UNCHS, 2007:1).

Precarious settlements ('favelas' and informal settlements) make up nearly ten per cent of the area of Sao Paulo and accommodate almost one-third of the urban population. Nearly 25 per cent of these settlements are situated in water catchment areas, thus causing environmental and health problems in addition (Schwedler, 2011:25).

The influx into the towns and especially metropolises –particularly after the land reform program in 1963– is mostly to refer to the very and varying wide gap between the rural and the urban areas that persisted for many years. This in turn left to an inequity in employment opportunities, high differences between income levels, infrastructures like access to energy, communications, education, health, entertainment, power and other social and welfare services. According to statistics bureau of Iran, in 1996 61.31% of the population lived in 614 urban centers-some 36 million (www.sci.org.ir). By the 2020 this figure is estimated to raise to 80 % (zanjani, 1992:55).

Limiting the split between cities and countryside would perhaps be the best and abiding solution, where it is possible to do so in a rational span of time. Unfortunately, this tends to be a very long-drawn process and may be a cause to very large crisis in country if government, decision-makers and planners do not take any urgent reasonable actions.

The Research results show that there are two major inefficiencies in failure of the government efforts, including lack of adequate national policy in low-cost housing and growth in the less development region, and inefficiencies in the management of rural and urban areas(Magsoodi Tilaki et al,2001:160).

Experience of the past few decades –specially results of the last five development programs before and four development programs after Islamic Republic Revolution (IRR) (1979) – have, however, shown that none of policies has succeeded to any satisfactory degree (preventing the growth of cities in any region of the country, spatially in metropolitans). Surly, the certain result of migration to cities in a country is squatter settlements because of increasing demands for shelter and inability of urban hous-

ing market to offer sufficient housing with appropriate cost. This phenomenon is a certain features in our cities, especially in the metropolitans and medium size cities. Some urban authorities are being against these, and do not know or do not want to know this settlements and dwellers are the certain and undeniable facts of our third world urban life.

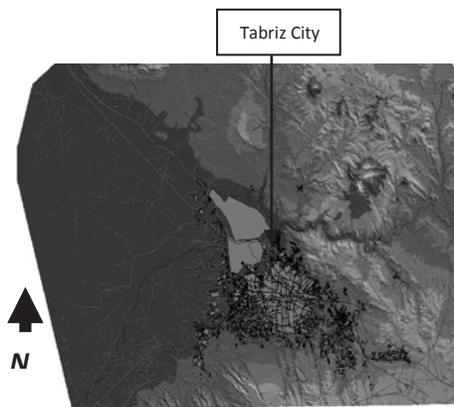
Thus, urban policies in development plans need to be revised in the light of this reality, so that, insisted of being denied a cheap legitimate shelter, (and thus being forced to break the law for sheer survival), the migrant is given the corporation of the city in constructing a self-help shelter of the type that offers the best compromise his needs and his purse on the one hand and with the city’s development plan on the others. In these fields, city councils, municipalities and (NGO’S) by the side of government have an important part.

What is needed, therefore, is the stock of the urban situation and realistically to review and (suitably) improve the urban planning strategy so that forceful and positive steps are tackled effectively the problem of spontaneous, squatters and dwelling house for the urban low income within the existing constraints. The case study of *Tabriz city* is outlined briefly in the following paragraphs, which somewhat will illustrate the condition of squatter and spontaneous settlements in Iran as a sample and help to make this argument clearer. This study includes three parts after introducing of town of *Tabriz city* and geographical position of north squatters as a first part, the most important hazards in which of theme squatters confront with many man-made and physical problems are discussed in the second part. Finally the land tenure and dwellings qualities are evaluated.

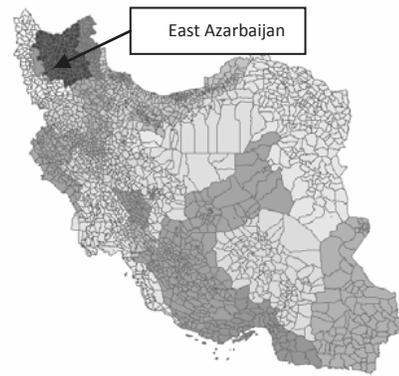
## 2. The case of Tabriz City

The metropolitan town of *Tabriz city* is the fourth largest city in Iran, east Azerbaijan province, (figure 1). The urban population of Tabriz city had increased from 0.5 million in 1966 to 1million in 1986. It has now reached to 1.8 million (2008) population.

**Fig.1.** Position of East Azerbaijan and physical Site of *Tabriz city*



The estimated population of the city is 2 million for 2006(Hoseinzadeh dalier 1995, 2). From its current population about 400 thousands live in squatters and spontaneous areas, nearly 25%



of its inhabitants are squatters (Zamani, 2000, 202). There exists different zones of informal and slum settlements in *Tabriz city*. Informal settlements of *Tabriz city* vary in their ages and origins as well as their ethnic mix-up (Moosavi, 2011:107). In *Tabriz city*, such areas are in two sections of town, where the standard of living is very low and housing condition is very poor. These areas are includes:

1. The north squatters: this area is the most congested squatter settlements in Tabriz city (figure 2). Its total population is over 0.3 million (nearly 340 thousands). This area is composed of five sections some important characters of which are shown in table 1:

2. The south squatters, these areas in relation to north squatters have a little congestion. It has now closed to 80 thousands (2004) population. Most squatters of these areas have settled in “Zangolabagh” section. Settlements in these regions are faced to some physical and man-made hazards;

**Table 1.** Residential characteristics in north squatter settlements of *Tabriz city*

	population	Shelter	Net density	Density in each shelter	Density in each room
Darreh eichy	68054	9629	468	1.23	2.77
Gorbany	103201	14935	481	1.24	2.78
Seylab	47101	7112	309	1.15	2.54
Heidar abad	47625	7406	116	1.15	2.74
Yanog	72395	10156	515	1.28	2.69
	Total= 338376	Total= 49238	Ave.= 378	Ave.= 1.21	Ave.= 2.7

(After Jamali, Hoseinzadeh Dalir, pourmohammadi, 1995:229)

## 3. Physical and Man-made Hazards

### 3.1 Physical Hazards

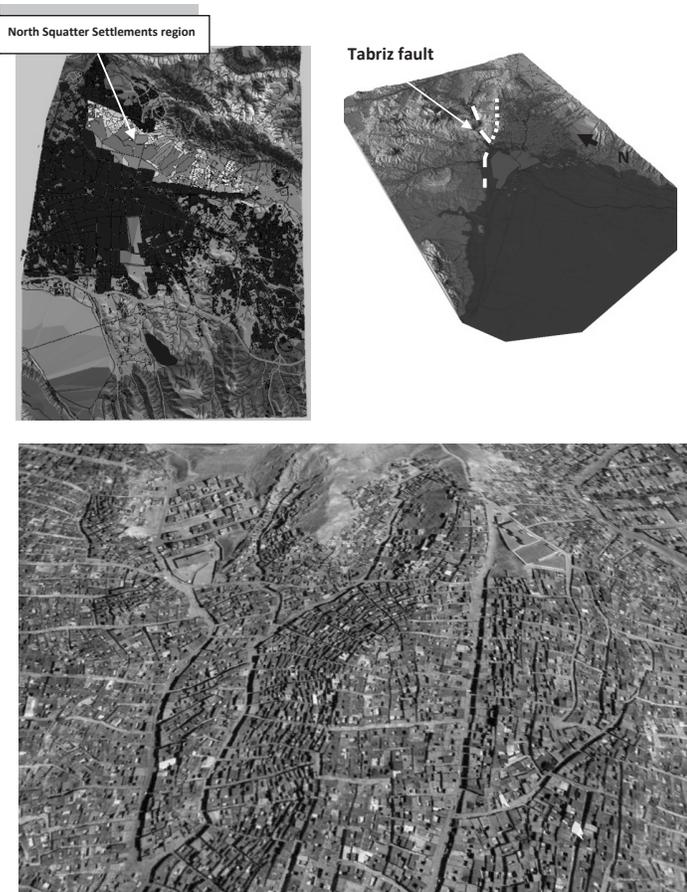
**Earthquake:** The geological studies show that the city of *Tabriz city* in general and the north squatter settlements in particular have been built just close to the *Tabriz city* fault and all the time they are exposing to danger (figuer2). It is a reverse fault, and we know these kind of fault is one of the most dangerous kinds. *Tabriz city* is a prone city to having earthquake, and in the past centuries the very most destructive earthquakes have been occurred in this city

**Table 2.** The most important earthquakes of Tabriz city history

Year (A.B)	Mortality
855	Full destruction
1041	50000
1537	40000
1633	Very violent earthquake
1640	Very violent earthquake
1721	250000
1779	100000
1780	100000
1787	Very violent earthquake

Source : (Madani & shafiey, 1993:420).

**Fig.2.** North Squatter settlements of Tabriz city (left) and main Tabriz city fault position (right) and near aspect from north squatter settlements (above)



Only in the last century about 98 earthquakes have been recorded (Madani & shafiey, 1993:420). These data shows that from the last most destructive earthquake, 143 years in minimum and 209 years in maximum have been past. Therefore, living in these areas (just in earthquake focus) drawing a very terrible and regrettable end for its inhabitants. Unfortunately, it seems no one of the decision makers wants to accept this reality and its probable bitter conclusions before that a tragic event be occurred. As, there are very closely correlations between distance and hazards in relation to quake focus, then it is very necessary for the urban authorities and decision

makers especially municipality, to try to replace these settlements in other sites or at least upgraded them as soon as it possible.

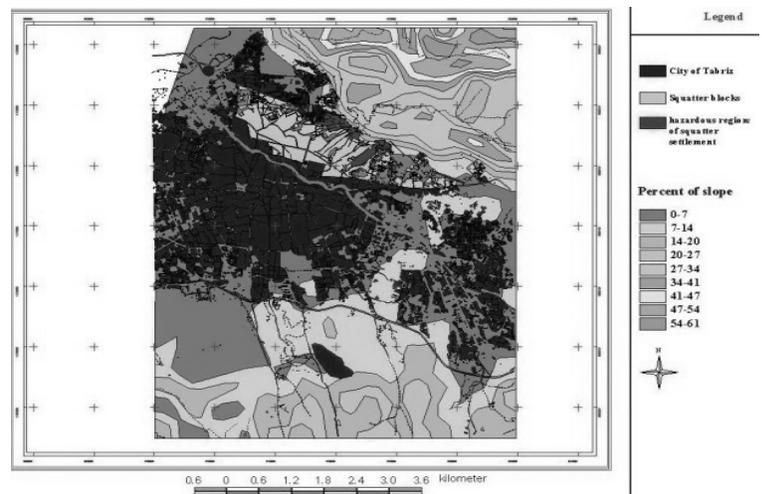
**Land slide:** sheer slope is one of the important physical factors which can have negative effects on human settlements. It can create, invigorate or accelerate some physical dangers, like land slide, and damaging inundation. Geologist and urban experts in urban areas have categorized land slope in five levels, these are:

- Slopes under 5%(sustainable slope);
- Slopes between 5 and 15%(unsuitable);
- Slopes more than 15% with solid underground materials(unsuitable);
- Slopes more than 15% with weak underground materials (hazardous);
- Slides which have no relation to slope percent or underground materials quality (Azizpour, 1999:35).

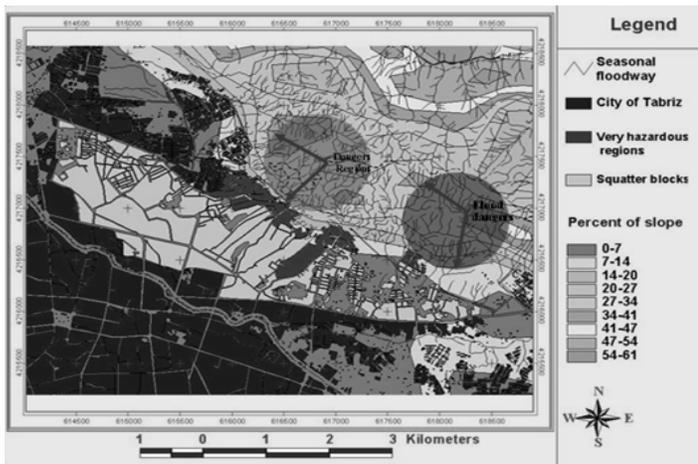
Generally, sites with slope more than 10% till 30% are unsuitable and over 30% are being counted very dangers for urban structures. As shown in the figure 3 nearly to of north squatter settlements are being in regions with more than 7% slopes, and in some case they have been built in slopes, over than 20%. This condition is not only especially for squatter quarters but also some newly planned and modern quarters have been developed in regions with slopes more than 20% till 30%.

- Landslip and inundations are affected more or less as similar as land slid from land slope, and they are confronting these regions with varies and vast hazards. Then it is necessary to prevent new constructions in these areas, figures 3 illustrate a part of these bitter realities.

**Fig.3.** Slope categories and flood hazards in northern squatter regions of Tabriz city



- **Inundation:** Intense slope, lack of botanical covers and sewage system, violent seasonal rainstorm, and clay formation of soil totally causes to create of multiple inundations in these areas (figure 4). Squatter’s infirm shelters are very vulnerable in confronting with flood dangerous, and then it is necessary to make artificial channels at least to control its hazards in short-



term before that we have had a master plan for them. Unfortunately, municipality has not any attention for these realities; it seems they have practically neglected these parts of town and only planning some approaches in the offices which have no any sanction or effects in the region’s unpleasant conditions.

### 3.2 Man-made Hazards

- Acoustic pollution:** This is a man-made phenomenon which predominantly exists and creates problems in urban environments. Factories, automobiles, airplanes, trains, ships, all kind of motorized instruments, entertainment centers, and garrisons and so on are the most important sources of acoustic pollutions in urban areas. Our studies in these showed that acoustic pollution because of airplanes(as fighter plans of second air base of *Tabriz city*, and passenger and single or twin engine planes of International Airport of *Tabriz city*) flies just over these regions is very intense. Table 3 exhibits some major elements of these kinds of pollution.

Table 3: some main acoustic pollution elements in the region of north squatter settlements of Tabriz city

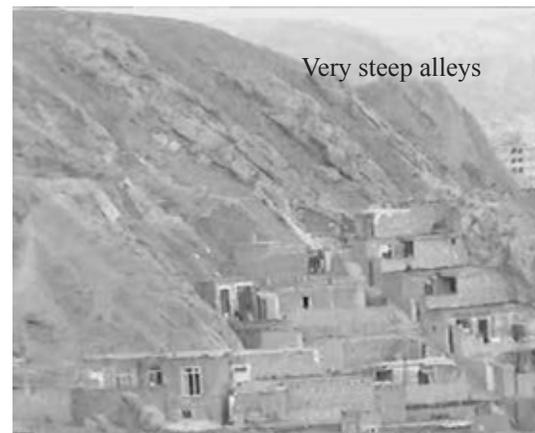
Kind of producer	Distance from ground level or to shelters	DB	Effect	Rate of pollution
Fighter planes	350	135-140	Painful	Very intense
Passengers planes	300	130	Painful	Very intense
Single or twin engine planes	300	120-130	Painful	Intense
Automobile (all kind averagely)	15	75-90	Tormenter	Medium
Bus	15	95-100	Tormenter	Medium
Logger factory	1	95	Tormenter	Medium

Certainly more research will show that these undesirable con-

ditions have been bad effects on squatter’s life quality in all aspects.

- Garbage accumulation:** only it is mankind which produces garbage in his environment. Its repulse has a great coast for municipalities in the all towns. Anyone could not find for it any entirely suitable solution which will be harmless both for natural environments and urban environments/economies (Ashkani, 1992, 213). Although this is a “civic comprisal” matter but its unpleasant effects on squatter settlements are very salient. Unsuitable access for street cleaner trucks (because of narrow and very steep alleys (figure 4),lack of garbage cans, instructions of correct rubbish repulse, community participation and of authorities insufficient attention, cause to create many problems in these areas such as stink, agglomeration and reproduction of harmful insects, bacteria, incidence of infectious diseases and so on.

Fig.4. inundation and physical conditions of squatter settlements



- Sewage system:** Field observations showed that there are no

any alleys which direct their sewage to brooks out of their environment. This primary form of sewage repulse system is very usual especially in alleys which are in the height (figures 5).

**Fig.5.** lack of suitable sewage system in squatter settlements



As shown in figure 5, sewage repletion in the lower parts is consequences of this inappropriate system too, in which can be accounted as a main factor in creation of infectious diseases in the region There is no any accurate data on this.

- **High tension derricks:** This is an aspect which can see it plenty in these areas. Derrick pillars generally are inside of shelters and even in some cases in the court of dwellers. This most nearness among homes and high tension derricks cause to household's health is under their magnetic field and it can be very dangerous for them (figure 6).

**Fig.6.** position of high tension derricks in squatter settlements



#### 4. Evaluation of Land Tenures and Dwellings

Everywhere, land tenure issues touch deep human feelings of dependency and inter-dependency because the supply of land is limited. Land cannot be reproduced except marginally. Each country has its own set of tenure rights and practices, which derived from the cultural, social, historical, political and ethnical contexts. This issue in Iran has a very long historical root. According to Gezenphon "land and home tenure is the most popular and lawful

property for Persian" then for everyone land and home tenure is one of the greatest wish. Such eager demands beside insufficient supply nowadays are increasing worth of home and land tenure and this cause to the low incomes cannot have access to them easily. When predominantly low income migrants coming to metropolitans, they have not enough saving to buy or lease a legal suitable home for themselves. Beside it, insufficient supply of inexpensive housing, force them to refer to illegal home and land markets and the complication of problems just beginning from this point.

Field study shows that near to 67% of squatters have only illegal preliminary agreements for their housing and 23.5% have no any legal or illegal title deeds. Near to 1% access to devoted lands or dwellings and approximately 8.5% have legal title deeds. Legal land tenure distribution for each block of squatter settlements is different. As shown in figure 7 squatters of some blocks have little than 5% and some others more than 10% legal deeds. The data show that there is very closely a correlation between the rates of legal title deeds with remoteness or nearness of squatter blocks and typical urban structures boundary (figure7).

On the subject of squatter dwellings quality, the data show that approximately 67% of dwellings have semi-resistant quality and 21% of them have poor quality and only 12% of housing have resistant quality. Field examination showed that it refers to two factors: first these houses belong to the households which have comparatively the high income employments, second those are housing which are in the vicinity of the main roads (figure 7).

#### 5. Conclusion

Shelter is one of the greatest problems facing government of Iran. It is caused by the acute shortage of affordable housing for the low-income groups in urban areas. From the case study, the harsh reality is that about one-third of the urban households in *Tabriz city* still have no access to the suitable shelter. This in turn left to some political, economical, cultural, geographical, demographical and social factors. Squatter settlements of *Tabriz city* are confronting with many physical and man-made hazardous in which requiring the regional government as well as decision makers and urban planners practical attentions.

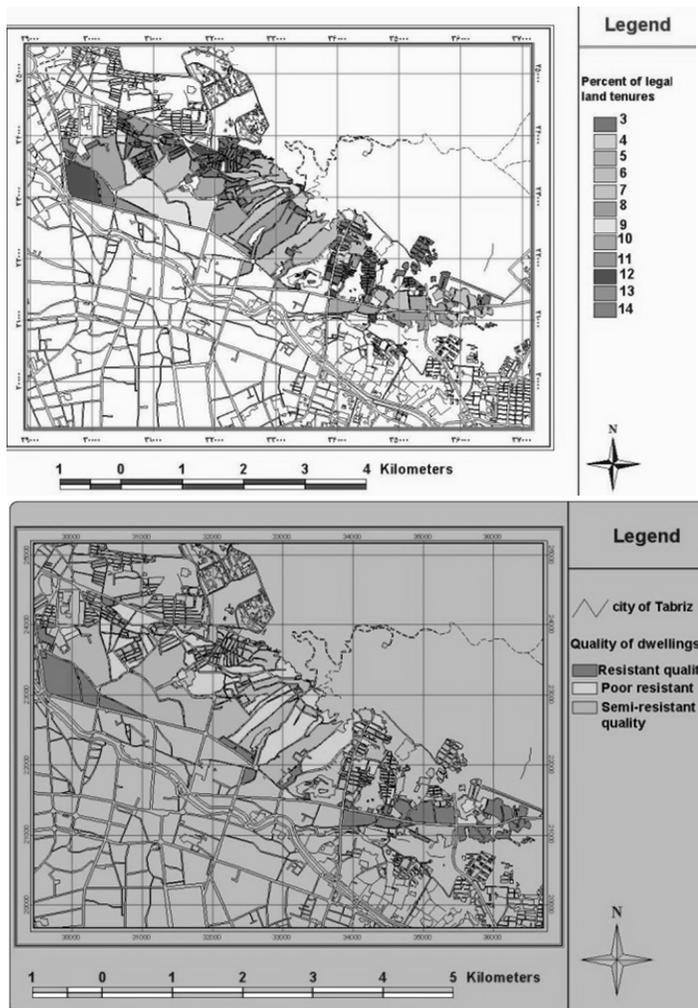
As stated earlier there are very closely correlations between distance and hazards on relation to quake focuses, it is necessary, the urban authorities and decision makers specially municipality and city council of *Tabriz city*, to try to replace these settlements or at least upgrade them as soon as possible. Surly its coasts are entirely low than quake injuries.

It is recommend that all in charge regional government agencies (such as municipality, city council and etc.) with participation of NGOs take to two kind of practical planning for improving of quality of the squatter settlements: at the first stage it is imperative to formulate an action short termed plan to upgrade the existing settlements. At the second stage they should be used for long termed structural plans. In this stage they must to apply combination use of many approaches(such as sites-and-services schemes, incremen-

tal development, land sharing, land pooling, land readjustment, housing cooperative and squatter enabling) to change in place of the squatter or regularization of these settlements and resistant of shelters.

Finally the urban authorities should increase effective demand of the squatter for shelter, goods or services by organizing them and their access to finance. As squatters tend to participation in all improving projects, it is necessary to give them secure land tenure and encourage them to take several form of community-base organizations. These communities would have a major role in self-helping of squatters and participation in all projects of local governments.

**Fig.7.** Percent of legal land tenures in squatter settlements blocks (top) and quality of household dwellings (bottom)



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