

MOVING TOWARDS OR AWAY FROM SUSTAINABILITY- TEHRAN AS THE CASE EXAMPLE

Zohreh A. Daneshpour, Ph.D.

Associate Professor, Department of Urban & Regional Planning, Faculty of
Architecture & Urban Planning, Sh.Beheshti University (SBU),
Evin, Tehran 19839, Iran

z_danesh@sbu.ac.ir

ABSTRACT

Many societies, in keeping with international and national appeals, consider not only the present but also the quality of life for future generations. Thus the concept of sustainable development was launched based on the interdependency of social, economic and environmental aspects of life. Tehran have suffered many unresolved problems which exert significant negative impact on people and the environment and are hindrances to any sustainable development. The aim of this paper is to assess Tehran's state of sustainability and to define whether it is moving towards or away from sustainability. Considering the nature and continuity of such problems and the impediments to their resolution, this paper has deduced that Tehran's move towards sustainability is questionable.

Keywords: sustainability & sustainable development, sustainability measures, sustainability challenges, quality of life, Tehran

Aim and idea

The awareness of the urgency of an urban development that can connect the social and economic needs with the long-term environmental capacity is demonstrated by a number of official documents and public initiatives of international, national, and local levels. No recipe has been given for any single solution. Exchanging ideas and comparing practices proven to be successful in similar situations, is a way to devise individual methods towards sustainability.

The aim of this paper is to assess Tehran's state of sustainability and to define its inclination: whether it is moving towards or away from sustainability and sustainability measures and what policies and planning tools has been adopted to address these challenges and what is the impact of international appeals upon national measures and actions. To this end a number of questions have been posed, questions that are intended to deal with in this paper: (a) how sustainability in Iran and Tehran can be delineated and what is its crucial indicators, (b) how Tehran has tackled the challenges of sustainability or what are the policies and planning tools that have been adopted to deal with these challenges, (c) how different societies around the world address the challenges of sustainability, and (d) what policy-making and policy-implementation lessons Tehran can learn from other metropolitan areas, worldwide.

Conceptual framework

Definition of Sustainability, sustainable development and urban sustainability

Though there is no universal blueprint for sustainability, there are different, while varying, definitions of sustainability, as:

- Sustainability is a creative, local, balance-seeking process extending into all areas of local decision-making.
- Sustainability can be said to be "the enforcement of the "common interest" which requires the enforcement of wider responsibilities for the impacts of decisions requiring changes in the legal and institutional frameworks that will enforce the common interest. The law alone cannot enforce the common interest; it needs community knowledge and support, which entails greater public participation in decisions that affect the environment.
- Environmental sustainability cannot be perceived without social equity and economic sustainability. A world in which poverty and inequity are endemic will always be prone to ecological and other crises. Many problems arise from inequalities in access to resources.
- Sustainability requires views of human needs and well-being that incorporate such non-economic variables as education and health, clean air and water, and protection of the nature.
- Moving toward sustainability is a long-term goal, so it is important that the incremental steps - taken in the short-term - go ahead in the right direction (after Roseland, 2000).

Sustainable development too is difficult to define, though there are some definitions which directly refer to it as against sustainability, as:

- Sustainable development deals with the relationship between economic growth and environmental protection, seeking to ensure that future economic growth and development is achieved without longer-term environmental degradation (Ratcliffe & Stubbs, 1996).
- Sustainable development is known as a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development; and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations (UN-Habitat, 2006).
- Conservation of resources is a strong component of sustainable development.
- Sustainable development helps cities and towns to base standards of living on the carrying capacity of nature, while seeking to achieve social justice, sustainable economies and environmental sustainability.
- Sustainable development requires having due regard to the Earth's regenerative capacity, the ability of its systems to recuperate and maintain productivity (Blowers, 1993).
- Sustainable development requires meeting the basic needs of all and extending to all the opportunity to satisfy their aspirations for a better life (UN-Habitat, 2006).
- Sustainable development involves more than growth. It requires a change in the content of growth, to make it less material and energy-intensive and more equitable in its impact (UN-Habitat, 2006).
- Sustainable development requires that the adverse impacts on the quality of air, water, and other natural elements are minimized so as to sustain the ecosystem's overall integrity (UN-Habitat, 2006).

Sustainable cities are not equally considered sustainable for all social and ecological interests, and are not generic, planned objects, uniformly implemented throughout the world, but are individually constituted phenomena, produced within specific geographical scales and spaces (Whitehead, 2003). There are different visions of urban sustainability, one is market orientated which conceives that urban areas undergo economic development and as their wealth increases, will prevail over environmental

and social challenges, thus suggesting that economic growth is ultimately beneficial for the environment. Cases of the environment-development relationship were presented by the World Bank in their 1992 report, considering that industrialization brings manufacturing-related pollution and different types of pollution increase and decrease during different stages of development. Other visions are mainly socialised and welfare orientated (after Marcotullio, 2001).

Specifications of a sustainable city are (Whitehead, 2003, Ratcliffe & Stubbs, 1996, European Conference on Sustainable Cities & Towns, 1994):

- A city whose achievements in social, economic, and physical development are to last.
- A city that has a lasting supply of natural resources on which its development depends (using them only at a level of sustainable yield).
- Such a city has an environmentally sensitive process of development.
- Conservation of resources in such a city is a strong component of sustainable development.
- Such a city cannot permit itself to export problems into the larger environment or to the future.
- Such a city shall strive to improve accessibility and sustain social welfare and urban lifestyles with less transport as it is imperative for a sustainable city to reduce enforced mobility and stop promoting and supporting the unnecessary use of motorized vehicles. In this case priority is given to ecologically sound means of transport.

Some consider it "useful to think of the sustainable city as a strategy designed to address the traditional social and economic regulatory problems of urban areas, in and through a new set of environmental priorities and ecological practices" (Whitehead, 2003).

Sustainability and sustainable city according to critical analysis

Critically analysed, "the sustainable city is considered first as part of the wider regularization (or normalization) of the socio-ecological contradictions of capitalist urbanisation" and second that "the strategies for urban sustainability are being forged within the wider socioeconomic context of neo-liberal regulation and interurban competition". In this framework a sustainable city has specifications as follows (after Whitehead, 2003):

- As a "multiple space" of ecological, economic and social activity, the sustainable city represents a crucial terrain upon which future battles over territorial justice will be waged.
- The sustainable city represents an economic space within which the social, economic and ecological contradictions of capitalism are being managed and strategically addressed

Uustainable city

As cities develop, the degree of social inequality, cultural conflict and political fragmentation experienced within urban boundaries increase (Marcotullio, 2001). Thus is that the ustainable city has been described as a complex hybrid of social, economic, political and ecological forms, which are continually articulated and rearticulated within specific spatial contexts and through particular historical struggles (after Whitehead, 2003).

Quality of life and sustainability

On the policy agenda of the concept of sustainability is to maintain an acceptable quality of life for all. Though it is increasingly difficult to distinguish between industrialization and urbanization impacts on the environment (Marcotullio, 2001) - urbanization itself a part of the development process - creates both challenges and opportunities. Main challenge is to manage the process so as to avoid a severe deterioration in the quality of life. Sustainable development intends to ensure a better quality of life for all, now and for generations to come and achieving social, economic and environmental objectives at the same time.

Cities in less developed countries are growing much faster than the capacity of authorities to cope. Technologies of industrial countries are not always suited or easily adaptable to the socio-economic and environmental conditions of developing countries. To compound the problem, the bulk of world research and development addresses few of the pressing issues facing these countries. Nevertheless, in all countries, the processes of generating alternative technologies, upgrading traditional ones, selecting and adapting imported technologies should be informed by environmental concerns and the objectives of sustainable development and environmental protection must be built into the mandates of the institutions working in environmentally sensitive areas (UN-Habitat, 2006).

For some countries – more and less developed - globalization has set the context for development and urban environmental and social conditions are strongly linked to regional and global economic and social flows (Marcotullio, 2001), though this is not the case for all.

However, these issues must be included in any attempt to assess or analyse sustainability.

Consumption and sustainability

Sustainable development requires the promotion of values that encourage consumption standards that are within certain bounds of the ecological capacity. Mainly in lesser developed countries, despite investment in pollution-related infrastructure, consumption-related pollution levels are high (after Marcotullio, 2001).

Sustainability and urban planning

While the planning system cannot on its own deliver sustainability, planning can play an important role in moving towards it. Planning have to work alongside existing and new areas of environmental policy and the traditional land-use emphasis of many countries following the post-war British planning system will need to be widened to pay greater regard to environmental preservation (after Ratcliffe & Stubbs, 1996).

In many countries (such as UK) the issue of government policy guidance to influence the planning system has been recognized and strategy documents have been produced to embark its aims for deal with and the implementation of sustainable development (after Ratcliffe & Stubbs, 1996). Also measures have been taken in many countries to encourage planning authorities to ensure that the principles of sustainability are enacted by introducing them into local planning policy in development plans. Nevertheless the planning and the planners' position - at the forefront of change - are not assured in terms of dealing with sustainability issues, especially if the lead is taken up by other professions or the power of decision-making is not bestowed to the local level. Whether planning and planners - being interdisciplinary and familiar with the three goals of balancing social equity, jobs, and environmental protection are influential in resolving economic-environmental conflicts differs from country to country. In order to hold a central place in the debate about sustainable development, planning and planners must

exploit those areas where they have the greatest leverage and expertise (after Campbell, 1996).

Sustainability related tools, strategies and policy issues

First it must be considered that "the road to sustainable development is paved with failed efforts to incorporate the environment into everyday municipal decision-making" (Roseland, 2000).

To devise strategies that will allow countries, cities and communities to move from their present - often destructive - processes of growth and development towards sustainability and sustainable development requires policy changes and essential tools plus changes in the attitudes and procedures of both public and private sector decision-makers.

In spite of everlasting debates over the precise characteristics of sustainable communities and cities, there are a number of features of sustainability and sustainable development which can be applied almost everywhere. In this respect the sustainability issues open for policy-making - important for local governments worldwide - include (after Roseland, 2000):

- Availability of infrastructure that results in environmentally respectful use of resources such as cycling and pedestrian infrastructure;
- Moving towards minimization and proper management of waste;
- Moving towards an energy-efficient transportation; through means such as reducing per capita car use and per capita water consumption,
- Moving towards more compact developments;
- Applying an integrated approach to planning;
- Continuously carrying out local environmental assessments;
- Cooperation with the community and non-governmental organizations in the implementation of environmentally friendly plans and programmes;
- Reducing economic and social polarization;
- Integration of marginalized sections of population into efforts construing sustainable development.

In general it can be deduced that one of the most important necessities of sustainability and sustainable development is reducing consumption of resources even as the cities and communities grow (after Roseland, 2000).

Indicators of sustainable development

Indicators of sustainable development have a variety of different uses including raising awareness, improving communication, simplifying complicated information, setting targets and measuring our progress towards better quality of life plus sustainability (after DEFRA, 2004).

The three pillars of sustainable development - within which indicators, especially for urban areas, are devised to assess and deal with environmental and quality-of-life problems - are economic growth, social progress and environmental protection (DEFRA, 2005). Urban indicators in general refer to society, environmental factors and problems, urban structure, housing, and transportation.

Indicators are important, but need to first understand the gap between current situation and sustainability, and then set priorities for action. The appropriate indicators and targets for monitoring progress can only be defined after this is completed. This way, indicators can assist keeping track of improvements toward the ultimate sustainability objectives instead of simply measuring improvements over past performance with randomly selected indicators. Indicators must reflect both current

problems and issues and current values. Indicators are in fact used to promote policy: an effective tool to measure sustainability from a consumption perspective which can engage all citizens, and places equity in the center of the structure.

The process of identifying the indicators of sustainability involves revisiting fundamental issues (such as values, aspirations), and reviewing current sustainability issues. Thus indicators are an essential and powerful tool that:

- Influence policy agenda of local governments and municipalities by identifying and emphasizing relevant issues that may otherwise overlooked;
- Help identify and build on the strengths of a community;
- Help to identify challenges and start tackling issues strategically;
- Provide a framework that helps with visioning, setting goals, and determining the future place of a city;
- Identify and evaluate which programs reach desired targets and objectives;
- Motivate action on social, economic and environmental issues;
- Help engage citizens, businesses, governments and organizations to play an active role (individually and collectively) in tackling sustainability;
- Indicators are powerful tools that keep communities and governments accountable to their strategies and long-term goals;
- Purpose of indicators is to identify the links between fragments. Without an integrated picture, studies are imprecise and the structure of indicators is incomplete. Nonetheless there are few integrative indicators that cover all of the important aspects of sustainability.

Environmental quality, air pollution & transportation

While air quality in towns and cities has improved considerably¹ in the past decade, it is still a serious problem, especially for some cities and for certain socio-economic groups² of population. In many countries environmental performance has not matched their economic progress. Indeed, limiting pollution has been one of the greatest challenges worldwide.

Although improved access and ease of mobility can make a positive contribution to social and economic progress, transport can have negative effects on the environment. The future challenge is to find a way to reduce the negative impact of travel and adopt a balanced approach in line with the principles of sustainable development. Many countries around the world have failed to meet their emission targets. The environmental conditions within human settlements have become a central concern, particularly due to the strong links between economic growth, poverty and the environment (HABITAT 2002; 2003). Within the context of sustainable development, differences between problem orientated and comprehensive environmental policies have become distinct. Though in some of the more developed countries many of the

¹ Toronto, for example, made headlines around the world in 1990 by becoming the first city to commit itself to reducing its 1988 level of carbon dioxide emissions 20% by 2005. Included in its “call for action” was a goal of “significantly reducing the number of commuting autos” and a strategy to “promote significant reductions in the energy intensity of transportation in the city” by promoting public transit, bicycling and walking plus encouraging development and redevelopment that would contribute to energy-efficient urban form, reduce the need for transportation, discourage automobile use and encourage public transit and bicycle transportation.

² In England, people in the most deprived areas experience the worst air pollution (for example, they are exposed to 41% higher concentrations of the pollutant nitrogen dioxide than people living in wealthier areas), and are near to more sites producing a greater number of emissions that present a greater hazard (DEFRA, 2004).

pollution-related problems have been resolved, environmental problems - resulting from consumption - have increased. While industrial pollution often needs to be addressed through national policies and intervention, the critical links to the sustainable development of human settlements at the local level are important.

Air pollution from transport³ has been reduced in Western Europe and North America, mainly as a result of vehicle technology improvements. The technological improvements have been mainly counterbalanced by the growth in traffic. While in less developed countries, the pollution from mobile sources as a result of factors such as the rapid increase in the number, age and the overall condition of vehicle - has been excessively increased.

Sustainability in Iran and Tehran

Pursuing the concept of sustainability in Iran

Much of what is currently done in the name of planning - both in Iran and its capital Tehran - is of limited value in addressing sustainable development. Comparable to the international aura surrounding the concept of sustainability and sustainable city, this concept has not gained considerable political attention, social support and administrative responsiveness and momentum.

Physical urban transformations in Iran were accompanied by dramatic social, cultural and economic changes including increases in per capita incomes since 1974 due to oil boom creating rapid and prolonged formation of wealth. The development of the petroleum industry - which was a factor behind industrialisation and over concentration of political and economic power in the capital - the ambitious modernisation programmes of the pre-1979 period and the economic boom experienced by Iran during this period⁴, as well as the centralisation policies of the state, culminated in the over concentration of national market in and around Tehran and rapid urbanization. Up until 1979 Tehran's problems were mainly due to the imposition of these aspects of development on a traditional social, economic, administrative and political structure. But the short life of the boom period was followed by economic recession in 1977, which led to civil unrest, urban crisis and outbreak of political opposition, and finally the 1979 change of regime. With such new experiences as drastic political and administrative changes, falling income derived from oil revenues and the 1980-1988 war, new problems emerged throughout the country and in Tehran, adding to the previous unresolved problems (after Daneshpour, 2005, 2007). Economic indicators alone, however, do not portray the social transformations experienced in this country. Not only the increased wealth, but also the quality of life in Iran dramatically improved (as manifested in reductions in shares of population below poverty lines, longer life expectancy, reductions in birth mortality, increases in access to basic services and greater rates of literacy).

With a considerable time-lag, sustainable development themes have been introduced in Iran following international documents, and treaties, though only few governmental initiatives have since been introduced and applied.

The procedure of studying and challenging sustainability is more or less the same: the assessment of the environmental conditions, the evaluation of the urban quality, the identification of environmental and quality of- life indicators, the definition of performance standards to be pursued and, finally, the promotion of policies and actions. But what makes it unattainable, is the traditional approaches of planning and managing

³ Especially sulphur dioxide, nitrogen dioxide, particulates and hydrocarbons.

⁴ Iran had one of the highest growth rates of the time.

urban areas in Iran. In fact it is not simple to connect traditional planning instruments, decision-making procedures and legal tools to a sustainable development process aiming to improve the current conditions - without hampering future opportunities - via a variety of instruments, including the use of better technologies, coordinating the use of resources, introducing new environmental rules and public participation and integration of decisions.

Actually, a sustainable development label has been given to different proposals embedded in urban development plans. This situation does not mean that nothing relevant has been done regarding environmental protection and urban quality, as more attention has been given to such areas of decision as pollution control, proper waste disposal, and, some technological advances and a general improvement in the use of resources has occurred. Existence of a sectoral approach in this country means that the interrelationship among different sectors is ignored. Actually there is no international or regional commitment to bind the country to consider international treaties.

State of the environment and choosing the indicators of sustainability in Tehran

Compared to international sustainability indicators, among 146 nations of the world Iran ranks 132 and its pollutants are eight times more than the international standards. Hence Tehran is not in a suitable condition in terms of sustainability.

In order to evaluate the sustainability situation of Tehran some indicators which could be used to measure some of its most important characteristics, were considered in the core study of this paper. For this study it became necessary to limit the analysis to the indicators which first have an imminent feature of being a persistent problem area and second its relevant information can be easily obtained through different available sources. Thus, to simplify the analysis, only one aspects of urban sustainability - meaning air quality and road traffic - has been considered in this paper. Actually one of the main impediments to sustainability in Tehran is the sustainability of polluting sources. Under the present circumstances - especially due to the rising population - Tehran has turned into a major city threatened by ecological, economic and social problems.

Air pollution and Tehran

Cities are the main contributors to and victims of global environmental problems (Mega, 2000) and Tehran is a perfect example. Tehran is a consumer city as more than 40 percent of the country's economic activities are carried out in Tehran, is one of the worst cities in the world in terms of air pollution and UN has declared it as one of the most polluted cities in the world⁵. Thus air pollution and its causes have been considered as the major indicator of assessing sustainability in Tehran and this paper is of the view that it is through this indicator that sustainability can best be explained in Tehran.

Tehran's unresolved problems – especially air pollution and problems related to traffic congestion - and their significant negative impact on people and the natural and man-made environments, has been a major hindrance to any sustainable development in this city.

Although Tehran has more than 40 years of experience in urban planning and policy-making, the traits of the public intervention mechanism has been such that there has always existed many impediments making the internationally stated principles of sustainability and efforts to upgrade the quality of life, difficult to grasp. Impediments

⁵ Tehran ranks fourth (ranked in order of risk magnitude among all cities of the world, the cities are Mexico city, Beijing, Shanghai, Tehran, Calcutta, Bombay, Delhi, Tianjin, Manila and San Paulo.

such as the lack of an efficient and effective planning and information system to support decisions, political and administrative instability and the tendency to address urban problems in a sectoral manner, while sustainability and quality of life issues cannot be dealt with separately and an integrated and multi-faceted approach is required.

With a population of more than 10 million in 2007, Tehran is the largest and the most densely populated city in the country and in the region. Uncontrolled growth of Tehran has resulted in many negative environmental consequences. Since early 1970s national and local authorities have become concerned about traffic-related problems that endanger the health of people who live and work in Tehran.

Tehran's air quality problem and air pollution⁶ - a chronic problem - is highly dependent on its traffic problem which itself is a very complex problem. Also it is caused by industrial emissions of the industrial units⁷.

The amount of air pollution generated by urban transport depends on the length, speed and number of trips and the technology of vehicles. Conversely, for a given urban population, the land-use pattern and the length and number of daily trips are closely correlated with the average population density, the spatial distribution of trip destinations and origins and the resultant pollution. Different factors have contributed to the rising air pollution in Tehran which – compared to the internationally recommended measures – are two to three times more. The factors which worsen the overall environmental situation in Tehran are:

- Economic factors: Low fuel prices subsidized by the government have historically caused slight incentive for people for fuel conservation.
- Activity related factors or factors related to land-use mistakes: these factors are: (a) most industries located in and around Tehran are located mainly on the western periphery of Tehran, while the direction of Tehran's major wind is from south-west to north-east, (b) Iran's busiest airports and main airports of Tehran are located in the west and south-west of the city.
- Technological factors: Tehran suffers from obsolete and outdated transport vehicle technology for its produced vehicles. In spite of the application of modernized technologies in car production in many countries, the applied technology in Iran is not advanced and does not consider the environmentally safe measures (in spite of the public sector's requirement of the car manufacturers to meet emission standards). This is while with the incoming of new cars, the old cars are not discarded⁸.
- Factors related to the quality of fuels: Low quality of fuels⁹ (a decade ago lead was removed from gasoline).
- Dilapidated stock of vehicles: The city is packed with old cars which do not bear standard fuel conversion systems and do not meet up-to-date emission regulations (this is in spite of the public sector's programmes which were introduced to remove the older, polluting cars away from the transportation network of Tehran).
- Insufficient parking spaces: This factor increases the time spent in traffic and hence increases the pollution (daily need to parking space in Tehran is more than 170 times the available space).
- Factors related to the quality and quantity of the infrastructures and public services: Tehran has an inadequate, inefficient and under-developed public transportation system. Buses and metros do not cover every area of the city. Most people have to

⁶ Carbon monoxide is the main air pollutant in Tehran.

⁷ 35% of the total in the country located in and around Tehran.

⁸ 400 new cars enter Tehran daily, either through national production or imports.

⁹ Leaded gasoline and high sulfur content of diesel fuel.

either use private cars or hire taxis. This has forced the people to use private cars (which accounts for about 60 percent of all passenger trips in the city) for daily commuting and has created severe traffic congestion and excessive use of private cars and resulting heavy traffic due to a common national trend to disobey traffic rules.

- Topographical/climatologically factors (sunshine, frequent temperature inversions): Tehran is bound from the north and the east by mountains and especially in the north by the massive mountain range¹⁰ that is stopping the flow of the humid wind¹¹, contributing to low winds and low rainfall. As a result, there is thermal inversion that traps Tehran's polluted air. The UV radiations combined with the existing pollutants significantly raise the level of the ozone. In addition the direction of Tehran's major wind is from south-west to the north-east and this spreads the industrial pollution all over the city.
- Quantitative factors: Tehran suffers from (a) extensive and disproportionate increase in its population and (b) large number of cars, minibuses, buses, vans, trucks, and motorcycles¹² operating in an extremely congested road space with a very low speed¹³ which constantly pollutes the city¹⁴.
- Factors related to open as against built environment: Tehran has a low proportion of trees, green areas and open spaces compared nationally and internationally.
- Factors related to insensitivity of all stakeholders towards environmental issues: deficient public and political awareness and sensitivity towards environmental issues.

Health effects of air pollution have been studied in many countries of the world and many studies have demonstrated the adverse effects of air pollution¹⁵, on human health. The cardiovascular impacts of air pollution on ischemic heart diseases - the leading cause of death in Iran - has also been explored (Hosseinpoor, et al., 2005). These findings have many implications for the redesigning of public health policy with due regards to air pollution.

Existing and current policies to deal with pollution in Tehran

Unlike many countries, there is no initiative in Iran and Tehran for the promotion of an urban plan to deal with sustainability issues. In many countries the general goal of such a plan is to assess the sustainability of the area under consideration. For such plans there is a risk of limiting the scope of the plan to a technical document with no practical effect, no legal power, lacking the recognition of the necessity of participatory processes and power structure.

Successive public sector policies – short and long term -to deal with rising pollution in Tehran can be summarized as follows:

- Alternative fuels: The dual policy of (a) adopting alternative fuels to reduce carbon dioxide plus encouraging public means of transportation to convert from petrol engines to engines that run on compressed natural gas, and (b) increasing the production of cleaner natural gas so more cars can use it instead of gasoline plus manufacturing cars that run on both fuels.

¹⁰ Alborz Mountains.

¹¹ from the Caspian Sea to the north of the country.

¹² about 1.4 million vehicles and more than 2.0 million motorcycles.

¹³ The average speed of vehicle is below 18 Km/h.

¹⁴ It is estimated that in Tehran between 65 to 70 percent of total emissions are related to urban transportation.

¹⁵ They are the major sources of CO, NO₂, and PM₁₀.

- Introducing Traffic Zone: Introducing a dual policy of (a) permit system to limit the number of cars in the most congested areas and (b) defining a "Traffic Zone"¹⁶ to cover the city center during peak traffic hours.
- Expansion / Improvement of transportation network: Including (a) launching some divisions of Tehran subway, (b) increasing bus networks and services¹⁷, and (c) expansion of inner-city motor-ways and ring-roads.
- Raising public awareness: Attempts to raise people's awareness about the hazards of the pollution, including (a) installing pollution indicator boards that on daily basis announces the classified level of each pollutant as safe, hazardous or dangerous (b) publication of the air pollution related deaths in Tehran, (c) announcing the list of polluting industries - operating across the country while most of which are based in the Tehran Province by Department of the Environment^{18 19}., (d) announcing "Clean Air Week" in 2009 instead of the previous "Clean Air Day" by the Department of the Environment.
- Imposing fuel rations: This policy aimed to reduce fuel consumption²⁰.
- Introducing inspection regulation: Inspection and maintenance of vehicles was aimed to improve the emission levels and hence affect pollution levels of vehicles in Iran, since their average life is high.
- Development of green spaces: Tehran has a low ratio of open spaces compared to many cities worldwide. By adopting a policy to increase this ratio, the aim was to counter measure pollution in Tehran²¹.
- Relocation of industries located within the built space of the city: In spite of a decision to relocate the pollutant industries away from Tehran²², in 2006 (16 years after this approval) merely one third of the scheme has been implemented.
- Relocating pollutant industries: Since early 1990s the Municipality of Tehran has put the management of pollutant industries and workshops on its agenda²³.
- Preparation of different plans²⁴: Producing a policy package and a comprehensive strategy for reducing vehicle related air pollution and environmental damage.
- Expansion of public transportation: reducing the share of private transportation²⁵, to increase the share of underground railway²⁶ and public transportation²⁷.
- Miscellaneous policies: Including (a) equalizing the incoming to outgoing private cars in Tehran, (b) changing the working hour of different institutions in Tehran, (c) limiting the movement of one person private cars, motorcycles and smaller passenger carriers, (d) limiting the entry of motorcycles to inner areas of Tehran. Motorcycles are responsible for more than a quarter of Tehran's pollution and a major factor of

¹⁶ Since 1979

¹⁷ Which in Tehran have increased of nearly 100 per cent since the 1990s.

¹⁸ Nearly 1,000 units.

¹⁹ According to the existing regulations, polluting industries are charged for above one percent pollution.

²⁰ Adopted in 2007.

²¹ The green space per person ratio has increased from 2.5 m2 in 1989 to 10 m2 in 1993.

²² As approved in 1990. As part of the scheme, it was intended to build 17 industrial complexes.

²³ Nearly 7900 units have departed Tehran.

²⁴ Such as (a) "Tehran Transport Emissions Reduction Project, 1995-1997" for Greater Tehran Area, carried out in cooperation between Japanese Joint Venture and its Iranian counterpart, (b) preparation of a comprehensive plan to control traffic (almost abandoned since 2005), (c) adoption of a 10-year plan to reduce air pollution in Tehran in 2008 (including proposals to improve the capital's public transportation system and phase out old vehicles that lack exhaust filters).

²⁵ From 36.0 % to a target of 25.0 %.

²⁶ From 6.0 % to 30.0 %.

²⁷ From 18.0 % to 25.0 %.

chaotic traffic in Tehran, and (e) temporarily closing educational institutions during pollution climax in the most polluted parts of Tehran.

The policies listed above have made a difference for short-terms, without having long-term effects. An indication of short-term effect of these policies is that during the post 2006 period the number of days with harmful air quality in Tehran has increased. Also, the gains of the government's anti-pollution efforts were counterbalanced by a huge growth of the number of cars.

Consequences of traffic in Tehran

Some of the reported qualitative and quantitative consequences of extensive traffic and the resultant pollution in Tehran can be listed as:

- Excessive pollution levels which has dangerous consequences on the well-being of the people who live and work in Tehran. High concentration of carbon monoxide causes bad moods, dizziness, excessive fatigue, eye irritation, respiratory problems and heart attacks plus tension and violence and a phenomena called increased "road rage" and the general bad mood.
- During 2008 about 9,900 people in Tehran died because of two pollutants²⁸, indicating that these two caused the deaths of 27 people per day. There was an increase during the period 2006-2008²⁹.
- 20 million hours of working time was lost daily in traffic in Tehran.
- There were increase in respiratory and heart diseases in Tehran during 2008³⁰.
- Primary and middle schools in Tehran were randomly closed.
- Decrease the number of birds in Tehran^{31 32}.

Concluding remarks

Generally speaking due to the sustainability of the problems surrounding the quality of air in Tehran, this paper has come to the deduction that Tehran is moving away from sustainability measures. Though this paper has not tried to develop a firm definition of sustainability, it is of the view that the creation of sustainable cities is not simply a technocratic exercise in urban and regional planning, but is part of a wider set of socio-ecological processes. Studying sustainable cities becomes less about listing a set of universal social and ecological principles. It becomes more about analysing the ways in which - at different times and in different places - certain social, economic and environmental strategies of urban development can and should emerge.

Despite some steps forward in some of the areas related to sustainability in Tehran (such as the reduction in emissions of some air pollutants or improved energy efficiency), more effective measures are needed to protect the environment and human health. Nevertheless sustainable planning experience in Tehran and in Iran is still in an embryonic state, a state in which ideas are imported and their local understanding as well as application is far from universal experiences. Nevertheless some conclusions can be deduced. The traditional approaches of managing urban processes are not

²⁸ NOX and PM10.

²⁹ 2500 people were dead in 2006 due to air pollution in Tehran, according to official reports and 12000 according to unofficial reports.

³⁰ 3 %.

³¹ By 59.3% in 50 years.

³² The first study in 1950s, a number of 150 bird species had been observed in Tehran and its surrounding countryside, In 1970s, only 80 bird species had been identified and in 1990s a similar study that showed the metropolis was home to only 61 bird species. Air pollution, global warming, and changes in ecological system have been the main reasons behind the birds' migration.

efficient any more. Simply duplicating the more developed countries' energy use, sustainable development and sustainability and quality of life principles and patterns is neither feasible nor desirable in Tehran, Iran and many countries worldwide.

Responding to the threefold aim of this paper, first following the attempts to assess Tehran's state of sustainability in order to define its inclination, it became apparent that due to its long lasting and unresolved environmental - or to be precise, pollution - problems, Tehran is not moving towards sustainability. Also searching for the policies and planning tools that has been adopted to address these challenges, this study indicated that in spite of some seemingly ample efforts in terms of environmentally related studies and policy production attempts, these studies and policy documents – in addition to their substantive inefficiencies - are not related to current urban plans and all have sectoral nature, unrelated to the other decision areas in the city. In view of the impact of international appeals upon national thinking, measures and actions have not exceeded the inclusion of the concept of sustainability and its agenda as an overall motto in existing plans and policy documents. This means that there is a need in this city - and similar cases worldwide - to turn abstract mottos into concrete action policies without which a move towards sustainability would not take place and materialize. Actually, Tehran's air pollution control requires a huge revolution in the thinking of all officials and there is a need for more fundamental solutions and an incremental resolution of social, cultural, economic and urban management problems in the city.

Considering the above mentioned threefold findings, all implying a sort of deficiency in areas related to environmental sustainability of this city - and similar cases worldwide – and also allowing for an overall aim in this field which is the protection and improvement of the urban environment so as to improve the quality of life, to safeguard human health and to protect local and global eco-systems, or generally speaking reducing the total environmental impact (or "ecological footprint") of urban activities, a package as a corollary of the discussion made in this paper can be stated as follows:

- Continuously assessment of the environment by preparing an annual report on the city's state of environment.
- Enhancing the understanding of this concept at local levels and adapt its meaning as was made known in more developed countries. More and less developed countries face different (while similar) environmental problems and how urban planning can accommodate sustainability to address these varying problems and how the lesser developed countries are tackling these issues and locally adapt this concept and measures are very important. Despite this, there is a need for the transfer of experience and knowledge from more experienced to less experienced cases.
- There is a need to prepare the necessary tools, including the introduction and improvement of legal, institutional and management frameworks in countries who intend to admit sustainable thinking. Proposed legislation has to be precautionary and based upon polluter-pays principles, similar to many more developed countries
- Reducing the impact of transport in urban areas which needs action across a broad front. This includes encouraging a shift towards the use of the more sustainable forms of transport. Sustainability criteria mean that proposals which would add to congestion problems cannot be supported. Encouraging the use of more environmentally sustainable transport modes and extending the public transportation system and making the public transport system responsive to populations needs, can increase the capacity of urban areas to cut congestion and move towards sustainability. Also there is a need to promote environmentally-friendly vehicles in public transportation.

- Adopting sustainable production patterns (producing more value with less impact) should be a driving principle for more sustainable production patterns.
- Adjust the existing visions: In many European countries higher standards of living for many years has been linked to better access implying more travel, more emphasis on sustainable development. The development of indicators to assess this vision has brought forward the goal of less travel and reducing the need to travel, improve choice in transport and improve access to employment and public services. This means that the link between rising prosperity and increased travel have to be broken.
- Adoption of integrated approaches to the management of the urban environment: There is a need to integrate the sectoral urban studies and plans in order to attain one important aspect of sustainability which is integration. In fact sustainability and quality of life issues cannot be dealt with separately and an integrated and multi-faceted approach is required (similar to the EU that has already introduced a powerful regime for integrated pollution prevention and control, benefiting urban areas).
- Management of all urban resources in a manner consistent with the preservation of their reproductive capacity and that requires new approaches.
- Promoting a culture of environmental responsibility is needed for the population and decision-makers in general in Iran and Tehran (similar to many European and other countries) and similar cases worldwide.
- Linking long and short term decisions: To move effectively toward sustainability, people in general and their governments should understand the range of policy instruments available to them and the wider context of how community policy is made and what are the long-term consequences of the short-term choices.
- Stop road development obsession: Adopt the policy of maintenance of the existing roads while curtailing new road building.
- Making the polluter pay: Including policies such as (a) making those responsible for pollution pay the costs, (b) adopting a penalty system whereby a financial penalty is imposed on car use by means of road pricing (to charge the motorist on the basis of mileage traveled). This requires investment in public transportation so that it would be far cheaper than using roads and run at a sufficient frequency to be accessible to many people.

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