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## Urbanization and its implications in a mega city: Need for spatial information management

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### Abstract

Rapid and aggressive urbanization is associated with the depletion of natural resources, which in turn deteriorates landscape structure and conditions in the local environment. Rapid increase in population due to migration from rural areas is one of the important issues Urban Development. Urbanization in India is changing land change to a great extent and often results in Spread. Dispersal areas often lack basic facilities such as water supply, sanitation, etc. Regular monitoring and understanding of the rate of urban development is needed to ensure maintenance of natural resources. Urban sprawl is the limit of urbanization that advances development of urban forms with ecology and destruction of natural lands. Rate of change of the extent of land use and urban sprawl can be efficiently designed with the help of imagination and geology. Knowledge of urban area, especially development magnitude, shape geometry, and spatial. The pattern is necessary to understand the growth and characteristics of the urbanization process. Urban pattern, size and evolution can be determined using spatial matrix. This communication determines the amount of urbanization and related development patterns in Delhi. Four decades of spatial data were analyzed to understand Mobility of land and on land use. Increasing scope for understanding and increasing local spatial changes.

**Keywords:** urbanization, development, spatial, management, growth

### Introduction

Today there is an ever-increasing demand for the collection, integration, management and sharing of reliable spatial information, and the relevant education, experience sharing and development of best practices. This growing demand is driven by some of the most important changes in society which in turn are magnified by rapid urbanisation and the conditions of the world's megacities. Urbanisation is a major change taking place globally. The urban global tipping point was reached in 2007 when for the first time in history over half of the world's population 3.3 billion people were living in urban areas. It is estimated that a further 500 million people will be urbanised in the next five years and projections indicate that 60% of the world's population will be urbanised by 2030.

This incredibly rapid growth of megacities causes severe ecological, economical and social problems. It is increasingly difficult to manage this growth in a sustainable way. It is recognised that over 70% of the growth currently takes place outside the formal planning process and that 30% of urban populations in developing countries are living in slums or informal settlements, i.e. where vacant state-owned or private land is occupied illegally and is used for illegal slum housing. In sub-Saharan Africa, 90% of new urban settlements are taking the form of slums. These are especially vulnerable to climate change impacts as they are usually built on hazardous sites in high-risk locations. Even in developed countries unplanned or informal urban development is a major issue. Urbanisation is also contributing significantly to climate change. The 20 largest cities consume 80% of the world's energy and urban areas generate 80% of greenhouse gas emissions worldwide. Cities are where climate change measures will either succeed or fail.

Rapid urbanisation is presenting the greatest test for land professionals in the application of land governance to support and achieve the Millennium Development Goals (MDGs). The challenge is to deal with the social, economic and environment consequences of this development through more effective and comprehensive land administration functions, supported by effective Spatial Data Infrastructures, resolving issues such as climate change,

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insecurity, energy scarcity, environmental pollution, infrastructure chaos and extreme poverty.

### **Problems to be Managed within Megacities**

Administrations in large cities are often confronted with a multitude of key problems, like high urban densities, transport, traffic congestion, energy inadequacy, unplanned development and lack of basic services, illegal construction both within the city and in the periphery, informal real estate markets, creation of slums, poor natural hazards management in overpopulated areas, crime, water, soil and air pollution leading to environmental degradation, climate change and poor governance arrangements. The inevitability of further population growth is a common issue. Some cities reported that their administrations have little control over population growth; it was a regional or national issue and must be addressed at that level. However, monitoring population change effectively and being able to respond through planning and infrastructure development will be major challenges. Informal settlements are a problem in many cities.

An increasing number of citizens do not have either permanent or temporary access to land and adequate shelter. This exclusion is caused, in many cases, by structural social inequalities, inheritance constraints, conflicts, non pro-poor or pro-gender land policies and land administration systems that are ineffective and expensive for the end user. Without a range of appropriate interventions being applied within the broader context of economic growth and poverty reduction policies, social exclusion and poverty will continue to spiral out of control; already 90% of new settlements in sub-Saharan Africa are slums. Natural hazards and emergency management are major issues in most cities. Risk profiles from floods, fires, earthquakes and other hazards differ among cities, but capacity to plan, prepare, respond and recover from disasters is a common need.

The rapid growth of megacities causes severe social, economical ecological and problems. How can this growth be nurtured in a sustainable way? The challenge for land professionals is to provide the megacity 'managers', both political and professional, with appropriate 'actionable intelligence' that is up-to-date, citywide and in a timely manner to support more proactive decision making that encourages more effective sustainable development. Spatial information has become indispensable for numerous aspects of urban development, planning and management. The increasing importance of spatial information has been due to recent strides in spatial information capture (especially satellite remote sensing and positioning), management (utilising geographic information systems and database tools) and access (witness the growth in web mapping services), as well as the development of analytical techniques such as high resolution mapping of urban environments. These more efficient techniques can lead to a wider diversity of information that is more up-to-date.

The value of spatial (location-referenced) data is growing in recognition internationally. Many countries with developed economies now have policies and strategies aimed at maximising the benefit from spatial data held by government agencies in particular. A wealth of existing map, image and measurement data can already be found in areas such as land administration, natural resource management, marine administration, transportation, defence, communications, utility services and statistical collections.

The challenge is for users, both within and outside these areas of activity, to discover, access, and use this information to improve decision-making, business outcomes and customer services. As cities get larger spatial information is becoming a key resource in efficient delivery of e-government services, public safety, national security and asset management. In this study, it is proposed that a city-wide spatial data infrastructure linked to similar structures in other levels of government, can provide a sustainable solution to many problems of megacities. Despite all the progress made in spatial data collection, modelling and dissemination, it is important to look for ways and methods to improve e-government taking into account the needs of citizens.

The goal of this research is to investigate the emerging needs, the current trends and the extent of using SDIs in selected megacities, but also to identify the emerging possibilities for using new technical tools for the governance of sustainable large urban areas applied by the surveying-mapping- data processing community. The study aims to demonstrate these technical tools, not only to governmental policy makers, but also to planners, economists, scientists, environmentalists, sociologists and all others with an interest in the life of megacities. However, it should be mentioned that each city should build its own spatial data infrastructure, and should choose its own tools appropriate to its own social, economic and cultural environment. The publication suggests alternative ways to meet the current requirements and makes general recommendations on best practice. It does not advocate the use of any specific tools because each country has a different history and experience. Urbanisation is an irreversible process. The 20th century has seen the emergence of megacities (cities with population greater than 10 million). Such large population concentration in cities is a significant historic change. The number of megacities has risen from two in 1950 to twenty in 2005. Moreover, 17 out of the 20 megacities in the world are located in the world's less developed regions. Ancient Megalopolis, built by Epaminondas in 371–368 B.C., was the capital of the Arcadian alliance in Greece. It was considered to be the model of a prosperous, happy and peaceful city.

Most current megacities (that share the same "name" with the ancient city) but also metropolitan cities (cities up to 5 million) do not experience a similar quality of life, since global population growth is becoming an urban phenomenon mainly in the less developed regions. It is ironic that much of what were once considered the major advantages of life in the city, like security, better housing conditions, and services provision have now become major disadvantages of urban life, like criminality, slums and lack of services. Massive displacement of people to megacities perpetuates environmental degradation and climate change resulting in the shrinkage of areas available for agricultural, and causing the loss of livelihoods based on agricultural and animal breeding. It is clear that sustainable development cannot be achieved without sustainable urbanisation.

### **Problems Identified in Megacities**

In many megacities, the city administrations do not have responsibility for all matters covering the full area of the cities. Several cities reported that their city administrations did not have control over development, but rather it was the responsibility of subsidiary local government units. In some

cases, other levels of government had land use and development control responsibilities. So, even if city planning is centrally coordinated, often city administrations have little control over the implementation (land use and building controls) of these plans. In short, some city administrations have control over key city development functions; others do not. The influence of megacities reaches well outside their administrative boundaries to the peri-urban and regions beyond. It is essential that the greater region be managed holistically to maximise the economic benefits of the city. Regional planning places even greater emphasis on effective governance of the larger region, cooperation in planning and development control and information sharing.

The inevitability of further population growth is likely to be a common issue. Some cities reported that their administrations have little control on population growth. It was a regional or national issue and must be addressed at that level. However, city administrations need to address the consequences of growth, which will add further stress to existing systems and facilities, even for those cities not experiencing problems at the moment. Just finding enough housing for people will be a common problem. Monitoring population change effectively and being able to respond through planning and infrastructure development will be major challenges.

Spatial information has become indispensable for numerous aspects of urban and rural development, planning and management. The increasing importance of spatial information has been due to recent strides in spatial data capture, management and access, as well as the development of analytical techniques such as high resolution mapping of urban environments. A key factor for success will be utilisation of spatial information and technologies to support the operation of the allocation of property rights, housing needs, land use planning, land management and taxation. They will also support management of key problems such as disaster management, flooding control, environmental management, health and transportation.

New tools, techniques and policies are required to baseline and integrate the social, economic and environmental factors associated with megacities, to monitor growth and change across the megacity and to forecast areas of risk – all within shorter timeframes than previously accepted. Moreover, they must be flexible enough to meet traditional needs such as land development, tenure and value applications, but be designed to be interoperable and integrate within the city wide SDI as it evolves. Access to integrated spatial information from the SDI will lead to more joined-up, proactive decision making allowing the prioritising of scarce resources to tackle the most sensitive and risk prone areas within a megacity.

Just as importantly, managing performance of cities including monitoring, evaluation and reporting functions is a key challenge. This includes data collection and analysis and a conclusion reached was that you couldn't monitor performance without relevant quality spatial information. The study has found that spatial information and technology is being recognised widely as one of the tools needed to address the big urban problems, but there is still a general lack of knowledge amongst communities of practice about how spatial solutions can be used. The key action required is knowledge transfer, especially amongst users in city administrations. Use of case studies demonstrating current

best practice in selected cities could be a way of showing other cities what is possible. However, detailed solutions will need to be tailored by spatial professionals in each instance.

Since spatial information is used more with greater citizen awareness, there is a risk popular antitrust related to privacy issues. It is therefore necessary that there are policy frameworks legally established for the proper use of spatial information. Lifting is also important public awareness of benefits to citizens will be obtained through SDI, mainly due to increase transparency in city administration; And the opportunity for public participation in decision making.

### Conclusion

Temporal land cover analysis indicate of decline in that the vegetation by about 75.03%, while the area under non vegetation has shown an increase of 121%. Land use analyses for the period 1977 to 2010 done through the Gaussian maximum likelihood classifier indicate that the area under built-up has increased from 3.6 (1977) to 25.06 (2010) %. During the past four decades the total urban (built-up) area has increased by more than 638% mainly from the conversion of open areas and other areas including agriculture land. Spatial metrics considering the area, edge, shape, aggregation obtained through the moving window method to quantify the urban builtup land density provide an efficient method for predicting the urban growth pattern. This has aided in visualizing and quantifying the burgeoning urban footprint at Delhi. The analysis also revealed of sprawl and the process of densification has happened around the city centre and has spread out of the core during 1990's and have started to get clumped during 2010. Aggregation and sprawl of built-up land has occurred on cost of fragmentation of various other classes for ex. agriculture land and urban green spaces. Visualisation of urban growth helps the urban planners and decision-makers in formulating appropriate development strategies to mitigate the potential impacts on the urban environment.

Government needs to play a vital role in planning sustainable cities with the healthy urban environment and sustenance of natural resources. The results of the current analyses highlight of the significant changes in land cover with the decline in vegetation, water bodies, crop and fallow land. This necessitates an integrated approaches in urban planning to ensure the sustenance of water, moderation of micro climate, etc. Conservative urban planning would take into account the sustenance of natural resources and people's livelihood aspects. To ensure groundwater recharge, government officials are required to maintain minimum vegetation cover in the area in addition to recharge through percolation pits and rainwater harvesting. A green belt or native vegetation on either side of the banks helps in soil erosion, protection, reducing salinity and improving water quality. It applies a holistic approach in urban development, so that areas of different land-use classes are appropriately protected, considering ecological and environmental services to maintain inter-generational equity.

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