

***Measuring Urban Neighborhoods Sustainable Development with Fuzzy Logic and geographic Information System
(Case Study: Tehran – 17th municipal region)***

Farhudi R.

Assistant Prof., Faculty of Geography, University of Tehran

Rahnemai M.T.

Associate Prof., Dep. of Geography, University of Tehran

Gharakhlu M.

Associate Prof., Dep. of Geography, University of Tehran

Teimouri I.*

Ph.D. Candidate in Geography & Urban Planning, University of Tehran

Received: 24/05/2010 Accepted: 24/01/2011

Extended Abstract

Introduction

"The sustainable development model is a challenge to the conventional form of development. Conventional approaches see development as simply modernization of the globe along Western lines." Pressing constraints on development and entrenched negative trends were the result of modernization in the world. These include: economic disparity and poverty, the impact of diseases, over-consumption of resources in industrialized countries contributing to climate change, and environmental deterioration and pollution of many kinds: including the impacts of intensive farming, depletion of natural resources and loss of forests, other habitats and biodiversity. "The 1960s and the 1970s were marked by an intensification of concern about pollution and awareness that environmental problems arise within the context of a complex interrelationship between humankind, the global resource base and the social and physical environments. As a consequence, questions about the acceptability of conventional growth objectives, strategies and policies were brought to the forefront of public debate. "Sustainable development has been the central concept in the United Nations World Conservation Strategy and in the report of the World Commission on Environment and Development, also known as the Brundtland Report. The Brundtland Report defines sustainable development as

* E-mail: Teimouri_iraj@ut.ac.ir

Tel: 09127141874

"development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Urban development is especially important within the broader context of sustainability. The reality of "accelerated urbanization growth in the south countries (like Iran) overrides its damaging influence in local and global scales; " e.g. environmental, social, economical and political problems such as an increase in resource demands, waste production, air pollution, poverty, inequity, housing shortages, crimes, narcotic use... caused concerns about urban sustainable development. Tehran is one of 10 under developed metropolises among the 124 metropolises in the world, and as such is obliged to contend with a variety of problems; e.g. air, noise and water pollution, traffic jams, housing shortages, biodiversity reduction, vulnerability to probable earthquakes, lack of urban services, facilities, infrastructure, overcrowding, poverty and social vulgarities. This research takes the 17th municipal region, as a study area, for measuring the sustainability we collected data in the neighborhood scale.

Methodology

An "indicator of sustainable development must assess human development and sustainability" They can help incorporate information from physical and social sciences in decision-making, and they can help measure and calibrate progress toward sustainable development goals. They can provide an early warning to prevent economic, social and environmental setbacks. They are also useful tools to communicate ideas, thoughts and values.

In order to attain a superior spatial comparison of the urban area, all of neighbor hoods were selected as the area of study; in order to measure sustainability 20 indicators were used the sustainable development indicators were selected based on availability and fact and the indicator's data was collected. Main data sources utilized are Tehran Municipal Reports, The Statistics Center of Iran and The Iranian Survey Organization.

Using urban sustainable development indicators will help to understand the situation of the city in the sustainable development context. This article is trying to use Fuzzy Logic and GIS as a sustainable development measuring tool. For measuring the sustainability, this research used 20, economical, social, environmental indicators. Due to a broad range of varying scales, subsequent to the original data collection the scales were refined to a standard scale for use in further analysis.

Fuzzy logic is an extension of classical formal models of reasoning into models that incorporate fuzziness. The fundamental difference between classical logic and fuzzy logic is in the range of their certainty-values. In fuzzy logic, the certainty or fallacy of any given fuzzy proposition is completely subjective. Assuming that certainty and fallacy are expressed by values 1 and 0 respectively, the degree of certainty for each fuzzy proposition is expressed by a number in the unit interval of [0, 1]. Foremost a fuzzy membership function was defined for the normalized value: in this stage a triangular fuzzy membership function was defined with three linguistic values of Weak, Moderate and Strong; after which the fuzzy membership grade for the total data was calculated. Mamdani Fuzzy Inference was used for measuring sustainability. Early inference has five linguistic values of Very Bad, Bad, Average, Good and Very Good. Final inference which indicates the sustainability status in a special indicator has 9 linguistic values.

Results and Discussion

After all, they returned to non fuzzy value and the results were plotted in GIS. The result of study shows, intermediate sustainability in Fallah neighborhood, which has the best position among the neighborhoods, also Bolursazi neighborhood has the worse condition among the neighbor hoods.

Using fuzzy logic as a measurement tool for Tehran's 17 region sustainability, demonstrates the fact that non-existent sustainability among the various city districts is a very serious problem impeding national development strategies. By reviewing the history of urbanization in Iran, the problem consuming today's cities has risen from problems existing in peripheral regions, a result of inconsistencies in the country's governmental policies.

Conclusion

Pressing constraints on development and entrenched negative trends were the result of modernization in the world. The Brundtland Report defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Urban development is especially important within the broader context of sustainability. Tehran is one of 10 under developed metropolises among the 124 metropolises in the world, and as such is obliged to contend with a variety of problems. This research takes the 17th municipal region, as a study area, for measuring the sustainability we collected data in the neighborhood scale. In order to measure sustainability 20 indicators were used the sustainable development indicators were selected based on availability and fact and the indicator's data was collected. Foremost a fuzzy membership function was defined for the normalized value. The result of study shows, intermediate sustainability in Fallah neighborhood, which has the best position among the neighborhoods, also Bolursazi neighborhood has the worse condition among the neighbor hoods.

Keywords: *Urban Sustainable Development, Measuring Sustainability, Fuzzy Logic, Mamdani Implication, GIS.*