



Population Growth and the Interaction of Urban Environmental Challenges, Case Study: Zahedan

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ABSTRACT: During the recent decades, urban management in Iran has increasingly confronted numerous challenges due to different kinds of social, cultural, political, executive, financial, and legal factors. The present study is going to specify and analyze the aforementioned challenges in the domain of the urban environment in order to determine how far they have been effective, how they have been prioritized, and what strategies or solutions are needed to meet or reduce them. Zahedan is among those cities of Iran that due to its uncontrolled growth in terms of its framework and population, has exposed urban management to many challenges during the last two or three decades, specially, in the domain of the environment. The present study aims to investigate and analyze the effects of challenges, resulted from population growth, on the environment of Zahedan. This research's method is descriptive-analytical and the gathered data and information have been statistically processed and analyzed using SPSS software. The results indicate that the greatest challenge in the domain of the environment is related to «water resources». Considering the population growth, human, soil, and air resources are respectively other problems which can lead to further significant problems in urban management system.

Keywords: Population Growth, Environment, Urban Management, Water Resources, Human Resources, Soil and Air Resources.

INTRODUCTION

Development, physical growth, and increased population in urban places such as pre-planned and modern cities are among the geographical phenomenon which has totally changed the system of human settlement. Increased urban abnormalities, demolishing of farmlands around cities, and land use changes in specifically, building in natural landscapes, urban sprawl, creation of problematic spatial areas, and also some institutional problems in municipality such as inefficiency of financial resources, are the objective results of current development (Moezzi et al., 2011, p. 2). Iranian cities had slow physical growth at first but when their development got naturally exogenous, especially during fast urbanization starting in 1340s, their populations increased rapidly due to natural population growth and immigration of villagers. These factors led to physical growth of cities and high amount of constructions which have caused uncontrolled use of

water resources, air pollution due to uncontrollable traffic of cars, formation of marginal neighborhoods and slums (Gharakhloo & Zangane Shahraki, 2009, p. 21). Although these environmental problems seem to be invisible for managers, they would cause further complex socio-spatial problems in urban life (Athari, 2000, p. 36).

In comparison to most of Iranian cities, Zahedan has significant rate in physical development and population growth. Considering its superior geographical status and according to existing statics of population and areas of Iranian cities, Zahedan faces more growth and increasing physical development. Despite detailed and comprehensive plans, Zahedan's fast growth is confronting numerous economic, social, and environmental problems and land use dilemmas as well. If decision makers hesitate from thinking about the meta-frames of development and realities in proposal plans, they would face up to great and serious environmental and spatial crises and challenges (City and Home Consulting Engineers, 2010).

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Through identifying the challenges of population growth in Zahedan during the recent three decades, the present study is going to specify and analyze the aforementioned challenges in the domain of the urban environment in order to determine how far they have been effective, how they have been prioritized, and what strategies or solutions are needed to meet or reduce them.

PROBLEM STATEMENT

During the recent decades, urban management in Iran has increasingly confronted numerous challenges due to different kinds of social, cultural, political, executive, financial, and legal factors. In other words, urban growth and development is a function of the level of growth and development of the other economic and popular culture variables. Physical growth of cities could be resulted from inefficiencies of planning systems and predictions. The Rapid and often uncontrolled city development, which is resulted from rapid population growth, is the new challenge of urban management (Reconstruction Assistant of Planning Department of Ministry of Interior, 2002, p. 11). These challenges need special implications for policy making and urban management system.

CASE STUDY

Zahedan, the capital of Sistan and Baluchestan Province with a 90-year history of residence, was first established for political and administrative functions. Then by providing other urban services such as commercial, educational, military, business, and immigration services, it became one of the megalopolises in Iran. Although Zahedan does not have a significant historical background, it has set up a suitable foundation for population growth and physical development due to its political and geographical situation. Therefore, it seems that the city has followed its growth steps more quickly than its normal pace. Like its rapid population growth, the physical spaces of the city have developed increasingly in the recent years and as the result, the city has confronted multiple spatial problems, especially the environmental ones.

Introducing the Study Limits

The province of Sistan and Baluchestan covers an area of 187502 square kilometers equal to 11.5 percent of the country's area (Statistical Yearbook of Sistan and Baluchestan Province, 2009). Zahedan, the capital city of Sistan and Baluchestan province, is located in the southwest of Iran near the border of Iran with Afghanistan and Pakistan (Fig.1).



Fig. 1. The Geographical Location of Zahedan (Statistical Yearbook of Sistan and Baluchestan Province, 2009)

Table 1. Factors Effecting Formation and Extension of Zahedan

Social and Cultural	People's Orientations & Tendencies- Social Isolation
Economical	Land Price- industries & Economic Work Spaces
Natural Geography	Farmlands, Subsurface Waters, Steep Slopes & Surrounding Mountains, Wind Direction
Political	Town Construction Plans- Transfer of Lands to People - Determination of City Limits
Spatial Framework	Railways, Inter-city Roads, Ring Roads & Bypasses

(Davoud pour and Ardalan, 2008, p. 6)



By political and administrative centralization of Zahedan, its size and population increases. Immigration to Zahedan, either from Iranian cities or Afghanistan and Pakistan, is continues. Population growth rate overtakes urban planning and gradually leads to unusual and inharmonious development of city and formation of unconventional settlements in the form of neighborhoods with their own special features. Most of the lands with private ownerships —particularly the Gergij people — were sold to land demanders since 1929 at a low price or given to them based on land scrip or firm promises. Some parts of lands Such as Shir Abad, Babaeyan, Karim Abad, Salt Factory, Imam Reza, and Hasan Abad neighborhoods, were owned by widespread and organized invasion in order to seize them in the early days of the revolution. In brief, it can be concluded that Zahedan is a city founded by the Baloch people and its early buildings were built by non-Iranians. In its consolidation phase, the city became official through an administrative reform and then it got administrative, political, and military centralization by the change of name. Afterwards, some neighborhoods were unconventionally formed in or around the city due to increased immigrants, population and their need for settlements. Near these neighborhoods, some regions were formed with their own buildings, street systems and urban services leading to shape the current city of Zahedan. (Fig. 2)



Fig. 2. Location of Zahedan in a Photo Taken by Satellite, Aban, 2004 (Geography Organization of Armed Forces, 2004).

According to the classification provided in the detailed plan of this city in 1990, Zahedan includes three districts, 20 areas, and 85 neighborhoods. (Fig. 3) (City and Home Consulting Engineers, 1990).

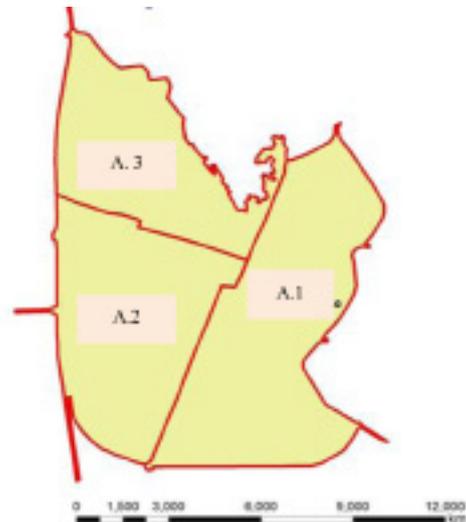


Fig. 3. (City and Home Consulting Engineers, 1990) Urban Districts in Zahedan City

Population of Zahedan has changed over thirty years with an annual average growth rate of 5.04%. Increasing trend in population growth was significantly faster, in compare with other provinces and other counties of its own province, by around 1.23 times. (Statistical Center of Iran, results of General Census of Population and Housing in different years).

Table 2. Population of Zahedan County in 2011

Description	Population	Household
Zahedan	660575	157266
Urban Zones	575116	137154
Rural Zones	85269	20083
Non-residential	190	29

In regards to the comparison between urban and rural population, documents show that there is an increasing trend in the rural population growth rate.



LITERATURE REVIEW

Sustainable development or sustainability has been highlighted as an essential principle in urban master planning, with increasing recognition that uncontrollable urbanization may well give rise to various issues such as overexploitation of natural resources, ecosystem destruction, environmental pollution and large-scale climate change. Thus, it is deemed necessary to modify the existing urban and regional administrative system so as to cope with the challenges urban planning is being confronted with and realize the purpose of urban Sustainability (Moezzi et al., 2011).

Urban man-made assets have impacts, not just on those who develop, build and operate them, but on people who may be quite remote from them. For example, the impact of a building on greenhouse gas emissions arising from fossil fuel use, pollution caused by travel to work patterns and employment opportunities provided by urban developments may be far removed from their immediate locality. There is a growing recognition of the need to internalize these external costs and benefits in accountancy frameworks, drawing on experiences in accounting for sustainable development. This desire, however, presents major challenges in identifying, evaluating and allocating the external environmental, social and economic costs and benefits of an urban environment. In the dimension of environmental impacts of human built environment, there is a category of pollution, greenhouse gases emissions, waste, fossil fuel, materials, land, water, Nuisance and biodiversity (Xing et al., 2009). Environmental quality is an abstract concept resulting from both human and natural factors operating at different spatial scales. In urban areas, the local scale is dominated by individual buildings, streets and trees, but regional scale influences may include the whole city and beyond (Nichol & Wong, 2005)

Environmental pollution may destroy the natural landscapes that are still surrounding the cities (Torres, 2011), weakening important ecosystem services such as improvement of water quality or protection from flooding (Butterworth et al., 2007). For instance, the water quality of the Yamuna River, in the downstream of the Delhi capital city, is amongst the worst in India (Kazmi et al., 2013). The situation is further complicated by the existence of various institutions with no clear responsibilities and inadequate financial resources to provide sustainable solutions. It can be concluded that peri-urban water management in developing countries faces multiple conflicts, including those between stakeholders (Douglas, 2006).

The maxim “Think globally, act locally” is usually understood to refer to worldwide environmental values being achieved through positive, affordable actions taken by local communities. Developments which are “water-sensitive”, involving water conservation and storm water retention strategies are employed at the urban allotment or “cluster” level to reduce infrastructure costs and environmental degradation of aquatic environments (Coombes et al., 1999).

There is an abundance of sustainability assessment methods. They tend to differ in the applied tools, but two well-established frameworks are mostly used, namely the PSR (OECD) and DPSIR (EEA) framework of drivers, pressures, states, impacts, and responses and the three-pillar model of social, economic, and environmental dimensions, possibly expanded by institutions or culture as a the fourth pillar. Peri-urban water management in developing countries is an issue of serious concern and suffers from lack of sustainable solutions. Centralized metropolitan systems often serve only a small urban core (Marshall et al., 2009) and their expansion lags behind the pace of urban growth (Peter-Varbanets et al., 2009).



Fig.4. Components of the Sustainability Assessment Framework



This article will consider the three elements of environmental problems including air pollution, soil resources and water resource, and attempts to investigate

the interaction of population growth and the potential environmental challenges in Zahedan.

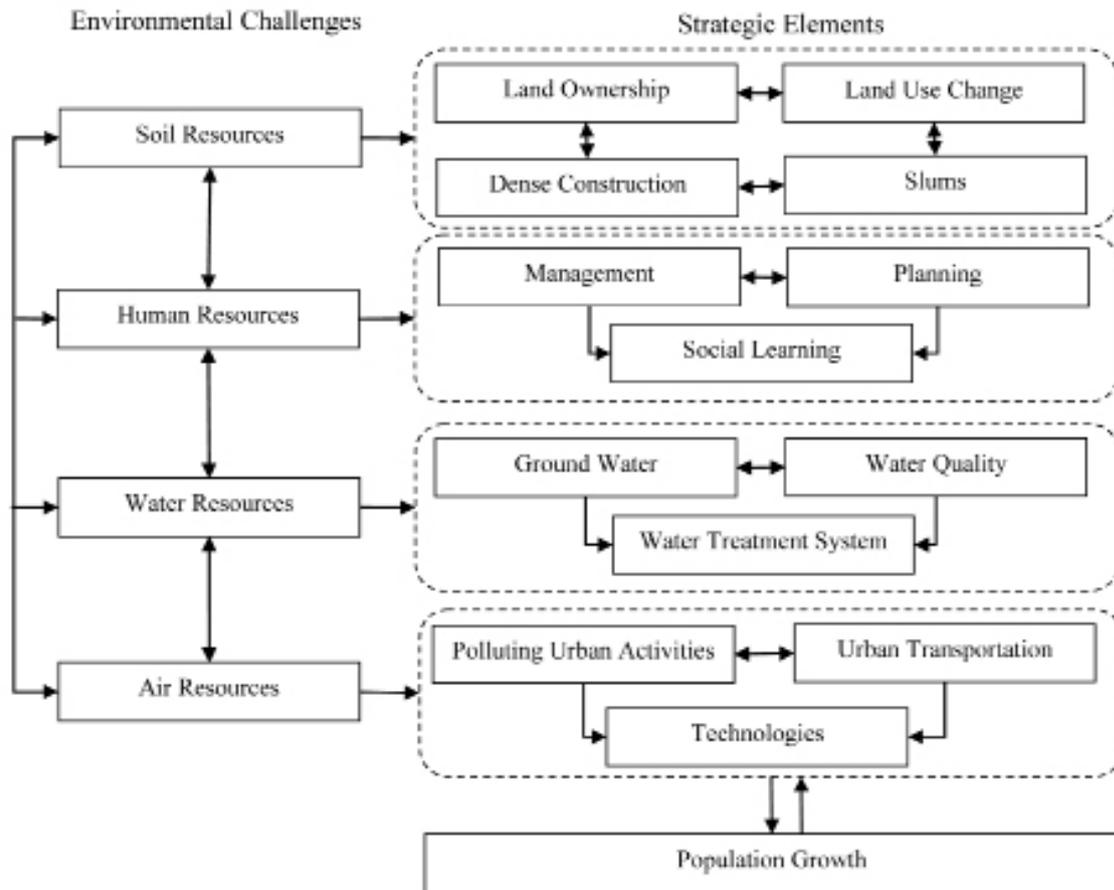


Fig. 5. Analytical Framework for Assessing the Interaction of Population Growth and Environmental Challenges

Urban Environmental Challenges in Zahedan

The city of Zahedan is among the relatively new cities. Its framework and population has grown rapidly and irregularly leading to environmental challenges for urban management system. Excessive consumption

of groundwater tables, increasing amount of urban waste, dense construction in open spaces, and changing farmlands to residential areas in some parts of the city are among the most important and general problems. Besides, some other environmental issues, that the municipality of Zahedan is facing, are the following:



Table.2. Environmental Challenges in Zahedan, Based on the Viewpoints of Managers and Municipality Staffs

Water Resources	Soil Resources	Human and Management Resources	Air Resources
<ul style="list-style-type: none"> • Continuing constructions on groundwater tables • Changing the natural courses of streams • Constructions near natural streams • Lack of urban wastewater system • Increased salinity degree and PH of water and lack of detailed investigation of this phenomenon • Lack of specific programs and mechanisms to reinforce water ground tables • Lack of proper planning to control surface waters of Zahedan • Lack of specific mechanism to refine wastewater collection in north of Zahedan city (Lar Canal) • Lack of proper planning to implement the comprehensive plan of water supply system for the green space of Zahedan which indeed results in redoubling the waste water for irrigating the green space of the city. 	<ul style="list-style-type: none"> • Changing and ownership of lands which are suitable for green space utilization • Unsuccessful implementation of green belt project • Paving the roads with asphalt which results in urban heat island phenomenon • Creation of slums in Zahedan city at a higher level than national average • Occurrence of land-hunger phenomenon in a way that any kind of planning confronts problems in relation to the land use • Development of compact residential buildings disregarding infrastructure and superstructure aspects • Annexation of approximately 800 hectares of land to the lands in the west and northwest of Zahedan without proper planning 	<ul style="list-style-type: none"> • Lack of experts and specialists particularly in relation to the urban environment • Lack of proper and systematic training for human resources in some bureaus such as municipality, department of environment, department of natural resources • Lack of specialized disciplines and sub disciplines related to the environment in the universities of Zahedan. • Lack of sufficient coordination between organizations that are responsible for the environment in Zahedan such as department of natural resources, municipality, department of environment, and department of land conservation in order to face the urban environmental challenges • Necessity of merging and adding courses in elementary and guidance schools titled «the environment of cities» • Development of a comprehensive and detailed plan without the involvement of municipality, department of natural resources, and department of environment • Lack of research and study projects related to the needs of the urban environment • Lack of coordination between funding and real needs and urban environmental challenges 	<ul style="list-style-type: none"> • Excessive traffic of cars and increased pollutants • Increased use of heating and cooling systems due to increased population, particularly the systems which use fossil fuel • Increased number of excessive activities of some factories and businesses constructed around cities • Lack of necessary substructures proportional to population growth and physical development in the domain of transportation • Lack of comprehensive look at proper and principled implementation of urban planning in the domain of transportation • Construction of schools and educational centers in the areas with heavy traffic, main streets and thoroughfares of the city



RESEARCH HYPOTHESES

- Population growth seems to be effective in emerging the urban environmental challenges in Zahedan.
- The effects of population growth are different in increased environmental challenges in the domains of water, soil, and air.
- It seems that because of population growth in Zahedan, water resources confront more challenges in comparison with the other resources in the domain of the environment.

RESEARCH GOALS

- Investigation of urban environmental challenges resulted from population growth during last three decades.
- Offering appropriate strategies to solve the problems and meet the current challenges of the environment in Zahedan.
- Offering necessary suggestions for future planning and using appropriate strategies.

RESEARCH METHOD

This research is an applied study in terms of the target and is descriptive-analytical in terms of the entity. Through the descriptive method, the data and information

have been collected using library studies and field operations. Through the analytical method (statistical analysis), some indices have been considered based on the research hypotheses and operation variables. The data of these indices are collected by a questionnaire, explained and analyzed by statistical tests.

Cochran’s formula was used to obtain the sample size (Hafez Nia, 2004, p. 142). Samples were selected at the confidence level of 95%. 129 managers and experts of municipality organization were selected as the sample size. Likert five-item scale was used for measurements.

The reliability of the questionnaire was determined using Cronbach’s alpha in SPSS environment. The obtained value in Cronbach’s alpha test must be higher than 0.7 to confirm the reliability of the questionnaire. Cronbach’s alpha test was done with 54 items. The Cronbach’s alpha coefficient of the questionnaire was 0.932, showing its high reliability.

The analysis of the data was done using inferential statistics methods such as one-sample t-test, independent two-sample t-test, analysis of variance (ANOVA), Pearson coefficient, and Friedman test by SPSS 17.

RESEARCH VARIABLES

There are some Independent and dependent variables and investigated indices (Table 4).

Table 4. Independent and Dependent Variables

Independent Variable	Dependent Variable
Population Growth of Zahedan City	Environmental challenges of Zahedan City



Table 5. The Investigated Indicesa References of the Study

Fields of Challenges	References
Water Resources	Simultaneous decline of water quality and population growth, direct relationship between population growth and rapid contamination of underground water resources within city limits, reinforcement of groundwater tables by providing urban water and sewage system.
Soil Resources	The amount of quantitative and qualitative consistency and consonance of soil resources with population growth, spontaneous decline of soil quality and population growth, spontaneous increased soil efficiency and decreased population growth, prevention of excessive use of soil, consistency of population distribution in the country with the needs and standards of the natural environment and its surroundings.
Air Resources	Providing substructures of transportation consistent with population growth in order to produce the minimum of air pollution, the amount of traffic problems resulted from population growth and increased air pollution, quality and efficiency of urban transportation system and its role in decreasing air pollution, increased costs of public transportation section due to population growth resulting in increased pollutants.
Management Resources	lack of appropriate training, lack of coordination between governmental organizations responsible for the urban environment, population growth of cities and the amount of successful operation of governmental organizations to deal with environmental challenges especially trash disposal consonant, spontaneous provision of human resources and equipment in waste collection section, the amount of decrease in the quality of trash disposal, the status and quality of trash collection and disposal in all the neighborhoods of the city, the amount of coordination of urban environment funds.

HYPOTHESIS TESTING

Inferential statistics were used to test the research hypotheses. The tests used in this study were one-sample or one-group t-test, Friedman test, and Pearson coefficient.

According to one-sample t-test, the level of significance is lower than 0.05 and population mean (mean

of challenges) in all different domains of the environment is higher than average (3) on one hand, and the value of the difference between the mean and upper and lower bounds in all the domains is positive on the other hand, therefore the amount of environmental challenges of Zahedan city in different domains is higher than the average (Table 6).

Table 6. The Amount of Environmental Challenges Due to Populattion Growth

Different Domains				Test Value=3			
Urban Environment	Population Mean	T Value	Freedom Degree	Level of Significancy	Mean Difference	Level of Significancy: 95 Percent	
Soil Resources	3.80	20.8	128	0.000	0.806	0.729	0.883
Management Resources	4	18.73	128	0.000	1.003	0.897	1.109
Air Resources	3.87	14.14	128	0.000	0.868	0.746	0.989
Water Resources	4.04	18.26	128	0.000	1.042	0.929	1.156



TESTING THE FIRST HYPOTHESIS

Population Growth Seems to Affect Urban Environmental Challenges in Zahedan

The results obtained from one-sample t-test reveals: since on one hand the level of significance is lower than 0.05 and the population mean (the environmental effects) is higher than average (3), and on the other hand the value of difference between the mean and other upper and lower bounds in all the domains is positive, therefore the amount of urban environmental challenges in Zahedan is higher than the average. So, the first hypothesis claimed by the researcher is confirmed. Thus, it can be inferred that population growth of Zahedan has led to many urban environmental challenges in the different domains of water, soil, air, and management resources.

TESTING THE SECOND HYPOTHESIS

Effectiveness of Population Growth in Increasing Environmental Challenges is Different in the Domains of Water and Soil Resources

The results obtained from Friedman test at the significance level of 95 percent showed that: since the level of significance is lower than error rate (lower than .005), there is a significant difference between the challenges in different domains of water, soil, and air resources in the environment of Zahedan. Investigating the ranks of water, soil, air, and management resources showed that the domains of water and management resources confront more challenges in comparison with the other environmental domains and stand in the first and second ranks respectively. In other words, population growth of the city has complicated the challenges of water and management resources.

Also according to Pearson coefficient, there is a significant relationship and high correlation between the environmental challenges and population growth in Zahedan and the domains of water, soil, and air resources in the study limits. Interpretation of this fact, that all the domains of the environment in Zahedan have been affected by population growth in the recent decades, suggests that the amounts of effectiveness in different environmental resources are different. It means that the domains of water resources and management of human resources have been affected maximally and the domains of air resources and soil resources have been affected minimally by population growth.

TESTING THE THIRD HYPOTHESIS

It seems that because of population growth, the domain of water resources has confronted more challenges in comparison with the other resources in the environmental debate. The results obtained from Friedman test and Pearson correlation show that, due to population growth, the domain of water resources has confronted the most challenges in the recent decades, followed by other domains of environmental resources such as management, soil, and air resources. Therefore, the third hypothesis claimed by the researcher is confirmed.

CONCLUSION

The present study which is based on the viewpoints of municipality experts and managers investigates the environmental challenges of Zahedan city resulted from the increasing population growth in last three decades. This would help to predict further environmental challenges and to prioritize them in the process of evaluation in policy making system which could lead to a more systematic and goal oriented system. The obtained results are as the following:

The majority of the samples (82.2%) believe that the population growth of Zahedan has led to increased environmental challenges in the domains of water, soil, and air resources. This can confront the city management with serious challenges. According to inferential statistics, the amount of environmental challenges of Zahedan city in different domains is large and higher than average.

Investigation of the urban environmental challenges of Zahedan showed that the domain of water resources confronts more challenges and is more affected by population growth in comparison with the other domains and stands in the first rank. In other words, population growth has increased the environmental challenges in the domain of water resources. With a little difference, the domains of human and management resources stand in the second rank and soil and air resources stand in the last rank.

The other results indicate a significant relationship and strong correlation between environmental challenges in different domains within the study limits and population growth. Although all the domains of environmental resources are strongly affected by the population growth of Zahedan, the levels of this effectiveness are different among the different domains.



Suggestions

Considering the process of the present study and its results, some strategies and suggestions are offered. First, these suggestions are generally explained in the field of urban planning and development and then, they are described separately in the environmental fields of Zahedan in order to solve the problems of urban management in the future.

General Recommendations

- Applying research-based management approach in different domains, particularly in the urban environment, so that different tasks can be performed using the viewpoints of municipality experts, experts outside the municipality and based on research findings. This will help to avoid personal tastes in policy making and administrative planning.
- Conducting studies and researches to provide scientific and practical solutions for urban environmental problems.
- Implementation of civil projects according to prioritization based on sustainable development of the city.
- Training the staff of municipality, environmental organization, and natural resources organization to prevent environmental problems that are specific to cities.
- Developing and using information and communication technology to meet biological and environmental challenges.
- Developing geo-reference information banks for biological and environmental problems.
- Dividing the city into smaller districts and dedicating specific management system for each district.
- Eliminating restrictive rules and revising laws to prevent increased pollution of cities, particularly in relation to water resources.
- Revising detailed plans and paying attention to the viewpoints and suggestions of all organizations which involve in the urban environment.
- Allocating funds which are proportional to the needs of urban environmental needs.
- Assigning professional managers who are skilled at principles and rules of the urban environment in the organizations and institutions which have direct relation with the subject.
- Using counsellors to construct the next phases of physical development of city, particularly on ground water tables.

Domain of Air Resources

- Using counsellors and masters for proper implementation of comprehensive plans in the domain of transportation and prevention of increased air pollution.
- Forcing some organizations and offices, particularly ministry of education, to move some schools and centers that cause traffic in busy intersections.
- Forcing the organizations involving in transportation to implement civil projects observed in comprehensive and study plans.
- Predicting suitable functional hierarchy in the central areas of the city in comprehensive traffic plan.
- Attracting more support from ministry of country to meet needs of public transportation considering the imposition of some load of national transportation on Zahedan city.
- Leading investors to construct public multi-story parking lots in suitable areas (considering the approved traffic plan and distribution of fruit and green grocery markets and daily shopping centers proportional to the distribution of residential areas and population density).
- Attracting financial and technical support from national institutions to provide funds and technical assistance for urban transportation.
- Minimizing time of urban commuting (issuing user licenses for different urban activities in order to let people to have access to various services, specially daily shopping and visits).
- Providing facilities for public transportation (carrying out necessary studies to construct urban BRT lines).

Domain of Soil Resources

- Revising to locate the landfills.
- Proper drainage in landfills.
- Prioritization to implement the plans in the areas of the city with more impermeability problems.
- Launching the large site of Aseman Park in the northern heights of Zahedan by allocating necessary budgets to increase the green space per capita.
- Accelerating and facilitating the development of urban sewage system.
- Developing the green space in order to allow the citizens to spend their free time in compliance with proposed prioritization.
- Standardizing the urban green space (developing parks and green space in neighborhoods, areas,



regions, city, margins of streets and passages according to the prioritization in GIS system in the five-year program).

- Paying attention to some important issues such as bedrocks, erosion, slopes, soil type, soil permeability for city construction.

Domain of Water Resources

- Revising and repairing the transfer courses of existing surface waters.
- Changing the stream courses from the upstream and leading them to more suitable courses.
- Supporting and cooperating in private sector investment or governmental institutions and non-governmental public sector to establish cultural-artistic and sport institutions and centers by providing land.
- Reinforcing the cultural-social role of Zahedan city as the cultural center of the southeast of the country and neighboring countries.
- Connecting the subsystems of surface water collection and leading them to existing canals and streams in the city.

Domain of Human and Management Resources

- Prioritization for providing protective installations considering shortages (predicted in the detailed plan and complementary suggestions of the five-year program).
- Reducing the difference between predicting the revenues in the approved budget and collected receipts and revenues.
- Promoting the effectiveness and management of expenses and using the potential of private sector of NOGs for implementing urban environmental plans.
- Increasing the share of sustainable revenues by collecting the collected revenues of other organizations as maximally as possible, such as the fuel sale share of oil company stations in Zahedan, to solve environmental problems.
- Interacting with provincial and national authorities and proper utilization of Zahedan's location as the capital of the province (to provide financial resources from national and provincial construction budgets).
- Using modern irrigation methods for the urban green space.
- Improving the quality of environment and controlling and reducing the environmental pollutants (removing the polluting industries from the city).
- Using refined sewage to supply urban green space water (considering the launching of urban sewage

system).

- Using low-water plant species to develop the green space and green belt of the city.



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