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*Special Theme*

**URBAN AND REGIONAL PLANNING**

*Guest Editor*

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# The Indian Geographical Journal

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# SLUM PLANNING IN INDIA - SPECIAL REFERENCE TO RAY

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## Abstract

*In India, several schemes and Programmes have been launched from time to time to promote integrated city development, and to enable the slum dwellers to gain access to the basic services. The paper explores the social mission named Rajiv Awas Yojana popularly known as "RAY", an ambitious program for slum free India which is now replaced by Pradhan Mantri Awas Yojana ("PMAY"). This paper summarises the various slum development programs of India at different level by giving an overview of these programs. It discusses in detail about the principles of RAY program, in the light of how it has overcome the disadvantages of the earlier slum development programmes. This has been taken from the published research articles pertaining to slum policies on slum development in India. Finally, a brief account of PMAY has been added and how the slum redevelopment is considered under this mission has been explained.*

**Keywords:** Slum, RAY, Redevelopment, PMAY

## Introduction

At global level, during the implementation of the first Decade for the Eradication of Poverty (1997-2006), a total of 227 million people (at 2010) have moved out of slum conditions. That means governments have collectively surpassed the Millennium Development target by 2.2 times, (UN-HABITAT report on the state of the World Cities 2010/2011: Bridging the Urban Divide). Despite new commitments to poverty eradication, and the efforts towards the implementation of poverty eradication programmes, the progress made in reducing poverty worldwide has been uneven. Although some regions experienced poverty reduction, in many countries poverty has been on the rise. In December 2007, the General Assembly proclaimed the Second United Nations Decade for the Eradication of Poverty (2008-2017). It was reiterating that, "eradicating poverty was the greatest global challenge facing the world and is a core requirement for sustainable development, especially for developing countries" (UN, Poverty, Social Policy and development division, 2008). The "absolute number" of slum dwellers has increased from 776.7 million in 2000 to some 827.6 million in 2010 (UN Habitat, 2011).

At National level, according to 2001 census, a total of 52.4 million people were living in 10.2 million households of 1743 cities/towns spread across 26 states and Union Territories (Report of the committee on slum statistics, 2010). As per census 2011, there were 65 million slum population in the 4041 statutory towns of India (AHP, GOI, 2013).

Some recent statistics projected that the slum population will increase to 104.7 million by 2017, the terminal year of the 12th Five Year Plan (Om Prakash Mathur, 2012).

Despite facing several impediments, the local, state and central governments in India have been successful in partially dealing with the problems of slum dwellers. The data on living conditions and demographic profile of the slum dwellers was collected by the National Sample Survey Organisation (NSSO) in its 65<sup>th</sup> round. It highlighted the fact that there had been a considerable improvement (compared with its 58th round) in the living conditions, in the slums and squatters, in India, over the last one decade. However, due to the unplanned urbanization in the country, the slums are growing at an alarming rate much faster than they are resolved or taken care of by the government (Upinder Sawhney, 2013).

### *Slum Policy and Slum Clearance Program - An Overview*

A number of schemes and programmes have been launched from time to time in order to promote integrated city development, and to enable the slum dwellers to gain access to the basic services such as potable water, sanitation, health and educational facilities. Land and housing being a State subject; Central Government's role in improving slums in the country is more by way of facilitation by providing financial resources and establishing legal/administrative framework for undertaking various activities that benefit slum dwellers. In addition, Central Government has also played an important role in channelizing funds and technical assistance received from International and bilateral agencies to various State Governments and local agencies. The strategies and priorities for improving slums are evolving over time, and new initiatives are tailored based on the experiences gained by implementing many schemes launched over previous plan periods.

After Independence, the Government of India announced the first act under the name of Slum Clearance "The Slum Areas (Improvement and Clearance) Act, 1956" (Act no. 96 OF 1956 dated 29th December, 1956) during the Second Five Year Plan. Consequently, all the state governments were required to set up the necessary organizations and enact legislation for the same. Each state had its own time to enact the act such as Andhra Pradesh in 1956, Tamil Nadu in 1957, Punjab and Haryana in 1961, Karnataka in 1973, Madhya Pradesh in 1976 and with little alterations Maharashtra in 1971 and Gujarat in 1973 as Slum areas (Improvement, Clearance and Redevelopment) Act, etc. Some of the state governments created parastatal bodies like housing and slum boards to look into issues concerning slums and the urban poor. For example, slum clearance Board (Tamil Nadu, Karnataka), Slum rehabilitation authority (Gujarat, Maharashtra).

The Fourth Five Year Plan emphasized on urban planning and de congestion of cities. A Scheme for Environmental Improvement of Urban Slums was undertaken in the Central Sector from 1972-73 with a view to provide a minimum level of services, like, water supply, sewerage, drainage, street pavements in 11 cities with a population of 800,000 and above. The scheme was then extended to nine other cities. Integrated Low Cost Sanitation Scheme was launched in 1980-81, to provide proper sanitation in the slums. The scheme is

being operated through Housing and Urban Development Corporation (HUDCO) by providing subsidy through the central government and loans by HUDCO.

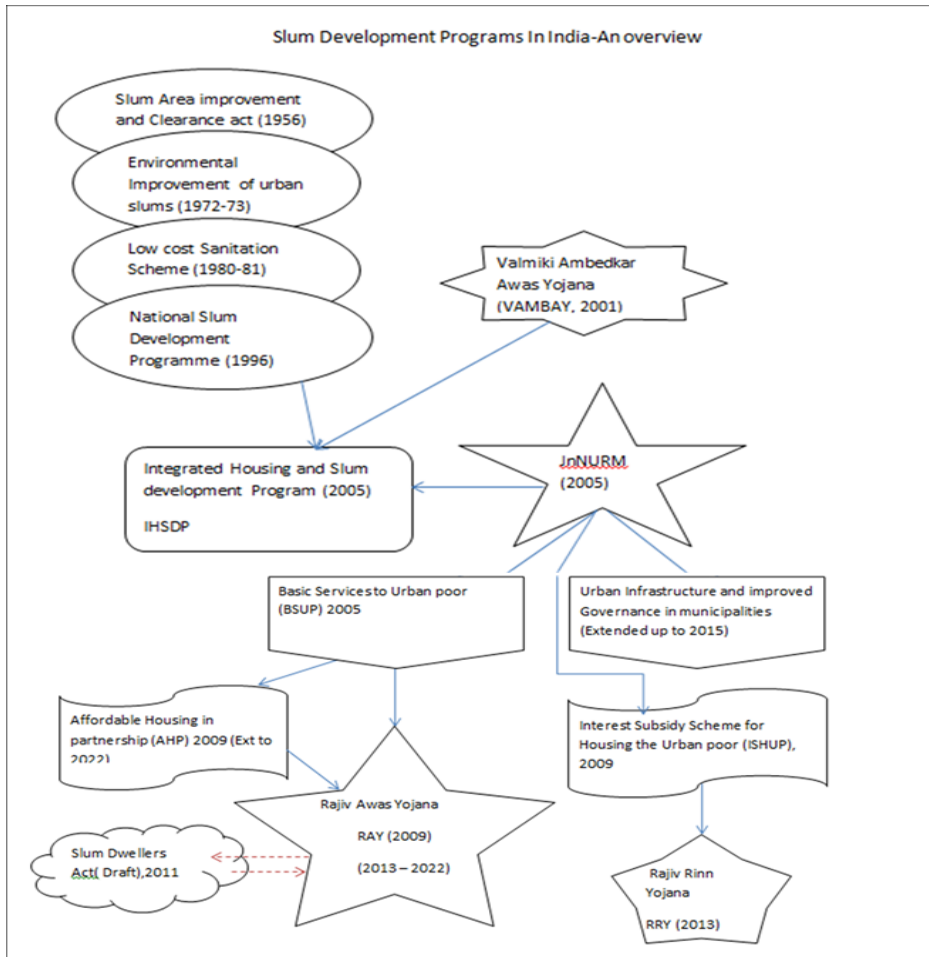
The National Slum Development Programme (NSDP) was launched in August, 1996. Under NSDP, Additional Central Assistance (ACA) was being released to the States/UTs for the development of urban slums. The objective of this programme was upgradation of urban slums by providing physical amenities like water supply, storm water drains, community bath, widening and paving of existing lanes, sewers, community latrines, street lights, etc. Besides, the funds under NSDP could be used for the provision of community infrastructure and social amenities as pre - school education, non- formal education adult education, maternity, child health and primary health care including immunization, etc. The programme also had a component of shelter upgradation or construction of new houses. The Ministry of Urban Employment and Poverty Alleviation had been nominated as the Nodal Ministry, to monitor the progress of the programme in respective States. NSDP had been discontinued from the financial year 2005-06 (Ministry of Housing and Urban poverty Alleviation - M/o HUPA.2006)

In 2001, a new centrally sponsored scheme called Valmiki Ambedkar Awas Yojana (VAMBAY) with a view to ameliorating the conditions of the urban slum dwellers living below the poverty line, who do not possess adequate shelter was launched. The scheme has the primary objective to facilitate the construction and upgradation of the dwelling units for the slum dwellers and to provide healthy urban environment through community toilets under Nirmal Bharat Abhiyan, a component of the scheme. The scheme was the first of its kind meant exclusively for slum dwellers with a Government of India subsidy of 50 per cent; the balance 50 per cent to be arranged by the State Government with ceiling costs prescribed both for dwelling units/community toilets. The State's share may consist of funds from any source in the form of subsidy or loan from Housing and Urban Development Corporation Limited (HUDCO) or any other agency.

The guidelines of the scheme provide for submission of proposals by the nodal agencies of State Governments to HUDCO, who, in turn, process and forward them to this Ministry with their recommendations. The funds are released by this Ministry only after a VAMBAY account is opened by the State Nodal Agency and the share of the State/Union Territory Government is deposited in that account (VAMBAY, 2001).

#### *Slum Development Programs in India*

VAMBAY and the discontinued National Slum Development Programme (NSDP) have been subsumed in a new scheme called Integrated Housing and Slum Development Programme (IHSDP). This scheme was launched along with Jawaharlal Nehru National Urban Renewal Mission (JNNURM) in 2005. IHSDP aims at having an integrated approach to ameliorate the conditions of the urban slum dwellers, who do not possess adequate shelter and reside in dilapidated conditions. The scheme is applicable to all cities and towns as per 2001 Census except cities/towns covered under JNNURM.



**Fig. 1. An Overview of Slum Development in India**

IHS DP is funded on 80:20 basis between Central Government and State Government / ULB/ Parastatals and 90:10 basis between Central Government and Special category States\*. The primary objective of the scheme is to strive for holistic slum development with a healthy urban environment by providing adequate shelter and basic infrastructure facilities to the slum dwellers of the identified urban areas (M/o HUPA website)

In 2005, the government of India announced a major initiative - the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) - to address the much-needed investment in cities to cope with urbanization and its challenges. It had two sub-missions: urban infrastructure and improved governance in municipalities, to be managed by the Ministry of Urban Development, and Basic Services for the Urban Poor (BSUP), to be managed by the Ministry of Housing and Urban Poverty Alleviation. These Sub-Missions were only for selected 63 cities.



A City Development Plan is required before the city can access Mission funds under BSUP. The State Governments and the Urban Local Bodies (ULBs)/Parastatals are required to execute a Memorandum of Agreement (MoA) with Government of India indicating their commitment to implement the identified reforms. Signing of this tripartite MoA is a necessary condition to access Central assistance. BSUP supported projects provide shelter, basic services and other related civil amenities to low-income settlements, such as security of tenure, affordable housing, water, sanitation, health care, education and social security.

Affordable Housing in partnership (AHP) was introduced in 2009 as part of BSUP component of JNNURM aimed to encourage private sector participation in the creation of affordable housing stock recognizing that mere efforts of Government would be insufficient to address the housing shortage. Now it will be continued as part of RAY with suitable amendments (AHP, 2013). A major initiative, Interest Subsidy Scheme for Housing the Urban poor (ISHUP) was launched in 2009, for the provision of housing for the Economically Weaker Sections (EWS) and Low-Income Groups (LIG) through the JNNURM.

#### *Rajiv Awas Yojana (RAY)*

The main focus of RAY was an integrated approach aimed at bringing within the formal system those who are forced to live in extra-formal spaces and denial of the right to services and amenities available to those with legal title to city spaces. It aims at correcting the deficiencies of the formal system of urban development and town planning that have failed to create conditions of inclusiveness and equity. So that, henceforth, new urban families, whether by way of migration or natural growth of population, have recourse to housing with municipal services, and are not forced to create encroachments and slums and live extralegal lives in conditions of deprivation of rights and amenities (Guide lines of RAY).

M/o HUPA held a series of meetings in year 2009, with the housing ministers of various state governments as well as representatives of NGOs and CBOs working on housing and sanitation for the urban poor. These meetings were designed to refine RAY based on the lessons learned from the shortcomings of previous programmes. Thus, RAY conceived a participatory process to develop city development plans, including plans for the upgrading and tenure security of all slums. (as mentioned by Livengood and Kunte, 2012).

In early 2010, M/o HUPA finalized the RAY policy and issued guidelines to cities for generating their slum-free city plans – a pre-requisite for receiving RAY funds. These plans are intended to make up for the failure of municipalities to address slums comprehensively under JNNURM–BSUP.

The duration of Rajiv Awas Yojana will be in two phases: Phase-I, for a period of two years from the date of approval of the scheme (The first Phase ended in June 2013).

Phase-II will cover the remaining period of the Twelfth Five Year Plan 2013-17 RAY and will be running in a Mission Mode. Recently on 3<sup>rd</sup> Sep 2013, the Cabinet Committee on Economic Affairs has approved the launch of RAY as a Centrally Sponsored Scheme (CSS), to be implemented in Mission mode during 2013-2022 (extended for five more years). The CCEA has also approved the continuation of Affordable Housing in Partnership Scheme (AHP) as part of RAY with amendments. It has also been decided to continue the Interest Subsidy Scheme (ISS) for Housing the Urban Poor (ISHUP) and rechristen it as the Rajiv Rinn Yojana (RRY). The program will run as a standalone Central Sector Scheme. (PIB, GOI, 2013).

The following Table tries to appraise, how RAY has overcome the lapses/drawbacks of the previous programs in brief.

**Table 1. Main features of RAY program**

Earlier Programs	Main Features of RAY
<p>☞ it should provide a well-structured step-by-step process that aids mandated officials to concurrently deal with physical, legal, organizational and financial intervention based on a powerful and prescribed but flexible step-by step process ( Bimal Patel et.al., 2011)</p>	<p><input type="checkbox"/> Guidelines for preparation of a Slum free city Plan of action gives step by step process to be followed in very lucid manner. (RAY Module 1,2and5)</p> <p><input type="checkbox"/> User manual for urban local bodies provides step by step actions to be followed in monitoring system.</p> <p><input type="checkbox"/> GIS mapping, MIS-GIS integration under RAY(details are given in Module 3)</p> <p><input type="checkbox"/> Community Participation details in Module 4</p>
<p>☞ many programmes for their rehabilitation, the beneficiaries, are required to contribute a certain percentage of the cost of housing/dwelling units, which they are not able to afford. ; Therefore, many such schemes are of no use to the target population (Upinder Sawhney,2013)</p>	<p><input type="checkbox"/> Facilitating a supportive environment for expanding institutional credit linkages for the urban poor.</p> <p><input type="checkbox"/> Once secured tenure is given, the dwelling space shall not be transferable, but shall be mortgageable for the purpose of raising housing loan.</p>
<p>☞ Non-notified slums* are excluded from getting the benefits of slum development programs ( Ramnath Subbaraman et.al., 2012)</p>	<p><input type="checkbox"/> Bringing all existing slums, notified or non-notified (including recognised and identified) within the formal system and enabling them to avail the basic amenities that is available for the rest of the city/UA.</p>
<p>☞ leaving municipalities to choose between upgrading homes ... or relocating families VAMBAY lacked institutional processes for participation and grievance redress, resulting in many involuntary relocation projects. (Avery Livengood and Keya Kunte, 2012)</p> <p>☞ communities, governments, and NGOs can work most effectively together to ensure the inclusion of slums within city plans( Pratima Joshi et.al., 2002)</p>	<p><input type="checkbox"/> Community will be involved at every stage, from planning through implementation to post-project sustenance stages. The attempt to “design for people would be done with the people”.</p> <p><input type="checkbox"/> Community participation is seen as the significant aspect of RAY that will create community ownership and sustainability of the programme</p>

<p>so that people's organizations can take part ....and, hopefully, influence reigning paradigms of development' ( Sheela Patel et.al., 2001).</p> <p>NGO and CBO participation in BSUP projects, like those under VAMBAY, had no place in the decision-making process ... (Avery Livengood and Keya Kunte, 2012)</p> <p>requires matching funds or guarantees that local authorities or state agencies are usually unwilling to provide. And even the limited funds available are extremely difficult for the poor to access. Clearly, an alternative delivery system involving NGOs and CBOs is needed ( Sundar Burra, 2005)</p>	<p><input type="checkbox"/> RAY makes a concerted effort to encourage and require participation of NGOs and CBOs in planning and decision-making.</p> <p><input type="checkbox"/> Slum Dwellers' Federation (SDF) at the city level, and Slum Dwellers Association at each slum level should be envisaged and enabled under RAY, so that information on RAY and the city and slum plans and other details are shared and communicated slum redevelopment is planned and implemented in consultation and with the consent of the community.</p> <p><input type="checkbox"/> CBOs, Voluntary technical and professional organizations, including SDF will be encouraged to partner with the ULBs in participatory planning, inclusive city development and execution of RAY.</p>
<p>in almost all municipalities, participation is viewed simply as providing information to communities about the project. In most projects, there were no mechanisms for accountability to the beneficiaries ( Sheela Patel, 2013)</p> <p>In all slum related schemes, specific projects will have to be identified by municipalities in consultation with slum dwellers and given priority. This will ensure that only viable projects are taken up, and that community participation is forthcoming (Robert M. Buckley' 2007)</p>	<p><input type="checkbox"/> "...decision-making should necessarily be done with the involvement of the community."</p> <p><input type="checkbox"/> Lead NGOs/CBOs should also be associated in slum survey operations and dialogues for preparation of slum level redevelopment plans.</p> <p><input type="checkbox"/> It does the following "Empower communities to participation in the identification, planning and monitoring of slum development, form and strengthen 'Ward Committees" or 'Mohalla Samities" as formal and legal mechanisms to promote community participation in local development" ( Neelima Risbud,2010)</p>
<p>.A major challenge is for government to accept that the data collected by communities has the necessary legitimacy for implementing state projects and for policy making and execution. Often, the assumption is that only professionals can handle this kind of task (Sheela Patel et.al., 2012)</p> <p>it is important., surveys and maps created by the urban poor are not just methods for creating information but are also methods for creating knowledge (Arjun Appadurai, 2012)</p>	<p><input type="checkbox"/> The participation and involvement of the slum dwellers from the stage of survey and planning through implementation, concurrent evaluation and social audit of RAY are critical.</p> <p><input type="checkbox"/> Community will be involved in the Survey leading to preparation of Slum Free City Plan</p> <p><input type="checkbox"/> Engage community in cross checking the demarcation of slum boundary, number and locations of tenements and households and other community facilities through GIS.</p>
<p>household surveys and settlement mapping to support the construction of needed infrastructure and services (especially if there are no maps and little or no data on residents and their housing) (Sheela Patel,2013).</p>	<p><input type="checkbox"/> identify and engage Lead NGO/CBOs to guide and anchor community mobilization for the purpose of slum survey.... “.</p>

<p>☞ The key to stopping slum formation is to increase low-cost formal sector production to rates near those of new household formation (Bruce Ferguson and Jesus Navarrete,2003)</p> <p>☞ the forthcoming RAY would critically depend upon the ability to recognize the adaptive nature of informal institutions that are a result of extant distortions in the housing and land markets for it to meet its objectives ( Sahil Gandhi (2012).</p>	<p><input type="checkbox"/> Redressing the failures of the formal system that lie behind the creation of slums.</p> <p><input type="checkbox"/> Institutionalizing mechanisms for prevention of slums including creation of affordable housing stock.</p>
<p>☞ By being members of small daily savings groups..., the women ,with the few and least stable incomes are able to create a consolidated voice to help bring about the changes they seek in their city (Celine d’Cruz and Patience Mudimu, 2013).</p>	<p><input type="checkbox"/> Title of the EWS/LIG housed would be given as far as possible in the name of the female members of the household or in a joint name.(AHProgramme part of RAY, 2013)</p> <p><input type="checkbox"/> Every slum dweller shall be given a legal entitlement, which shall be in the name of the female head of the household or in the joint name of the male head of the household and his wife (Slum dwellers act, 2011)</p>

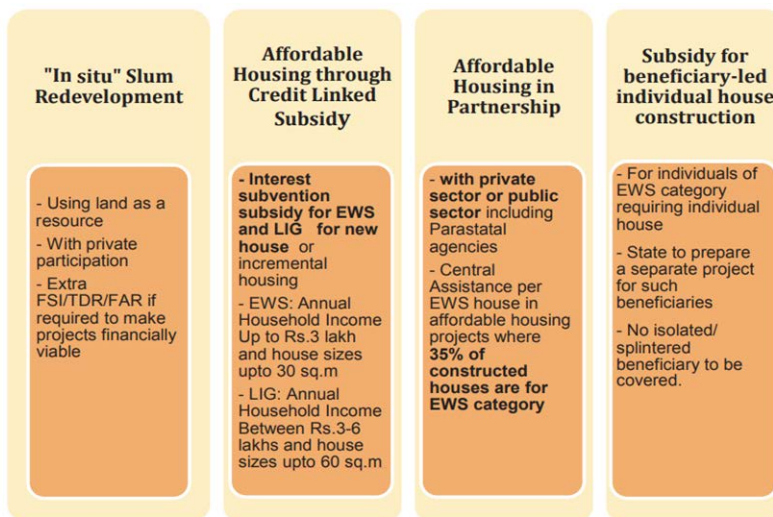
Due to change in the government, the RAY program has been integrated with all the housing schemes including non-slums (urban poor, economically weaker section-EWS) and named as Pradhan Mantri Awas Yojana (PMAY). Even then, RAY is still considered as a unique program, which aimed for slum free India and had been implemented in some states and have a successful story.

#### *Pradhan Mantri Awas Yojana (PMAY)*

The Mission is to be implemented during 2015-2022 and will provide central assistance to Urban Local Bodies (ULBs) and other implementing agencies through States/UTs for:

1. In-situ Rehabilitation of existing slum dwellers using land as a resource through private participation
2. Credit Linked Subsidy
3. Affordable Housing in Partnership
4. Subsidy for Beneficiary-led individual house construction/enhancement.

Credit linked subsidy component will be implemented as a Central Sector Scheme while other three components will be implemented as Centrally Sponsored Scheme (CSS). The 'Housing for All' scheme will replace all previous government housing schemes such as the Rajiv Awas Yojana, which aimed for Slum free India. The Mission will be implemented through four verticals giving option to beneficiaries, ULBs and State Governments. These four verticals are as below:



**Fig. 2. Four verticals of PMAY Mission**

The following paragraphs give a brief account of these verticals.

#### *'In-situ' Slum Redevelopment using land as Resource*

'In-situ' slum rehabilitation using land as a resource with private participation for providing houses to eligible slum dwellers is an important component of the 'Pradhan Mantri Awas Yojana – Housing for All (Urban)' mission. This approach aims to leverage the locked potential of land under slums to provide houses to the eligible slum dwellers bringing them into the formal urban settlement. Slums, whether on Central Government land/State Government land/ULB land, private land, should be taken up for 'in-situ' redevelopment for providing houses to all eligible slum dwellers. Slums so redeveloped should compulsorily be denotified. State/ULB can also consider clubbing of nearby slums in clusters for in-situ redevelopment to make them financially and technically viable. Such cluster of slums can be considered as a single project. A viable slum rehabilitation project would have two components i.e. 'slum rehabilitation component' which provides housing along with basic civic infrastructure to eligible slum dwellers and a 'free sale component' which will be available to developers for selling in the market so as to cross subsidize the project.

#### *Credit-Linked Subsidy Scheme*

Beneficiaries of Economically Weaker section (EWS) and Low-Income Group (LIG) seeking housing loans from Banks, Housing Finance Companies and other such institutions would be eligible for an interest subsidy at the rate of 6.5 % for a tenure of 15 years or during tenure of loan whichever is lower. The Net Present Value (NPV) of the interest subsidy will be calculated at a discount rate of 9 %. The credit linked subsidy will be available only for loan amounts up to Rs 6 lakhs and additional loans beyond Rs. 6 lakhs, if any, will be at nonsubsidized rate. Interest subsidy will be credited upfront to the loan account of beneficiaries through lending institutions resulting in reduced effective housing

loan and Equated Monthly Instalment (EMI). Housing and Urban Development Corporation (HUDCO) and National Housing Bank (NHB) have been identified as Central Nodal Agencies (CNAs) to channelize this subsidy to the lending institutions and for monitoring the progress of this component. Preference under the Scheme, subject to beneficiaries being from EWS/LIG segments, should be given to Manual Scavengers, Women (with overriding preference to widows), persons belonging to Scheduled Castes/Scheduled Tribes/Other Backward Classes, Minorities, Persons with disabilities and Transgender.

#### *Affordable Housing in Partnership (AHP)*

The third component of the mission is affordable housing in partnership. This is a supply side intervention. The Mission will provide financial assistance to EWS houses being built with different partnerships by States/UTs/Cities. To increase availability of houses for EWS category at an affordable rate, States/UTs, either through its agencies or in partnership with private sector including industries, can plan affordable housing projects. Central Assistance at the rate of Rs. 1.5 Lakh per EWS house would be available for all EWS houses in such projects.

#### *Beneficiary-led Individual House Construction or Enhancement*

The fourth component of the mission is assistance to individual eligible families belonging to EWS categories to either construct new houses or enhance existing houses on their own to cover the beneficiaries, who are not able to take advantage of other components of the mission. Such families may avail of the central assistance of Rs. 1.50 lakhs for construction of new houses or for enhancement of existing houses under the mission. A beneficiary desirous of availing this assistance shall approach the ULBs with adequate documentation regarding the availability of land owned by them. Such beneficiaries may be residing either in slums or outside the slums. Beneficiaries in slums which are not being redeveloped can be covered under this component if beneficiaries have a Kutcha house.

### **Conclusion**

Rajiv Awas Yojana (RAY) has overcome the lapses of initial slum development programs and has many positive features. But the implementation of RAY till its mission period did not happen. This paper has documented the positive features of that program even though, this was not fully implemented. But the salient features of RAY have been taken into PMAY and the strategy has been adopted in in-situ slum redevelopment. Irrespective of the name of the Mission RAY or PMAY, the improvement of the lives of slum people is important and that should be achieved as per the mission target.

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## DECENTRALISED PLANNING AND DEVELOPMENT - KERALA EXPERIENCE

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### Abstract

*Decentralisation as a development strategy was recognised and acted upon since formation of Kerala. Setting a theoretical frame and the national context for decentralisation, this paper deliberated on various initiatives in Kerala that had culminated in a remarkable experiment of people's plan campaign for local level planning. Several useful lessons can be drawn. However, there are also challenges to sustain Kerala's accomplishment and firm up decentralisation through multi-level planning.*

**Keywords:** Decentralisation, Participation, People's plan, Panchayat

### Introduction

Decentralisation is a strategy for local level development. It proposes to bridge development gaps, bring distributive justice and equality, wise-use of local resources and address aspirations of local people. Strategically, it calls for transfer of political, administrative and fiscal power to the lower tiers below national/sub-national level as the case may be. Over 75 countries in the World are experimenting with decentralisation (Ahmad et al, 2005). It is often argued in case of India that given the spatial variations of natural resource endowment, development potential, levels of development and socio-cultural differences, a single development strategy, hitherto followed for the entire country may not bring the desired results (Gadgil, 1967, Misra and Sundaram, 1980, Raj 1971, Ghosh, 1988). The multi-level decentralised planning was suggested to commensurate the spatial variations in resource distribution, and to address inter-regional and intra-regional disparity in development and heterogeneity in social structure. Since Independence there were various attempts in the country to pursue the path of decentralised development and finally in 1992-93 Constitutional amendment mandated all the States to introduce Panchayat Raj System with necessary political, administrative and financial powers.

Kerala's attempt for decentralisation began immediately after formation of the State in 1956 and installation of an elected Government in 1957. After a series of abortive attempts the State implemented decentralised planning in 1996 by launching People's Plan Campaign (PPC) (Charvak, 2000), which is considered as a paradigm shift in democratic decentralisation and earned global attention (Thomas Isaac & Franke, 2000; Franke, 2008; Heller, 2005, 2008; Tornquist, 2001 Gopinath, 2009). This paper proposes to discuss the history of decentralised planning in Kerala and various other initiatives that underpinned PPC. As a prelude, it is felt important to briefly deliberate on theoretical issues of decentralisation and India's attempt for decentralisation including constitutional amendment.

*Theoretical Framework of Decentralisation*

Decentralisation and centralisation represent two ends of a single continuum (Torrissi et al., 2011). Through decentralisation, the geographical space is functionally rescaled to serve specific purpose. Development is one of the purposes for which decentralisation is considered a strategic initiative. Space, place and region are part of the core concepts in Geography. In post-colonial period, regional planning evolved as part of Government initiatives in many countries around the World and suitable institutions have been built. A new professional field developed and consensus emerged about the theory and practices of regional planning (Friedmann and Weaver, 1979) and various disciplines got involved. Area development, decentralised development, and multi-level planning figured in the deliberations of regional planning and development at the national and sub-national levels (Sundaram, 1983, FAO, 1985, Sundaram, 2017).

Pike et al (2006) reviewed the main concepts and theories of local and regional development in the context of all prevailing development theories and observed that 'local and regional development adopts a territorial approach as a means of achieving economic development. The diagnosis of the economic, social and institutional conditions of every territory and the identification of local economic potential are the foundations upon which such development strategies are built.' The territoriality is an important dimension of local level development (Tello, 2010). It recognises heterogeneity of geographic space. Decentralisation aims to optimise utilisation of local natural and human resources, address aspirations of the local people, empower them to participate and take decisions, search for local solutions to address local problems and also to contextualise local problems in the larger decision-making frame or prevailing political and economic conditions. Broadly, there are six elements to pursue decentralised development. These are (i) territoriality, (ii) mobilisation, (iii) public participation, (iv) local ownership and management, (v) multi-disciplinarily, and (vi) nesting and integration.

Decentralisation as a development strategy has advantages and disadvantages. While there are many advantages, specially, in the matter of efficient delivery of services and public goods and better matching policy and needs of local people, questions are often raised about the capacity of the local bodies to address larger economic issues and overcome territorial disparity. To address these concerns, the concept of multilevel planning and decentralization go hand in hand. There is also ideological contestation about the term decentralisation. While the policy literature and multilateral donors usually focus on the efficiency dimensions of decentralised local government, civil society groups and social movements have tended to emphasise participation to create wider space for 'expanding the role of public powers to underwrite social citizenship' (Heller, 2005:80, Heller, 2008). The left intellectuals consider decentralisation as a means to carry class- struggle forward and to empower the people with rights (Patnaik, 2004). They try to distance their efforts from the market driven initiatives which encourage NGO patronised self-help groups in the villages with little or no concern about entitlement. This philosophical positioning is significant in understanding Kerala's decentralisation, which stresses on empowerment, entitlement and welfare.

*National Initiatives for Decentralisation and Constitutional Amendment*

Decentralisation in India, particularly rural decentralisation through Panchayati Raj Institutions has generated wide spread interest across the World (Johnson, 2003, World Bank, 2000, UNDP, undated). It proposes to address some of the vital issues concerning basic necessities of the human society- poverty alleviation, provisioning of public services, change in social, economic and cultural lives, improvement of quality of life, empowerment, and ensuring human dignity and meeting aspirations. Gandhiji's vision of 'Gram Swaraj' through universal education, economic self-sufficiency and village democracy forms the bedrock of India's attempt of decentralised development in rural areas. Since Independence there had been various initiatives and committees formed to introduce decentralisation (Table 1). All these commissions acknowledged importance of democratic decentralisation and necessity of Panchayat Raj institutions, thereby prepared the ground for 73<sup>rd</sup> and 74<sup>th</sup> constitutional amendment to provide Panchayats and Municipalities the constitutional status (Jha, 1999). The article 243 G envisaged development functions of Panchayats as (i) preparation of plan for economic development and social justice and (ii) the implementation of schemes for economic development and social justice as may be entrusted to them including those in relation to the matters listed in the Eleventh Schedule. The States have been mandated to hold elections for local self-governments and create all necessary provisions to devolve administrative and financial powers to the lower tiers (Government of India, 1993). The Gram Sabhas are given a key role in the process of PRI system. Both the Central and State Governments are expected to play the role of facilitator by establishing and nourishing the village Panchayats as effective self-governing institutions.

*Decentralisation in Kerala*

Technically late starter, however, the State has out-shone all other States in the country in the matter of implementing Panchayat Raj system and ushered a new beginning in democratic decentralised by launching People's Plan Campaign (PPC) in 1996. How did Kerala succeed to chalk out its own course of action and achieve many of the goals of decentralisation? A question often debated at the national and international deliberations. During course of the discussion, we shall also try to broadly address this question.

*Preparatory Phase/ Strengthening the Basics*

Modern Kerala was formed in 1956 amalgamating princely states of Travancore and Kochi and Malabar part of Madras Presidency under colonial rule. The State covers 38860 km<sup>2</sup> area and accommodates 33 million people. Around 28% of geographical area is administered by forest department and therefore lies beyond the jurisdiction of Local Self Government institutions. At present there are 1200 local self government institutions comprising 941 Gram Panchayats, 152 Block Panchayats, 14 District panchayats, 87 Municipalities and 6 Corporations. Geographically, Kerala's set up facilitates decentralisation (Chattopadhyay and Franke, 2006). Universal availability of water and topographic set up promoted dispersed settlement pattern. To cater to the need of dispersed population, the public service facilities like educational institutions, health care

facilities, markets, post and communication network etc. are decentralised. The historical legacy of distributed service facilities continued and further strengthened after formation of the State. We briefly discuss here some of the activities that have contributed to decentralization and PPC.

**Table 1. Chronology of attempts for decentralisation and committee reports**

Year	Item	Ideas and concepts
First plan 1951-56	Community Development Blocks (CDB)	To break up the planning exercise into national, state, district and local community levels
Second Plan 1956-61	District Development Councils	Drawing up of village plans and popular participation in planning through the process of democratic decentralisation
1957	Balwantrai Mehta Committee established	Village, Block, District panchayat institutions established
1967	Administrative Reforms Commission	Resources to be given/local variations accommodated, purposeful plan for area
1969	Planning Commission	Formulated guidelines; detailed the concept of the district plan and methodology of drawing up such a plan in the framework of annual plans, medium-term plans and perspective plans.
1978	Ashok Mehta Committee M L Dantwala report	Review of activities of PRI. Block-level planning to form link between village and district-level planning. Block-level planning to form link between village and district-level planning
1983-84	Centrally Sponsored Schemes / Reserve bank of India	Strengthen district plan/ district credit plan
1984	Hanumantha Rao Committee	Decentralisation of functions, powers and finances; Setting up of district plan bodies and district plan cells
1985	G. K V. Rao committee	Administrative arrangements for rural development; District Panchayat to manage all development programmes.
1992-93	73 and 74 Constitutional Amendment	Constitutional status of Local Self Governments

*Modified after Planning Commission of India (2008)*

*First Administrative Reform Committee:* The general election of 1957 witnessed installation of an elected communist led government for the first time anywhere in the World. It created the ground for political decentralisation based on the Report of the Administrative Reforms Committee (ARC) (1958), which envisaged formation of two tier local government structures in Kerala: one at the Panchayat and Municipal level, and another at the district level. There were proposals to transfer certain power and responsibilities to the elected District councils from the State, and in stages these district councils “will assume full authority over development work in the district except the very

important schemes which may be specifically retained in Government's direct control and function as full-fledged local self-governing units" (Govt. of Kerala, 1958). As the government was dislodged in 1959, these administrative reforms could not be implemented; however, the recommendations of ARC formed the basis of Panchayat Acts in 1990s.

*Land reforms:* The land reform bill which was introduced after formation of elected government in 1950s and 60s could finally be passed in 1969 as Kerala Land Reforms (Amendment) Act and implemented in 1970s put an end to the feudal system and ensured the rights of the tenants. Thus, a large section of people got access to land resources facilitated by government both through legislation and cost sharing (Franke and Chasin, 1989). Land reforms removed landlordism, provided ownership to a majority of people, helped reduction of difference between economic classes, and even minimised caste inequalities (Franke, 1992, Jaydev and Ha, 2015). Given the nature of land in Kerala and its productivity, access to land resource had far reaching impact on socio-economic conditions of people. Land reforms ensured dwelling places for a large section of people, distribution of wealth, social security, and redistribution of power structure.

*Science and Technology Institutes:*

The 1970s is an important decade for Kerala. Apart from implementation of land reforms and labour laws, this decade also witnessed setting up of district planning offices in all district linked with the technical division of State Planning Board. Another significant development was adoption of Science Policy Resolution by the State Government and establishment of a number of research and development institutes dealing with health, industry, economics, earth science, water resource, forest resources and fisheries. These institutes were set up to help the State in its planning process and bring frontier knowledge for development of the State. Subsequently, new institutes were established under Government of India, and State Government. Besides there were new Universities, Professional Colleges, Management and Technology institutes. All these have created an ambience of professionalism and the State is able to draw expertise from these institutes as and when required. Decentralised planning, which considers territorial heterogeneity as opportunity requires location specific precision science and technology and multi-disciplinary approach.

*Civil Society and People's Science Movement:* Kerala has one of the strongest civil societies (Tornquist, 1999). There are different perceptions, meanings, and manifestations associated with the term 'civil society' in the contemporary context (Tandon and Mohanty, 2000). The common denominator of all the formulations is that civil society provides the space for citizens to collectively act for common public goods. With high level of literacy, activism and awareness people are organised voluntarily in a multitude of organisations ranging from socio-religious associations to environmental groups and women organisations. Many of these organisations/ associations were involved in education and health sectors since early part of 20<sup>th</sup> century. Kerala's achievements in health and education can be partly attributed to these initiatives. Many organisations espousing the causes of environment, welfare of the under-privileged groups, women and other socially

marginalised groups emerged after Independence. A strong people science movement (PSM) gathered momentum in the State since 1960 pivoting around Kerala Sasthra Sahitya Parishat (KSSP) with a slogan “Science for Social Revolution” (Ekbal and Thomas Isaac, 1988). Besides, there are various associations and trade unions formed under political patronage. Civil societies in Kerala succeeded to create common platforms to express individual’s concern, develop consensus among different sections of people, spread awareness, promote discussions, and help mediate and negotiate with the authorities for common public goods. As these forces are distributed across the length and breadth of the state, the local issues find their way into mainstream deliberations of policy makers and setting up of development agenda. The idea that the relationship between civil society and government in a democracy should be mutually reinforcing (Tandon and Mohanty, 2000) is perhaps best manifested in Kerala.

*Library Movement:* Library movement in Kerala is a unique feature. It manifests contribution of voluntary effort. Since establishment of the first public library in Trivandrum in 1829 there had been a steady growth and now Kerala can boast of 8182 libraries affiliated to Kerala State Library Council. There are 248 libraries for every one million people in Kerala. The library management is decentralized through District library council and Taluk library council function under the guidance of State Library Council. Functioning of the library, particularly rural libraries include helping students in studies in rural areas, career guidance, book distribution for women, and also nurturing of social and cultural lives of women. More than 1000 libraries opened children’s wing and started book reading competition for children. Libraries are turning into people’s cultural statutory body and help grooming concerned and responsible citizen.

*Environment Movements:* Environmental movement in modern Kerala can be traced to the protest organised by local people of Vazhakkad a village on the bank of river Chaliyar and local fish workers against the Grasim industries at Mavoor in 1964. The Silent valley movement against installation of a hydel power project inundating a segment of virgin tropical rain forest in 1970s was one of the most significant environmental movements not only in Kerala but in whole of India. The project was finally abundant at the instance of Government of India and the Silent valley area was declared as national park in 1985. Other notable movements were: (i) against use of Endosulfan pesticides in the cashew plantations in Kasargod district, (ii) the Plachimada movement in Palakad district in 1998. (iii) Muthanga Adivasi movement in 2001 claiming property rights on land, and (iv) Save river campaign. All these movements testify how struggles of local people bloomed as mass movements. This was possible due to awareness of people and their eagerness to participate for a larger cause of social development. Public participation is an important component for decentralization.

### *Experiments and Actions*

*Total Literacy Campaign:* Kerala has remarkable achievement in spreading literacy. It was the first state to be declared total literate. The new education policy (NEP) of Government of India adopted in 1986 stressed on decentralization, social mobilization and

integration for removing illiteracy (Government of India, 1995). It kept provision for actively involving voluntary agencies, groups and interested individuals to spread elementary education. The new policy also considered it necessary to integrate adult literacy and non-formal education programmes with socially relevant themes like family planning, health care, environment and nutrition. The situation in Kerala was ripe to take advantage of this new policy. The KSSP, which launched its own literacy mission in 1977, played an active role and along with district administration launched the total literacy programme under the aegis of Total Literacy Mission for Ernakulam district in 1989. 42 voluntary organization and groups participated in the total literacy campaign in Ernakulam district (Sivadas, 1991). It took the form of a mass movement with people voluntarily participating not in the programme alone but also in meeting local logistics. The atmosphere was socially charged both for illiterates to learn and for literates to avail the opportunity to teach (Tharakan, 1990). It is important to note that total literacy programme in Kerala was not only limited to enable people read and write, but also to spread awareness about other social and environmental issues and to make people conscious and cultivate self-dignity. It was thus a silent social revolution that brought attitudinal change among the illiterates (Rajan, 1991). Regional and localized approach followed in Ernakulam district and subsequently in the entire State of Kerala was a key element for the success of total literacy programme as distribution of illiterate people varied spatially and also across the social structure. Total literacy campaign manifested the importance of synergy of Government, Civil Society and common people, power of mass mobilization and necessity of decentralized approach in accomplishing the task of executing socially useful programmes.

*Participatory Panchayat Resource mapping (PRM):* While the total literacy campaign was underway, one of the Research and Development Centres in the State, CESS was experimenting with micro level resource mapping in Ulloor Panchayat in the suburb of Thiruvananthapuram city to generate biophysical resource data for local level planning (CESS, 1991). This experiment was finally perfected as Participatory Panchayat Resource Mapping (PRM) programme in collaboration with social science professionals and KSSP (CESS 1991, 2000; Chattopadhyay et al 1999, Chattopadhyay et al., 2004). The programme involves a series of activities starting with environment building to finalisation of action plans (Table 2). It may be reasonably argued that Ulloor exercise followed by Kalliasseri experiment inspired much of Kerala's decentralized planning effort in subsequent years (Chattopadhyay and Franke, 2006). The PRM has been completed for all panchayats in Kerala under the guidance of Kerala State Landuse Board (KSLUB) and data are being used for panchayat level planning, in particular, for watershed management.

*Panchayat Raj Act (1994):* The 73<sup>rd</sup> and 74<sup>th</sup> constitutional amendment provided mandatory provision to set up democratically elected three tier panchayat raj system in all the States in India. Accordingly, the Legislative Assembly of Kerala passed the Panchayat Raj Act, 1994. It conformed to the mandatory provision of the Constitution. The three-tier system consists of Gram Panchayat, Block Panchayat and District Panchayat. This is in variance of all previous attempts to decentralize through two tier systems of district council and panchayats and conceiving district governments with jurisdiction over rural and urban

areas (Thomas Isaac and Franke 2000). As mandated by 73<sup>rd</sup> Constitutional amendment Government of Kerala also appointed a Finance Commission for fiscal devolution.

*People's Campaign for Decentralised Planning*: 1996 was a watershed year for decentralised planning not only in Kerala but also in India and many other developing countries experimenting on decentralisation. People's campaign for preparation of 9<sup>th</sup> Plan (1996-2001) was launched. Kerala's many movements and experiments in democracy, equality, and participation culminated in this remarkable experiment in local democratic planning and decentralised development (Chattopadhyay and Franke, 2006). The newly constituted State Planning Board (SPB) in Kerala made full use of all constitutional provisions and spelt out an innovative course of actions. The brochure issued by the State Planning Board in 1996 stated that

'35–40 per cent of the Ninth Plan programme will consist of schemes formulated and implemented by the local bodies within the respective areas of their responsibilities. In order to empower the panchayats and municipalities to undertake this task in a scientific and participatory manner the board resolved to organize a people's campaign for Ninth Plan'.

To implement this programme, that Bandyopadhyay (1997) termed as innovative, audacious and original, the details were meticulously worked out and acted upon. (Table 3). Details pertaining to all these steps have been elaborately discussed in Thomas Isaac and Franke (2000). This programme substantially decentralised the functions of the government bureaucracy and introduced decentralised planning while mobilizing the energy of hundreds of thousands of activists and volunteers to go beyond what government-funded projects could accomplish.

**Table 2. Activities for executing PRM programme**

Phase/ Type of Activity	Details
Environment building	Interaction with the panchayat and NGO. Campaigning in the panchayat, preparing ground for initiating the programme. Formation of a PRM committee. Conducting PRA as entry programme.
Training materials and guide book	Preparation of materials for training volunteers, like hand outs, sample maps and other required materials. Guide book for master volunteers and other professionals.
Selection of volunteers	Selection of at least five volunteers from the local people in each Ward/ Village/ hamlet/ unit area of 1-2 km <sup>2</sup>
Training of Volunteers	A. Training of master volunteers, who will lead the team and coordinate the work at the panchayat level, preferably in a R&D Institute B. Training of other volunteers in the respective panchayat
Mapping by volunteers	Landuse and asset mapping in cadastral scale follows training of other volunteers. Consolidation and re plotting of mapped data continue.



Mapping by Professionals	Mapping of land form, surface material/ soil, water potential and other relevant details in desired scale (1:12,500 or in cadastral scale for smaller area)
Finalisation of maps	Finalisation of all maps, preparation of short write up and preparation of environmental appraisal map for discussion at the panchayat
Action planning	Presentation of maps in the panchayat and developing an action plan map through interaction with the panchayat. Appraising PRM committee/ Panchayat about the resources, potentials and problems of the panchayat.

Source: Compiled from CESS, 1991, Chattopadhyay et al, 1993

It was not simply to draw plan from below, rather it strived to bring about attitudinal transformation of the participants. This was not possible through executive government order. It required continuous engagement, creativity and the social logic of the movement. The campaign gave training to thousands of local officials and activists in what must be one of the most extensive adult education and empowerment programmes conducted anywhere in the world (Table 4). The campaign raised consciousness about the local resource base, problems encountered by local people and environmental issues in development planning in Kerala. It built upon the PRM we discussed before and inspired several local communities to create innovative projects in environmental protection and sustainable resource management. Panchayats started preparing their own development reports- 'Vikasana Rekha' and identified projects. These Development reports comprised eight chapters – introduction, development strategy, resource mobilization, sectoral programmes, integrated development, welfare of scheduled castes and scheduled tribes, women's development and monitoring. All panchayats in Kerala have their own plan and development reports. There are 12 task forces formed to look after all development sectors of (i) agriculture and irrigation, (ii) animal husbandry, social forestry and fisheries, (iii) industry, (iv) energy and housing, (v) transport and tourism, (vi) education, (vii) health, (viii) drinking water and sanitation, (ix) women and development, (x) welfare of SC/ST, (xi) culture and (xii) resource mobilisation.

*Plan Integration and Technical Support:* Plan integration at hierarchic level is an important aspect of decentralized development. This integration was supposed to be organized in such a way that the plans of the higher tiers complemented those of the lower tiers. Integration was also planned for the ongoing centrally sponsored schemes implemented through the community development blocks. At this point it was realized that the District Planning Committees did not have sufficient technical staff to undertake proper scrutiny of the vast number of projects that emerged from the Grama Panchayats. To deal with this problem, campaign organizers came up with the idea of appealing to Kerala's many retired but active experts. Four thousand volunteers were mobilized as Volunteer Technical Corps (VTC) who gave at least one day per week of free time to help evaluate and improve the project proposals prepared by the Gram Panchayats. Around 50% of VTC were Graduates, Post graduates, M.Phil and Ph.D degree holders and another 41% were professional.

The VTC later merged with other expert groups to become the Expert Committees that helped bypass contractors and reduce corruption. The Voluntary Technical Corps were expected to provide the expertise required at the Block or Corporation or District level. The VTC had no right to change the priorities set by the local councils. Local Governments have absolute freedom in formulating and implementing projects based on their priorities, subject to plan guidelines issued by the State Government. There were massive transfer of functions, functionaries and funds within ten months from the beginning of the Campaign during August-September, 1996. Capacity building through training followed giving responsibilities; and accountability followed transfer of power and financial resources. It was one of the most significant institutional reforms in governance.

*Financial Devolution:* Financial decentralization is one of the three pillars of decentralization. Kerala has successfully implemented devolution of Plan funds based on a non-discretionary and equitable formula. The local self governments now receive funds to implement the schemes devised by them. Since 1997-98 an average of 25% of the State's investible resources have been devolved to local governments as development funds (SPB, 2018). Another 9% funds are shared with the LSGs from the States' tax revenue. LSG receives funds under general category, scheduled caste sub-plan and tribal sub-plan. The outlays are fixed based on recommendations of State Finance Commission as envisaged in Constitutional amendments. However, adequate fiscal autonomy is yet to be granted to the Panchayats who remain heavily dependent on transfers from central and state government.

*Kudumbashree Programme:* This is one of the programmes manifesting strength of local need-based approach, innovation and people's participation. All three are essential components of democratic decentralization and local level development. From a modest beginning as Community Based Nutrition and Poverty Alleviation Programme (CBNP) in Malapuram district in early 1990s, upscaled in 1997 as Kudumbashree and tuned as the main vehicle for poverty eradication in 1998 this programme has come a long way and succeeded to 'alter lives of poor women in the state, change their perception, rebuild their confidence, boost their morale, rediscover their dignity and honour, empower them economically, socially and politically' (Jose undated). The Kudumbashree programme acclaimed nationally and internationally, is considered as a model programme worth emulating by other Indian States. Kudumbashree mission is a comprehensive self-help group-based activity. It can boast of 4.4 million women participants or 25% of total female population in the State in 2017. There are 2,77,175 Neighbourhood Groups (NHGs), 19,854 Area Development Societies (ADS) and 1073 Community Development Societies (CDS) distributed in all the districts. Kudumbashree executes programmes in close cooperation with local self-government organizations. This positive linkage has great potential in facilitating women to enter in local self-government institutions (John, 2009) and thereby further strengthening and deepening democratic decentralization.

**Table 3. Major Phases of People's Plan Campaign for Democratic Decentralization**

Phase	Dates	Objective	Activities
1. Grama Sabha/ward convention	August-September	Identify felt needs of the people; generate participation and interest in the Campaign	Meet at local school or other location; plenary sessions and small group discussions, listing of local problems
2. Development Seminars	October-November	Assessment of resources, development problems and tentative solutions	Collect data at local offices; carry out transect walks; write local development reports; conduct development seminar
3. Task Forces	December	Turn proposals from Development Seminars into formal projects	Meet, discuss, and draft project proposals
4. Village and Municipal Councils	January	Finalize local plan	Prioritize projects; draft and approve local plan
5. Block and District Councils	February	Finalize block and district plans	Analyze local plans; integrate them and develop appropriate complementary projects
6. Volunteer Technical Corps-Expert Committees	February-March	Appraisal and technical corrections to projects	Read, evaluate, suggest improvements to projects. Assist panchayats to make viable projects
7. Release of Funds, Project Implementation, Monitoring, and Evaluation	March-June	Implement and monitor the projects in the local plan	Open accounts, draw checks from treasury, set up beneficiary committees, hire contractors, activate monitoring committees

Note: Dates during the first year of the Campaign, 1996–97, were significantly delayed.  
Source: Thomas Isaac and Franke 2002:4

**Table 4. Details of the Training Programme, People's Plan Campaign, 1996****1. Training Module Topics:**

Challenge of development, Philosophy of decentralization, Local rules and statutes, Role of Grama Sabhas, Participatory Rural Appraisal (PRA) techniques, Secondary data collection and analysis, Preparation of development reports, Project preparation, Plan document preparation, Plan Appraisal, Sectoral development perspectives, Implementation of projects, Micro level development models, SC, ST and gender issues, Resource mobilization.

**2. Training personnel:**

- i). 600 Key Resource Persons (KRPs) or state level experts got 20 days training.
- ii). 15,000 District Resource Persons (DRPs) got 14 days training.
- iii). 1,00,000 Local Resource Persons (LRPs) got 3 days training.
- iv). 10,000 Volunteer Technical Experts enrolled.

**3. Composition of the trained personnel:**

Women 24.82 per cent  
SC/ST 2.75 per cent

Government Officials 5.47 per cent

Others 66.96 per cent

Note: Composition percentages in section 3 are overlapping

Source: Kerala State Planning Board, Thiruvananthapuram 1998; cf Thomas Isaac and Franke 2002:68–69, 76–77, 164 and 177–79.

### Lessons

Kerala's development history demonstrates 'that critically examining one's context and making, by mass protest if necessary, the appropriate adjustments leads to a radically healthier, egalitarian, and meaningfully informed society' (Brown, 2013), which is the goal of decentralisation and sustainable development. There are several lessons to note from Kerala's experience (Oomen, 2004, Heller, 2005, Jafar, 2014). These are useful to understand the process of decentralised planning and development. Other States in India striving to implement democratic decentralisation may also find them applicable. The architects of the programme could successfully infuse a belief among academicians, researchers, politicians, people spearheading science movements, and larger society that decentralisation is necessary for sustainable development of Kerala. Existence of 'a differentiated civil society- both an effect and cause of movements-more than anything else that explains the cumulative and in particular democratising impact of social movements in Kerala' (Heller, 2005). When PPC was launched, Kerala society was perhaps ready for such a big bang in participatory development. Kudumbashree movement which got strengthened through PPC provides important lessons for other States for capacity building and poverty alleviation.

### Five Future Challenges

Two decades have passed since introduction of PPC. There had been perceptible changes in plan formulations at the ground level and several milestones have set. There were also changes in modus operandi with change in Governments and their priority. Nevertheless, the process set by PPC continued with varying momentum. There are a couple of issues that warrant due consideration. Spatial and sectoral integration remain a challenge. Participation at the Gram Sabha level is found to be waning and the enthusiasm is missing in many cases. Degeneration and corruptions have crept in. Beneficiary committees introduced recently are expected to address these issues. One of the significant events in Kerala is unprecedented growth of urbanization. Around 48% of total population in Kerala now lives in urban areas. Formulation of plans for Urban Local Governments is an important issue in decentralized development of Kerala.

*District Plan:* Preparation of district plans is mandatory as envisaged in 73<sup>rd</sup> and 74<sup>th</sup> constitutional amendments. There are several attempts in various States across the country to workout district plan as a part of the exercise of decentralized planning. However, the approach was mostly centralised and top down. Constitutional amendments clearly spelt out that the district plan will be a consolidation of the plans prepared at the lower tiers of Block and Gram Panchayats. It was also constitutionally mandated to establish the District Planning Committees (DPC) to accomplish the task of consolidation.

Although there were some attempts to develop district level data base (Chattopadhyay and Chattopadhyay, 1995, Mridul et. al., 2000) the task of consolidation of panchayat plans is yet to be accomplished. The Planning Commission of India (2008) brought out a manual for 'Integrated District Planning' and there were some attempts to prepare district plans without much progress. The district plan must have the scope and space for nesting and spatial integration. Recently Government of Kerala took renewed interest for preparation of district plans by District Planning Committee as part of PPC phase II. How far it strengthens regionalisation and decentralisation remains to be seen.

## Conclusion

Since formation of the State in 1957 there were attempts to introduce political and administrative decentralisation. However, most of these attempts were of limited success till launching of PPC in 1996. With constitutional mandate the State could initiate political, administrative and fiscal decentralisation and has succeeded to a considerable extent. Various state initiatives, reforms, social and science movements, and civil society have contributed in Kerala's achievements. Other States in India can learn from Kerala's experience. If the six principles of decentralisation-territoriality, mobilisation, participation, local ownership and management, multi-disciplinarity and nesting and integration are considered, the most spectacular achievements are in the matter of mobilisation, participation and multi-disciplinary approach. The PPC succeeded to create a socio-political-technical space for participation and dialogue and force public discourse on decentralised development. It is important to build over that base introduce territoriality, ownership and integration, and strengthen local self-government institutions to firm up decentralization through multi-level planning.

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# GEOGRAPHICAL INFORMATION SYSTEM AND CRIME MAPPING - A STUDY OF AJMER CITY, RAJASTHAN

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## Abstract

*Crime mapping using GIS tools provides a basic criminal investigative analysis that includes activities such as geographic profile and specific case support-based crime investigation. The study deals with crime mapping and identification of clusters and hot spots of crime prone zones of Ajmer city. It helps delineation of the susceptible pockets of crime in the area on the basis of concerned socio-economic parameters. Such GIS enabled crime maps provide law and order force an assistance in strategic planning, crime analysis, and operations (Thangavelu, Sathyaraj, and Balasubramanian, 2013). Its basic objective is to identify the probability of occurrence based on past incidence of various crime locations. They provide spatial crime hot spots so that police can plan better surveillance and scheduling so as to minimize crime incidence and take preventive action in short time based on minimum distance maps. As per the scope it provides a spatial decision-making system to Ajmer city police for better surveillance scheduling of a year. The study also presents alarming results for the concerned administrative departments as it indicates some strong correlations between the socio-economic parameters and crime sprawl. This research also showcases some alarming facts about rape occurrences in the Dargah region of Ajmer city. The paper facilitates Ajmer city police in spatial crime mapping and demarcation of hot spot zones towards better crime prevention control. This macro level research intends to benefit and assist the police officials towards generating their surveillance plan and crime control strategy in the region.*

**Keywords:** Spatial Crime Mapping, Hot Spot Analysis, Geospatial Techniques, Surveillance Plan, Crime sprawl.

## Introduction

Crime is an exercise done by an individual or a group of persons which is unethical, harmful and unsocial to the society. Crime can be the consequence of illiteracy, poverty, or revenge (Ansari and Kale, 2014). Crimes that occurred and crimes solved for a particular duration may not be that effective in India. Crime mapping is done physically to help trace suspects and establish their modus operandi in most of the states in India. It helps the police determine areas where a particular group of suspects or individuals are active. A wide range of socio economic variables is classified including household income, educational achievement, employment status, and poverty status; other demographic variables age, religion and race are also taken into consideration. The relation between these variables and crime type provide understanding of crime in a spatial context (Mitchell, 2011).

On the basis of compared data, police officials trace local suspects and enhance patrolling in the affected areas. GIS is gradually picking as an important technology for social crime prevention systems in India. Present Geographic Information System (GIS) provides an opportunity for crime analysis and makes available inputs to crime prevention planning. The spatial research facilitates towards better community policing rather than analytical prediction. Crime mapping using GIS tools provides a basic criminal investigative analysis that includes activities such as geographic profile and specific case support-based crime investigation. Such GIS enabled crime maps provide law and order force assistance in strategic planning, crime analysis, and operations (Thangavelu, Sathyaraj, and Balasubramanian, 2013). Patrolling must be conducted scientifically after clearly studying crimes to leverage confidence and to install a sense of security among all citizens.

In this study various types of crimes such as robbery, home/shop breaking, automobile theft, kidnapping, rape, murder and other theft were considered. By preparing hotspots of various crimes mentioned, police can crackdown on criminals based on previous incidents of various years. The crime incidences are recorded based on coordinates using GPS system and fed using a tool so as to generate maps with colour coding for crime analysis. The basic idea of this is not only to curb the crime but can provide a quick response by police patrolling units which are nearby. The system which is used for capturing, storing, converting data format, exploring and displaying geospatial data is known as Geographic Information System (GIS). The Geospatial data also known as geographically referenced data defines both the location and the characteristics of the part called spatial feature which may contain roads, land extents, and vegetation on the Earth surface (Shahebaz and Kale, 2014).

Geography of an area plays a dominant role in the spread of crime, as physical landscape and terrain can strongly define the type and pattern of crime. The connectivity and inaccessibility of locations, transport network, economic profile and political scenario of an area governs crime. It may be home, work place or any other place which is in proximity to it (Ravi, Sarvesh, and Parul, 2016). Crime patterns change over space and time in an area and GIS maps and spatial crime patterns to capture and study the patterns for better crime control are of immense help to the police (Pramod Kumar, Ravikumar, and Soma, 2012). For crime prevention sufficient allocation of resources is very important. GIS can be used as a tool to identify factors that are contributing to crime, by creating crime maps and providing solution to society through crime analysis by getting Clusters and Hotspots (Saravanakumar and Revathy, 2016). The ability to access and process information rapidly while displaying it in a spatial and visual medium permits agencies to distribute resources quickly and more effectively. GIS can aid with huge amounts of location-based data from multiple fronts. It enables the user to layer the data and view the data most critical to the particular problem or operation (Johnson, 2000).

The appropriate tools of both spatial and statistical analyses such as neighborhood and correlation analysis, etc. from GIS can be used in the study area for mapping liable crime prone spots (Olajuyigbe, Omole, Bayode, and Adenigba, 2016). Geospatial

technologies help to capture the spatial heterogeneity of the different types of criminal activities and security resources and thus to start a spatial connection between the events in a specific region of attention (Kaura, et al., 2014). GIS permits police force to plan properly for emergency response, decide mitigation priorities, analyze historical events, and forecast future events (Sangamithra, Kalaikumar, and Karthik, 2012). Crime is a major issue, where an efficient analysis of different remote sensing techniques is accomplished for crime investigation by crime investigation agencies (Napoleon et al, 2017). One of the major activities that has to be performed by crime investigation department is mitigation of hot spot locations where the number of crimes are more (Sivaranjani and Sivakumari, 2015). Using hotspot techniques such as spatial analysis, interpolation and spatial autocorrelation the areas of high concentration crime can be found (Ansari and Kale, 2014). Such hotspots are small zones that have a great deal of crime or a disorder, even there may be no common criminal; and crime analysis try to link these to underlying social situations (Eck, Chainey, Cameron, Leitner, and Wilson, 2005). Though there is no theoretical basis, hotspots are areas of imaginary boundary where there is recurrence of crime incidents (Divya, Robinson, and Selvan, 2014).

Crime analysis is the method used by the law enforcing agencies to lessen, avoid and solve crime problems with criteria that determine the potential crime area for decision support (Nurul Hazwani binti, bin Othman, and bin Selamat, 2012). A strong influence of landuse attracting crime spots are alcohol outlets, certain cultural facilities, commercial buildings, bars and low-income housing colonies; in contrast, transport depots, gardens, grand stands are strongly detracting (Natalia Sypion and Leitner, 2017). Through best path finding which is a situational crime prevention (SCP), pedestrian will analyze the situation first before taking any decision with regard to path so as to lessen chances for the criminal to commit crime (Wan Nawawi, Mohamad Nor, and Abdul Jalil, 2015). The present study focuses on identifying crime prone zones through crime mapping with probability of occurrence based on past incidence of various crimes. It intends to provide spatial crime hot spots so that the police can plan better surveillance and scheduling to minimize crime occurrence and take preventive actions in a short time based on Euclidean distance maps. As per the scope it provides a spatial decision-making system to Ajmer city police for better surveillance scheduling for the year.

### **Study Area**

As per Census of India-Rajasthan-2011, Rajasthan is the largest state in the country, with difficult terrain comprising of desert, forests, mountains, tribal belt, ravines and a long international border. It is also typically hard to reach population groups. Ajmer city is the head quarter of Ajmer district and is a popular religious and tourist destination. Ajmer is a municipal corporation with 55 wards with area 219.36 square kilometers. Ajmer city stretches from 26°23' North to 26°23' North and 74°36' East to 74°40' east geographically. Ajmer city has four national highways namely NH-8, NH-58, NH-79 and NH-89. The city has nine Police Stations (PS) and one *Mahila Thana* (Women Police Station) (Ravi, Sarvesh, and Parul, 2016).

## Objectives, Data and Methodology

The objectives of the study are based on the scope of the study so as to attain the expected results. They include crime mapping and identifying clusters and hot spots of crime prone zones; delineating the susceptible pockets of crime on the basis of concerned socio-economic parameters and conduct a spatial investigation of rape incidences in the Dargah region of Ajmer using geospatial techniques.

**Table 1. Demography details of Ajmer city**

Item	Persons	Males	Females	Ratio / Percent
<b>Population</b>	542,321	278,545	263,776	947
<b>Literacy</b>	416,511	226,757	189,754	76.8%
<b>Illiteracy</b>	125,810	51,788	74,022	23.2%
<b>Workers (Total)</b>	174,922	143,668	31,254	32.2%
<b>Non-Workers</b>	367,399	134,877	232,522	67.8%

Source: Census Commissioner, India, 2011

The study has been undertaken as a pilot study to understand various Geospatial tool usages in crime analysis by means of primary data collected from all police stations of Ajmer city. Interaction with the major stakeholders of crimes to gather domain knowledge has been used in analysis inference.

The crime data falling under all 10 police stations is collected with permission for the categories such as – home breaking, kidnapping, murder, rape, automobile theft, robbery and other crimes. The data collected on ward basis of all 55 wards for six years from 2009 to 2014 has been taken for the study. The socio-economic data of Ajmer city was available for the year 2011 only for sex ratio, non-working and illiterate population which are relevant variables in this context.

**Table 2. Ward wise Crimes and Non-Spatial data of Ajmer city**

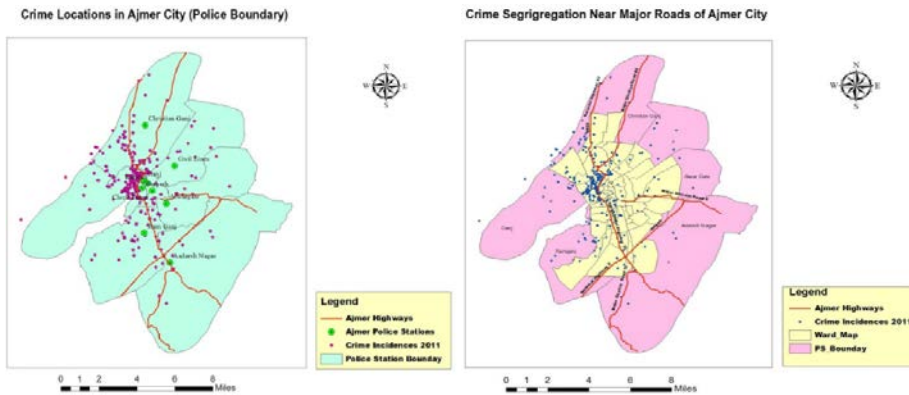
Ward No.	Total Crimes	Total Population	Illiteracy	Non-Working Population	Sex Ratio
01	10	18719	4293	12512	972
02	4	11110	2005	7647	963
03	27	12902	2814	8652	997
04	21	12492	5608	9103	896
05	11	8177	2776	5396	962
06	7	11422	2841	7585	989
07	0	9190	2780	5927	946
08	5	11859	3769	7984	964
09	4	9475	2310	6233	978
10	3	8927	3641	5819	953
11	5	16493	3359	11076	941
12	1	9345	1479	6495	967
13	8	15746	4650	11157	956
14	3	5802	1056	3964	922

15	1	6497	1374	4468	982
16	7	7261	1177	4823	955
17	0	6773	1446	4564	954
18	0	5048	730	3335	947
19	0	6885	1362	4607	924
20	0	4959	1389	3739	969
21	0	5998	1010	4052	968
22	3	6380	1723	4284	898
23	0	11621	4134	8141	957
24	43	10141	3713	6767	944
25	74	9758	2019	6621	955
26	2	9743	1659	6550	990
27	4	5479	782	3792	992
28	1	6312	1318	4270	963
29	0	6051	1052	4004	960
30	1	6376	1091	4331	946
31	4	6784	1435	4670	905
32	0	8885	1604	5985	989
33	1	5807	1101	3704	953
34	0	9479	2068	5694	1133
35	0	9516	1826	6112	958
36	1	5497	895	3669	902
37	4	8919	1420	6279	923
38	0	10057	2355	6882	948
39	5	9128	3461	6279	935
40	0	12121	2482	8382	951
41	0	10382	1578	7285	946
42	0	9295	1470	6366	978
43	0	9861	1743	6733	962
44	0	11918	1990	7934	973
45	0	12901	3178	8703	830
46	6	19069	4161	13105	958
47	6	7067	1213	5014	952
48	0	13392	3109	8410	711
49	1	8199	1278	5414	960
50	2	13486	3260	9552	961
51	1	11505	3232	8111	940
52	3	9793	1891	6611	964
53	2	9909	1886	6549	968
54	0	14860	2140	10006	966
55	11	17550	5674	12052	923

Source: Census Commissioner, India, 2011, Ajmer Development Authority and Rajasthan Police

Ward wise total crimes and non-spatial attribute data collected from Police Stations is provided in Table-2. The crimes register as per different police stations are listed in Table 3 and shown in Figure 1. The 9<sup>th</sup> police station Mahila Thana crime registration was

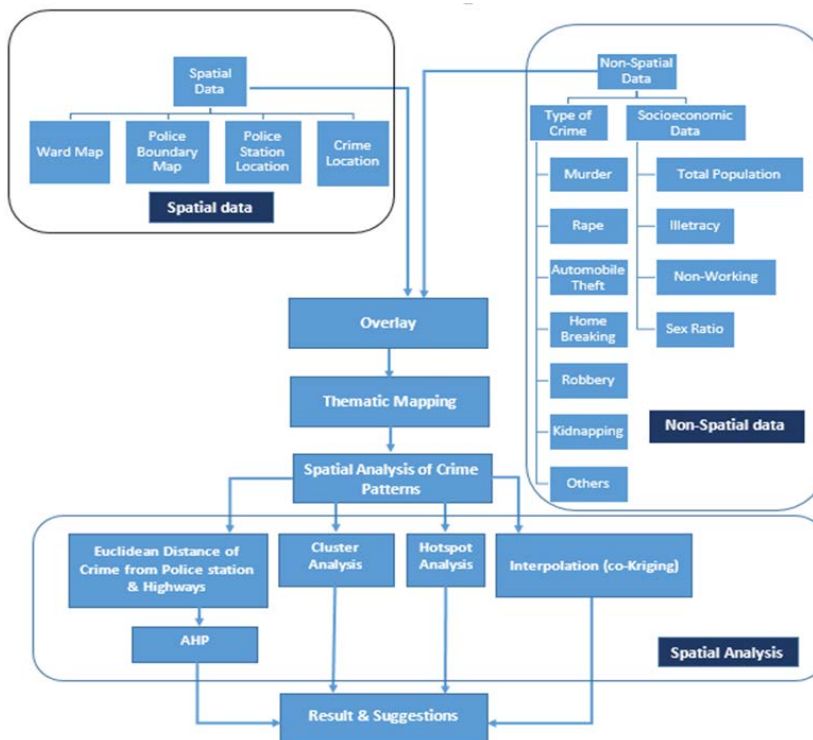
made at Alwar Gate police station itself, as it is located just opposite to Mahila Thana. This is made as per administrative reasons of police establishment of Ajmer city.



**Fig. 1. Crime Location with Police boundary**

**Fig. 2. Crime Segregation near Major Roads**

GPS was used to collect geographic locations of the crime incidence. Census data was collected from Census Department of Ajmer and Ajmer city map were collected from Police Department.



**Fig. 3. Research Methodology Adopted in the Study**

Year-2011 map was analyzed for crime hot spots creation and probability of crime occurring. The distance from police station was created to study the crime forecasting and better planning to curtail crime through surveillance. Susceptibility of rape incidences was measured for effective surveillance (Figure 3).

**Table 3. Various Crimes within Police Station limits of Ajmer city**

S. No.	Police Stations	Automobile Theft	Home Breaking	Kidnapping	Murder	Rape	Robbery	Others	Total Crimes
1.	Adarsh Nagar	4	7	0	4	0	0	5	20
2.	Ram Ganj	9	7	1	1	3	1	4	25
3.	Christian Ganj	21	19	8	8	3	0	16	75
4.	Kotwali	41	4	3	1	4	4	21	78
5.	Ganj	4	0	2	0	3	0	1	10
6.	Dargah	7	2	1	8	5	1	0	31
7.	Clock Tower	16	5	1	3	2	0	3	30
8.	Civil Lines	14	2	0	2	1	3	20	42
9 and 10	Alwar Gate (including Mahila Thana)	12	11	1	4	4	2	9	44
	<b>Total</b>	<b>128</b>	<b>57</b>	<b>17</b>	<b>31</b>	<b>23</b>	<b>11</b>	<b>79</b>	<b>355</b>

### Analysis and Outcomes

The shape files for police boundary and ward map were generated through digitization and the crime locations were plotted as points. A separate shape file for Police stations was created as a point file. Open street map was used to generate national, major and other minor roads of the city through open layer. Crime incidences were later plotted and analyzed to find out the hot spots and probability of crime incidence based on incidents recorded. The densest network of roads in Ajmer city is in wards 3, 7, 8, 9, 15, 16, 22, 23, 25, 27, 28, 29 and 37. The major concentration of crime with respect to distance was noticed along the major district road 85. In Figure 2, the maximum crimes spots are lying nearest to the minor and major roads in the Euclidean distance map. National Highway nos. 89, 79, 58, 48 and 8 passes through the city and maximum concentration of crime is near 58 and 79. The major district roads prone to crime are 79, 85 and 6. Figure 4 indicates that major crime occurrence is very close to the Kotwali, Dargah, Clock Tower and Ganj Police Stations. This old city region is densely populated, has very narrow lanes, and is the overcrowded commercial zone of the area. It can be referred to as the CBD (Central Business District) of Ajmer city in the urban terminology. Though police stations are located in the vicinity, still the crime occurrence is frequent here as observed.

Kriging is basically a statistical method to calculate weights based on neighboring values. It is also known as BLUE (Best Linear Unbiased indicator). For Ordinary Kriging (with Local Mean), all crime locations within the Police boundary were taken as a source data set using a fish net. The basic idea of kriging is to predict the value of a function at a given point (Environmental Systems Research Institute, 2017). Ordinary kriging technique was applied to generate a map for crime location in the neighborhood areas. Co-Kriging was used with crimes as primary variable and the socio-economic indicators with a strong correlation with the primary variable for further prediction. The correlation coefficient of total crimes with non-spatial attributes such as population, illiteracy, non-working population and

sex ratio were taken. Table-4 depicts that illiteracy; non-working population and population are highly correlated with crime. Sex ratio obviously negatively correlated.

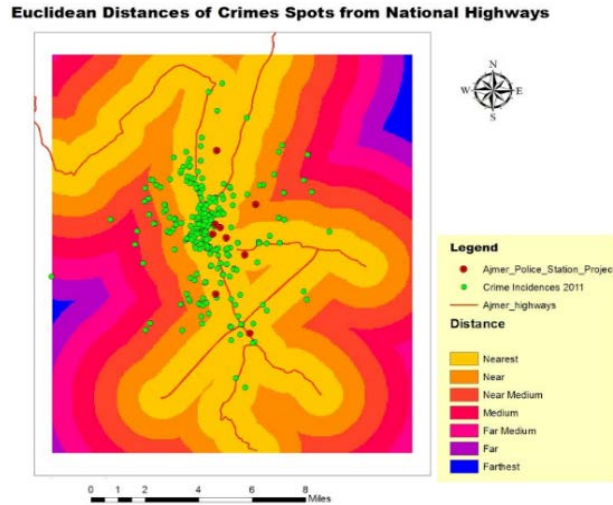


Fig. 4. Euclidean Distance of Crimes from National Highways (NH)

Table 4. Correlation Coefficient between Crime vs Non-Spatial Data

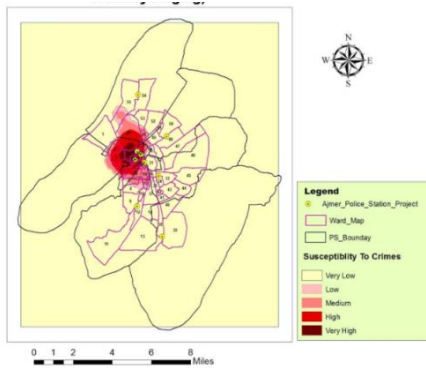
Sl. No.	Non-spatial Attribute	Correlation Coefficient
1.	Illiteracy	0.991974628
2.	Non-Working Population	0.938512548
3.	Sex Ratio	-0.979543878
4.	Population	0.964581285

The results of interpolation technique states that the crimes are more susceptible in the north western and central part of the city in wards 2, 3, 5, 6, 20, 22, 24 and 25. There is a gradual decrease of probability of occurrence in the neighbouring wards 15, 16, 26 and 55. It further becomes very low in the periphery region (as in Figure 5).

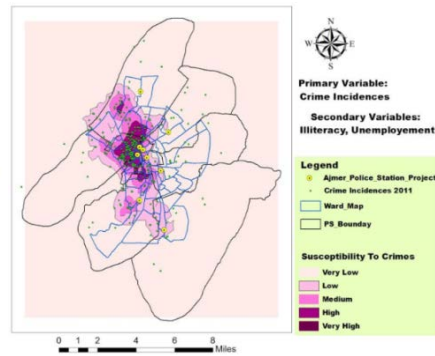
*Co-kriging* requires much more estimation, including estimating the correlation for each dependent variable with the independent variable (Environmental Systems Research Institute, 2017). A very high positive correlation was observed between crime and illiterate and non-working population. Whereas, a very high negative correlation was noticed between sex ratio and the registered rape incidences (as in Table 4).

The Co-kriging technique results were much more accurate and formed three ‘*High Crime Susceptible Regions*’ in the area spread in Dargah, Ganj, Christian Ganj, and Clock Tower. This section of the city is a religious center with hundreds of pilgrims moving in and out of this region which is in ward 55 in the north, 15 and 16 in the south central and rest concentrated in 3,4, 5, 21, 22, 23, 24 and parts of 25, 26 wards. ‘*Medium Crime Susceptibility*’ is observed mainly in wards 55, 2, 8, 10, 36, 17, 18, 29, and 27. The surrounding regions have low and very low susceptibility of crimes (as in Figure 6).



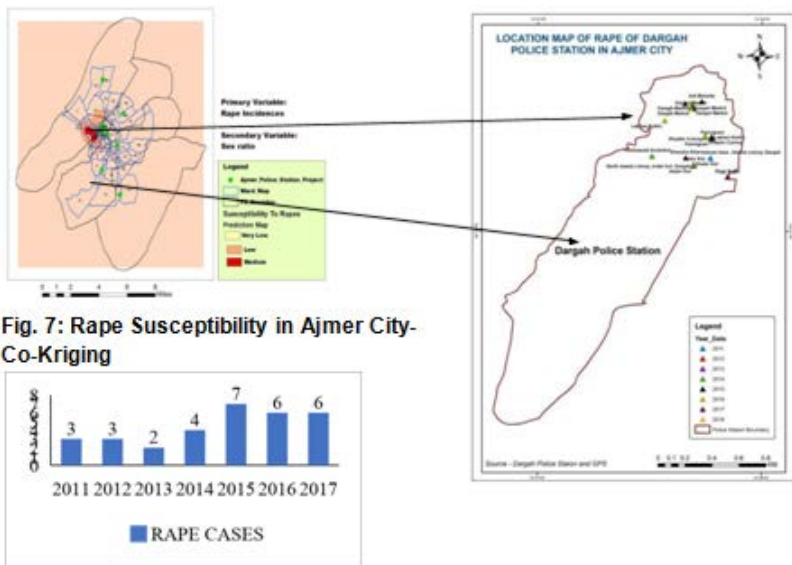


**Fig. 5. Crime Susceptibility in Ajmer City**



**Fig. 6. Crime Susceptibility in Ajmer City - Co-Kriging -**

GIS presents a remarkable tool for police for execution of surveillance and planning in the specified crime prone areas. As it clearly delineates the tense and unsafe pockets in a region, it definitely benefits the investigation and patrolling activities by the law enforcers. A study was conducted to investigate the cases of Rape incidences in the Dargah region, reporting nearly maximum crimes in the city using data from 2011 to 2017. As per the police data, most of the incidences took place in Imli Mohalla, Pannigram, Lakhan Kothri, Dargah Bazaar, Khadim Mohalla, Silawat Mohalla, Sheeshkhan, Diggin Bazaar and Ander Kot areas of Dargah Region.



**Fig. 8. Rape Incidences in Ajmer City (2011-2017)**

The data was the cases of violence against women, which basically come under section 498-A and 406- IPC in Dargah Region of Ajmer City. In comparison to other cases of violence against women in this region these cases are greater in number per year. Records indicate, the criminals of these cases belonged to the nearby regions, however the

victims of such dreadful conditions were from outer city and states, some of them were of Delhi, U.P., West Bengal and Bihar. This region has Muslim community domination and belongs to the old city of Ajmer. The people are conservative and consider case filing, a social taboo and stigma, don't report incidences against women in police stations. As per the SHO, Dargah Thana, nearly 50-60 percent cases against women are not filled due to various reasons. The road map of Ajmer city shows the connectivity of Dargah Region with National Highway No. 8, 79, all major city roads and minor city roads which shows the good connectivity of this region and this adds to the prevailing of violence against women. There are numerous other factors which are responsible for violence against women such as congested lanes, pilgrim inflow, high concentration of population, old city profile etc.

## Conclusion

The objective of crime mapping and identifying high crime prone zones using various parameters has been met. The objective of facilitating better surveillance planning so as to control crime effectively by police authorities is achieved well within the scope set. As the crime spots have a strong association along roads, the scheduled patrolling can definitely check the crime occurrence in the region. The Ajmer administration also gets an insight about the relationship of criminal offences and socio-economic indicators and can work towards suppressing them. The study can be extended further by forecasting the shift in hot spots with respect to various crime investigation using machine learning or the other techniques. It would definitely ensure safety and security in the area and work towards social welfare. Action, reaction and prevention can effectively be planned using Geospatial Techniques for crime eradication.

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# HEALTH AWARENESS LEVELS AND NECESSITY FOR SEX AND LIFESTYLE EDUCATION AMONG THE URBAN EDUCATED YOUTH OF KOLKATA - AN ANALYSIS OF THE ISSUES AND CHALLENGES

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## Abstract

*Human sexuality is the sum total of an individual's biological constitution, life experiences, knowledge, behaviour and attitudes; it is influenced by a number of diverse physical, psychological, interpersonal, and cultural factors. 'Youth' is regarded as the period of transition from adolescence to adulthood and this period is supposed to be the healthiest of all periods in human life. During this period, psychological developments take place in the form of a search for identity, developing a body image, sex role and a value system. Sex education, alternatively called sexuality education or sex and relationships education, is the process by which information and forming attitudes and beliefs about sex, sexual identity, relationships and intimacy are acquired. It helps in the development of young people's skills so that they make informed choices about their behaviour, and feel confident and competent about their choices. It is acceptable now that young people have a right to sex education, partly because it is a means by which they are helped to protect themselves against abuse, exploitation, unintended pregnancies, STDs and HIV/AIDS. The objective of the study is to study the current lifestyle pattern of the youth and to study the major sources of sex education among the youth. Hence, it was seen that young people do not have any reliable source of sex-education and hence gather information from friends, TV and newspapers. In the absence of any formal source of sex education, there lies a need for a one-to-one personal education on sexuality and health-related issues so that young minds are not too anxious and misconceptions and unsafe sex does not prevail.*

**Keywords:** Youth, Sex education, Human sexuality, Lifestyle.

## Introduction

Sexuality education has time and again been one of the most controversial topics in the field of adolescent health. Sexuality education has been a much-contested issue all over the world. People are divided over whether sex education should be imparted to students or not and even if it should be, what should form part of such a curriculum. In India, sexuality education has thrown up various anxieties at most times and still remains a deeply fraught terrain. Today, with an increased outcry against sexual violence that women face, sexuality education has again come to the forefront, and its importance as part of the school/college curriculum is being stressed upon in today's time. It becomes important at this juncture to look critically at the issue at hand.

Human sexuality is the sum total of an individual's biological constitution, life experiences, knowledge, behaviour and attitudes; it is influenced by a number of diverse physical, psychological, interpersonal, and cultural factors. 'Youth' is regarded as the period of transition from adolescence to adulthood and this period is supposed to be the healthiest of all periods in human life. During this period, psychological developments take place in the form of a search for identity, developing a body image, sex role and a value system.

Sex education, alternatively called sexuality education or sex and relationships education, is the process by which information and forming attitudes and beliefs about sex, sexual identity, relationships and intimacy are acquired. It helps in the development of young people's skills so that they make informed choices about their behaviour and feel confident and competent about their choices. It is acceptable now that young people have a right to sex education, partly because it is a means by which they are helped to protect themselves against abuse, exploitation, unintended pregnancies, STDs and HIV/AIDS.

The silence around sexuality and the lack of sexuality education also leads young people to seek information about their bodies and the sexual act from often misinformed sources: peers, the media, badly written biology books and pornography. It is a known fact these days that in the absence of a comprehensive sexuality education, pornography becomes the source for sexuality education for most young people. The harms of learning about sexuality solely through patriarchal hard-core pornography are obvious to gender equality, body image, marital/non-marital sexual relationships and freedom from violence and abuse. The objective of the study is to study the level of knowledge and awareness on health issues and lifestyle pattern major sources of sex education among of the urban youth. A hypothesis is proposed in the study as - there is a need for sex-education among the urban youth.

### **Study Area**

The selected area of study is Kolkata. It is the capital of West Bengal and a metropolitan district. About 51percent of urban population of West Bengal reside in Kolkata. Kolkata served as an ideal area for study as the colonial city is still embedded in traditional value system and culture yet trying to catch up with the modern lifestyle of the global economy and adapt to the changes with the changing times.

The study was conducted among urban educated youth in the age group of 18-34 years and the tool used for data collection was a self-administered questionnaire.

### **Methodology**

The methodologies used for the study were mainly Quantitative Analysis. Quantitative methods in the study were:

- a) Frequency distribution
- b) Cross –tabulations and chi-square tests
- c) Computation of indices

To study the level of correct knowledge on Reproductive Health, a *Reproductive Health Knowledge Index* was calculated by using the scoring method and then a composite index was formed. Eight variables pertaining to knowledge on conception, abortion, safe sex and STD was taken into consideration for calculating the index.

To study the level of awareness and correct knowledge among youth on HIV/AIDS transmission, prevention and misconception, a simple frequency distribution was calculated. In all twelve dependent variables were selected to study the level of knowledge.

Twelve indicators were taken to *Calculate the index on HIV/AIDS Knowledge* based on transmission, prevention and misconception. They were:

- a) Transmission through Homosexual unions
- b) Transmission through Heterosexual unions
- c) Transmission through infected needles
- d) Transmission through infected Blood and blood products
- e) Transmission from infected mother to child during birth
- f) Transmission from infected mother to child through breast-feeding
- g) Prevention through abstinence
- h) Prevention by using condom during sexual intercourse
- i) Having one uninfected faithful partner
- j) HIV/AIDS can be transmitted by mosquito bites
- k) HIV/AIDS can be transmitted by sharing meals with an infected person
- l) HIV/AIDS can be transmitted by hugging and shaking hands

Later these variables were recoded to construct a HIV/AIDS *knowledge index* through composite indexing method. Keeping the median values and quartile values, the index was divided into three categories as low knowledge, medium knowledge and good knowledge. Using this index cross tabulation was done with a set of selected independent variables.

Life style index was computed on the basis of frequency of seven selected variables which were frequency of smoking; taking alcohol; tobacco and gutka; visiting pubs and discos; visiting commercial sex workers; watching pornography and socializing with boyfriends/ girlfriends.

## Findings

### *Level of Knowledge and Awareness on Health Issues and Lifestyle Characteristics of Urban Youth*

In the life cycle of the human being, adolescence and youth are the most critical stages of life. Psychologists call this period as a state of storm and stress. It is a state of rapid changes in physical, psychological and social behaviour. Reproductive health occupies a central position in the identity of health as well as the development of a given population. However, the events of reproductive health are usually found in women who due to their biological function invariably bear the greater burden of the shortcomings of

reproductive health such as unsafe motherhood or unsafe abortion. Lack of knowledge of growing up, coupled with physical changes creates various kinds of complexities, confusion, stress, tension and mal-adjustment in the life of adolescents. Majority of the youth are unaware about the physical and psychological changes due to ignorance and illiteracy. Not only the ignorance but the lack of sex education and shyness increase the problems and risks of early pregnancies and STDs.

According to WHO definition

- ❧ 'Sex' refers to the biological characteristics that define humans as female or male. While these sets of biological characteristics are not mutually exclusive, as there are individuals who possess both, they tend to differentiate humans as males and females. In general use in many languages, the term sex is often used to mean "sexual activity", but for technical purposes in the context of sexuality and sexual health discussions, the above definition is preferred.
- ❧ 'Sexuality' is a central aspect of being human throughout life and encompasses sex, gender identities and roles, sexual orientation, eroticism, pleasure, intimacy and reproduction. Sexuality is experienced and expressed in thoughts, fantasies, desires, beliefs, attitudes, values, behaviours, practices, roles and relationships. While sexuality can include all of these dimensions, not all of them are always experienced or expressed. Sexuality is influenced by the interaction of biological, psychological, social, economic, political, cultural, ethical, legal, historical, religious and spiritual factors.

Risky sexual behaviors and lack of knowledge on sexuality-related topics are among the leading problems most associated with mortality, morbidity, and social ailments among the youth. In this context, policymakers and schools in India must consider the burden of mortality and morbidity associated with lack of sexuality education.

### *Knowledge about Reproductive Health among Youth*

Knowledge about sex, reproduction, contraception, sexually transmitted disease (STDs) and HIV/AIDS is a pre-requisite for safe sex in the context of both pregnancy and diseases particularly HIV. A higher level of knowledge influences the consistent and effective use of contraceptive methods to prevent pregnancy and condom use to reduce the risk of contracting HIV. Reproductive health knowledge was examined using a scale which assessed the respondent's ability to respond correctly to items requiring accurate knowledge relating to sex, reproduction, contraception, STDs, HIV/AIDS and condom use.

Reproductive Health Knowledge is a pre-requisite for safe sex in terms of prevention of disease as well as unwanted pregnancy. It was observed that 91.4 per cent of respondents knew that a child is conceived through sexual intercourse when an ovum is fertilised by a sperm. Still, 8.6 per cent respondents were lacking in the basic information about conception. In the Indian society, or rather in the family, a woman is always blamed if a girl child is born and said that she is incapable of reproducing a male child. But the basic truth is not known by many, that the sex of the unborn male child is not dependent on the

mother but on the father. It was observed that only 52.5 per cent respondents correctly knew that the sex of the male child is determined by the X chromosome of mother and Y chromosome of the father. Hence 47.5 per cent youth are still unaware or are incorrectly informed. It was also observed that the factor which determines the sex of the female child (Mother's X chromosome and father's X chromosome) was correctly known to 53.8 per cent respondents and the rest were either unaware or had incorrect information. A large proportion of young women and men were not aware that a woman is more likely to get pregnant on specific days in a menstrual cycle. The highest chances of conception are between 8 and 21 days of the menstrual cycle. A large proportion of youth have misconceptions about the fertile period. The rest 47.7 per cent respondents were either totally unaware (20 per cent) or had incorrect information.

The basic concept of preventing pregnancy was not known to about 10 per cent of the respondents, while 90 per cent respondents knew that having safe sex with use of contraception can prevent unwanted pregnancy.

**Table 1. Knowledge about Conception and Safe Sex, 2009-2010**

<b>Knowledge Indicators</b>	<b>Percentage</b>
<b><i>Knowledge On Conception Of A Child</i></b>	
God's Gift	4.8
By Kissing or Hugging	1.3
Through Sexual/Physical Intercourse	91.4
Do Not Know	2.4
<b><i>Factor Determining The Sex Of A Female Child</i></b>	
Mother's X Chromosome, Father's X Chromosome	53.8
Mother's X Chromosome, Father's Y Chromosome	33.8
Do Not Know	12.3
<b><i>Factor Determining The Sex Of A Male Child</i></b>	
Mother's X Chromosome, Father's X Chromosome	27.0
Mother's X Chromosome, Father's Y Chromosome	52.5
Do Not Know	20.4
<b><i>Conception Chances Are The Highest Among Women During</i></b>	
Anytime Of Menstrual Cycle	7.5
First Seven Days of Menstruation	13.2
8-21 Days of the Menstrual Cycle	52.3
Last Week of Menstruation	6.6
Do Not Know	20.4
<b><i>Pregnancy Can Be Prevented By</i></b>	
Washing Genitals After Intercourse	2.0
Using Contraceptives	90.1
Different Positions During Sexual Intercourse	1.1
Urination After Intercourse	0.9
Do Not Know	5.9

Source: Compiled from Field Data 2009-2010



*Knowledge on Abortion*

*Abortion* is the termination of a pregnancy by the removal or expulsion of a fetus or embryo from the uterus, resulting in or caused by its death. An abortion can occur spontaneously due to complications during pregnancy or can be induced in humans and other species. The medical termination of pregnancy or induced abortion is legally performed at medical institution like Hospitals, Nursing homes and Abortion Clinics. Some perform it legally and some do it illegally by charging higher rates, in case of unmarried youths and pregnancy outside marriage. But the basic knowledge of safe sex and timely abortion is not known to all. Only 39.8 per cent respondents felt that abortion should be performed within 12 weeks of conception. About 43.1 per cent felt abortion should be performed within 3 weeks, and this is not possible since a pregnancy is confined only after four weeks. These 60 per cent respondents did not have the correct knowledge about the correct and safe time of abortion. When an unwanted pregnancy occurs and an abortion is required, then a patient should take proper medical advice and care. About 90 per cent respondents felt that one should go to registered doctors and proper clinics for safe abortion, while the other 10 per cent were either unaware, felt one should go to quacks or resort to traditional methods.

**Table 2. Knowledge about Abortion, 2009-2010**

<b>Knowledge Indicator</b>	<b>Percentage</b>
<b><i>Knowledge About Safe Period Of Abortion</i></b>	
Anytime During Pregnancy	2.4
Within 30 Weeks of Pregnancy	4.0
Within 12 Weeks of Pregnancy	39.8
Within 3 Weeks of Pregnancy	43.1
Do not Know	10.8
<b><i>Where To Go For An Abortion</i></b>	
Quacks	2.6
Registered Doctors/clinics	90.1
Traditional methods	.4
Do not Know	6.8

Source: Compiled from Field data 2009-2010

*Knowledge on Sexually Transmitted Disease*

*Sexually transmitted disease*: Any disease transmitted by sexual contact; caused by microorganisms that survive on the skin or mucus membranes of the genital area; or transmitted via semen, vaginal secretions, or blood during intercourse. Because the genital areas provide a moist, warm environment that is especially conducive to the proliferation of bacteria, viruses, and yeasts, a great many diseases can be transmitted this way. They include AIDS, Chlamydia, genital herpes, genital warts, gonorrhoea, syphilis, yeast infections, and some forms of hepatitis. It is also known as a *morbus venereus* or venereal disease.

The knowledge about Sexually Transmitted Disease (STD) and its transmission was studied among the youth. It was observed that 93.2 per cent respondents were aware of STDs. The mode of transmission of STD was not very clear rather confusing to the respondents. Only 44.4 per cent knew that STD is transmitted directly skin to skin through sex. About 44.6 per cent believed that it was transmitted through needle sharing. The rest were either unaware or not informed or thought it can be transmitted through dirty toilet seats or dirty clothes.

**Table 3. Knowledge about Sexually Transmitted Disease, 2009-2010**

<b>Knowledge Indicator</b>	<b>Percentage</b>
<b>Aware of Sexually Transmitted Disease (STD)</b>	
Yes	93.2
No	4.6
Do not Know	2.2
<b>How is STD Transmitted</b>	
Needle Sharing	44.6
Dirty Toilet Seats, Door Handles And Dirty Clothes	1.8
Eating Unhygienic Food	.4
Direct Skin To Skin, Through Sex	44.4
Do not Know	8.8

Source: Compiled from Field Data 2009-2010

Based on the eight indicators, a scale was prepared and index on Reproductive Health was constructed. The three categories within *Reproductive Health Knowledge Index* were Low, Moderate and High Knowledge. It was observed 45.5 percent had high reproductive health knowledge, followed by 32.7 percent low knowledge and 21.8 percent moderate knowledge.

**Table 4. Distribution of Reproductive Health Knowledge among Youth, 2009-2010**

<b>Reproductive Health Index</b>	<b>Number of cases</b>	<b>Percent</b>
Low knowledge	149	32.7
Moderate knowledge	99	21.8
High knowledge	207	45.5
Total	455	100.0

Source: Computed from Field Data 2009-2010

#### *HIV/AIDS Related Knowledge*

Though the level of knowledge among the respondents was fairly good, still some lacked proper knowledge about transmission and prevention and misconceptions too need to be removed.

Knowledge about spread of HIV/ AIDS among urban educated youth revealed that even till date, 15 percent of the youth did not know about the consequences of unprotected

sex; 42 percent did not know about the risk of homosexual unions and 11 percent were not aware of vertical transmission. Almost, as high as 73 percent respondents were completely unaware of the transmission of HIV/AIDS through breastfeeding of infants by an infected mother.

**Table 5. Summary of HIV/AIDS Knowledge, 2009-2010**

	HIV/AIDS knowledge variables	Proportion with correct knowledge	Proportion with incorrect knowledge
1	Transmission through Homosexual unions	58.5	41.5
2	Transmission through Heterosexual unions	85.1	14.9
3	Transmission through infected needles	91.9	8.1
4	Transmission through infected blood and blood products	94.9	5.1
5	Transmission from infected mother to child during birth	89.2	10.8
6	Transmission from infected mother to child through breast-feeding	27.3	72.7
7	Prevention through abstinence	50.5	49.5
8	Prevention by using condom during sexual intercourse	86.4	13.6
9	Having one uninfected faithful partner	74.9	25.1
10	HIV/AIDS can be transmitted by mosquito bites	82.4	17.6
11	HIV/AIDS can be transmitted by sharing meals with an infected person	95.6	4.4
12	HIV/AIDS can be transmitted by hugging and shaking hands	95.4	4.6

Source: Computed from Field data

The knowledge on HIV/AIDS transmission, prevention and misconceptions has been observed among the respondents. Based on the parameters of knowledge, a *Composite Index* on HIV/AIDS knowledge was constructed and cross tabulations done against knowledge Index with the background characteristics to examine the factors which influence the level of knowledge among youth. The HIV/AIDS Knowledge index shows that, 35.8 percent youth have a low knowledge base, 50.8 percent respondents had a moderate knowledge base and 13.4 percent had a good knowledge on HIV/AIDS, among whom only 1.5 percent scored all correct knowledge.

### *Lifestyle Characteristics of Urban Youth*

#### Youth Attitudes

Today's youth are growing in a rapidly changing environment with different beliefs and values about morality and sex from those of the earlier generations and that has

created conflicting demands and a totally different lifestyle pattern from that of their parents. They are well exposed to the outside world, thanks to globalisation and media which has made every urban youth upto-date about the latest fashion, trend, news and gossip is just a click away on the mobile or internet. Hence all this exposure has made an impact on his views, perception, beliefs and judgment power.

**Table 6. HIV/AIDS Knowledge Index, 2009-2010**

HIV/AIDS Knowledge Index	Number of cases	Per cent
Low Knowledge	163	35.8
Medium knowledge	231	50.8
Good Knowledge	61	13.4
Total	455	100.0

*Source: Computed from Field Data 2009-2010*

### ***Lifestyle Characteristics of Urban Youth***

#### **Youth Attitudes**

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The views or attitudes of the urban educated youth have been clubbed into groups: the liberal views (i.e. those which have changed and progressed with time and pace) and the other as the conservative view (i.e., those who still believe in the traditional ways of thinking and who should change their ways of thinking).

In Table 7, attitude towards twelve issues related to relationships, sexuality, marriage and contraception behaviour have been discussed. According to 41.1 percent youth pre-marital sex was acceptable while 58.9 percent were not in favour of it. Extra-marital sex was only acceptable to 11.9 percent youth, while 88.1 percent were strongly against it. Thinking process is changing, and this was seen in the acceptance rate of a live-in relationship, where 42.6 percent were for it while 57.4 percent still hold a conservative mindset.

When dealing with views on sexuality, it was seen that 43.5 percent youth had no problem with the issue of homosexuality while 56.5 percent were against it. About 42.4 percent youth believe it was not necessary for a girl to be a virgin till marriage while 57.6 percent strongly believed in virginity until marriage. On the other hand, 78 percent youth believed that masturbation was common among young men and 22 percent did not believe so. A positive change in attitude was observed when the question on HIV test should be

made compulsory before marriage was asked, 89.7 percent youth stood for the motion and 10.3 percent did not feel it to be necessary. This is a very positive sign as health awareness and consciousness about a healthy family is being perceived as a goal by the youth. Today's youth perceive that safe sex should be practiced. Hence 90.5 percent feel it is necessary to use a condom during sex with both regular and casual partner to avoid the risk of unwanted pregnancy, prevent STD, and prevent HIV infection. 93.6 percent youth feel that there was no harm in a woman to ask her male partner to use a condom for safe sex. Now looking into views on marriage, 96.4 percent youth felt that each individual has the right to choose his/her own life partner. Nearly 73.8 percent preferred to go for a love marriage over an arranged marriage. Before marriage, 76 percent youth were ready to discuss about family life, family size, contraception and sexual behaviour with their prospective partner.

**Table 7. Perceptions and Attitude of Youth, 2009-2010**

Characteristics	Liberal	Conservative
Pre-marital Sex	41.1	58.9
Extra-marital Sex	11.9	88.1
Live-in relation	42.6	57.4
Homosexuality	43.5	56.5
Virginity	42.4	57.6
Masturbation	78	22
Making HIV test mandatory before marriage	89.7	10.3
Use of Condom with regular/casual partner during sexual activity	90.5	9.5
Women can suggest her male partner to use a condom	93.6	6.4
Individuals have right to choose their life partner	96.4	3.6
Would prefer a love-marriage	73.8	26.2
Discuss about family life, family size and sexual behaviour with your partner before marriage	76.0	24.0

Source: Computed from Field data

#### *Youth Practices and Habits*

In recent years, youth are open to globalisation forces and have easy access to media, their behaviour habits and practices are also governed by the social and economic environment surrounding them. There were 30.5 percent youth who were addicted to smoking, and 69.5 percent youth did not smoke. Consumption of alcohol was common among 36.3 percent youth. Chewing of tobacco was common among 12.1 percent educated youth. Early access and curiosity to know about the opposite sex and sexual experimentation drove about 48.8 percent youth to easily access adult materials and 52.3 percent youth had access to watching blue films and pornographic materials and 9 percent youth also indulged in sex-chat on internet. The use of drugs has come down in recent times, people are well aware of the ill-effects of the use of drugs and hence in the survey it was found that only 1.5 percent youth used drugs.

In the times of modernisation and in a metropolitan city like Kolkata, access to different modes of media exposure is common and youth use the different sources of media for communication, awareness and are always up to date. Hence, it is seen that 96.3 percent youth watched T.V.; 84.0 percent youth listened to radio; 83.5 percent youth surfed the internet, 98 percent youth read newspaper and magazines and 53.6 percent regularly went out for movies with family and friends.

Some practices and habits other than the above are the sexual behaviour of the youth. About 44.3 percent youth practiced celibacy or abstinence; another 33.6 percent youth ever had indulged in any sexual practice or intercourse. In the past one year, 29 percent of the youth were sexually active and had sexual relations. Thus, this gives an overall view of the habits and practices of the urban educated youth of Kolkata.

**Table 8. Different Habits and Practices among Youth, 2009-2010**

<b>Habits and Practices</b>	<b>Yes</b>	<b>No</b>
Smoke	30.5	69.5
Consume alcohol	36.3	63.7
Chew tobacco/ghutka	12.1	87.9
Access to adult material	48.8	51.2
Watch blue films/pornography	52.3	47.7
Use drugs	1.5	98.5
Watch TV	96.3	3.7
Listen to radio	84.0	16.0
Read newspaper/ magazine	98.0	2.0
Surf internet	83.5	16.5
Go for movies	53.6	46.4
Indulge in sex-chat on internet	9.0	91.0
Practice abstinence/celibacy	44.3	55.6
Ever had sexual intercourse	33.6	66.4
Had sexual relation in the past one year	29.0	71.0

*Source: Computed from Field Data*

### *Youth and Lifestyle Related Risks*

Youth lifestyle risk for the respondents was calculated on the basis of frequency of certain behavioural and habits. It was observed that 69.5 percent respondents never smoked; 63.7 percent never consumed alcohol; 87.9 percent youth never consumed tobacco/Ghutka; nearly 67.5 percent of respondents never visited pubs; about 96.3 percent respondents never visited commercial sex workers and about 43.1 percent respondents never socialized with a partner that is they did not have a boyfriend/ girlfriend. Those who were exposed to the above behavioural practices and habits did have some amount of risk involved which arose from their lifestyle practices.

A lifestyle risk index was calculated through a composite index based on the frequency of seven parameters. They were frequency of smoking; consuming alcohol, visiting pubs/bars; consuming tobacco/ghutka; watching blue films; visiting commercial sex

workers and socializing with boyfriends/girlfriends. It was found that 20.7 percent respondents belonged to the 'no risk' group. The remaining, 34.1 percent were in 'low risk'; 28.8 percent were in 'moderate risk' and 16.5 percent respondents were in 'high risk' category.

**Table 9. Life Style Risk Index, 2009-2010**

Life style indexing	Number of cases	Percent
No Risk	94	20.7
Low Risk	155	34.1
Moderate Risk	131	28.8
High Risk	75	16.5
Total	455	100.0

Source: Computed from field Data 2009-2010

#### *Major Sources of Sex-Education*

Adolescence and youth is marked by a discontinuity between childhood and adulthood. World Health Organisation (WHO) has defined adolescence as the age of 10 to 19 years. It is characterized by physical, psychological and social change, transformation and maturation that take place during this period. It is a period when society sends mixed signals to its youngsters which results in confusion, frustration, despair and risk taking behaviour. Young people want to seek guidance but do not know from where to get it. In one of the studies done by Savara and Sridhar (1993), the scholars noted that parents and teachers act as a source of providing sex knowledge to only 16.30 percent of urban educated Indian men. Thus, there is a need for giving proper knowledge about sex and related issues to the adolescents and young people. Sex education aims at helping the growth of positive feelings among children about sex, impart to children the truth that one needs love to nourish love, ensure that feelings which interfere with sex and love does not pile up anxieties inside the minds of youth.

Sex education perhaps helps in preparing young adolescents to have responsible attitudes and behaviour for a harmonious sexual life. Sex knowledge is the inculcation of the moral attitude towards sex instincts. It also dispels many myths and superstitions and clarifies the various terms of sexuality.

#### *Sources of Sex-Education for Youth*

The introduction of Sex Education at high school and college level faced some agitation from the administrations of the institutions and parents to some extent. But now many colleges in Kolkata have the Red Ribbon Clubs where regular lectures on sex education and safe sex are given to create awareness among the youth to practice (if needed) safe sex and hence not risk their life and also their partner's ( present and future) life . Since the topic about sex is still thought to be a taboo to be discussed at home in front of children and youth in most families in Kolkata, parents do not play a significant role in imparting safe sex knowledge to their children. During youth, the anxiety and curiosity to

know about the opposite sex and indulge in sexual relations make it difficult for the youth to resort to some correct, knowledgeable source for sex education. Thus they fall back on cheap sex books and magazines, surf the internet for watching and gaining knowledge on sex and related issues and sometimes get perverted images and ideas with uncensored pornographic materials which simply enhances their urge and make them vulnerable towards indulging in sexual activities that is mostly risky and unsafe since such actions are not planned.

If we study the sources of sex-education among the youth, the most significant source that emerges is that of friends and peers. Among the respondents also, 24.64 percent admitted that friends were their source of sex-education, who were also poorly informed or sometimes experienced enough to share their experiences with others. The next important sources of sex-education as mentioned by the respondents was the television (21.44 percent) and those from Adult Magazines/Pamphlets/ newspapers (20.66 percent). Internet served as a source to almost 11 percent youth. School/College teachers and Doctors contributed to only 5.41 percent and 5.19 percent of cases and these may be considered as the best inter-personal means of correct knowledge. Other sources of mass media like radio, public announcements and drama/street plays/cinema halls contributed to 4.53 percent, 3.87 percent and 1.77 percent cases respectively. Among Other sources, only 1.55 had reported that someone from their family spoke to them about sex-education. This clearly portrays the lack of inter-personal, one-to-one interaction of youth with some knowledgeable and experienced person who should be there during this period of life where physiological, psychological and behaviour change takes place and one needs proper guidance about sexuality and sexual behaviour.

**Table 10. Source of Information on Sex Education among Youth in Kolkata, 2009-2010**

Source of Information	Percent
Friends	24.64
TV	21.44
Newspaper/magazine/pamphlets	20.66
Internet	10.94
School/ college teachers	5.41
Doctors	5.19
Radio	4.53
Public announcements	3.87
Drama/street plays/cinema halls	1.77
Others	1.55
Total	100.00

*Source: Computed from Field Data 2009-2010*

Thus, this calls for an integrated sex-education programme to be incorporated in the syllabus of high school and college students in all Government and Private institutions so that the problems, doubts and queries of youth regarding sexuality, reproductive and sexual health and safe sex practices can be instilled in their minds during this vulnerable age and they can take their decisions judiciously and not risk their lives.



### *Policy Needs and Implications*

Young people need to be equipped with knowledge and information on diverse issues, ranging from risk and protective sexual behaviours, including the role of condoms, to physical maturation, formation of partnerships, sources of information, counseling and services, their rights in accessing services and exercising choices. Sex and family life education must be imparted in ways that meet the needs of those in and out-of-school, responding to, rather than obfuscating, their sexual health questions. Equally important is the acquisition of life skills that will enable youth to put information into practice, encourage them to break down gender stereotypes and relate to each other as equals, develop self-esteem, as well as strengthen their abilities in problem-solving, decision-making, communication and their inter-personal relations and negotiation.

Parents, teachers and the adult community must facilitate and be involved in this process, whether through free and open communication, or by creating environments that protect adolescents from abuse, and enable them to access information and the full range of services. Programmes are needed at the family and community levels that enable parents and other community members to overcome their discomfort, enhance their knowledge of adolescent health and development, and improve their communication skills. Programmes are also needed that convince parents of the need to focus on enhancing informed choice among adolescents rather than imposing close supervision and controls as a more effective strategy of ensuring sexual and reproductive well-being. Messages on the legal age at marriage, the adverse consequences of early marriage, and the importance of eliminating gender double standards and imbalances that may adversely affect the lives of both boys and girls must be reinforced.

Girls and boys, married and unmarried have different priorities and needs, and must overcome a different set of obstacles in accessing sexual and reproductive health information and services. In order to be 'youth friendly', programmes and services must recognise that young people's needs and lives are different from those of children and adults, and respect these needs in an acceptable and non-threatening manner. The involvement of youth in adaptation programmes- design, implementation, monitoring and evaluating- is essential.

### **Conclusion**

Today in the age of globalisation when internet can be accessed in a personalized mobile phone, an influx of uncontrolled information which does not differentiate between the reality and fantasy leaves a young mind at crossroads. The adolescents and youth are open to unrestrained exposure to mass media and cannot correctly distinguish between what is good for them and what is not. With urbanization, female literacy, women's participation in workforce and overall development of society, the mean age at marriage among the urban females has gone up and the age of menarche has come down. Thus the gap between the onset of puberty and marriage (co-habitation) has also increased. Moreover, the kind of exposure youth have these days has also put them at risk of health

problems, risky lifestyle practices and early exposure sexual debut has made it more important to make them aware about their physiology, changing body, mental and emotional well-being and also their desire to know about the opposite sex in a well-informed manner and so a definite need for sex-education is required and the youth also want a reliable source from where they can get answers to their questions that keep arising in their minds from time to time.

The youth have access to information, but whether that information is correct or not is doubtful. Youth are highly influenced by peer groups and peer pressure. How well are these peer groups informed about making correct choices and decisions is another matter of serious concern! Thus from the above analysis it becomes clear that the level of knowledge and awareness is not good enough to protect them and prevent them from risky behaviour, unhealthy practices and unsafe sexual relationships. We can prevent such situation only by giving the adolescent and youth proper and correct knowledge through sex-education. This will not only help them understand their own physiology, sexuality and the changes taking place within them physically, emotionally and psychologically as well. This will help them cope up with the situation and take correct and responsible actions in the future regarding their personal lives, marriage, family and health. Today's adolescent and youth are the future responsible citizens of our country.

It is our responsibility to give them proper and correct information and that too through proper inter-personal channels without attaching any biasness or stigmas and taboos around sex and sexuality. Young urban educated youth do not have quick and hygienic access to reproductive healthcare and counselling facilities where they can get satisfactory answers to their questions. Hence, it becomes the responsibility of the policy makers, medical fraternity, mass media, educational institutions, teachers, parents and guardians who have to share the responsibility of informing the adolescents and youth about the transition phase which they are passing through and their demanding needs for information should be cautiously dealt with and such that youth take responsible and informed decisions in future. We cannot control the behaviours and lifestyle practices once they have gone out of control, but we can impart knowledge and create awareness among youth so that they can make their choices about their lives and lead a healthy and a happy family life and become responsible and economically active citizens of a healthy nation.

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# TRANSITIONAL CITY - A CRITICAL DISCURSIVE PERSPECTIVE ON URBAN DEVELOPMENT, SHIFTING PRIORITIES, AND SOCIO-SPATIAL MARGINALITIES IN AGRA, UTTAR PRADESH

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## Abstract

*City with historic glory, Agra is now in transition. This can be interpreted in the context that both city-centric growth policies at national and state level, and city-specific aspirations coincide and culminate into new urban development priorities. Partly, this shift is influenced by the global connectivity among cities and exposure to out-of-context urban growth modalities. Agra is not an exception to it as it is reimagining the potentials it has: the home of the World Heritage Sites; growing tourism; and regionally important city in the fringe of national capital region. City image is not just being (re)shaped by present aspirations, the conventional urban planning strengthens it further. This paper focuses on how ongoing efforts in remaking Agra as the 'global' tourist destination has appropriated the local, and in process the locales-slums dwellers and disadvantageous communities- have been marginalised in urban space.*

**Keywords:** City, Heritage, Transition, Tourism, Urban Planning, Urban Space

## Introduction

With the advent of modern urban planning, cities showed prime concern in adopting measures to combat various problems and crises. Geography and space is interlinked and one is incomplete without the other. There are two main types of 'geographical planning'- physical planning and economic planning. The former is concerned with physical developments such as urban renewal, urban planning and landuse, whereas the latter is concerned with spatial aspects of economic development. These both shape urban environment. Controlling unplanned urban growth measures were taken up to segregate landuses through rationalization of space and planned city and regional development. Dominance of town planning was undoubtedly strong and professionally as it was believed to be universally applicable irrespective of cultural context and complex social geographies. What was recognized was that well organized and physically coherent cities grounded in the good functional and aesthetic principles are better than those that are not (Beauregard 2003). With the passage of time and experiments with newly accepted ideas, the Master Plan based development became a common practice to cope with and dealing with haphazard urban growth, uncontrolled urban expansion and growing problems of inner cities. With this, urban areas are spatially controlled and zoning directs the future growth and expansion of cities. For long, Master Plan approach has remained a common

practice not only in the advanced West but same is equally welcomed in developing world as well. Wider application of such an approach was follow up of the colonial practices in which major cities were seen as centres of power and played important role in growth of colonization. In the postcolonial period, similar planning practices and regulatory frameworks were put in place to shape urban space. The fact is that urban context and circumstances have registered a sea change however, urban planning operates more or less in the same manner. It is also true that economic and political decisions influence urban development and planning. Therefore, urban planning is an activity, process and a tool for reorganization of space by which it shapes lives of those who inhabit urban space and it changes with change in development priorities.

### *Focus*

The paper critically discusses practices of urban planning and changes occurring within, with reference to Agra city. This city has a history of more than one thousand years of existence. Much of the urban growth and erection of new buildings first started during the Mughal Rule, and the modern developments took place in colonial times. Though the city has been growing rapidly during the post-independence period, the post-economic reforms urban growth has brought in economic as well as spatial transformation in Agra. This way, studying reorganization of urban space, new spatial changes taking place in the city, 'heritage' tourism and the way vague attempts are at work to make it a significant global tourist destination is noteworthy. The important objectives this paper addresses are: i) to critically discuss urban development practices, planning rationalities, and influence of neoliberal economic condition on the city space; ii) to examine inclusivity of urban governance, and form of socio-spatial marginalities in the city of Taj.

### *Methodological Framework*

The present study tries to provide an interdisciplinary perspective on urban development process and urban transition if not fully economic transition that is taking place in the city of Agra. This study deals with two majors concerns which affect and influence the growth and development in cities like Agra. First, the study acknowledges the idea that town planning is a form of 'social action' or 'social practice' (Nigel Taylor, 1998) meaning it tends to embrace a sound *judgment* to intervene in urban space. This sound judgemental thinking in planning practice is to do *with what best to do* in addressing diverse urban problems. The question is how sound judgment is arrived at and how it spatially affects the city living. Second, with globalization of the national economy, city like Agra are showing and experiencing urban transition which reflects in makeover efforts at work in the city. This framework helps to understand the nature of transition and how it shapes urban development or spatial practice (Rao, 2007). This brings in huge multiplicity of urban challenges and promises and how urban planning sphere engages with and addresses such diverse concerns- if it does at all- in making city a sustainable, inclusive and resilient place.

### *Physical Designing of Urban Space*

Urban planning is about constructing urban spaces to create synergy among long term economic needs of people, requirements of housing and basic infrastructure and preservation of natural environment (Landman and Ntombela 2006). In fact, in Europe the most impressive results of formal town planning were achieved in the so-called Baroque Era of the seventeenth and eighteenth centuries. Therefore, urban or town planning has developed from the industrial and colonial age to the modern age through scientific and technological inventions, art, and architectural movements, social reforms, planning laws, urban growth management strategy, growing ecological and environmental awareness, and also changing emphasis in planning and development of new planning tools (see Das 2007: 41). This tool is required to overcome socio-economic crisis of the city by introducing reorganization of urban spaces. Since beginning the city planning has been more interested in shaping the geographical layout, but it has been reluctant in addressing social needs of the community at local level. Urban planning stresses more on the segregated landuses, a distance between one field of functions to another, new street patterns, public spaces for the community, clearance of congested central areas of the city, promoting economic activities for the growth, traffic circulation, parking, sewer, drainage, water supply, electricity etc. Planning remained concerned with making public/political decisions more rational, though utopian in practice. This 'rationalist-cum-scientific' model of planning coincides with 'to-down' normative model of planning action (Landman and Ntombela, 2006). Both in idea and practice, planning heavily relied on comprehensive measures for overall or 'total' development of urban centres in the public interest. Planners' decisions played significant role in the city design, management and landuse planning. Such initiatives were based on the earlier initiatives started during the early twentieth century which focused on the decentralization of urban functions, population and industry (see Howard, 1898, Le Corbusier, 1920). Secondly, a variety of planning methods is used to improve environmental conditions in the cities themselves. However, universal applicability of such motives, in a sense, undermines the local societal contexts and cultural space.

### *New Turns*

With more or less inadequacy and incapability of conventional urban planning due to avoidance of cultural, social, economic, political, institutional and environmental factors, several other approaches and strategies are developed. New urban discourses have been put forth by different scholars and new theories proposed by others. There is a growing enchantment with the outcomes of urban planning. Partly this is due to the trend of an increasingly politicized population challenging government and partly because it is clear that planning has lost its way (Allmendinger, 2001). The society has been shifting to new times and plurality of decisions making should be adopted instead of imposing one particular view and justify it over others. The utopian thinking and ideas were infused with and colonized by modernist notions of technical and scientific rationality. Thus visionary thinking was pushed down for the possible alternatives in conventional planning.

Some of the new approaches include communicative or collaborative planning (Herbarmas, 1984) which is thought to be interactive, diverse in character, participatory and inclusive in nature. Hall (2002) adds that planning should be exploratory and instructive instead of claiming unique expertise. Sustainable urban planning aims at the inclusion of social, economic and environmental aspects for the better future of the cities. Eco-city planning has emerged to cope with complex urban problems at local or regional level. New urbanism (a design-based approach) and just city approaches have been applied for planned and equitable urban development, distribution of resources and management.

### *Uttar Pradesh's Urban Development Initiatives*

Uttar Pradesh is the most populous state in the country which accounts for 16.4 percent of the country's population. The state of Uttar Pradesh is the second largest economy in India after Maharashtra, contributing 8.17% to the country's total GDP. Level of urbanization in Uttar Pradesh was 20.78, which is lower than the Indian national average of 27.78% in 2001. At present 22.28% population of the State lives in urban areas as per census 2011. The state has about 628 urban local bodies (ULBs). Out of these, twelve are the Municipal Corporations, 193 Nagar Palika Parishads and 423 Nagar Panchayats. The task of improving urban services lies with ULBs and at the same time they face severe challenges. As per census, 2001, the most populous cities in the state were Kanpur (2.7m), Lucknow (2.3m), Ghaziabad (1.8m), Agra (1.5m) and Meerut (1.4). Urban centres are growing rapidly and expanding out loosely defined as the peri-urban areas. Over the last three decades, highest decadal growth is recorded in Lucknow and Agra of KAVAL cities.

### *Urban Growth of Agra*

Agra was founded after the Mughal Victory to serve as a permanent headquarters of the Mughal Suba. Agra gained momentum and soon developed into one of the important cities of Hindustan along the river Yamuna. Its ecology and environment were very well preserved by the rulers. Different kinds of improvement works were carried out during different regimes of Mughal Empire. The imprints of Mughal Era are still prominent and remain long lasting in and around Agra Landscape. At the dawn of the nineteenth century, after Lord Lake's victory, Agra was under the domain of British rule. Present Agra is a district headquarters city and this urban agglomeration consists of the Municipal Corporation, the Cantonment Board in the south, Swamibagh and Dayalbagh Towns areas in the north. The City of Agra, as we see it today, is a conglomeration of numerous localities that came into existence at different times due to the (natural) process of expansion (see Mahendra 1971: 42). Table 1 shows that the population of the city has increased threefold between 1951 and 2011. The highest decadal growth rate (i.e.38.52%) was registered in 1961 and thereafter it showed a declining trend over the next two decades. There was again an upsurge in decadal growth rate from 1991 onwards. However, the last decade registered a declining trend in population growth. Even the density of population has been increasing over the decades and by 2011 is reached 11,178 persons per square. Even, Town Panchayats and Cantonment areas are growing in size.

Overall, the decadal growth shows a decreasing trend in the post reform period. This pattern justifies the fact that large cities like Agra are not very attractive to provide inclusive livelihood opportunities to the aspiring migrants and for the city dwellers. Hence there has been a significant out-migration from surroundings districts including Agra to the National Capital Territory of Delhi (NCTD) in the post-globalization period. Consequently, a city like Agra has not been a favoured destination for migrants. However, it does not mean Agra city is stagnant because heritage and tourism being dominant factors attracted huge investments in areas of new townships, apartments, hotels and resorts around the city.

The city has a literacy rate of 73.11%, lower as compared to the national average of 74%. The rate of literacy in males is somehow higher than that of the females. The sex proportion of Agra is 875 females per 1000 males, while the child sex proportion remained at 857. Hinduism, Islam as well as Jainism are the three noteworthy religions in the Agra region. About 25% population of Agra city is directly or indirectly earning their livelihood through shoe-making industry. Agra is now the most populous and fastest growing city of Uttar Pradesh. Of the total population, more than 50% are estimated to live in low-income settlements where water is in short supply, electricity is sporadic and livelihoods are haphazard. Agra Municipal Corporation is subdivided into ninety electoral wards. With this the city has experienced many spatial changes in its urban space. From the Medieval to the British and then post-independence period, the city remained as the melting pot of diverse social and cultural milieu. If the city is viewed from the 'morphological' angle, the bazaar or the central business district is located in the old part around the fort and accommodates different types of central functions.

### *Reorganisation Practices*

Living conditions in inner city are highly uncomfortable as a result of increasing concentration of population and economic activities (see Bedi 2000). Being established during the medieval period, the city retains narrow roads and streets that cause congestion in different *mohallas*. Spatial organization of the city includes old areas built during the Mughals a new urban zone produced by the colonizers, and the construction and growth of the new city with the influx of population. Each of these spaces have their own distinct everyday life, social character and functional organization. Shelter and housing were considered as one of the acute problems in the city. To combat such urban problems, the State constituted Agra Development Authority (ADA) in 1974. It functions under Uttar Pradesh Urban Planning and Development Act, 1973. The Master Plan-I (1971- 2001) was prepared by the department of Town and Country Planning and Agra Municipality and approved by the Government in July, 1975. The objectives of the ADA authority remained to control and regulate the growth of city. Plan envisaged the existing and present structures to be improved and future development will not affect them. With the realization that the centre of the city is congested and crowded, the city was directed to grow out in the north, north-western and south-eastern direction, as shown Map 1. The river Yamuna on the eastern side imposed a geographical constraint.

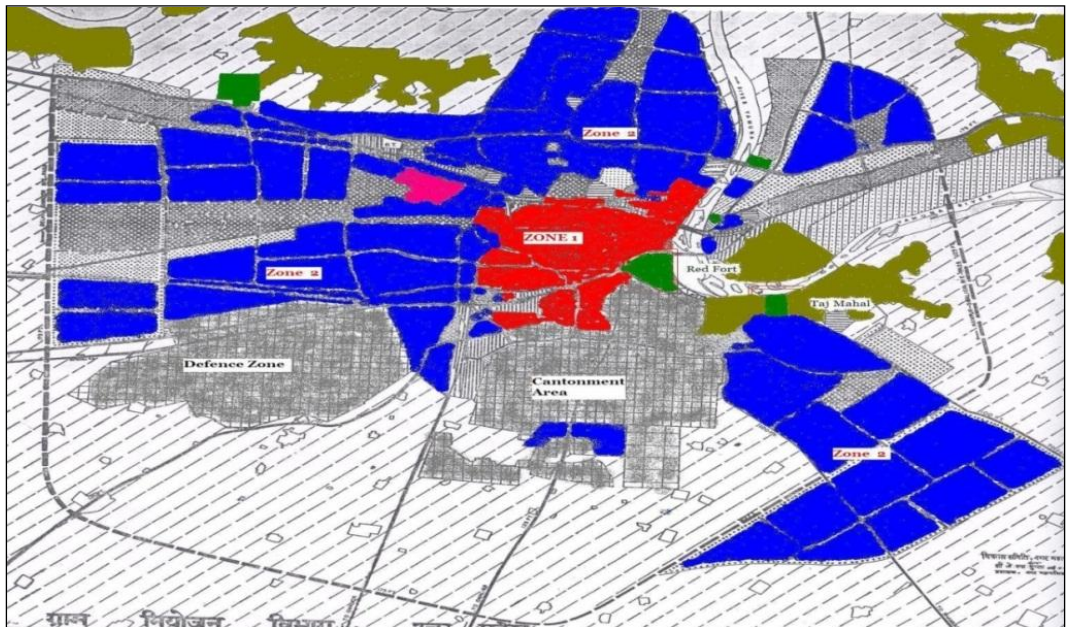


**Table 1. Trend in Population and Growth Rate in Agra Metropolitan City**

Area	Component	Population and Decadal Growth Rate						
		1951	1961	1971	1981	1991	2001	2011
Agra Municipal Corporation	Population	333,530	462,020	591,917	694,191	948,063	1,275,134	1,576,138
	Growth (%)	29.59	38.52	28.11	17.27	36.57	34.49	23.61
	Density	-	7476	9563	5563	6936	9043	11178
	Area (sqk)	-	61.8	61.8	141	141	141	141
	Dayalbagh							
	Population	-	4,110	4,301	4,070	4,871	3,326	2,830
	Growth (%)	-	-	4.65	-5.37	19.68	-31.72	-14.91
Swamibagh								
	Population	-	1,210	1,330	1,433	1,647	1,911	2,039
	Growth (%)	-	-	9.82	7.74	14.93	16.03	6.69
Cantonment								
	Population	42,135	41,340	37,074	47,624	49,755	50,968	53,053
	Growth (%)	57.33	-1.89	-10.32	28.46	4.4	2.44	4.09

Source: Census of India 2001, 2011, UP Census Division 2011

The Master Plan-I had categories of landuse like residential, commercial, community facilities, governmental use, industries, open place and transport. Urban planning under the Master Plan-I was very much influenced by the 'dynapolis theory' which assumes a city has to grow out in the parabolic manner along the main transport corridors and radiating routes. Based on morphology and future urban growth, the whole city was divided into two broader Zones. Zone-I (red patch) included parts of the old city, the built-up area during Mughals Era and the Colonial periods. The "central functions" of the city were classified such as industries, commercial, community facilities, government offices etc. The existing polluting industries (i.e. foundries and *petha* manufacturing units) were allocated space in the Zone II (blue patch). However, shifting locations of polluting industries was planned on the fringe areas: the Trans-Yamuna river areas on the west of Agra-Aligarh road; south of Agra-Kanpur road; and along the Agra-Mathura road. New residential developments were planned in the north, western, southern fringe areas and off to Trans-Yamuna area. In addition, *landuse zonal regulation* with the development controls were put into practice and authorities were to enforce them effectively. Zone-II was aimed at rational segregation of landuse, land development and controlled future growth (Master Plan-I, 1971-2001). In 1971, the population of Agra Urban Agglomeration was about 6.34 lakh and based on past growth trends; population for 2001 was estimated to be 12 lakh. Thus, as shown in the Table 2 shows, a total 8360-hectare land was supposed to be developed for different uses and requirements.



**Fig. 1. Based on the Master Plan-I, 1971-2001**

Source: *The Master Plan - I, 1971-2001, Agra Development Authority*

The lion's share was given to the residential landuse followed by community facilities, transport, open spaces and others. The ADA was the responsible parastatal body having powers to prepare and execute the plan and also for acquisition and distribution of land. *Uttar Pradesh Urban Planning and Development Act, 1973* made it clear that development authority has to provide basic infrastructure on the land well before its public ownership.

Population of city has been growing steadily. With estimated urban population by 2001, the Master Plan-I envisaged about 12.2 million houses to be provided by the end of the Plan. Due to loopholes in public housing policy and institutional hindrances, housing supply was affected leading to growing slums and *jhuggi jhomparis*. The current urban form shows that the city has grown more in the north and around the core of the city, southward and in Trans-Yamuna areas due to easy accessibility by flyovers and bridges over the Yamuna River.

The Master Plan-II seems a long perspective plan for twenty years extending from 2001 to 2021. Instead of the two zones as demarcated in the first plan, the Master Plan-II categorized Agra Metropolitan Area into seven development Zones. City planners have projected 2.2 million populations in Agra by 2020. Accordingly, by 2021, housing requirements would reach to 256,488 units. The Plan mainly focuses on development and reutilization of 'vacant land' or 'unused landuse' of densely populated areas in an effective manner for social purposes i.e. parks and community facilities. The landuse of the Master Plan-II is shown in the Table 2.

This perspective plan is in line with shifting priorities of urban governments from providers of social goods and urban amenities to promoters of urban economic growth and investment. This is a phase of neoliberal development where public sector is allowing and inviting non-state actors in urban development and providing services to growing urban population. Even the international development cooperation and funding institutions like the UNESCO and the USAID do play an active role at local development in Agra. However, intra-city or ward level inequalities in Agra are rampant and wide spread. Present planning takes recognizance of the importance of growing heritage-based tourism and its contribution to the economy. For better transport facility, one outer ring road, and the Yamuna Expressway has been completed to reduce the traffic congestion in the city and connecting Agra with Lucknow. This planning shows a trend of spatial expansion with the centrifugal pattern of functions and activities.

**Table 2. Landuse and Changes in Agra Metropolitan Area**

Existing Landuse, 1971 (Based on First Urban Survey)			The Master Plan-I Proposed Landuse 1971-2001		Developed Landuse by 2001		The Master Plan-II Proposed Landuse 2001-2021		Landuse Changes (in Hectare)	
	Land Area (Hectare)	Percentage	Land Area (in Hectare)	Percentage	Land Area (in Hectare)	Percentage	Land Area (in Hectare)	Percentage	1971-2001	2001-2021
Residential	1148	41.66	3254	39	4886.34	61.85	9923.81	49.53	2106	5037.47
Commercial	459	16.7	300	3.58	207.62	2.62	544.17	2.72	-159	336.55
Industrial	229.6	8.33	1040	12.44	542.72	6.88	1606.31	8.01	810.4	1063.59
Community Facility	0	0	1252	14.95	842.62	10.67	1763.41	8.8	1252	920.79
Offices	172.4	6.25	60	0.71	177.93	2.25	508.41	2.54	-112	330.48
Traffic & Transport	172.4	6.25	1254	15	858.65	10.86	2161.61	10.79	1081.6	1302.96
Tourism	0	0	0	0	116.48	1.49	178.18	0.89	0	61.7
Open Spaces	574	20.83	1000	11.95	136.47	1.72	875.41	4.37	426	738.94
Others	0	0	200	2.38	131.56	1.66	2475.72	12.35	200	2344.16
<b>Total</b>	<b>2755.4</b>	<b>100</b>	<b>8360</b>	<b>100</b>	<b>7900.34</b>	<b>100</b>	<b>20037.1</b>	<b>100</b>	<b>5605</b>	<b>12136.64</b>

The Master Plan- I (1971-2001): Agra Development Authority, Agra, Uttar Pradesh

The Master Plan-II (2001-2021): Agra Development Authority, Agra, Uttar Pradesh

Source: Existing Landuse, 1971 Based on Data Retrieved from Town and Country Planning Department, Agra, Uttar Pradesh

Table 3 shows zonal distribution of landuse in Agra Metropolitan Area as per the Master Plan-II, 2001-21. Interesting details are covered here. The medium density (300 persons per hectare) residential areas will come up in Zone II and III. The Low-density residential areas are proposed to come up in Zone III, V, VI and VII. New commercial activities are planned in outer Zones than in the central parts of the city. Pollution free industries are directed to come up in Zone V and VI. In addition, lands are demarcated for the information technology, service and communication industries too. New community facilities are to be created in Zone III and V. Conservation of natural forest cover around The Taj Mahal Complex, up to 500 meter in the radius, is top priority for maintaining healthy and natural environment in Zone VI. As per planning; residential, commercial, industrial and recreational spaces will be developed in almost equal proportion in Zone VI (Fig. 2).

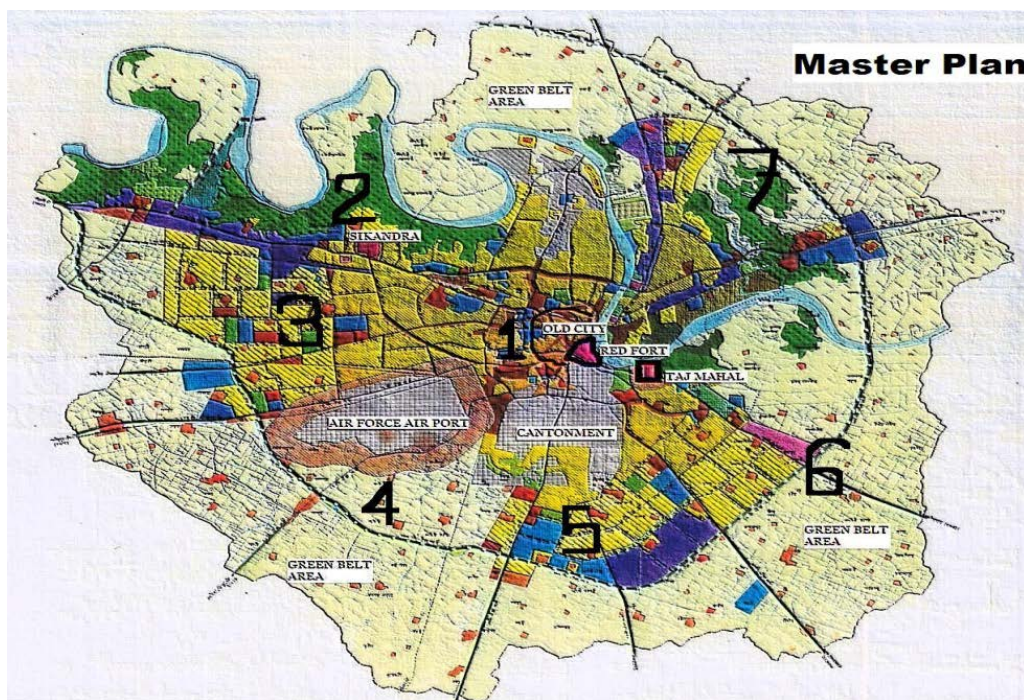


This very Zone also depicts how heritage-based tourism is causing huge spatial changes in the area around in connection to growing number of hotels, restaurants, resorts, shopping lanes, etc. Alongside new urban development priorities, the interior and old areas of Tajganj (in the vicinity of the Taj Mahal) are left in isolation and are home to slums and poverty stricken groups.

**Table 3. Zone Wise Landuse Break-Up of the Master Plan-II, 2001-2021**

Landuse Category	Land To Be Developed in Each Zone by 2021 (in%)							Total Land (in Hect.)
	Zone I	Zone II	Zone III	Zone IV	Zone V	Zone VI	Zone VII	
Residential	6.5	19.2	34.8	0.05	12.0	14.9	12.3	9923.8
Commercial	16.7	23.8	27.3	-	9.5	13.6	8.0	544.5
Industrial	10.5	14.8	22.3	4.5	19.5	15.0	13.0	2161.6
Recreational	0.02	37.8	17.3	-	10.7	14.6	18.9	875.4
Greenbelt	-	-	16.3	5.9	38.0	6.6	32.5	421.5
Other Uses	0.9	4.1	16.3	45.1	7.9	6.6	16.4	2054.1

Source: The Master Plan-II, 2001-2021, Agra Development Authority



**Fig. 2. Planning Zones of Agra Metropolitan Area, 2001-2021**

Source: The Master Plan - II, Agra Development Authority

## **Conflicting Priorities**

The share of community facility, open or park space has been decreasing in landuse allocation over the two plans. The salient features and objectives of the present Master Plan-II are: controlling and directing the current unplanned growth by planning measures; holistic adjustment of different areas of the city; provisions for residential and community facilities to the various income groups; a compatible relationship between social, economic structure, and industrial and commercial areas; guiding the private, public, semi-public institutions for implementation of the projects; and provision for roads and highways for the current and the future areas to be developed. Existing urban institutions are being restructured and new actors are welcome in urban management and supply of services. The point is that city is subject to two processes: i) physical planning through landuse and regulations; and ii) key programmes and policies launched to enhance urban development, strengthening governance and supply of basic services.

However, the later are hardly complementary to the first one, and largely fail addressing socio-spatial inequalities in Agra. The flagship Jawaharlal Nehru National Urban Renewal Mission (JNNURM, 2005) stressed on urban governance and infrastructure and basic services to the urban poor. Rowan Ellis suggests, in the context of neoliberal effects, "older structures of urban regulation and management have been replaced by a regime of governance wherein multiple and various state, non-state and quasi-state actors become involved in urban governance" (2011: 1). New central urban programme is an extension of what Ellis has suggested. Apart from landuse planning, the Jawaharlal Nehru National Urban Renewal Mission enlists Agra as one of the beneficiary cities. This reform-led urban policy had justified a necessity of local reforms already suggested by the Japanese Bank for International Cooperation. Share of fund allocations under JNNURM- City Development Plan to various sectors are as follows: roads and transportation (63.1%), water supply (11.5%), sewerage (9.7%), urban poverty and slum (6.1%), environment (3.2%), urban renewal in inner city (2.3%), industry (0.1%), urban renewal in inner city (2.3%), solid waste management (1.1%) and heritage and tourism (0.7%).

A huge share of the total cost is channeled to the roads and transportation, and infrastructure facilities in the city. Recently, a mega project the Yamuna Express Way is completed between Agra and Delhi which offers huge investment climates for developers all along the highway. These developments draw our attention to the fact that the city is on the move for having 'world class' facilities. On the other side, the older parts of the city are not on high priority even though social and environmental conditions have worsened over the years there. The case of Agra is similar to the other urban centres of the state of Uttar Pradesh as most of inner city areas lack access to modern infrastructure and basic facilities and services. But, being home of the Taj, the city has been witnessing significant urban transformations and spatial changes in and around Agra in relation to its regional importance and growing tourism in the post-globalized period.

## Hegemony of Heritage and Tourism

Cities dominate global economic activity, even more than their population would suggest, because of powerful economies of scale. City planning has given more importance to physical environment. Urban management of civic amenities and their public reach is inadequate. It is not an odd thing to see because most of such policies are meant for the landuse development for the concerned urban centre. With the increase of urban population, the morphology of the city has been transforming. In addition, the 'heritage' of Agra such as the historic Taj Mahal and its global popularity is playing an important role in shaping priorities of urban development and distribution of resources and civic amenities. There are more than two hundred historical buildings or monuments in and around Agra Metropolitan Region. On its part, the Archaeological Survey of India (ASI) retains authority of listing monuments and now about over fifty monuments in Agra fall under the purview of the Monuments Protection Act. These are places of attraction for both domestic and foreign tourists. Taj Mahal, Agra Fort, Fatehpur Sikri, Itima-ud-Daula, Akbar's Tomb, Mariam's Tomb, Ram Bagh and Mehtab Bagh are Centrally Protected Monuments (CPMs) and heritage sites. Agra circle has three of the World Heritage Sites: The Taj Mahal, Agra Red Fort and Fatehpur Sikri. Compared to other sites, Agra is famous and well known across the world for the Taj Mahal with millions of tourists annually visiting this magnificent marble monument (as shown in Table 4). As a result, the functional character of Tajganj space has changed to *adapt* to the needs of tourism and tourist facilities. Parts of existing residential areas are converted into budget hotels, cafes and emporiums all along the main road and land values got enhanced. Regulation of tourism in Tajganj and consistent efforts to maintain a classic image of the area has affected locals most - hawkers, vendors, *thelwalas*- whose subsistence incomes were associated with arrival of tourists. Thus, long term urban plan remains an important instrument for guiding and regulating development of towns and cities over a period of time, and contributes to planned development both conceptually and operationally (Meshram 2006: 7). Landuse and its management becomes the essential thing for the planners. Restructuring of urban space leads to changes in structure of economy and city. Capital accumulation and change in built environment are more concerned with new economic reforms. Doing so, planners, architects of city design, and those they lead along with them in their beliefs are not consciously disdainful of the importance of knowing how things work (Jacobs 2003: 64). Instead, they mostly focus on how cities 'ought' to work and what 'ought' to be good for people. Fainstein (1991) adds the connection between the economic structure and planning legitimacy is now straightforwardly claimed, and the tactics developed to stimulate economic growth are frankly enumerated (Perry 2003: 149). Table 4 shows tourists at Agra and their flow to the particular monuments and the historic Taj Mahal attracts more than half of them.

Further, rationales and techniques often tend to decide what is good or better for people living in a particular area. To do so, the state comes forward while taking it as a responsibility to provide for in the public interest. The 'collective consumption' of built environment (roads, sewerage networks, parks, railroads etc.) is regulated by the state. Then, in their creation and provision, they are often politicized and conflict occurs.

The government intervention in ordering urban built environment - urban planning - can be seen as a response to the social character of land, to the fact that land is not only a commodity but also a collective good, a social resource as well as a private right (Foglesong 2003: 104). Agra city landuse planning is a centralized one, where state is determining the landuse and growth pattern of the cities by institutional apparatus. The para-statal body such Agra Development Authority (ADA) is accountable only to state government and higher-level agencies in the centre. One of the failures of the plan implementation is that whatever has been proposed in the urban plans has not been achieved. The ADA Master Plans are basically landuse plans marking space for commercial, industrial, and residential purpose and deciding upon the density per acre in the residential areas.

**Table 4. Tourists Arrival to Agra Built-Heritage (Over the Last Five Years)**

SN	Monuments	2007		2008		2009		2010		2011	
		Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign
1	Taj Mahal	2624085 (58.4)	586105 (47.7)	2635283 (56.8)	591560 (47.3)	2585560 (54.9)	491554 (47.3)	4087968 (63.7)	621183 (46.6)	4646203 (62.8)	668903 (49.6)
2	Agra Fort	1177133 (26.1)	357570 (29.1)	1289810 (27.8)	385697 (30.8)	1398890 (29.7)	314116 (30.2)	1417641 (22.1)	381479 (28.6)	1605432 (21.7)	306097 (22.7)
3	Fatehpur Sikri	262083 (5.8)	198589 (16.2)	292483 (6.3)	191242 (15.3)	294316 (6.3)	159672 (15.3)	315420 (4.9)	210450 (15.8)	422450 (5.7)	229091 (17.0)
4	Akbar's Tomb	304938 (6.8)	42455 (3.5)	293504 (6.3)	40801 (3.3)	300213 (6.4)	35761 (3.4)	409368 (6.4)	52600 (3.9)	443553 (6.0)	57852 (4.3)
5	Mariam's Tomb	9435 (0.2)	38 (0.0)	12188 (0.3)	103 (0.0)	9937 (0.2)	117 (0.0)	18056 (0.3)	236 (0.0)	23880 (0.3)	234 (0.0)
6	Itima-ud-Daula	62811 (1.4)	39739 (3.2)	64647 (1.4)	39871 (3.2)	63974 (1.4)	33677 (3.2)	79208 (1.2)	55920 (4.2)	117401 (1.6)	62625 (4.6)
7	Ram Bagh	34756 (0.8)	284 (0.0)	32209 (0.7)	197 (0.0)	27461 (0.6)	162 (0.0)	31689 (0.5)	322 (0.0)	41820 (0.6)	307 (0.0)
8	Mehtab Bagh	17792 (0.4)	4357 (0.4)	20552 (0.4)	1544 (0.1)	26902 (0.6)	5250 (0.5)	59075 (0.9)	10890 (0.8)	98291 (1.3)	22214 (1.6)
	<b>Total</b>	<b>4494033</b>	<b>1229137</b>	<b>4640676</b>	<b>1251015</b>	<b>4707253</b>	<b>1040309</b>	<b>6418425</b>	<b>1333080</b>	<b>7399030</b>	<b>1347323</b>

Source: India Tourism Statistics 2009, 2010, 2011, The Ministry of Tourism, Government of India, India

Note: Figures in parenthesis are in percentage (%)

**Table 5. Domestic and Foreign Types of Tourists from 2007 to 2011**

	Types	2007	2008	2009	2010	2011
<b>Group I</b>	Domestic	90.4%	90.9%	90.9%	90.7%	90.2%
	Foreign	92.9%	93.4%	92.8%	91.9%	89.4%
<b>Group II</b>	Domestic	9.6%	9.2%	9.1%	9.3%	9.8%
	Foreign	7.1%	6.6%	7.2%	8.9%	10.6%

*Group I Includes:* The World Heritage Sites -Taj Mahal, Red Fort, and Fatehpur Sikri

*Group II Includes:* Centrally Protected Monuments- Akbar's Tomb, Mariam's Tomb, Itima-ud-Daula, Ram Bagh and Mehtab Bagh

The ADA has been undertaking large scale acquisition of urban land in order to control future development of Agra and make its own task of development economical. In such a process, the ADA has paid more attention on the acquisition, development and

disposal of land. New colonies have been established as per the requirement of differentiated urban society.

In the name of formal utilization of urban land, the authority had focused less attention on the needs and requirements of urban poor and socio-economically disadvantaged groups. Over the past decades, a number of effective measures have been taken by public authorities to reduce the threat to the monument, among them are closing of some foundries and the installation of pollution-control equipment at others, the creation of a parkland buffer zone around the complex, and the banning of nearby vehicular traffic.

### **From Cosmopolitan to 'Global'- Missing Links**

Agra has been a cosmopolitan city since the Medieval Era, as people here belonged to different religions, regions and races. Being promoted as important and must-visit tourist destination of the country, planning in the city is preparing to have global-standard quality facilities such as international convention centre, mono-and-metro rail project within the city, high-quality service hotels with western outlook and design. Agra Development Authority has drafted a plan for establishing a global tourist centre in the vicinity of the Taj Mahal Complex. This centre will provide following facilities and unique experience to the tourists: water sports, amusement parks, international sports stadium, golf courses, nature cure activities, multi-specialty hospital for medical tourism, natural and man-made wild life areas, self-sufficient internal and intra-city transport system, and new township and residential areas with green surroundings. Urban local bodies face many challenges in developing and managing the city. These challenges are in areas of qualitative water supply, sewage (only 17 percent of the total area of the city is covered) and drainage development and improvement, solid waste (average waste generation is 492 grams per capita per day) management and disposal of garbage (currently there is no regulated facility for garbage collection) with the increasing population pressure. City had 10 percent slum population as per the census 2001. Whereas, the District Urban Development Authority puts forth that about 44 percent of total population lives in slums. These are located at very spatially and environmentally vulnerable areas of the city. About 40 percent of the slum population does not have access to sanitation facility.

Most of the pollution elements (air, water, noise etc) have crossed the standard limits fixed by the concerned expert bodies. Thus, environmental pollutions have been affecting the city life and urban poor in particular. Water quality is low and the only source is Yamuna River and the other open water bodies either dried up or are being encroached for housing and real state purposes. Some of the water bodies are filled up with solid waste and domestic dirt. Necessity is to increase the drinking water treatment capacity to cope with the growing population. Conditions of marginalized groups such as poor Dalits and Muslims and women are miserable in interiors locations and they live in unhygienic environs which affect their health, life chances and socio-economic status. In Agra, in 2001, government records reported 252 slums constituting about 44% of city population. As per the City Development Plan estimations, 1.2 million people i.e. 9% of the total population live



in slums and slum like conditions. As per the recent survey undertaken by Regional Centre for Urban and Environmental Studies in collaboration with Centre for Urban and Regional

Excellence, the city has 417 slum settlements up from 378 in 2007 and 252 in 2001. For example, in trans-Yamuna area in the absence of Municipal piped water connection and supply, the primary source of drinking water in most of these localities of Agra is water supplied by private tankers - known as tanker economy. In marginalized locations of the city like Nagla Chhidda, Rajnagar, Nagla Harmukh and interior Tajganj, women suffer more than men. The fact is, women are invariably disadvantageous compared with men in city in terms of equal access to employment, housing, health and education, asset ownership, experience of urban violence and ability to exercise their rights. The civil society is not showing strong signs of pressurizing urban administration thinking about sustainable city development and adopting effective mechanisms to resolve urban problems faced by the citizens.

On the other side, declining share of open and recreational land and concretization of urban space, leads to changes in micro climate of the city. Over the decades open spaces, community facility, parks priority has been undermined in the planning process. More attention is paid to housing which is also not even in the city. With the involvement of private sector, the development authority is promoting corporate housing with advance facilities meant for middle-class centered requirement. Agra needs to go a 'sustainable' way. A sustainable place is one in which employment, mixed housing and social facilities are co-present and available to a range of socio-economic groups (Raco 2007: 306). For a sustainable urban future, development parameters of Agra city are not very encouraging. Therefore, as suggest by Nadarajah and Yamamoto, the emerging urban crisis challenges environment-based and economic-based approaches to sustainability, and seeks to bring to the forefront the multi-faceted and critical role that culture and (locale) plays in ensuring that cities are viable for future generations.

There has not been much intellectual discussion on what is meant by a "smart city" in a true sense in the Indian context; we have had a flagship launch of the programme to develop a hundred existing cities into smart cities of the country. Agra, one of the ten cities from the State, was selected finally for the scheme in September 2016. Within a year, as many as seventy detailed projects (DPR) were to be submitted for approval so that work could start. The smart city proposal for Agra includes Rs 2,133 crore makeover plans. 2,250 acres of area around Taj Mahal, Agra Fort, Jama Masjid and other parts of the city will be covered under the project. In preparing Smart City Proposal, the Agra Nagar Nigam's (ANN) website gathered around 3,60,000 votes on vision, site selection and pan city initiative. Fig. 1 shows that a large percentage of the citizens voted for heritage (28%), sanitation (15%), and solid waste management (13%) and less for social sector including housing provision, education, health sector. This represents a popular image of Agra. On the other side, declining share of open and recreational land and concretization of urban space, leads to changes in micro climate of the city. Over the decades open spaces, community facility, parks priority has been undermined in planning. More attention is paid to

housing which is also not even in the city. With the involvement of private sector, the development authority is promoting corporate housing with advance facilities meant for middle-class centred requirement.



**Fig. 3. Citizens Voting Towards Preferred Sector in Preparation of Smart City Proposal for Agra Metropolitan Area**

Source: <https://secure.mygov.in/group-poll/select-your-priority-development-agra-smart-city/>

Agra needs to go ‘sustainable’. A sustainable place is one in which employment, mixed housing and social facilities are co-present and available to a range of socio-economic groups (Raco 2007: 306). For a sustainable urban future, development parameters of Agra city are not very encouraging. Therefore, as suggested by Nadarajah and Yamamoto, the emerging urban crisis challenges environment-based and economic-based approaches to sustainability, and seeks to bring to the forefront the multi-faceted and critical role that culture and (locale) plays in ensuring that cities are viable for future generations.

**Conclusion**

Agra city planning has been determined by and operated in the sphere of modern, rational and comprehensive planning model. More emphasis has been t o design urban

landuse controlled by zoning rules. Though physical plans play an important role in structuring economic organization, urban land is reduced to an element which can be used according to set use. Changing the physical surroundings changes aesthetic and moral environment according to the planning ideology. If urban “plans” are taken as *texts* then one finds that distribution, allocation and location of different landuses reveal an inherent order of space creation. Space making is determined by the type of technocentric approach and values that the planners practice. This sort of planning process includes setting common objectives in the pursuit of urban development and shaping intra-city urban growth.

However, landuse-based planning rarely coincides with social urban planning which needs to focus on effective delivery of civic amenities and basic services to the different socio-economic groups like those who inhabit slums. Since Agra has the world heritage site and other monuments of national importance, local development is put against global aspirations of town planners and policy makers. Planning has to adopt an inclusive mechanism to a collective public or citizens involvement and support for making Agra a sustainable urban habitat. Though urban system in the state and country is decentralized yet Agra faces crucial challenges: inequalities in basic services, inadequate infrastructure, inequalities, incapacity of local institutions, lack of public participation and presence of marginal spaces. Another, urban growth shows clear decline over the last decades which is not a good sign for Agra and its region. Urban planning in Agra appears to have capitalized on one historical built monument- the Taj- but in the process ignored the other crucial elements of urban development. Apparently, ‘going global’ has appropriated the local (Taj Mahal), but locals seems to have been left out in this process.

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# DECADAL LANDUSE AND LANDCOVER CHANGE DYNAMICS IN EAST COAST OF INDIA - CASE STUDY ON CHILIKA LAKE

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## Abstract

*This study is based on landuse/ land cover change (LULCC) dynamics using multi-temporal satellite images for Chilika Lake from 2005 to 2016. Multi-temporal LISS IV data has been used for creating thematic landuse and land cover maps and change statistics at 1:10, 000 scale. Semi-automated object oriented classification approach has been followed to create multi-temporal landuse and land cover thematic maps in this study. The study revealed that Agricultural land (42%) is the most dominant landuse class followed by wetlands (35%), Forest (11%), Wastelands (8%) and Built-up (2.3%) of Total Geographic area (TGA). It is noticed that there is a drastic coastal landuse and land cover change in the recent decade. The study also demonstrated that there is a significant area reduction in the main lagoon because of illegal embankment and rapid growth of some species. There is a reduction in open forest area and increase in the scrub land, aqua-culture, mangroves, agricultural planation and rural built-up area. It is noticed that by opening a new mouth the biodiversity of different species and the inflow of water towards the main lake has increased which results in a growth in the economy of locals. Importance of the new mouth, problems of the area and measure solutions have been discussed briefly in this study. However, many issues exist regarding the ecological character, state Govt. and other international organisations are focusing to conserve and monitor it periodically. Landuse and land cover studies can be taken as an input for ecological and coastal management studies for future research in this area which can help to make a better management plan in future.*

**Keywords:** LULCC, Object oriented classification, Multi-temporal, Coastal Management

## Introduction

The Chilika lagoon spreads for around 830 Sq. km. along the east coast of India in the Odisha state (Fig. 1) and is the largest brackish water lagoon of Asia (Ram et al., 1994). The lagoon is oriented parallel to the coast between the Eastern Ghats and the Bay of Bengal and is connected to the Bay of Bengal through a 25km long narrow outer channel separated from the sea by a narrow spit (Asthana, 1979). It is taken as a serious problem in changing the environment. The change is due to human activities and natural processes (Meyer and Turnnor, 1994). Moreover, this change could be the result of complicated interactions of socio economic and biophysical situations like economic diversification, technological advancement, demographic pressure and many other related conditions (Reid et al., 2000).

The Chilika Development Authority (CDA) made an artificial mouth near the village of Sipakuda (Roy 2001). The new mouth was opened on 23 September 2000 with an initial cut of 80m in length to the existing spit of around 200m in width (Venkatarathnam 1970). A coastal management mechanism must be established to prevent these problems before appearing. Therefore, developing coastal management policies and strategies are important to prevent the harmful effects of environmental changes. For this, information technologies such as GIS, remote sensing (RS), and internet are important. These information technologies considerably support managerial decision-making process to manage spatial information. GIS integrates various information resources for coastal regions' management (Uckaç, 1998).

## Study Area

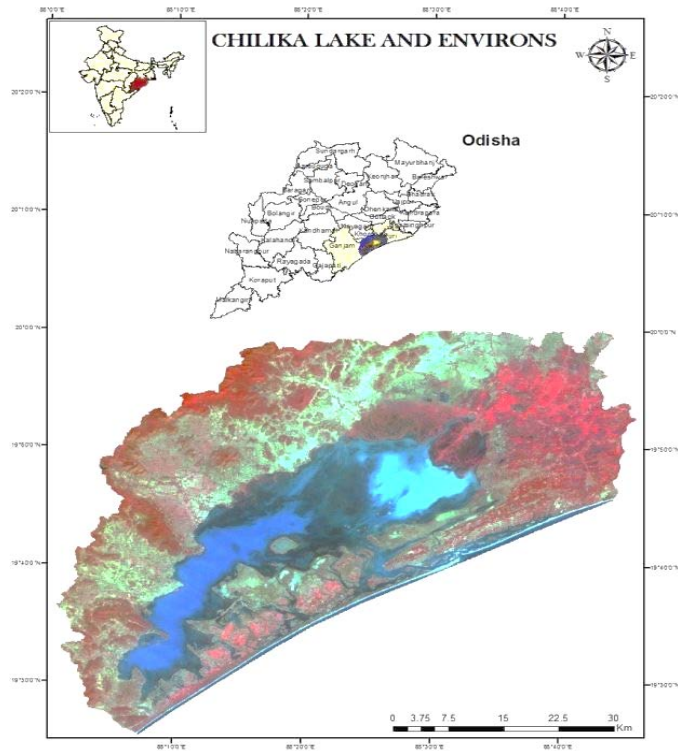
Study area of research is Chilika catchment which is situated in the east coast of India which covers Puri and Khurda districts adjoining Ganjam district of Odisha state. Its catchment also covers 18 blocks of Puri, Khurda, Nayagarh and Ganjam with an area of 3987 sq. km. (Chilika Atlas, 2007). Mahanadi river system and another western catchment are the two main subsystems which affect its catchment system hydrologically. Bhargabi, Daya, Makara, Luna are the main rivers which are coming under the Mahanadi river system and Kusumi, Tarimi, Mangalajodi, Kantabaia, Badanai, Kansari, Janjira and Kalajhar rivers come under the western catchment. Coastal land transformations since last decade are the major attraction for selecting the area. The study area becomes a major hotspot of biodiversity which serves as natural habitat for a range of species, birds, fishes and prawns etc. Chilika Lake is one of the Ramsar Sites which has a complex ecosystem. It is important to study the landuse and landcover of the catchment area and its pattern over years to access and monitor the ecosystem ensuring wise use of wetland system for productive resources.

According to the Salinity and Depth the lake is divided into 4 sectors as Northern, southern, Central and Outer Channel. One-third of the northern sector of the lake is covered by emergent vegetations (*Phargmites karka*) and towards central sector and the southern sector more of submerged vegetation (*Potamogeton pectinatus*; Linn) and Free floating vegetation (Water Hycinth) are present in the lake.

## Geology, Geomorphology and Soils

The formation of the lake is contributed by many complex geologic processes involving deposition of beach ridges and spits enclosing a body of sea water within the Bay. About 6000 yrs. ago it became a part of Bay of Bengal and served to be its gulf from its time of Pleistocene. The current form of Chilika is attributed to successive recession of coastline aided by marine and fluvial dynamics over 67,000 years (Phlegar, 1969). The process of sand bar formation was very gradual with the sea level rise being very slow during the Holocene (15-20 cm in a century). The growth of barrier is believed to be triggered by a minor tectonic elevation, subsequently aided by coastal progradation

attributed to lowering of sea levels and deposition of sediments by longshore currents (Rao and Sadakata, 1996).



**Fig. 1. Study Area**

Several erosional and depositional landforms are the major structures observed in the lake and its surroundings. Khondalites, unclassified granites, laterites, charnockites, anorthosites, granulites, laterites and alluvium are observed to be the main rock types around Chilika Lake. Some islands of Chilika comprise Eastern Ghat rocks. Many structural and denudational hills of khondalite, charnockite, gneisses, anorthosite and granite are observed towards the western phalanges. The hills are followed by lateritic plains. Large tract of alluvial plains extending to more than 400 km<sup>2</sup> surround the north part of the lake. This low-lying area is mainly built by recent deposited sediments having very gentle slopes. This region is drained by the Mahanadi Delta and its distributaries Bhargavi, Luna and Makara, which have extremely gentle elevation and sediment deposition. Two distinct shore terraces parallel to the northern shoreline mark the shoreline terraces formed due to continuous deposition and emergence of lagoon floor. Many sandy beach ridges are observed along the eastern part separating the lake from open sea. Some of these ridges raise up to 5-6 meters with characteristic swales in between which are occupied by creeks and marshes. The open coast is marked by the presence of a prominent spit connected to the mainland at its southern end.

Four major categories of soils are present in the lake based on the Harmonized World Soil Database. The hills on the west are marked by Nitisols (deep and dark brown clayey soils) whereas the deltaic region has Lixisols (soils with subsurface accumulation of low activity clays and high base saturation). A patch along the northern sector has Solonchaks or strongly saline soils. Arenosols or sandy soils with very weak soil development mark the coastal zone of the Chilika.

### *Hydrological Activities*

Chilika being a lagoon, all hydrological activities which take place are by coastal and riverine processes both resulting in the mixture of fresh water from rivers and salty water from the sea which makes the water brackish in nature. The lake is divided into four different sectors as (North, South, Central and Outer) according to the variability in salinity and depth. Inflow of freshwater is via Mahanadi, its distributaries and part of western catchment, salty (sea) water is brought by mouths and Palur Canal in the southern sector. Mahanadi River flows undivided till the delta apex at Naraj and then gets subdivided into three major tributaries as Kuakhai, Kathjodi and Birupa, along with the main Mahanadi river channel. Daya and Bhargavi Rivers, which are distributaries of Kuakhai help for the inflow of Mahanadi river water inflow to the lake. Badaghati, Badanai, Badasankha, Kansari, Kusumi, Mangalajodi, Salia and Tarimi are the major streams which flow from the western catchment which carry the monsoon runoff from a highly gullied and ravenous catchment with marginal forest cover.

With the sea directly interchange/exchange of water takes place resulting in water which is brackish in nature which makes the variability more in different species, sediments and nutrients. The overall hydrological regimes of Chilika Basin have been highly fragmented through construction of hydraulic structures which makes the water in the lake in general warm, alkaline, well oxygenated, turbid, brackish and nutrient rich. The lake water quality is conducive for aquatic life but seasonal and sectoral fluctuations are noticed due to connectivity with the sea, evaporation and wind action.

### *Problems and Solution Measures of the Study Area*

Chilika is facing the biggest threat mainly because of anthropogenic activities including creating big structures, large-scale deforestation which is supposed to protect it from the high tidal flooding activities; it being an important Ramsar site of India and the largest brackish water lagoon of Asia. Its biodiversity and aquatic resources including fishes, crabs and prawns etc. are continuously losing their counts due to deforestation which resulted in embankment of the coast by sands. The major issues faced by Chilika are due to over-fishing throughout the year and rapid growth of dolphin tourism which leads to increase both the number of fishing and tourism boats which disturb the ideal biodiversity in the lake ecosystem. Ecosystem of the lake had completely been disturbed when the two natural mouths got silted due to deforestation. Therefore, the major problems followed as;



(1) Siltation due to littoral drift and sediments from the inland river systems (2) Shrinkage of water surface area (3) Choking of the inlet channel as well as shifting of the mouth connecting to the sea (4) Decrease in salinity and fishery resources (5) Proliferation of fresh water invasive species (6) An overall loss of biodiversity with decline in productivity adversely affecting the livelihood of the community that depended on it(Chilika Framework - An Integrated Management Planning Framework for Conservation and Wise Use). The lake mouth was shifting due to longshore sediment transport and there was excessive siltation in Chilika lagoon. To combat the problems and to save the ecosystem, major hydrological interventions made are: a) Opening of a new mouth in the outer channel on 23rd September 2000.b) Regular de-siltation through dredging of lead channels in the lagoon. c) Renovation of Palur canal connecting the lagoon with Rusikulya estuary.

*Hydrological Interventions*

Opening a new mouth (32 km long narrow) on 23rd September 2000 in the outer channel which is connecting the main lagoon to the Bay of Bengal, has brought many advantages in the hydrological activities resulting in better biodiversity and productivity for the lagoon by increasing the counts of rare species as well as the available species in a significant way. Except this many benefits have been achieved as a) Salinity influx has improved, b) Reduction of the outflow channel has taken place by 18 km. c) Ideal exchange of water between sea and the lagoon. d) Good way of flushing out of sediments e) Reduction of fresh water weeds in a huge area.

**Materials and Methods**

*Data used*

IRS P6 LISS-4 MX of 2005 and IRS Resourcesat-2 LISS-4 MX images of 2016 have been used for delineating the landuse features and to mark the major changes. Details of the data used are given in Table 1.

**Table 1. Satellite image specifications**

Satellite	Sensor	Date of pass	Spatial resolution	Spectral Resolution	Radiometric Resolution
IRS P6	LISS-4	29 Jan, 2005	5.8 m	3 bands (2,3,4)	8 bit
IRS		22 Feb, 2016			16 bit
Resourcesat-2		19 Oct, 2016			

*Methodology*

The study being for a wetland system, it's important to work in the watershed or catchment area of the main lagoon. Arc Hydro tools has been used for delineating the watershed area as the study area from cartosat-1. DEM in ArcGIS 10.2.Semi-automated

classification method has been adopted to delineate and classify the landuse/land cover classes in the area. Major steps involved in the methods are as follow a) Segmentation b) Classification and Onscreen visual interpretation. Segmentation is a process which involves creating objects from the image by grouping pixels based on some homogeneity criteria such as uniformity, reflectance and texture. In this study shape (0.4) and Compactness (0.6) has been used for creating the objects. Segmented image should be visualised to create objects based on a shape. So, the optimal triplet must ensure that each derived object contains a unique category of pixels (Despinoy, 2007). A threshold should be set by the operator called “scale” to limit the region of growth in which a unique group of pixels will create an object. Visual assessment plays an important role to finalise the shape and size of the objects created, accordingly operator can change the scale and spectral difference parameter to create different object layers.

Later many rule sets (NDVI, Band3<sub>maen</sub>, shape etc.) has been applied to classify and label the objects into different landuse and land cover classes accordingly. Landuse classes have been finalised by visual assessment and some limited ground checks to create a landuse and land cover thematic map for year 2005. Visual interpretation of remote sensing images for extracting desired information could be achieved in an efficient and effective manner by using several basic interpretation keys (or) elements (Floyd F. Sabins Jr. 1987). The LULC old layer has been updated for the recent year (2015) and the changed areas have been marked for different LULC classes. Multi-temporal post classification comparison change detection was used to determine changes in LULC between 2005 and 2016 which is the most common approach to change detection (Jensen, 2004) and has been successfully used by NRSC/ISRO (2011) to monitor landuse / land cover changes at 1: 50000 scale all over India. LULC class statistics has been created for both the years and change in different LULC classes has been noticed.

### **Ground Truth Validation**

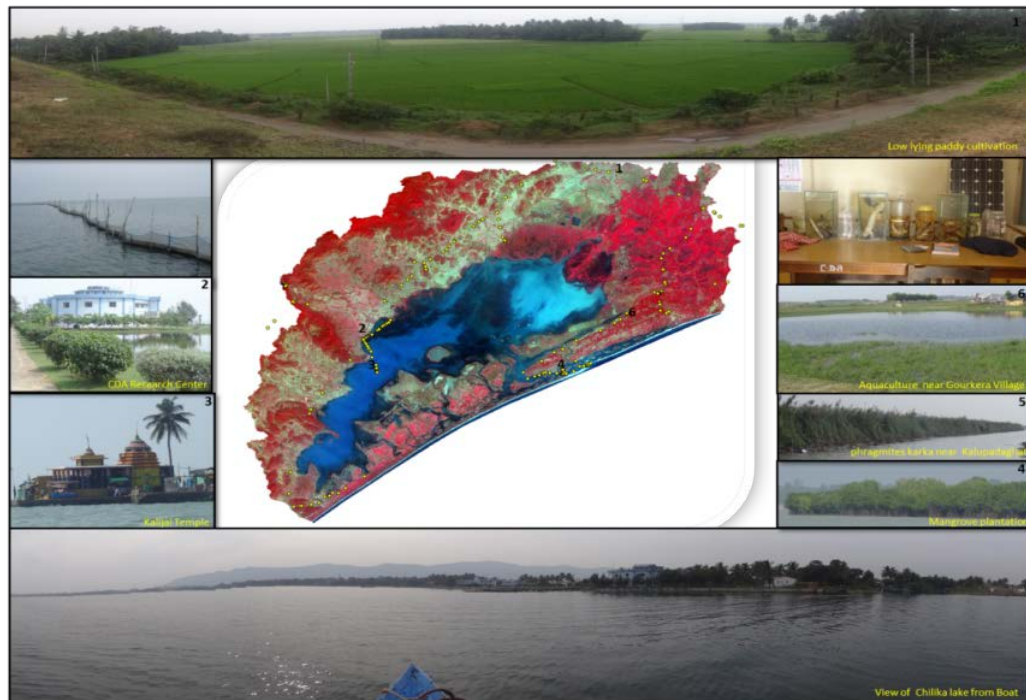
Ground data collection for the study area has been carried out to check, validate and update LULC change which was used to create the vector layer. These data, coupled with the 2006 field study, formed a database for validating the classification and changed areas. Sample ground truth photograph are given in Fig. 2.

### **Results and Discussions**

#### *Landuse / Land Cover Change Analysis*

Chilika lagoon is a brackish water lake which is a mix of fresh and marine water. It is connected with Bay of Bengal through inlets and also 52 rivers / rivulets from Mahanadi System and Western catchment of Chilika. In the year 2006, the lagoon had one inlet at the end of the outer channel which has degraded under deposition and then in August, 2008 a new mouth has opened naturally. A new Inlet opened during the month of September 2012. The first inlet was totally closed and the new inlets have shifted 1 km towards north from its

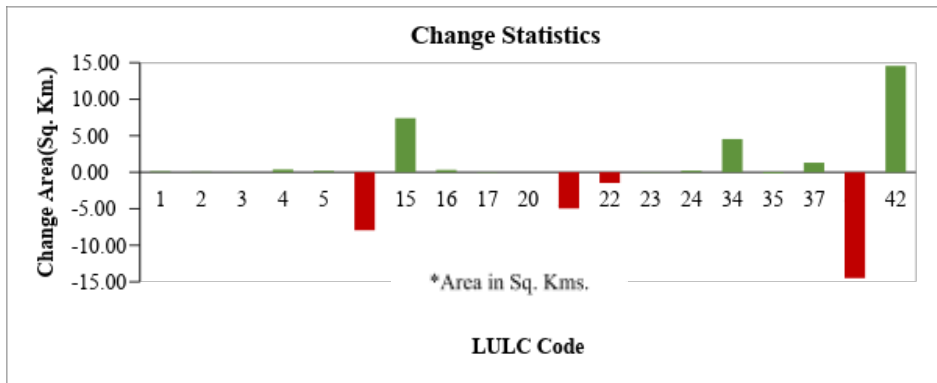
actual place because of longshore transport. Again a new Inlet opened after Cyclone Phailin which hit the Odisha coast on 12th October 2013. This shifting dynamics of the inlet towards the lake is responsible for the major coastal land use and land cover in recent years.



**Fig. 2. Ground Truth Pictures of the Study Area**

It has noticed that, in the year 2016, the maximum area is the agricultural land after water body i.e. 42 % of the total area. Forest area is 11% and the next highest area is wastelands i.e. 8%. Between 2006 and 2015, the number of aquaculture ponds has increased near the Chilika coast in the swampy areas, so the swampy land drastically decreased between the year 2006 and 2015 (Table 2). The settlement area also increased in the year 2015 over 2006 which shows population growth. The agricultural land also decreased because of settlement area increasing on the agricultural land. Water body area also decreased because of many human activities in the outer extent of the lake. Sandy area/Sand pits area have increased due to change in the inlet and there is a decrease in the open forest area where as plantation has increased in the study area. The area of main lagoon is decreasing significantly from recent years due to embankments in the northern region by aquaculture ponds and manmade creeks.





**Fig. 4. Landuse / Land Cover change Statistics**

## Conclusion

Remote sensing and GIS technologies can be reliable for generating the multi-temporal information of landuse/land cover and to see the change trend periodically and to monitor it. The present study has revealed that there is a significant coastal landuse/land cover change in Chilika lagoon in last decade. Changes and monitoring the landuse and land cover have significant implications for maintenance of ecological character of wetlands. Agricultural land (42%) is the most dominated landuse class followed by wetlands (35%), Forest (11%), Wastelands (8%) and Built-up (2.3%) of Total Geographical Area (TGA) in the study area.

It is noticed that there is a significant decrease in the main lagoon area which is because of the illegal embankment and the continuous growth of *Phragmites karka* species (*Nalagras*) which is big threat to the main lagoon. Aquatic vegetation as well as aquaculture area has been increased periodically within the main lake. Open forest area has decreased. The Built-up area has increased - not in a significant manner in this time interval - though some rural area has been included. The sandy area (Coastal area) has increased because of the change in position of the coastal line and the mouth for inlet. There is a reduction in open forest area and increase in the scrub land, aqua-culture, mangroves, agricultural planation and rural built-up area. It is noticed that by opening a new mouth the biodiversity of different species and the inflow of water towards the main lake has increased which results in a growth in the economy of locals. Remote sensing and GIS tools can be adopted to create thematic maps for landuse and land cover and to monitor it periodically which can be used for many environmental, ecological studies to notice its impact on the local climate resulting in better management of coastal areas and productivity.

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# INFLUENCE OF SCALE IN EXTRACTION OF WASTELANDS - A CASE STUDY OF PIPLANTRI VILLAGE, RAJSAMAND DISTRICT, RAJASTHAN

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## Abstract

*The increasing population demands excessive land and land-based products/services for agricultural as well as non-agricultural practises all over the world. In this aspect, the wastelands within the country are of great priority. Remote Sensing and GIS technologies have been highly rewarding in mapping, monitoring and utilising these wastelands for planning developmental activities. GIS Mapping of wastelands is dependent on various factors like scale of mapping, classification scheme, resolution of the base data utilized etc. The scale of the wasteland map can greatly influence the level of information, area assessment, estimation and planning activities. The present paper focuses on studying the influence of scale in wasteland mapping in a mining dominant region. A semi-automatic object-oriented classification method was adopted for mapping the wastelands at 1:50,000 and 1:10,000 scale in Piplantri block of Rajsamand district, Rajasthan. Observations have shown a considerable increase in area estimates and the accuracy of maps has increased from 86.15% to 94.25%. A comparison was made between the wasteland classes extracted at both the scales and advantages of mapping using LISS III and LISS IV images were harnessed.*

**Keywords:** Object oriented classification, Wastelands, Multi-scale extraction, Area assessment

## Introduction

Excessive utilization of land for both agricultural and non-agricultural practices in India has increased the demand for wastelands such as degraded lands, scrub lands, eroded and desertified lands etc. (Baka et al., 2017). The term wasteland is used to denote a low-quality land that cannot be used for agricultural practices or non-forested or barren area which can further be divided as cultivable and non-cultivable land (Arya et al., 2014). In contrast, normal cultivated lands, if not properly managed or underutilised due to some anthropogenic activity can turn into wastelands. Identifying wastelands within the country can help in planning developmental/landuse activities in these areas. Remote Sensing data has an important role to play in wastelands inventory, planning and monitoring. According to Narayan et al., 1989, a study carried out using Landsat MSS data at 1:100,000 scale, about 53.3 million hectares (16.2% of the total geographical area) of land was identified as wastelands in India. Reports have shown that, out of this 53.3 M hac, 22 M hac of land is affected by salinity, water logging, soil erosion, and alkalinity or used for shifting cultivation or left unused due to topographic undulations (Handique et al., 2016) (Ranga et al., 2015).

Availability of remote sensing data at various spatial and temporal resolutions and its cost effectiveness can help in timely monitoring of wastelands within the country.

The level of information that can be included in a thematic map depends on various factors like resolutions of the base data - satellite data/aerial photo, scale of mapping/interpretation, classification scheme, methodology adopted for mapping etc. Selection of an appropriate base data with suitable spatial and spectral resolution can aid in better interpretation of features and extracting the classes including their sub categories. For instance, a wasteland map produced at a smaller scale say 1:2,50,000 using AWiFS (Advanced Wide Field Scanner) image is more generalised as compared to a map produced at a comparatively larger scale like 1:50,000 using Landsat data. The minimum mapping unit of the map increases with increase in spatial resolution of the base data. Small or medium scale wasteland maps can help in assessing the approximate extent of wastelands within a region/country. With the objective of wasteland monitoring in India, National Remote Sensing Centre (NRSC), in collaboration with different State, Central Government Departments and Institutions and has completed various cycles of wasteland mapping for the country from 2000 to 2016 showing the spatial distribution of wastelands, in respect of their nature and extent.

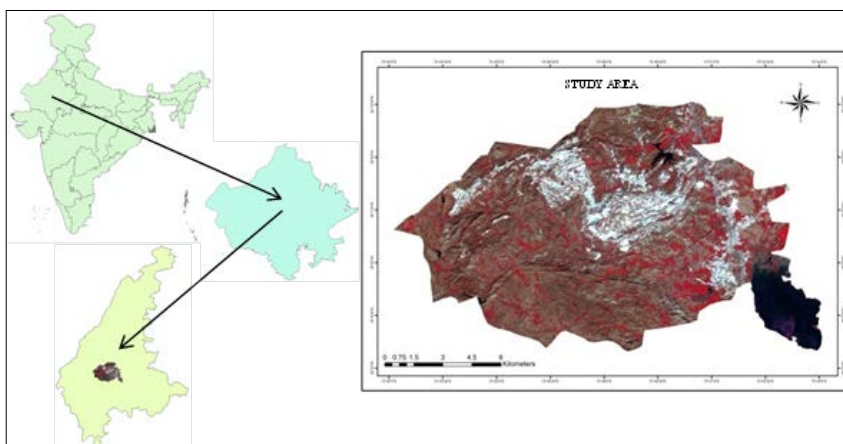
A 23-fold classification system was adopted for mapping wastelands at 1: 50,000 scale using on-screen digitization method. IRS –Linear Image Self Scanner III (LISS -III) data of 23.5m spatial resolution was used as a base for this exercise (National Wasteland Atlas, 2010). This 23-fold classification system at 1: 50,000 scale could bring out all the important categories of wastelands in the country and can greatly help in identifying different types of wastelands, their spatial distribution/extent and for undertaking appropriate reclamation measures. However, implementation of reclamation measures on ground requires a finer scale of mapping that can give more detail about the subclasses within the identified wastelands. Gautam N C et.al., 2009 brought out the necessity of larger scale wasteland mapping in India with a pilot study on Achampet mandal of Mahaboobnagar District, Andhra Pradesh. In his study, wastelands were mapped at a sufficiently larger scale up to micro-watershed level and were overlaid on cadastral maps for suggesting management activities. The study concluded that larger scale waste land mapping at village and panchayat level can better serve in initiating steps for reclamation. The National disaster management authority of India (2013), in its report brought out the importance of 10,000 and larger scale mapping for resource management, disaster activities and also for functional purposes. The present study aims at discerning the advantages of large scale wasteland mapping over medium scale mapping. A pilot study was carried out in Piplantri block, Rajsamand district, Rajasthan where mining related wastelands are predominant. The primary objective of this study is to extract all the possible classes and sub-classes within mining areas at 1:10,000 and 1:50,000 scales using IRS – LISS III and LISS IV datasets. The datasets used and importance of study area are presented in below, followed by methodology, results and discussions.



## Study Area

The study area is located in the central part of Rajsamand district, Rajasthan, covering an area of 165.398 sq.km. It consists of 35 villages in Rajsamand tehsil and surroundings with an extent of 25° 3' 30"N to 25° 10' 30"N latitude and 73° 42' 0"E to 73° 54' 0"E longitude (Fig. 1). Marble mining is a prominent activity in this region where various qualities of marbles are mined in different villages. Out of the 35 villages, five villages - Kunwariya, Dhani, Talai, Umthi, Jhanjhar are mostly occupied by marble mines. Scrub forest, dense and open scrub lands and mining dumps are the predominant wastelands found in the block. The mining wastes from the sites were earlier dumped in random locations which increased the marble dust in air. Later, developmental activities started taking place, wherein all the mining dumps are restricted to specified location, away from the residential areas/villages and reclamation of mining areas are carried out by planting trees etc. A seasonal lake called Rajsamand lake is a source of water supply and irrigation in this arid region. The study area is popular for wastelands reclamation. Population in these villages is mostly floating type due to the mining workers who migrate from village to village in search of work. Kelwa is major town in the study area dominated by commercial activities especially for marble marketing.

Piplantri village in the study area is famous for various reclamation activities taking place during the past five years (Mumford, 2018). The village is surrounded by various mining sites like Morwar, Umthi, Gogleta, Aarna, and others and the mining dust from these sites is causing serious impact on environment and drinking water (Mahim, 2013). Villagers of Piplantri made an initiative to plant 111 trees for every girl child born in the village. Special species like aloe vera and some medicinal varieties are planted which in turn are serving as source of livelihood for the women in Rajsamand district (Rakesh, 2015). Over the course of past six years, a quarter million of aloe vera trees have been planted in pipplantri village from which gels and juices are extracted and sold. This practise has reclaimed most of the mining dump sites and has improved the environment in the village its surroundings (Ron Dicker, 2013).



**Fig. 1. Location of the Study Area**

## Materials and Methods

### *Data*

Remote Sensing data from Indian Space Research Organisation's Linear Imaging Self Scanner (LISS) -III and LISS-IV sensors have been used for the study. LISS III and LISS IV sensors are on board Resourcesat-2 platform with spatial resolutions of 23.5m and 5.8m respectively. Both the datasets collect data in optical region (400-900nm) with a radiometric resolution of 8 bits (LISS III) and 10 bits (LISS IV) respectively. The images used in the current study are acquired on 13<sup>th</sup> October 2016 (LISS IV) and 17<sup>th</sup> October 2015 (LISS III) respectively. Enough care was taken that both the images are from the same season and have no radiometric or atmospheric errors like haze, cloud and other noise.

Ground truth information is collected for validating the produced maps and also for cross verifying certain features which appear to be confusing in the satellite image. A total of 96 ground truth points are used for accuracy assessment and ground verification of maps.

### *Methodology*

The methodology adopted for the current study is fourfold - 1) pre-processing of satellite data, 2) Object oriented classification using a set of training samples and rule sets, 3) On-screen interpretation and modification of the segments, 4) Quantification of areas for each wasteland class and comparative analysis. A semi-automatic object-oriented classification method was used for segmenting the LISS III image based on a set of rules. Training samples were collected from the image based on the prior ground truth information and referring to some high-resolution data. e-Cognition developer 9.0 (2015) was used for segmentation process. Initial classes considered for automatic segmentation included - scrub land, mining, water bodies and cropland etc. The polygons thus obtained were modified using on-screen digitization and manual interpretation for which ArcGIS 10.2 software was used.

### *Segmentation and Classification*

Segmentation process includes various parameters like scale, compactness, shape etc. The 'scale' parameter decides the size of the segmented objects based on the change of heterogeneity caused by fusing several objects, 'shape factor which is based on two geometric features called 'compactness which describes the closeness of the pixels as compared to a circle and 'smoothness' (which describes the similarities between the image objects as compared to a perfect square) is a measure of homogeneity of pixels in the image (Myint, 2011). In addition to these, other measures like texture, entropy are also used for creating the rule set (Blaschke, 2010). In this study, a scale of 25 with a shape factor of 0.15 and compactness of 0.6 were used to obtain satisfactory segmentation result that closely matches the objects in the image. These parameters were fixed using trial and

error approach based on how well they defined large and small object boundaries (Cleve et al., 2008).

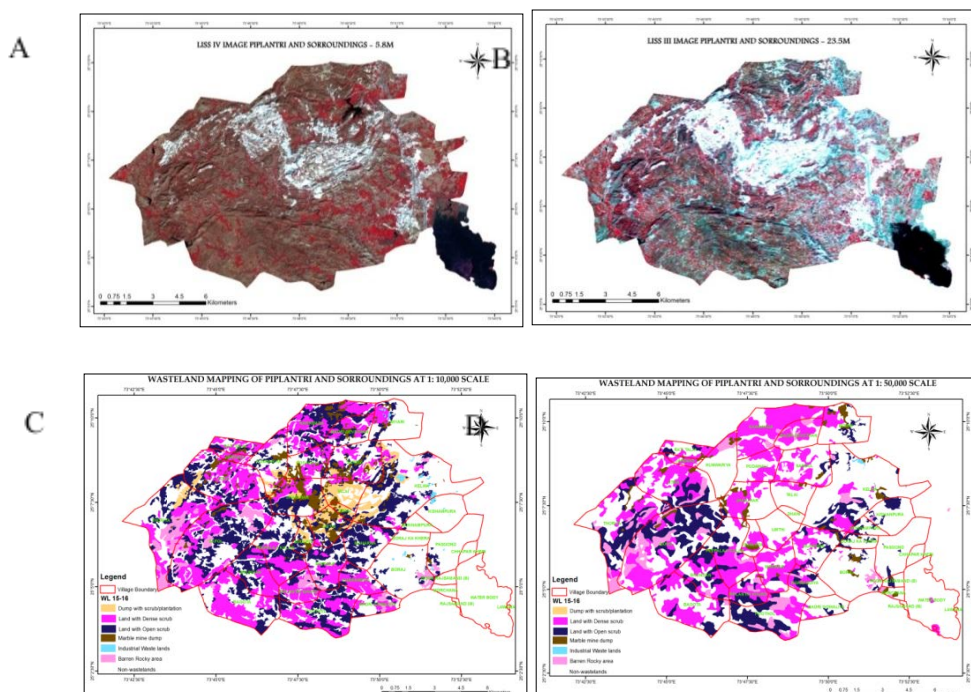
The obtained segments from eCognition are overlaid on LISS III image for further interpretation and on-screen modification of vectors. To remove the staircase appearance of the segmented objects, a smoothing filter with a tolerance of 25m was applied. The advantage of this combined method of automatic segmentation and manual interpretation (on screen modification of the segments) is its less error rate and feasibility of acquiring much accurate maps (Piyooosh et al.,2017). Six dominant wasteland classes within the study area were considered for classification of LISS III imagery. The final vector layer obtained after classifying LISS III imagery is used for interpreting the features from LISS IV imagery. Additional information obtained from LISS IV imagery was added to the vector layer by splitting the polygons and assigning new labels. Codes were assigned to each polygon and the doubtful classes/areas in the database were verified on ground for improving the accuracy of interpretation. The scale of interpretation for 50,000 scale and 10,000 scale maps was set to 1:25000 and 1:3000 respectively. Description of various wasteland classes interpreted within the study area is given below (as per National Wasteland Atlas, 2010).

1. *Mining dump with scrub/plantation*: Wastes from mining activities dumped in a region which in course of time develops scrubs on them.
2. *Land with dense scrub*: Scrub lands are associated with moderate slopes in plains and foot hills and are generally surrounded by agricultural lands. Land with dense scrub is the one with vegetal cover more than 15 percent.
3. *Land with open scrub*: Land with open scrub possesses sparse vegetation, generally less than 15 percent or devoid of scrub. This land is more vulnerable to deterioration due to erosion and has a thin soil cover.
4. *Marble mine dump*: Areas where waste debris is accumulated after extraction of required minerals. These lands may sometimes be confined to the surroundings of the mined area.
5. *Industrial wastelands*: These are the areas of stockpile of storage of dump of industrial raw material, marble stock, wastes after polishing the marble stones or quarried/mixed debris from earth's surface. These areas are conspicuously seen around urban areas and others where industrial/commercial activity is prominent.
6. *Barren rocky*: These are rocky exposures of varying lithology often barren and devoid of soil and vegetation cover. They are mostly observed amidst hill-forests as openings or isolated exposures on plateau and plains. Such lands have a characteristic spectral response and mostly appear in greenish blue to yellowish brown colour.
7. *Non-wastelands*: Areas that are under natural vegetation, water bodies, built up, active mining and other landuse classes fall in this class.

## Results and Discussions

Segmentation performed using training samples of five dominant classes - scrub, mining, urban, water and crop land was observed to yield good classification accuracy. The accuracies of segmented objects for considered five classes were 89.65% for scrub, 82.15% for mining, 80.25% for built up, 95.65% for water bodies and 90.45% for crop land. Confusions between mining dump areas and urban classes were observed in certain segments due to similar spectral reflectances of these classes which led to reduction in accuracy of urban class. Similarly, confusions were seen in the classes of water bodies vs. shadow areas and crop land vs. dense scrub. An overall observation was that, the accuracy of image segmentation is proportional with homogeneity and contrast of the image.

On-screen modification of sub classes within these five classes helped in further improving the accuracy of the wasteland map. major improvements observed from on screen modification/interpretation were - scrub land class was sub categorised into dense scrub, open scrub and barren land classes; mining class was classified into active mining (non-wasteland class), mining dumps, industrial wastes; built up class segments were re-modified to match with the image features. The obtained maps were validated with ground truth photos and additional information. Accuracy assessment of the maps performed using ground truth points reported an overall accuracy of 86.15% for 50,000 scale map and 94.25% for 1:10,000 scale map.



**Fig. 2. Wastelands of Piplantri Village, Rajsamand**

The resultant map after ground verification obtained at 1:50,000 scale is then overlaid on LISS IV image for further improvement and modification. The final maps thus obtained at 1:50,000 and 1:10,000 scales and the corresponding satellite images are presented in Fig. 2. Observation of area statistics from both the maps have shown a reasonable increase of wasteland area by 17.85 sq.kms in 10,000 scale map. The total wasteland area with the considered study site was observed to be 75.11sq.km (45.411% of TGA) in 1:50,000 scale map which increased to 92.96 sq.km (56.203% of TGA) in 1:10,000 scale map. High resolution LISS IV image with 5.8m spatial resolution helped in extracting the smallest wasteland polygons while these features could not be perceived in LISS III image due to its comparatively coarser spatial resolution. The high radiometric quantization of LISS IV image aided in distinguishing between mining dumps, active mining and industrial wastes whereas the 8bit LISS III image has limitations in distinguishing between active mining areas and mining dumps. Industrial wastes, which are mostly associated with commercial complexes/built up structures were well extract after on-screen modification. Many dump areas were identified as non-wasteland classes in 50,000 scale map (row1, Table 1) whereas 10,000 scale map gave a clear delineation between mining sub classes - active mines, dumps, abandoned mines and mining dumps with scrubs. Further observations in extraction of industrial wastes are presented in rows 3 and 4 of Table 1.

A comparison of class wise area statistics of maps at both the scale is presented in Table 2. It can be inferred from Table 3 that, increase in area is seen in 10,000 scale maps in the categories of land with open scrub, mining waste lands, mining wastelands with scrub and industrial wastelands. The classes land with dense scrub and barren rocky were observed to be reduced in 10,000 scale map. These changes in areas pertain to insufficient spatial resolution of LISS III image where land with open scrub is misclassified into barren areas, and dense scrub lands. Mining wastelands covered with scrub were completely misclassified as land with dense scrub at 50,000 scale. The percentage wise change in area with respect to TGA can be seen as a subset in Table 2.

#### *Summary on advantages of large scale (1:10,000) mapping over small scale mapping (1:50,000)*

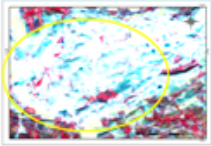
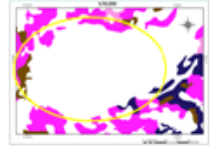

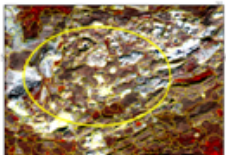
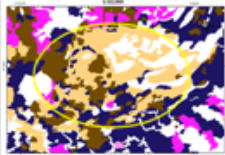

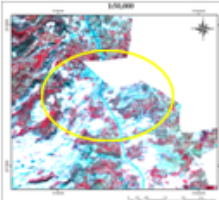
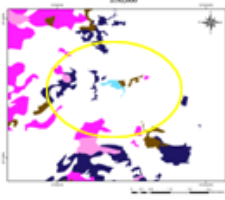

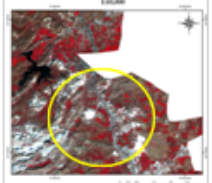
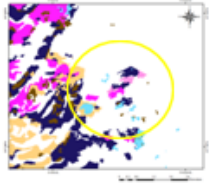

##### A. Minimum Mapping Unit

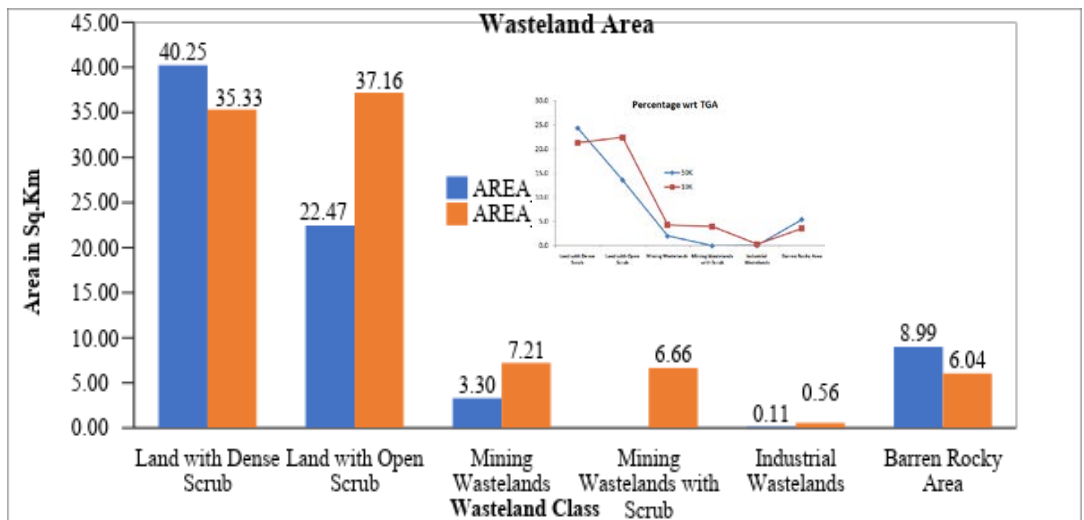
The Minimum mapping unit for 10,000 scale mapping is 900 sq.m (0.09 hectares), while for 50,000 scale mapping is 22,500sq.m (2.25hectares), considering 3mm x 3mm as the minimum mappable unit. This can help in extracting features with higher accuracy and precision.

##### B. Improvement in classification scheme

Sub class extraction within the existing wasteland classes. Mapping of wastelands at a higher scale can increase the level of classification i.e., the sub classes within a wasteland class can be extracted. An example of sub classes at level IV for Mining and scrub land classes are shown in the Table 3.

**Table 1. Observations made from IRS LISS III and LISS IV**

Class differentiation	Satellite image	Wasteland map	Observations
Discrimination of Active Mine vs. Mine dumps - LISS III at 1: 50,000 scale			 Unextracted marble dumps due to moderate spatial resolution (classified under active mining which is a non-wasteland class)
Discrimination of Active Mine vs. Mine dumps - LISS IV at 1: 10,000 scale -			 Extracted marble dumps due to high spatial resolution
Delineation of industrial wastes- LISS III at 1: 50,000 scale			 Unextracted industrial wastelands
Delineation of industrial wastes - LISS IV at 1: 10,000 scale			 Extracted industrial wastes and water bodies



**Fig. 3. Wasteland Area and Percentage Statistics**

**Table 2. Improved Wasteland classification scheme at 1:10,000 scale**

Level-1	Level-2 (2,50,000)	Level-3 (50,000 scale)	Level-4 (10,000 scale)
Wasteland	Scrub land	Land with dense scrub	a. Degraded land (plantation)
			b. Scrub land (Hillock)
			c. Scrub land (Plain)
		Land with open scrub	a. Scrub land (hillock)
			b. Scrub land (plain)
			c. Open lands
	Barren/rocky Mining	Barren Rocky Area	a. Stony waste/barren
			b. Barren with open scrub
Built up	Mining	Mining	a. Quarry
			b. Mining dump (types Eg: coal, marble etc.)
			c. Mining dump with scrub
			d. Water bodies affected with mining
	Industry	Industrial wastelands	a. Industrial dumps
			b. Ash ponds/industrial waste water

### C. Delineation of sub-classes and differentiation between confusing classes

As can be inferred from Table 1, the following observations can be made in delineating various wasteland classes and sub classes:

- ☒ Mining dumps (wasteland class) and active mining areas (non-wasteland class) could be differentiated
- ☒ Reclaimed mining dumps with different intensities of scrub and plantation could be identified and mapped
- ☒ Industrial wastes intermixed with mining dumps and commercial units (having similar spectral responses) could be separated.
- ☒ Industrial waste water areas could be separated from other water bodies.
- ☒ There is an increase in mapped wasteland areas by 17.85 sq. kms (Table 3) as the smallest units of wastelands could be extracted.
- ☒ Differentiation between barren rocky vs. open scrubs, open scrub vs. dense scrub was more precise.
- ☒ Polygon could be refined to closely match with ground observations due to better resolutions.

### Conclusion

Wasteland mapping was carried out for Piplantri block (35 villages) in Rajsamand district of Rajasthan using IRS LISS III and LISS IV images at 1:50,000 and 1: 10,000 scale respectively using a semi-automatic method. Marble mines, dense and open scrubs were the dominant wasteland classes observed in the study area. Sub-classes like - types of marble dumps, dumps covered with scrubs, industrial wastes were clearly delineated from

active mining and scrub lands in 10,000 scale mapping. Many dumping sites that were generalised as active mining (non-wasteland class) in 50,000 scale mapping could be delineated in 10,000 scale. The area of wastelands in 10,000 scale map has increased by 17.85 sq.km as compared to 50,000 map. The increased spatial resolution of the base data helped in improving interpretation capability and thus increasing the accuracy of wasteland map. Similar studies spread across different agro ecological regions in the country representing other wasteland classes can result in improved level of wasteland extraction which can help in better management of wastelands in the country.

### Acknowledgement

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**Archives - 1**

**A MESSAGE FROM BRITISH VISITORS**

***from The Madras (Indian) Geographical Journal***

(Vol. XIII March, 1938 No. 1 pp. 1-3)

The geography teachers of Great Britain extend to the enlarged Indian Association of teachers of Geography their congratulations on the good beginning made by the Association of Madras and their best wishes for the new and enlarged scheme.

Indian teachers of Geography are facing the same problem that British teachers faced a few years ago, namely a circle of difficulties each of which is the consequence of the next. How can this vicious circle be broken. The British teachers have not yet succeeded fully, but they have advanced some distance towards a solution. Firstly, there is need for maintenance and development of such opportunities of contact and exchange of ideas as are afforded by the Indian Science Congress; we hope the Geography section of that Congress will continue and increase its activities. Next there is need for the organization of vacation schools for teachers, with public assistance; this was one of the most useful schemes for breaking the vicious circle in Britain.

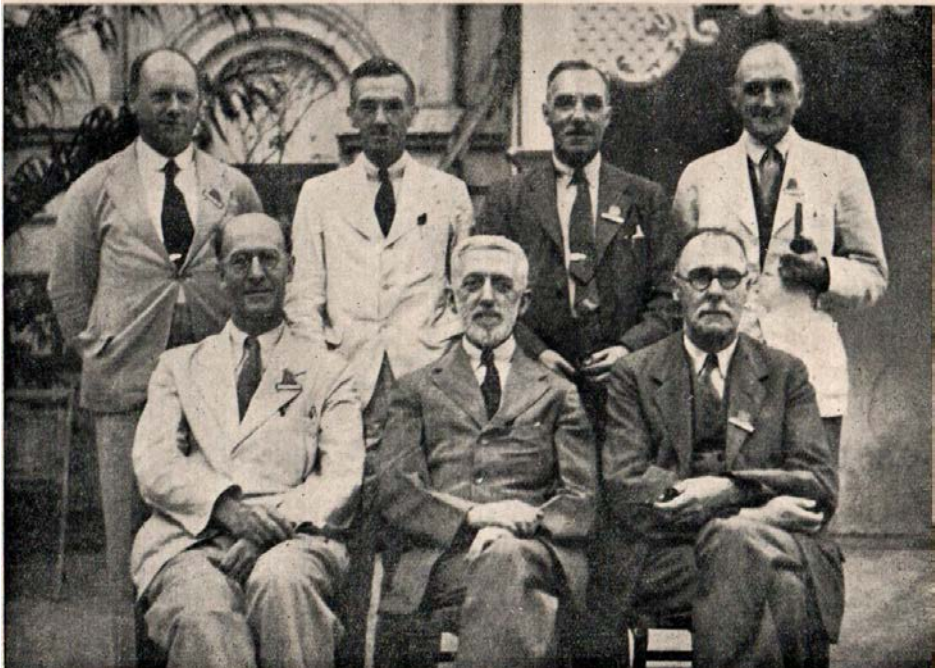
Co-operative effort, if possible by a joint committee of teachers of Geography: the survey office could probably reach an agreement about reduced prices for maps of the school district. Another scheme has been found useful in England, which might perhaps be adapted to the needs of Indian schools and Colleges. A committee chose a set of typical 1-inch maps (for Great Britain, Indian teachers might choose a set for a province or some other region of India); it then collected promises to order sets of these maps (6 maps in a set) and was able in this way to guarantee a sale of 5,000 sets, and so to send the maps to the schools at three pence per map if the school took ten sets or more (i.e., paid 15sh. for 10 sets). It was found valuable to have two of the maps with contours and water only.

Co-operative effort could also negotiate profitably with external examining authorities for modifications of syllabuses to meet Indian needs. Another valuable line of effort would be the creation of a small endowment to meet the expense of publishing regional studies of assured quality and balance.

A travelling exhibition is still another device, which has been found very valuable in England. These are a few suggestions based upon the experience of fellow-workers in Britain who have had to wrestle with the same problems that are now facing Indian Geographers to whom we from Britain extend our very best wishes.

Calcutta,  
7th January 1938.

H. J. FLEURE.



British Geographers who attended the Indian Science Congress Session at Calcutta -  
*Sitting from left to right:* Prof. C. B. Fawcett, Prof. H. J. Fleure, and Mr. J. McFarlane;  
*Standing from left to right:* Prof. W. T. Gordon, Mr. R. H. Kinvig, Prof. A. G. Ogilvie,  
and Dr. O. J. R. Howarth

# **GEOGRAPHY AT THE SILVER JUBILEE SESSION OF THE INDIAN SCIENCE CONGRESS AT CALCUTTA, JANUARY, 1938**

***from The Madras (Indian) Geographical Journal***

(Vol. XIII March, 1938 No. 1 pp. 4-9)

The 25th session of the Indian Science Congress held at Calcutta in January 1938 was important not only as a Silver Jubilee Session and a Joint Session with the British Association for the Advancement of Science, but also from the point of view of Geography, as among the new independent sections created for the Session was that of "Geography and Geodesy". Eight British Geographers graced the Session with their presence; and they all closely identified themselves with the activities of the Section. There were twenty-one papers contributed for the Section as against three papers on Geography last year when it was included in the Geology Section; and out of these twenty-one, eleven were from the members of the Madras Geographical Association and three by the British Geographers. The separation of Geography from Geology with an independent status for it, even though it was meant to be temporary, was thus amply justified. This separate existence and the earnest and sympathetic co-operation and guidance of the British Geographers produced an outburst of enthusiasm, which manifested itself in a variety of ways and won for the subject a permanently independent position and high prestige, which it has been lacking up till now in this country.

Besides the papers read at the meetings of the Section, there were interesting and instructive excursions arranged in which the members of this section joined; and of these, special mention may be made of the steamer trip over the Hooghly, the excursion to the Salt Lakes and a visit to the Survey of India Map Department. The last was very instructive, as the various stages in the preparation of the one-inch map with all the connected processes were demonstrated in a sequential order.

Of the popular lectures delivered almost every evening during the Congress week, special mention may be made of the very interesting lecture on "Stages in the Growth of Civilization" by Prof. H. J. Fleure, F.R.S. of Manchester, on the evening of the first day.

On the last day there was a group discussion on "River Physics in India", held jointly between the Sections of Mathematics and Physics. Geology, Geography and Geodesy and Agriculture, in co-operation with the National Institute of Sciences of India, and the Indian Physical Society.

There were altogether five meetings of the Section on the 4th, 5th, 7th, 8th and 9th January 1938. In the first meeting on the 4th four papers were read and discussed. The first of them was on "The Geographical Interpretation of the Distribution of Population in two typical districts in India" by Dr. S. P. Chatterjee of Calcutta and A. Ganguli. Two

typical districts-Nadia and Tinnevely-were selected and geographical factors determining density of population in different parts of the districts were brought out. Anomalies in the distribution of population in some parts of the districts were traced to the decline of industry and failure to respond to the changed environment. The paper was followed by a vigorous discussion.

Of the three other papers read on that day, Place-Names in the Tamil Country by Mr. Rao Bahadur, C. M. Ramachandra Chettiar and The Great Divide by Prof. C. B. Fawcett of University College, London, are published elsewhere in this issue, while The Types of Movements of People in the Cauvery Delta by Mr. S. Muthukrishna Ayyar will be published in the next number.

In the meeting of the Section on 5th January 1938, the first paper read was on The Technique of Regional Geography by Prof. A. G. Ogilvie of the University of Edinburgh; and this will be published in the next issue.

Col. Ponney of the Survey of India (Maps Dept.) spoke next on the increasing demand for maps of various kinds by educational authorities, to whom a circular had been sent asking for their requirements in the new provincial road-maps and in the proposed maps on a scale of 40 miles to an inch. Regarding Prof. Ogilvie's challenge (in his paper referred to above) with reference to the 1/M maps, he stated that the whole map policy of the Department was in the melting pot. But they would issue the maps in two kinds of sheets-one of them being the political; and the International maps (4° by 6°) would be retained. The latter is almost complete for India. He stated that the great difficulty was in keeping the maps up-to-date, and added that there was a Conference going on in Delhi of representatives of the Army, the Air Force and the Survey Department, which was discussing among other things the revision of the map policy of the Survey Department. He, therefore, could not say at the time what the policy would be with regard to the 1/M maps.

Replying to the question raised by Mr. N. Subrahmanyam that the topographical maps of the Government of India, single copies of which were now given at half-rate to educational institutions and for educational purposes, should be given at the same concession rate when a large number was required also, Col. Ponney said that he would try and find out if it was possible to do so, though he could not give a definite answer at the time.

An interesting and vigorous discussion next took place on "The Teaching of Geography in India", an account of which will be published in the next issue.

The Section then went into Committee with reference to the discussion of its position as a temporary one for the jubilee session only. Mr. N. Subrahmanyam, the Recorder explained the situation and requested the British Geographers to help the cause of Geography in India by throwing in the weight of their influence for the continuance of the Section.

Prof H. J. Fleure then proposed that the Geography and Geodesy Section should be retained permanently as a separate Section of the Indian Science Congress. The text of his Resolution ran as follows:-

The Section of Geography and Geodesy of the Indian Science Congress begs leave to submit to the Executive Committee of the Congress the following facts which it considers important in reference to its own future :-

1. Departments of Geography have been developed in one University after another and need Honours courses in the subject; and the Indian Science Congress offers a special, indeed an unique, opportunity for the workers in this subject to meet for mutual consultation.
2. The Section of Geography is one of the senior sections of the British Association for the Advancement of Science, and the Geographers of India need to have an opportunity for cooperative connection with the Geographers of Britain and other lands.
3. Geographers in consultation are specially prepared to contribute to the organizations necessary for gathering facts and Fig.s in the censuses of India and other investigations.
4. The Government of India is deeply concerned with the improvement of the standards of life in rural areas. The synthetic description of rural life in all districts is a special task for the Geographer as well as a practical step of the first importance for public welfare.
5. The Indian Science Congress has created a separate Section of Geography and Geodesy for the Jubilee Session. This decision has been followed by an immediate and large increase in the number and value of papers sent in. The continuance of this Section is earnestly desired and is urgently needed for the reasons stated above.

Dr. L. D. Stamp of the London School of Economics seconded the proposal.

Prof. C. B. Fawcett of University College, London, in supporting it, stated that of the arguments given in the Resolution, he would like to emphasize that a permanent Geography Section would serve to bring together the Geographers working in this country and abroad on a common platform.

The Resolution was carried unanimously. (It is since learnt that it has been decided to retain the Section permanently.)

Dr. A. M. Heron, the President of the Section, then delivered his Address on "The Physiography of Rajputana" (to be published in the next issue of the Journal) .

In the third meeting of the Section on the 7th January 1938, the first paper read was that of Prof. H. J. Fleure on "Geography and the Scientific Movement" (published elsewhere in this issue) .

The second paper on that day was that on "Natural Regions; in India" by Dr. S. P. Chatterjee of Calcutta, in which he bases the classification of the regions on the character of the forest flora, surface relief and climate. Man's adjustment to the physical environment has been shown in each of the natural regions.

The next paper taken up was that of Dr. S. C. Chatterjee of Ranchi, on "A Geographical Study of the Ranchi Plateau". In this paper the Geological structure of the plateau is studied in relation to the morphology, followed by a study of its climate, soil, vegetation, land utilization and distribution of population. It was illustrated by lantern slides.

The next paper was that of Mr. V. D. Krishnaswami of Madras on "Environmental and Cultural Changes of Pre-historic Man near Madras". Professor F. K. Morris of Chicago presided over this paper, which is published in this issue, and the next.

The last paper for the day was that of Dr. S. L. Hora on "The Origin of the Great River-Gorges of the Himalayas as evidenced by the Distribution of Fishes". (This will be published in the next issue).

In the 4<sup>th</sup> meeting on Saturday the 8<sup>th</sup> January 1938, the Section first went into committee and discussed the question of an All India Geographical Organisation to co-ordinate the geographical work done in the several provinces and states. A Committee of five members with Mr. N. Subrahmanyam as Convener was appointed to go into the question fully and work out a scheme for adoption at the time of the next Congress Session at Lahore in January, 1939.

The first paper read for the day was on "The Shifting of the Population Centres in Bengal" by Dr. S. P. Chatterjee and S.K. Bose, in which the geographical factors leading to the development of a number of towns in modern times at the expense of old towns have been studied. This migration is shown to have resulted in marked changes in the life and activities of the people.

"Population and its Distribution in Kerala" and "The Urban Centres of Kerala" by Mr. George Kuriyan of Madras, "The Geographical Limits of the Tamil Region" by Mr. B. M. Tirunaranan of Madras and the "Geography of Disease" by Miss Mary W. F. Waddington of Madras were the other papers read for the day; and they will be published in the next number of the Journal.

Two papers were read on the last day. The first of them on "The Rivers of the Palar Basin" by Mr. B. M. Tirunaranan will be published in the next number of the Journal; and the second on "Some Aspects of the Growth of Greater Madras" by Mr. N. Subrahmanyam has been included in the present issue.

At the close of the Session, Prof. H. J. Fleure conveyed the thanks of the British visitors to the Section as a whole and in particular to the President Dr. A. M. Heron and the Recorder Mr. N. Subrahmanyam and to the sectional officers for all the kindness and courtesy shown to them. He wished to express in particular their appreciation of the energy and enthusiasm of Mr. Subrahmanyam, who has done so much for the cause of Geography

in India, and has worked up the Journal of the Madras Geographical Association to the position that it now holds.

Prof. C. B. Fawcett wished to associate himself with all that Prof. Fleure stated, and added that the number of competent geographers in India being far too small, all credit was due to the few people that had started the work on right lines and set the model. He was very favourably impressed with most of the papers presented, which were of a high order.

Dr. L. D. Stamp stated how much all of them appreciated the papers and the discussions as well as the personal contacts with fellow-workers in the field of Geography. In the future more and more of this personal contact and mutual co-operation was needed, he said, between British and Indian Geographers in the studies and researches connected with the Geography of India.

The session then came to a close with a vote of thanks proposed by Mr. N. Subrahmanyam to the British visitors and a vote of thanks proposed by Dr. Chatterjee to the President Dr. A. M. Heron.





## News and Notes

### THE INDIAN GEOGRAPHICAL SOCIETY




Department of Geography, University of Madras, Chennai – 600 005

#### UG & PG Results of 7<sup>th</sup> Talent Test - 2017

#### THE IGS FOUNDER PROF. N. SUBRAHMANYAM AWARD

With the Cash Prize of Rs. 10,000/-




(First Prize: Rs. 5,000/-, Second Prize: Rs. 3,000/- & Third Prize: Rs.2,000)

UG Results of 7 <sup>th</sup> Talent Test - 2017				
Register Number	Name	Institute	Rank	Photo
141GEO29	Nithya Subashini U.	Department of Geography, Nirmala College for Women (Autonomous), Coimbatore - 641 018.	1	
147GY101	Amanda Joseph Samraj	Department of Geography, Tourism and Travel Management, Madras Christian College (Autonomous), Tambaram, Chennai - 600 059.	2	
U14GEO22	Kiruba U.	Department of Geography, Government Arts College for Women (Autonomous), Kumbakonam - 612 002.	3	

#### PROF. A. RAMESH AWARD

With the Cash Prize of Rs. 15,000/-

(First Prize: Rs. 7,000/-, Second Prize: Rs. 5,000/- & Third Prize: Rs.3,000)

PG Results of 7 <sup>th</sup> Talent Test - 2017				
Register Number	Name	Institute	Rank	Photo
33215406	Libina R. S.	Department of Geography, University of Madras, Chepauk, Chennai - 600 005.	1	
B505001	Abhijith A.	Department of Geography, Madurai Kamaraj University, Madurai - 625 021.	2	
15MAG217	Jerom James	Department of Geography, Government Arts College (Autonomous), Coimbatore - 641 018.	3	

Please Note:

- 1) The Winners are requested to send their passport size photograph, postal address & contact phone number by email (kkumargeo@gmail.com / geobalas@gmail.com)
- 2) The Winners are requested to make arrangements to attend the award ceremony function being arranged in the 92<sup>nd</sup> Annual Conference of the IGS and *National Workshop* on Geoinformatics for Watershed Management organised at Department of Geography, Bharathidasan University, Tiruchirappalli on 31.01.2017 (Tuesday) at 2:00 p.m.
- 3) For any queries kindly contact the Coordinator Dr. K. Kumaraswamy (9442157347) / Co-coordinators Dr. G. Bhaskaran (9444414688) or Mr. K. Balasubramani (9944060319).

**Name of the Universities and Colleges Participated  
in the 7<sup>th</sup> IGS Talent Test Examination Conducted on 10/ 01/ 2017**

- 1) Department of Geography, University of Madras, Chepauk, Chennai – 600 005.
- 2) Department of Geography, Madurai Kamaraj University, Madurai - 625 021.
- 3) Department of Geography, Bharathidasan University, Tiruchirappalli - 620 024.
- 4) Department of Environmental Remote Sensing and Cartography, Madurai Kamaraj University, Madurai - 625 021
- 5) Department of Geography, Presidency College (Autonomous), Chennai – 600 005.
- 6) Department of Geography, Queen Mary's College (Autonomous), Chennai - 600 004.
- 7) Department of Geography, Bharathi Women's College (Autonomous), 85, Prakasam Salai, Chennai - 600 108.
- 8) Department of Geography, Tourism and Travel Management, Madras Christian College (Autonomous), Tambaram, Chennai - 600 059.
- 9) Department of Geography, Government Arts College (Autonomous), Salem – 636 007.
- 10) Department of Geography, Arignar Anna Government Arts College, Namakkal – 637 002.
- 11) Department of Geography, Government Arts College (Autonomous), Coimbatore - 641 018.
- 12) Department of Geography, Nirmala College for Women (Autonomous), Coimbatore – 641 018.
- 13) Department of Geography, Bharathiar University Arts & Science College, Amaikulam, Puliam Parai (P.O.), Gudalur - 643 212.
- 14) Department of Geography, Government Arts College (Autonomous), Karur – 639 005.
- 15) Department of Geography, Periyar E.V.R. College (Autonomous), Tiruchirappalli – 620 023.
- 16) Department of Geography, Government Arts College, Thiruverumbur, Tiruchirappalli – 620 022.
- 17) Department of Geography, Kundavai Nachiar Government Arts College for Women (Autonomous), Thanjavur - 613 007.
- 18) Department of Geography, A.V.V.M Sri Pushpam College (Autonomous), Poondi, Thanjavur - 613 503.
- 19) Department of Geography, Government Arts College (Autonomous), Kumbakonam - 612 002.
- 20) Department of Geography, Government Arts College for Women (Autonomous), Kumbakonam - 612 002.
- 21) Department of Geography, Sri Meenakshi Government Arts College for Women (Autonomous), Madurai – 624 002.
- 22) Department of Geography, MVM Government Arts College for Women, Dindigul - 624 008.
- 23) Department of Geography, Government Arts College for Women, Nilakottai, Dindigul - 624 208.



## SUSTAINABLE LAND RESOURCE MANAGEMENT - HYDERABAD

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### **Abstract**

*Land Management is the art or science of making informed decisions about the allocation, use and development of the earth's natural and built resources. It includes resource management, land administration arrangements, land policy and land information management. It is "the process of managing the use and development of land resources and the process by which a country's resources are put to good effect. Land management is therefore the activities associated with land as a resource to achieve, social, environmental and economic sustainable development. The trend of urban expansion in recent years is becoming more and more difficult to direct or to control. To check the unplanned and haphazard growth of the cities, the principles of planning have been accepted as urgent and imperative tools. To achieve the goals of Planning, Master Plan, Zoning Regulations, Building Regulations, Layout Planning, Town Planning Schemes, Land Pooling Schemes apart from others are some of the important tools evolved from the 19th century onwards.*

**Keywords:** Land, Management, Sustainable Development, Environment

### **Introduction**

Sustainable development is commonly defined by the Brundtland Report as meeting the needs of the present generation without compromising the ability of future generations to meet their own needs. "Needs" include economic, environmental and ecosystem service delivery, and cultural goals including identity and subjectively defined values. Sustainable development is the combination of sustaining the natural environment, resources, and community and development of the economy and societal goals.

Land provides an environment for infrastructure provision, but it also is an essential condition for improved environmental management, including source/sink functions for greenhouse gases, recycling of nutrients, amelioration and filtering of pollutants, and transmission and purification of water as part of the hydrologic cycle. The objective of Sustainable Land Management (SLM) is to harmonize the complimentary goals of providing environmental, economic, and social opportunities for the benefit of present and future generations, while maintaining and enhancing the quality of the land (soil, water and air) resource. Sustainable land management is the use of land to meet changing human needs (agriculture, forestry, conservation), while ensuring long-term socioeconomic and ecological functions of the land.

Sustainable land management combines technologies, policies, and activities aimed at integrating socioeconomic principles with environmental concerns, so as to simultaneously:

- maintain and expand the service delivery (Infrastructure)
- reduce the level of production risk, and enhance soil capacity to buffer against degradation processes (stability/resilience)
- protect the potential of natural resources and prevent degradation of soil and water quality (protection)
- be economically viable (viability)
- be socially acceptable, and assure access to the benefits from improved land management (acceptability/equity)

The definition and these criteria, called pillars of SLM, are the basic principles and the foundation on which sustainable land management is being developed. Any evaluation of the sustainability has to be based on these objectives: productivity, stability/resilience, protection, viability, and acceptability/equity. The definition and pillars have been field tested in several countries, and they were judged to provide useful guidance to assess sustainability.

### **Aim and Objectives**

The aim of the study is to develop a set of guidelines for sustainable Land Resource Management for Hyderabad Metropolitan Development Area. The objectives are to

1. Study and assess the varied Land Management practices adopted nationally and globally.
2. Study of positive and negative impact case studies,
3. Scrutinize the policy framework adopted in the practices,
  - a. Draw a set of policy recommendations;
  - b. Listing the indicators and evaluation models adopted;
4. Achieve optimum social use of urban land,
5. Make land available in adequate quantity, at right time and at reasonable prices to both public authorities and individuals,
6. Study of HMDA case study area,
  - a. Assess and scrutinize the existing policies adopted;
  - b. Derive a current status of the land resource management issues and concerns;
  - c. Identify adoptive measures that would trigger the current status;
  - d. Listing the indicators adopted;
  - e. To encourage socially and economically efficient allocation of urban land such that urban development is done in a resource conserving manner and that the magnitude of land used is optimal;

- f. To promote flexibility in land-use in response to changes resulting from a growing city;
7. Identify national level policy recommendations and guidelines adopted in the cities,
8. Comparative study and assess of cases and case study area,
  - a. Deriving a set of indicators for Sustainable Land Management;
  - b. Phasing out the evaluation models for sustenance of the indicators;
9. Development of a model tool for sustenance,
  - a. Brining out a decision support tool for local self-government using technology;
  - b. Suggestion of Policy recommendations for efficient implementation.

## Methodology

Stage I: A detailed Literature Review was carried out, study of various desktop studies/best practices at national and international level was carried out, and identification of study area done.

Stage II: Checklist of data to be collected is prepared, Primary and secondary Data collection through census, district handbooks and reports is collected. Preparation of Base map, Collection of required maps from different agencies is carried out, design and preparation of survey formats is done.

Stage III: Data analysis of Primary and secondary data is done by using various statistical tools and techniques, identification of problems and issues in the case area is completed.

Stage IV: Formulation of the guidelines, proposals, recommendations, strategies, schemes, carrying out any residual studies, Evaluation of alternatives is completed.

### *Case Study Area – Hyderabad Metropolitan Development Authority*

The study area - Hyderabad is the capital for the newly formed Telangana state. The city lies in the Deccan Plateau on an average height of 536 m above MSL. The city is established in 1591 on the banks of River Musi by Muhammad Quli Qutb Shah, the ruler of Qutb Shahi dynasty. Hyderabad has been named as the most liveable city in India, for the second year in a row, according to a global survey by Mercer client services. Though Hyderabad ranked at 139, the city stood top among all the other Indian cities followed by Pune at 144. India city competitiveness reports rank cities based on indicators like financial, physical, administrative, human capacity, innovation etc. In its 2013 report Hyderabad is ranked 4th among the top 50 cities as the most competitive city after Delhi, Mumbai and Chennai. Hyderabad as a global identity has significant scope for attracting global investors to develop infrastructure.

The municipal governance of the city vests in the Greater Hyderabad Municipal Corporation (GHMC). The GHMC is responsible for providing infrastructure facilities and

upkeep of civic services including roads, bridges including flyovers, culverts, subways, etc; widening of roads and junction improvements; traffic and transportation amenities; street lighting; markets; storm water drainage and flood control; parks, play grounds, swimming pools, stadia, avenue plantation; rain water harvesting and water conservation; town planning - zoning and Building regulations; slum improvement and urban community development; slaughter houses, crematoria and burial grounds; prevention of food adulteration; hospitals, dispensaries and maternity and child welfare centers; vital statistics including registration of births and deaths; Multi Modal Transport System (MMTS); etc. The other parastatal agencies playing role in Hyderabad administration are:

- Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB)
- Hyderabad Metropolitan Development Authority (HMDA)
- Quli Qutb Shah Urban Development Authority (QQSUDA)
- Cyberabad Urban Development Authority (CDA)
- Buddha Purnima Project authority (BPPA)
- Hyderabad Airport Development Authority (HADA)

### *Economic Profile*

The city is the largest contributor to the state's GDP (Gross domestic product) and state tax. Hyderabad and its suburbs house the highest number of special economic zones among India's cities. The main economic sectors of Hyderabad are traditional manufacturing, the knowledge sector, and tourism. The service industry is a major contributor. Since its inception in 1591, Hyderabad has been a global trade center in multiple areas, including its status as the world's only diamond market. City-based handicrafts were sold in the Middle East and Western countries. In the 1970s, the pharmaceutical and electronic industries were established in the city because of its strategic location in south-central India, for which it is known as the gateway to south-central India.

### *Demographic Profile*

Being one of the prominent trade and commerce centres in the state, the city constitutes nearly 19% of the state population which is about 68,09,970 population (Census,2011) while the Hyderabad Metropolitan area constitutes around 77,49,334 (Census,2011). The details of city and metropolitan area growth rate are detailed in Table 1.1-1 and Fig. 1.1-1 respectively. It is seen in Table 1.1-1 that the city experienced the highest growth rate during 2001-11 at 87.2%. There are 1476 slums in Hyderabad out of which 1179 are notified and 297 are non-notified. The total slum area is 80.45 Km<sup>2</sup>, which is 12% of the total GHMC area. GHMC has about 352079 slum population residing in notified slums.

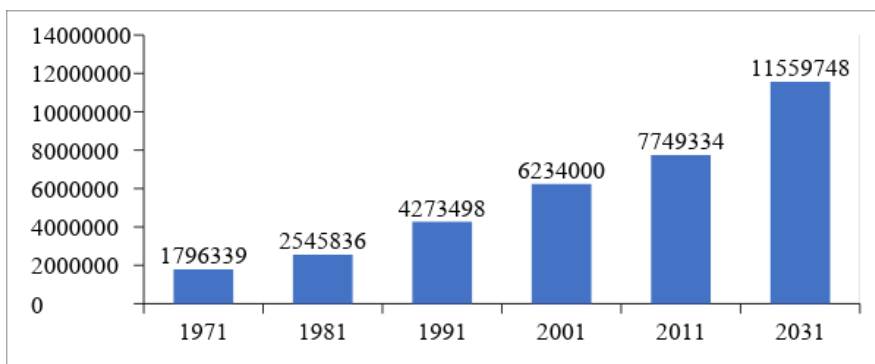
The circle wise details of Households in GHMC are given in the Fig. as below. In the GHMC limits, North - western Hyderabad records the highest number of Households i.e.

in Qutubullapur, Kukatpally., whereas the number of slum Households is noticed higher in Southern Hyderabad i.e in Charminar.

**Table 1:Hyderabad City - Decadal Population Growth**

Year	Population	Growth in %
1971	1796000	-
1981	2546000	41.8%
1991	3059262	20.2%
2001	3637483	18.9%
2011	6809970	87.2%

Source: Census of India

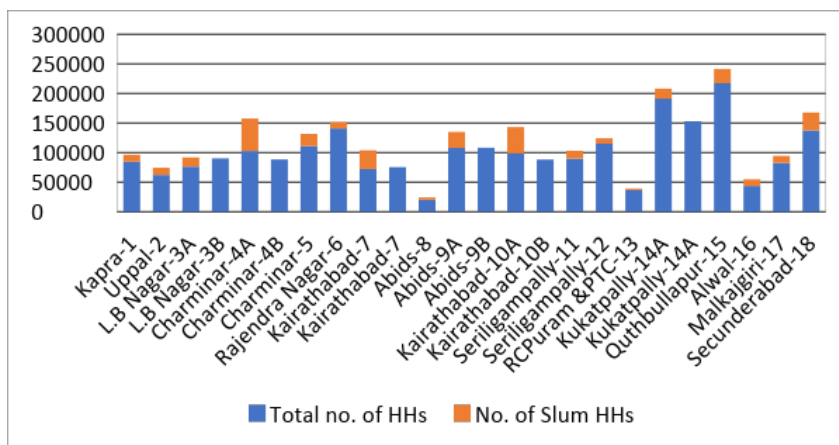


**Fig. 1. Hyderabad Metropolitan area - Decadal Population Growth**

Source: Census of India

*Hyderabad in Comparison to Other Metros*

In comparison to other metropolitan cities in the country, Hyderabad urban agglomeration stands at sixth place with about 77 lakh population, as seen in Fig. 3.



**Fig. 2. Household (HH) Distribution in GHMC**

### Spatial Growth Pattern

Occupying 650 square kilometres along the banks of the Musi River, Hyderabad has a population of 6.8 million and a metropolitan population of 7.6 million, making it the fourth most populous city and sixth most populous urban agglomeration in India. With increase in population, the spatial growth of the metropolitan city has increased from 150 sq.kms in 1951 to 780 sq.kms in 2010, as seen in Fig. 4.

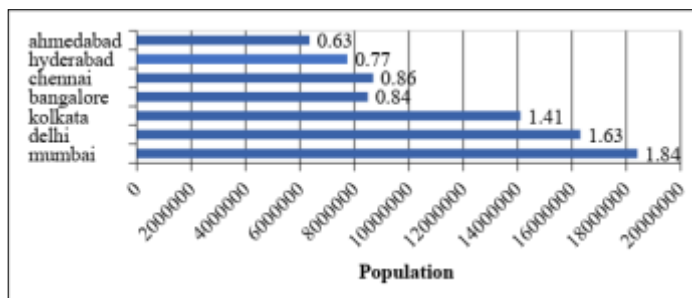


Fig. 3. Hyderabad in comparison to other metros

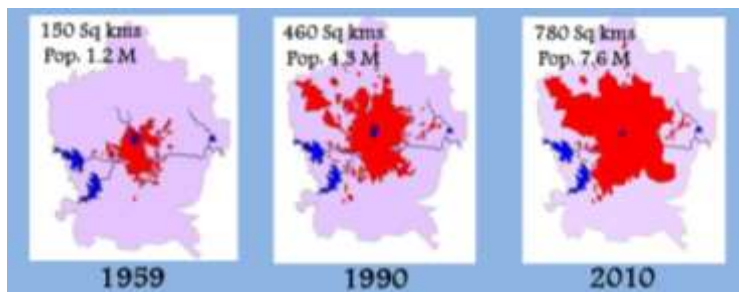


Fig. 4. Spatial Growth of Hyderabad

Source: GHMC, 2013

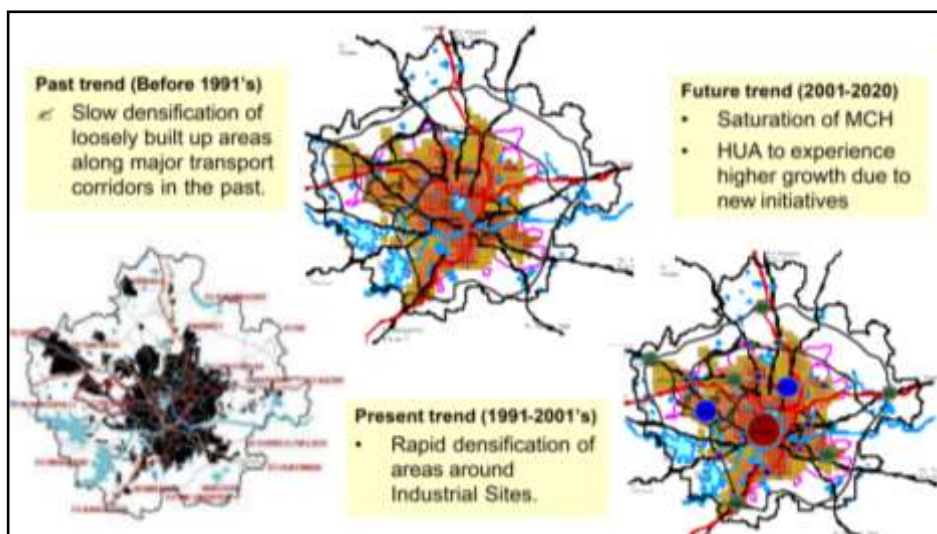
Table 2. City Competition Index

Indicator /City	Delhi	Mumbai	Chennai	Hyderabad	Bengaluru	Ahmadabad
Overall Competition	1	2	3	4	8	10
Factor Conditions	2	1	4	9	7	8
Financial	3	1	14	19	23	5
Physical	3	7	9	15	26	46
Communication	1	2	6	8	3	9
Administration	45	26	20	29	33	16
Human Capacity	1	2	10	9	4	3
Innovations	2	4	1	6	8	15
Demand Conditions	3	1	4	5	2	8
Demography	2	1	4	5	3	7
Supporting Indicators	1	2	7	8	12	15
Business Incentives	3	1	8	16	11	18
Supplier Sophistication	9	7	4	1	19	3
Institutional Support	2	3	7	19	27	20



In the year 1869, Municipal administration was first introduced for the city of Hyderabad. The city of Hyderabad was divided into four and the suburbs of Chaderghat were divided into five divisions. At that time, the city was just 55 km<sup>2</sup> with a population of 3.5 lakhs. In 1886, the suburban area of Chaderghat was handed over to a separate officer and then Chaderghat became Chaderghat Municipality. In 1921, Hyderabad Municipality has increased to 84 km<sup>2</sup>. In 1955, the Hyderabad Municipal Corporation Act merged the municipal corporations overseeing Hyderabad and neighbouring Secunderabad and formed Municipal Corporation of Hyderabad (MCH). MCH covered only 173 sq. km and to provide better amenities to the citizens, it was divided into 4 zones, 7 circles and 100 wards. MCH, like all other municipal bodies, used to provide civic as well as infrastructure facilities to the inhabitants of the twin cities. Thus, laying roads, maintaining streets, public health, sanitation, etc. were the major functions of MCH.

Later in the year 2007, MCH along with 12 other municipalities were merged to form the GHMC. Though the functions and duties of both the bodies are the same, the jurisdiction of GHMC is much larger than that of MCH. Together with MCH and 12 other municipalities in Ranga Reddy and Medak districts, GHMC covers an area of 626 sq. kms. The expansion of city limits and formation of GHMC was to make sure that the surrounding areas around Hyderabad are also developed and have better facilities similar to the citizens in the core city. Presently, Hyderabad has 18 circles divided in five zones and 150 wards.



**Fig. 5. Spatial Growth Pattern of Hyderabad Urban Agglomeration**

Source: GHMC

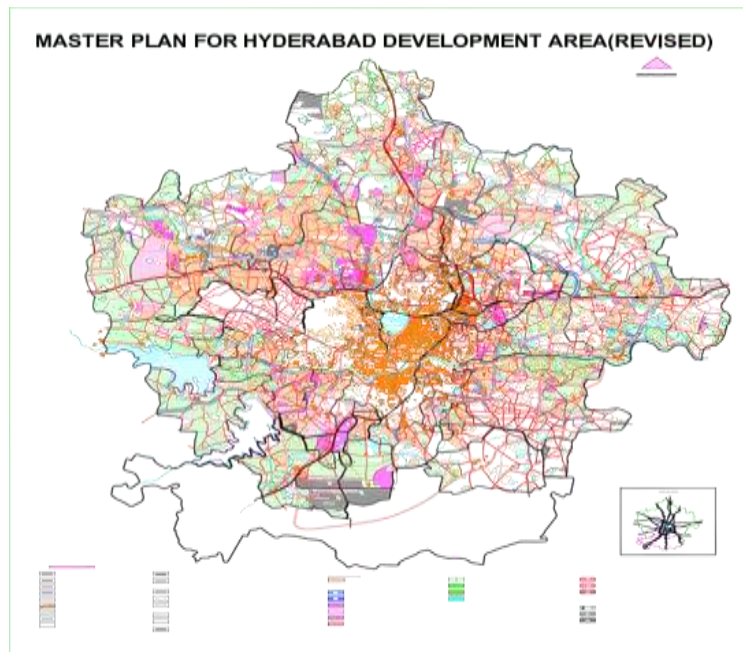
### Hyderabad Metropolitan Area

To ensure planned development of Hyderabad City, the then Government of Andhra Pradesh formed Hyderabad Urban Development Authority (HUDA) in 1975 which

was charged with the powers of acquisition, planning and development of urban facilities and infrastructure in planning area. To cope with the demand due to increased urbanisation and pressure on available land, the government of Andhra Pradesh had notified the Hyderabad Metropolitan Development Authority by an Act in the year 2008, with a notified area of 7,100 sq km under its purview. It is the 2<sup>nd</sup> largest urban development area in India after the Bangalore Metropolitan Region Development Authority (8,005 sq km).

HMDA was formed by the merging of the following erstwhile entities - Hyderabad Urban Development Authority (HUDA), Hyderabad Airport Development Authority (HADA), Cyberabad Development Authority (CDA) and Buddha Poornima Project Authority (BPPA).

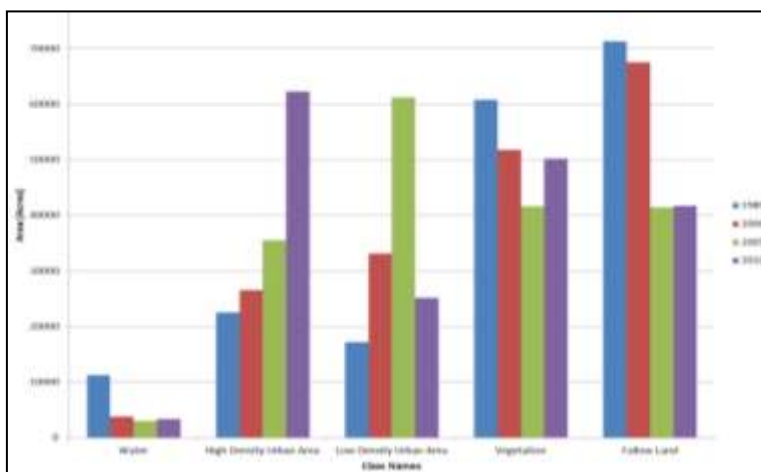
HMDA was set up for the purposes of planning, co-ordination, supervising, promoting and securing the planned development of the Hyderabad Metropolitan Region. It coordinates the development activities of the municipal corporations, municipalities and other local authorities, the Hyderabad Metropolitan Water Supply and Sewerage Board, the Andhra Pradesh Transmission Corporation, the Andhra Pradesh Industrial Infrastructure Corporation, the Andhra Pradesh State Road Transport Corporation, and other such bodies. The HMDA also maintains and manages the Hyderabad Management Development Fund, allocating finances based on the plans and programs of local bodies to undertake development of amenities and infrastructure facilities.



**Fig. 6. Jurisdiction of HMDA**

### Land and Infrastructure

Urbanization is likely to increase the demand of urban resources particularly land and infrastructure. With comparison to World countries, India has a lower rate of urbanization of around 31%. But the global estimates of India getting urbanized to 40% in 2030 or 55% in 2050 are certainly possible. However, after the 74th amendment is passed, the cities fail to generate more revenue. Even though property taxes are the highest revenue generated for local authorities and even though the country's urban population is larger, the cities fail to assure good quality living. The major reason being the inefficient land management techniques in cities that resulted in the cities to suffer in large urban divide. With growth of population, the change in landuse in Hyderabad is seen in the Fig. below



**Fig. 7. Change in Landuse over a time in Hyderabad**

### Status of Groundwater

Hyderabad city and its environs were blessed with a number of natural and man-made water bodies locally known as Cheruvus, Kuntas etc. These water bodies acted as water storage reservoirs for irrigation, drinking and groundwater recharge, and have been an inalienable part of the urban ecology of the city. Similar to pressure on urban land, population growth showed significant impact on ground water levels in the city. While some lakes were encroached and replaced by concrete buildings, several others got severely polluted with the domestic and industrial effluents. With the loss of water bodies and the consequent decline in groundwater table, long-distance and expensive water projects are being undertaken to provide water to the city. The crisis of water shortage in the city has been more evident since mid-1980s with the citizens getting municipal water supply on alternate days. The main source of water supply to twin cities of Hyderabad and Secunderabad is from six main impounding reservoirs namely Osmansagar on Musi River, Himayatsagar on Musi River, Manjira River, Krishna River, Singur, and Godavari River.

The total quantity of water that is drawn from the above sources is 355 MGD, while the demand is 732 MGD. The following map shows the location of the sources.

**Table 3: Sources of Water Supply**

Sources	Normal Drawls (in MGD)	Present Drawls (in MGD)	System Mode	Water Treatment Plant
Osmansagar	25	4	Gravity	Asifnagar filter beds
Himayatsagar	15	4	Gravity	Miralam filter beds
Singoor	75	0	Gravity/Pumping	Peddapur Ph-III and IV
Manjira	45	0	Gravity/Pumping	Rajampet, Kalabgoor
Akkampally (Krishna Ph-I II,III)	270	259	3 stage Pumping	Kodandapur filter beds
Godavari	172	86	4 stage Pumping	Mallaram filter beds
<b>Total</b>		355		

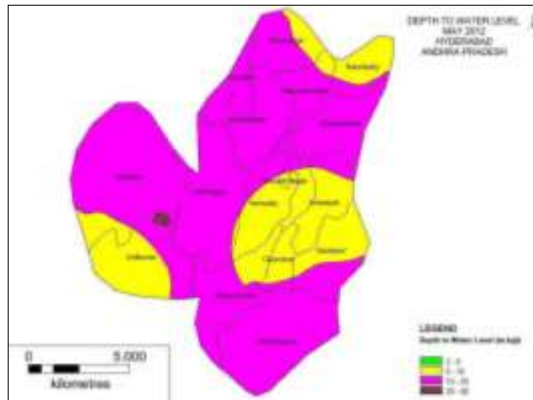
The water levels are depleted over the years at many areas like Kothapet, Moulali, Kukatpalli, Boinpalli, Aghapura, Erragadda, Basheer bagh, Langar house, Jubilee hills, Begumpet, Koti, West Maredpalli, Gudimalkapur, Musheerabad, Sanath nagar, Picket and Madhapur.

To facilitate improved civic service delivery, better planning and focused development, the city governance took following initiatives to conserve water bodies. They are:

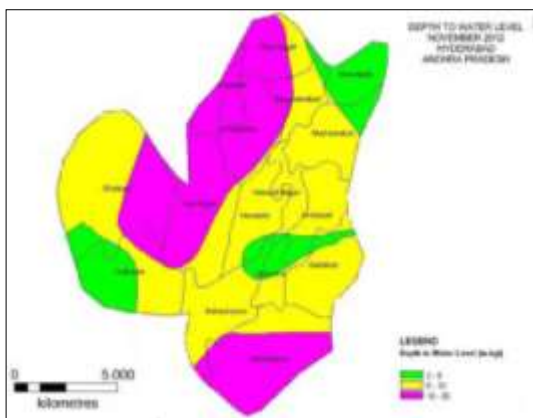
- Protection and conservation of lakes and waterbodies
- 2857 lakes identified in HMDA area.
- 455 lakes inside ORR and 2402 outside ORR.
- 168 lakes in GHMC limits and 2689 in HMDA limits.
- Consultants engaged for FTL Demarcation, preparation of maps and FTL fixation in coordination with Irrigation and Revenue Departments.
- FTL Demarcation completed for 1960 lakes by the consultants.

### Land and Development

The city of Hyderabad introduced impact fees for financing infrastructure. Since finance is the mainstay for development, the city government started levying impact fee for a number of years to mobilize sizeable resources for infrastructure development. To tap the increase in land value, the city adopted a number of measures from its planning system and infrastructure development, including development charges, betterment levy, impact fee, vacant land tax, open space contribution and special fees. For widening roads, GHMC introduced Transferable Development Rights (TDR) where relaxation in planning norms are compensated by trading land for public use.



**Fig. 8. Depth to Water levels (Pre-Monsoon)**



**Fig. 9. Depth to water levels (Post-Monsoon)**

The HMDA Act, 2008 under sections from 24 to 27 provides taking up of and pooling schemes and provides statutory backing to the land pooling mechanism. The land pooling scheme guidelines have been approved by the Executive Committee in its meeting held on 21-06-2013. The land pooling scheme guidelines are placed in the Board for approval. Pre-Expression of Interest meeting was conducted on 24.08.2013 and 31.08.2013 for clarification on issues relating to guidelines and implementation of the Land Pooling Scheme. A committee examined the proposals and recommended to take up two Pilot LAND POOLING SCHEMES namely 1) EdulaNagulapalle - Kollur Pilot Land Pooling Scheme and 2) Pratap Singaram - Gowrelli Pilot Land Pooling Scheme.

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# THE NATURE AND CHALLENGES OF RURAL-URBAN MARKETING LINKAGES IN ETHIOPIA - THE CASE OF KOBO TOWN AND ITS SURROUNDING RURAL AREAS

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## Abstract

*The study was undertaken to explore the nature and challenges of marketing linkages between Kobo town and its surroundings. In order to achieve the stated objectives, cross sectional survey method was employed on a randomly selected 160 sample rural households, 80 urban households and 40 traders, by preparing three separate questionnaires. Descriptive and inferential statistical tools were employed to analyze the data. The overall output of this study depicted that, there was strong consumption linkage with limited backward linkages but no forward production linkages between Kobo town and its surroundings. Thus, different measures that can foster the linkage are recommended.*

**Keywords:** Consumption linkages, Forward production linkages, Rural-urban marketing linkages

## Introduction

Traditionally, development policy and related researches have adopted a simplified concept of rural and urban areas with the words rural referring to more 'remote farming areas' and urban to 'crowded cities'. To a large extent, this view has facilitated the isolated treatment of issues affecting each space and it as a result failed to acknowledge the important poverty reducing inter-linkages that exist among the two spaces. In reality, rural and urban areas co-exist along a continuum with multiple types of flows and interactions happening between them (Braun, 2007).

The development policies have often been either urban biased or rural biased (Birhanu, 2003; Assefa, 2007; Mohammed, 2007). For instance, the Three Five year Development Plans (1957-1973) and The Ten Year Perspective Plan (1985-1994) did not give due attention for rural-urban integration and could neither solve the problems nor promote modernization. The past policies had been generally characterized by various types of biases: Spatial bias (concentration of industries in a few geographically selected and limited areas), scale and technological bias (preferential treatment of large farms) and approach bias (dominated by top-down approach in planning by neglecting bottom up approach) (Mesfin, 1995; Tibebe, 2003).

In the present regime, there have also been limited attempts to design policies which address urban related issues and rural-urban linkages (Goitom, 2005). The main development strategy is based on the Agricultural Development Led Industrialization (ADLI). According to this development strategy, the development of agricultural sector serves as the engine of growth for industrialization. The foundation of ADLI is that, resources should be directed to areas that provide the highest benefit to the largest number of people (that is agricultural sector) and on the economic argument that developing countries should use resources that they have in abundance (that is labor) and less of their scarce resources (capital). However, ADLI is criticized as rural oriented with almost complete neglect of recognition on the importance of urban development to initiate and develop rural areas. The emphasis remains on production rather than on exchange and trade. It is in the supply side rather than on the demand side (Birhanu, 2003; Tibebe, 2003; Assefa, 2007).

Ethiopia has many small towns, which are of immediate importance for agricultural development. However, the mere presence of small towns by itself could not necessarily bring the desired development unless the towns are capable of providing proper function and stimulate rural-urban linkages. These urban centres are expected to assist agricultural and rural developments by serving as markets, processing, service and employment centres for the surrounding rural areas. In Ethiopia, the extent to which positive rural-urban linkages exist between small towns and their surroundings, need an investigation since it is an important issue capable of addressing both rural and urban development (Tegegne, 2001). However, rural-urban linkages in general and rural-urban marketing linkages in particular in Ethiopia are not well studied as manifested by the existing reviewed few studies (Baker, 1986; Mesfin, 1995; Tegegne and Tilahun, 1996; Tegegne, 2001; Ministry of Federal Affairs, 2004; Goitom, 2005; Tegegne, 2005; Mohammed, 2007). Moreover, issues of irrigated rural farming and its integration with urban centers are not dealt well in their works which this study is supposed to focus. In addition, to the best of the writer's knowledge, no study has been carried so far on the raised issued in the study area. Hence, focusing on investigating the nature and challenges of marketing linkages between Kobo town and its hinterlands, this study hopes to fill this gap and contribute knowledge on the topic.

## **Materials and Methods**

To understand the existing rural-urban marketing linkages, this study adopted the cross-sectional survey method.

### *Nature of Data and Methods of acquisition*

Both primary and secondary sources of data were used to address the research questions. Primary data was collected from sample rural households, urban households and traders by preparing three separate questionnaires. The data was collected through trained assistants. Moreover, personal observation was also employed.



For reference purpose or to use as benchmarks against which the findings of a research may be tested, Secondary data sources (both published and unpublished) related to the issue were also consulted from different libraries, documentation centers, offices and organizations.

### Sampling Techniques and Sample Size

A two-stage sampling design was employed in data collection process. In the first stage for the rural household survey, three *kebelle* (the lowest administrative units in Ethiopia) Peasant Associations namely Abuware, Aradum and Kobo Zuriya, which fall within an average distance of 10 kms from Kobo town, were chosen purposively for the reason of wide practice of modern small-scale irrigation projects. This study adopts an average distance of 10 km from Kobo town to be an area of intensive interaction between the rural and urban areas. An average distance of 10 km from Kobo town is used due to the existence of secondary market places such as Robit (17 km South of Kobo), Wajia (15 km North of Kobo), Tekulesh (22 km West of Kobo) and Zobel (30 km East of Kobo) with their own sphere of influence. Moreover, the distance is assumed reasonable to be overcome on a daily walking travel since walking is the dominant mode of transport in the study area.

In the second stage, 160 rural households were selected through systematic random sampling technique from each identified three *kebelle* Peasant Associations. The roster of *kebelle* Peasant Associations were used as sampling frame and their sample size was determined proportionally to their total number of households. For the urban households about 80 residents were proportionally allocated for each four urban *kebeles* found in the town and selected through systematic random sampling technique. The urban dwellers association rosters were used as sampling frame. Moreover, 40 traders were randomly selected from different trade activities that have relationship with the objective of the study. The sample size was found to be sufficient considering the time and budget available for the study (Figure 1).

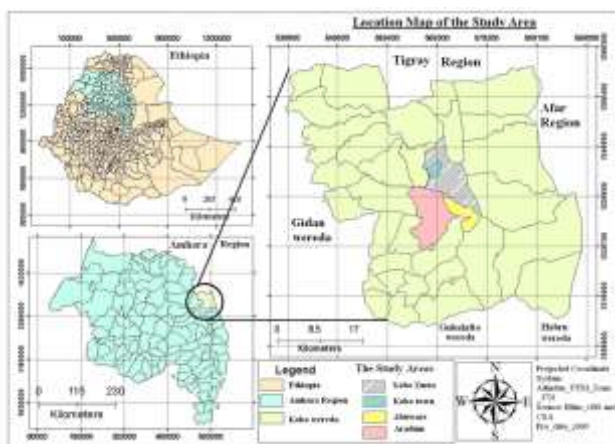


Fig. 1. Location of the Study Area

### Methods of Data Analysis

The methodologies employed to analyze the data were both qualitative and quantitative. Descriptive and inferential statistics were employed to analyze quantitative data; Descriptive statistical tools including averages, percentages, standard deviations, coefficient of variations and frequency distributions are employed to analyze quantitative data. Qualitative data analysis technique was also used to analyze opinions and perceptions by using common expressions and similar opinions. The instrument used to organize the collected data was Statistical Package for Social Sciences (SPSS).

### Results and Discussion

Pattern and intensity of rural-urban marketing (production and consumption) linkages, the main factors that affect the marketing linkages between Kobo town and the surrounding rural areas and the role of local governments to enhance the rural-urban marketing linkages are discussed here under.

Most of the sample rural households (94.375%) mentioned mixed farming as their main livelihood strategy, the remaining (5.625%) report to augment their income through participating in various off and non-farming activities. Thus, for the majority of the sample rural households' sale of crops, livestock, livestock and other animal's by-product are the main source of income.

*Agricultural Productivity in the study area:* The agricultural activity of the study area has been mainly characterized as subsistence type; highly dependent on natural rain. However, since 2003 with the help of Kobo Girana Valley Development Programme (KGVDP), there has been remarkable progress in agricultural productivity via modern small-scale irrigation projects.

*Crop Production:* *Teff* (a very fine, like cereal, scientifically known as *Eragrostis tef*), Sorghum and Maize are the main staple food crops occupying the largest proportion of cultivated land and cultivated through rain water. The main constraint of crop production in the study area includes; low and unreliable rainfall condition, occurrence of weeds and pests, little or no use of agricultural inputs, shortage of cultivated land, traditional agronomic practices and cropping system, inadequate agricultural support services, improper landuse system and so on (KGVDP, 2007).

The sample survey result indicates that, the average productivity of *teff*, sorghum and maize under rain fed conditions were found to be around 8, 14 and 17 quintal per hectare respectively. As indicated in Table 1.1, all of the sample rural households produce *teff* with an average yield of 6.14 quintals per household followed by sorghum, maize and chickpeas 6.49, 2.94 and 1.17 quintals per household respectively.

Mainly, teff and sorghum traders in Kobo town have also confirmed that, they purchase and collect these crops from the surrounding farmers and ship these grains to the other bigger places such as Mekelle and Dessie (Table 1).

**Table 1. Sample Rural Households' Annual Rain Fed Crop Production**

Crops	Respondents	Total production (qu)	Average annual production per household (qu)
Teff	160	982	6.14
Sorghum	139	902	6.49
Maize	17	50	2.94
Chickpeas	9	10.50	1.17

Source: Field Survey, 2014

In the study area, the major source of cash for the rural households was sales of crops. They sell their crops frequently to buy manufactured goods and services, other crops not produced by them (mostly oil seeds, pulses and spices) and for other purposes. The survey result depicted that of the total sample rural households, 74, 60, 7 and 9 respondents reported to generate income from the sale of *teff*, sorghum, maize and chickpeas respectively. Moreover, respondents also assured that, they sold these products to town traders, urban consumers as well as local consumers.

*Production of Pulses and Oil Seeds:* For the sample population of rural and urban areas and traders, the hinterlands are not a good supplier of pulses and oil seeds. Only 9 respondents reported to produce chickpeas through natural rain and 2 respondents cultivate sesame through irrigation and their total annual production was 10.5 and 2.5 quintals respectively (refer Table 1.1 and Table 1.2). Even though, there was high local market demand for the above-mentioned crops, an insignificant number of surrounding rural households report to have produced and supplied it. Accordingly, these products were supplied by the remote rural *Kebeles* of the study *Wereda* (Province) and by merchants from distant areas such as Korem, Geregera, Hara and Meresa. Thus, the production of pulses and oil seeds should be widely practiced in order to improve the income of rural households as well as to strength the marketing linkages between the town and the surrounding rural *Kebeles*.

*Vegetable and Fruit production:* Even though traditional surface irrigation system is historic, accessibility to modern pressurized irrigation system is a recent phenomenon in the study area. Nowadays there is a promising expansion of vegetable and fruit production. According to Adinew (2008), in the study *Wereda*, there is a significant increment both in irrigated land (192%) as well as amount of production (355%) resulting in increasing production per hectare (55.94%) from 1995 to 1999E.C (Ethiopian Calendar).

The dominant types of vegetables grown in the study area include onion, tomato, pepper and cabbage. Meanwhile, in the year prior to the survey, onion accounted for more than 90 percent of the total area and production.

According to KGVDP (2007), the average yield of the most commonly produced onion was 100 quintals and that of tomato was 123 quintals per ha. Though there is no discriminatory treatment in access to irrigation services, it is accessible only to farm households who have proximity of their land to irrigation water and facilities. Accordingly, 31.875% of the sample rural households report to practice traditional as well as modern irrigation to produce crops mainly vegetables (onion and tomato), while the majority 109 (68.125%) never practice irrigation. Most of the irrigators (89%) mentioned that, they cultivate vegetables mainly for sale because these vegetables are not as such important in their food items, only the remaining 11% of the respondents replied that, they used their product for both sale and home consumption purposes (Table 2).

**Table 2. Distribution of Sample Rural Households' Annual Vegetable and Fruit Production (Multiple Response were Given)**

Fruits and vegetables	Number of producers	Total amount of production (quintal)
Tomato	3	63
Red pepper	1	5.5
Cabbage	1	4
Onion	46	902.75
Sesame	2	2.5
<b>Total</b>	<b>53</b>	<b>977.75</b>

Source: Field Survey, 2014

The sample survey also divulged that, the average yield of onion, tomato and pepper was 63, 84, and 22 quintals per ha respectively (Fig. 2). Moreover, the researcher has also observed different fruit trees like avocado, mango, orange and papaya which are also diversifying and increasing the income of rural households and start to satisfy the high demand of urban households. Thus, in addition to vegetable production the expansion of fruit production is also increasing the income of rural households as well as strengthening the rural-urban marketing linkages.



**Fig. 2. Marketing of Onion in the Farm Area**

Regarding the market places where these vegetables are sold, all of the modern irrigators replied that, they sold almost all of their irrigated produce (mainly onion) at their farm to wholesalers who come from distant areas (Mekelle and Addis Ababa) and some produce to the urban households and retailers at Kobo town. Since the availability of market creates incentives for farmers to bring their produce to markets, such arrangement of market channel by KGVP and Kobo *Wereda* Agriculture and Rural Development Bureau should be strengthened. However, all of the vegetable producers expressed that, due to marketing problems (limited demand with excess supply), mostly in peak harvesting season, preponderance of one product (mainly onion), perishability of vegetables coupled with lack of modern warehouses, they are forced to sell their produce at prices lower than the fair price. Moreover, there is also price fluctuation in different years ranging from 150-450 birr per quintal for onion.

The majority of sample urban households (82%) as well as onion, tomato and cabbage merchants confirmed that, there is excess supply of these products by the surrounding irrigators. But for vegetables other than the above mentioned the rural hinterlands are not the main suppliers, rather distant places like Gojjam for Red Pepper whereas Meresa, Sanka and Girana for fruits like orange, lemon, and sugarcane and so on are the suppliers.

Generally, the survey outcome shows that, the majority of rural households (53.75%) consume all of their production, 32.5% consume three-fourth of their production while the remaining few (13.75%) consume half of their production and save (sell) the remaining production. This indicates that, almost a significant proportion (46.25%) of the sample rural households had a potential to supply agricultural products to the urban consumers, urban traders and for local consumers who might be food insecure.

*Livestock and other domestic animals Production:* In Ethiopia, livestock production is an essential part of the farming system as nearly all land preparations are done by animal-drawn ploughs. The same is true in the study area, where subsistence livestock production is carried out mainly for draft (oxen) power, milk and milk products both for household consumption and for markets. Meanwhile, compared to the sales of crops and vegetables, sales of animals and animal by-products contribute less significantly to farmers' income in the study area. This is because; livestock function as an important insurance substitute mainly during hard times.

Traditional animal breeds are the dominant livestock species reared in the study areas. Most farm households in the study area keep stocks such as goats, sheep, cattle, donkeys, camels and hens. These flocks consist of local species that are large in number but lesser productive. This is because; livestock and other animals are seen as symbols of status. Due to this traditional outlook, the society gives due attention only to quantity rather than quality.

The livestock in the study area are highly dependent on fodder from forest and crop residues. Grazing areas are communal which have been over exploited for a long period of time and are adversely affected by drought and erosion, and hence it becomes necessary for farmers to buy fodder (hay and straw) and bran for the dry seasons.

Despite the urban household's increasing demand for livestock, livestock and other animal products, all the sample urban households as well as livestock, livestock and other animal product traders stated that, the supply of these products (mainly milk and milk by-products, honey, skin and beef) by the surrounding rural *Kebeles* is insufficient. Thus, it is vital to introduce and expand improved breeds which are more productive, disease resistant, and have the potential to improve household's income, access to food and motivate the expansion of agro-processing activities in the town and facilitate the rural-urban marketing linkages.

As displayed in Table 3, the average number of oxen, cows, bulls, heifers, calves, sheep, goats, donkeys, camel, beehives and chicken population per sample rural households is 1.81, 1.87, 0.89, 1.13, 1.13, 2.90, 3.68, 0.93, 0.68, 0.09 and 6.76 respectively. The same Table also depicted that possession of bees, camel, sheep and goat is relatively more dispersed (respective coefficient of variation being 420, 145.3, 121.9 and 121.3%) showing high variability of possession by the sample rural households.

Cattle in general are kept for production of milk and milk products, as symbols of status and for traction power. However, due to shortage of grazing land and expansion of crop land, the number of cattle per household in the study area is decreasing from time to time and the primary purpose of cattle rearing is now for traction power and to supplement crop production. Regarding this issue an elderly respondent asserted that;

**Table 3. Sample Rural Households' Possession of Livestock and Other Domestic Animals**

Animals	Number of owners	Maximum	Mean	Standard Deviation	CV (%)	Total
<b>Ox</b>	154	3	1.81	0.684	37.8	290
<b>Cows</b>	125	6	1.87	1.546	82.7	299
<b>Bulls</b>	102	3	0.89	0.851	95.6	143
<b>Heifers</b>	102	4	1.13	1.071	94.8	181
<b>Calves</b>	103	3	1.13	1.063	94.1	181
<b>Sheep</b>	75	12	2.90	3.535	121.9	464
<b>Goats</b>	82	15	3.68	4.463	121.3	589
<b>Donkeys</b>	102	3	0.93	0.908	97.6	149
<b>Camels</b>	18	4	0.68	0.988	145.3	109
<b>Beehives</b>	9	2	0.09	0.378	420	14
<b>Chicken</b>	148	20	6.76	4.800	71.0	1082

**Note:** SD= Standard Deviation and CV= Coefficient of Variance

*Source: Field Survey, 2014*

*before the great chronic drought occurred (1984/85), Kobo Wereda was known in livestock population. For instance, I was rich enough and could efficiently support my family. I had more than ten milking cows, three pair of oxen, a mule, more than three donkeys, around twelve camels, many sheep and goats. This was possible because of wide availability of grazing and fallowing lands. But now, due to rapid population growth no land is devoted for fallowing purpose and the size of communal grazing land is deteriorating from time to time since it is distributed to young household heads to be cultivated which forced most of the rural households to have only a pair of oxen used for traction power with a milking cow.*

According to most rural household respondents' explanation, households' major sources of cash are sales of crops, animal products (mainly butter), and sales of forest product and seasonal employment. However, animals are sold only in cases of crop failure or other equally important family problem.

Oxen are important not only for land preparation and cultivation but also for threshing of crops besides the sale for beef and skin. As the number of oxen available to the households increases, yield of crops is also expected to improve (due to timely land preparation and planting) and the households are able to cultivate their own land by themselves instead of entering into share cropping or rent (contract arrangements). Owing to this idea, one respondent further indicated that *"my oxen helped me to prepare my land timely and to plough the land of others who have no draft power or labor through renting or share cropping arrangements"*. However, due to households' shrinking cultivated land as well as communal grazing land, it was observed that per capita farm oxen ownership is decreasing.

According to Adinew (2008), the study *Wereda's* total cultivated land has increased from 40897 to 41162 ha which is equivalent to 0.65% increment from 1995-1999 E.C at the expense of communal grazing land. As depicted in Table 1.3, most (96.25%) of the sample rural households reported to have farm oxen (the standard deviation and coefficient of variation is relatively very low that is 0.684 and 37.8% respectively showing less variability among the respondents in oxen possession). Among these, more than half of the total sample respondents (61.25 %) have a pair of oxen, 23.125 % have only one ox, and 11.875 % have three oxen while the remaining 3.75% have no ox at all. A farmer without an ox can be said to live in poverty, as he/she often faces challenges in his/her agricultural activity. He/she is forced to work on other farm for wage and even forced to practice land renting as well as share cropping arrangements with other well to do farmers. In the study area, the major coping strategies to alleviate shortage of farm power are renting of farm oxen and tractor, sharing oxen and traditional mutual support system locally known as *"debo/jiga"*. Although, most of the rural households (96.25%) have no critical shortage of farm oxen, only 7 respondents (which demonstrate the insufficient supply of oxen by rural hinterlands) reported that, they sold their oxen in Kobo town.

From the sample rural households none of them practice cattle fattening (beef farming) as a result, most of the cattle for butcheries and hotels are supplied by merchants brought from other areas like Gubalafto, Hara and Girana (*Weredas* of North Wello zone). In the study area, cows are kept to provide households with milk and milk by-products, for replacing the stock and as a symbol of status. The sample survey result, as indicated in Table 1.3 shows that, there are significant number of rural households 35(21.875%) who are not possessing any cow, whereas, the remaining 125(78.125%) of the sample rural respondents have cows ranging from one up to six.

Additionally, the coefficient of variation is 82.7% showing less uniformity in the possession of cows across the sample households. Most (87%) sample urban residents, traders and owners of snacks and shops stated that, the supply of milk and milk by-products by the surrounding area is very low. This may be due to low milk production resulting from traditional breeds which predominate and or the traditional belief of farmers i.e. "Milk should not be sold". Moreover, it was also observed that, proper attention was not given to their up keep, rather they were left outdoors free to scavenge for their food (natural grazing) which results in nutritional stress during the late dry season. Due to low productivity of cows, only 48 respondents reported to have sold butter to Kobo town. The remaining households who have cows used their milk and milk by-products for their own home consumption. Due to this insufficient supply of butter, merchants and distant rural *Kebeles* of the *Wereda* are the major suppliers to the urban residents. Coming to the sale of cows, only five respondents reported the sale of their cows at Kobo town. Thus, to generate regular cash income from the sale of milk, to strengthen rural-urban marketing linkages as well as to expand agro-processing industries, the introduction and expansion of modern market oriented dairy farming involving the introduction of crossbreeds of cows and utilization of complementary feed and management needs attention.

As of the all sample rural households' explanation, bulls are kept to replace oxen and for reproductive purpose. But due to shrinkage of communal grazing lands and expansion of cultivated land, the number of bulls owned by a household is very few. Regarding this issue one respondent mentioned that; "*a decade before every farmer had atleast one bull in his/her cattle stock but now, due to shrinkage of communal grazing lands, absence of fallowing land and expansion of cultivated land which is a direct impact of population growth, it is very difficult to get a bull in each and every household*".

The sample survey result depicted that, 70 respondents have only a bull, 23 respondents have two bulls and only 9 households reported to have a maximum of 3 bulls each. Contrary, 58 respondents have no bulls at all. Moreover, the coefficient of variation is 95.6% showing high dispersion of bulls' possession across the sample households. The survey result also indicated that, bulls were not highly marketed since only 12 respondents reported to have sold their bulls at Kobo town.



The main purpose of rearing of heifers in the study area is for milk and milk by-products and for replacing the stock. As observed in Table 1.3, due to shortage of grazing land and animal feed, the numbers of heifers owned by the rural households are very low and 36.25% of the respondents had no heifer at all. Moreover, the maximum number of heifers owned by a household was found to be only four. As a result, the coefficient of variation is 94.8% indicating less uniformity of heifers' possession across the sample households. As a result, only two households reported to have sold their heifers at Kobo town.

Sheep are reared to be used as an asset which could be easily changed into cash when need arises. Moreover, they are also slaughtered during different festivals. Similar to other livestock, in the study area, the number of sheep owned by a single household was found to be very low. Moreover, urban households as well as sheep merchants also demonstrated that, the supply of sheep by the surrounding rural *Kebeles* was insufficient.

It was found that, more than half of the sample respondents (53.1%) have no sheep at all and the maximum number of sheep owned in a household was 12. Thus, the coefficient of variation is 121.9% showing high dispersion of sheep possession across the sample households. With regard to the sales of sheep by the rural households, 32 respondents sold their sheep at Kobo town. As a result, most of the sheep appearing in the markets were brought by merchants from other places such as Afar, Hara and Girana. Moreover, hide merchants also confirmed that, there is a good supply of hides only during religious and other cultural festivals. Due to rapid expansion of the study area urban population, the demand and price of sheep is increasing. Accordingly, to satisfy this demand as well as to increase and diversify the income of rural households, the practice of sheep rearing should be encouraged and improved with the ultimate goal of strengthening the marketing linkages between Kobo town and the surrounding rural *kebeles*.

Similar to sheep, goats are reared to be used as an asset which could be easily changed into cash when needs arises. In addition, they are also slaughtered during cultural as well as religious festivals. Despite the existence of wide forest cover in the two sample *kebeles* (Aradum and Abuware) is an opportunity for rearing goats, as depicted in Table 1.3, it was found that, significant numbers of rural households (78) did not participate in rearing goats. Moreover, sample urban households as well as goat merchants conformed that, the supply of goats by the surrounding rural *Kebeles* was below the demand. The survey result also reveals that, the maximum number of goats owned by a rural household was found to be 15. Additionally, the possession of goats across the sample rural households lack uniformity since the coefficient of variation is 121.3%. In the year prior to the survey, only 43 goat owners reported to sell their goats in Kobo town. Most of the goats brought in to the town markets were from distant *Kebeles* of the study *Wereda* such as Zobel, Rama, Tekulesh, Robit and so on and by merchants from other places like, Afar, Hara and Girana.

In the study area, donkeys are the necessary assets used for transporting of goods to/from the market place. Moreover, they are also vital during in the harvesting season for transporting products and bi-products (crop residues) as well as to bring fire wood from the forest. The survey result as indicated in Table 1.3, revealed that, most of the respondents (63.7%) have donkeys ranging from one up to three while the remaining 36.3% of the respondents do not possess donkeys at all. As a result, the coefficient of variation in the possession of donkeys across the sample households is 97.6%. This may be due to the increase in the number of camels which replace the activity of donkeys in a better way. According to Adinew (2008), the number of camels found in the study *Wereda* has increased significantly from 1995-1999EC by 134.74 % (i.e. from 2530 to 5939). Since donkeys are the main mode of transport for the majority of farmers, its selling in the market might be low. Only 2 respondents sold their donkey at Kobo town. Most of the donkeys appeared in the market place were brought by farmers from remote rural *Kebeles* of the *Wereda* as well as by merchants from Girana, Hara and Afar region

In Ethiopia, as in most dry lands of Africa and Asia, camels are the principal source of income and food for millions of pastoralists. In addition, camels also play a central role in providing draught power and determining the wealth and social status of pastoralists. Since the drier climate and plain topography of the study area is comfortable for camels, recently the rural households of the study area have started keeping small stock of camels for different purposes such as; for transporting crop products and bi-products during harvesting season and for transporting goods to/from the market places and to use as a draft power.

In the survey, it was found that 12 respondents had camels ranging from one up to two, only 6 households had a maximum number of camels i.e. 3 to 4 and the remaining majority (142) respondents had no camel at all which results for a high coefficient of variation (145.3%). This further indicates lesser affordability of camel by the most rural households. On the other hand, all the camel traders mentioned that, camels kept in the study area are brought from Kemisie, Bati and Afar region. All of the camels found in the study area were males which showed that, rearing of camels was not practiced in the study area, as a result no farmer reported of selling his/her camel at Kobo town.

Forest beekeeping and backyard beekeeping are the common cultural practices of many farmers in some parts of Ethiopia, where the collection as well as selling of honey and other bi-products is a major economic activity. However, in the study area, beekeeping does not appear to be a common practice as it is evident from Table 1.3 and conformed by sample urban households as well as honey traders. This may be due to low existence of flowering plants and trees. Accordingly, only 9 respondents report to practice beekeeping with low number of hives (maximum of two) and resulting for the maximum value of coefficient of variation (420%) among the listed livestock. Thus, most of the honey exchanged in the market place is brought by farmers from distant *kebeles* of the *wereda* such as; Rama and Zobel and by merchants from distant area mainly from Sekota. Thus, to diversify and increase the income of rural households as well as to satisfy the urban

households' high demand of honey or to improve the marketing linkages between the surrounding rural *kebeles* and the town, introduction and expansion of modern beekeeping practice needs due attention. Moreover, beekeepers should also be encouraged to redress the situation by planting good plants that yield honey near to their hive colonies.

Chicken are kept for the production of meat and eggs for human consumption. In the study area, many peoples (92.5%) living in the rural areas have been engaged in keeping a small number of indigenous chicken in their back-yard, generally for home consumption and sometimes to earn incidental incomes as well. There are no additional production inputs such as feed, medicaments, etc. Chicken are left outdoors free to scavenge for their food; struggling for survival with many dangerous predators. At night they roost under same roof with the family. The sample survey result revealed that, 92.5% of the sample rural households have chicken ranging from 2 to 20. Only 12 respondents reported not to have chicken which result for relatively low coefficient of variation (71.0%). These rural households also reported to sell their hens and eggs at Kobo town. However, it was observed that due to low growth rates, poor fertility and high mortality (due to various widespread contagious and parasitic diseases) of chicken, problem of feed production and lack of controlled breeding, chicken had low production of meat and eggs. Thus, in order to satisfy the high demand of eggs and meat of chicken by the urban households and diversify and improve the income of rural households, modernized intensive poultry farming should be introduced and widely practiced by the surrounding rural *kebeles*.

*Agricultural Input Utilization:* It is believed that, urban centers as sources of and dissemination of ideas, information and technology are expected to improve farmers' access to modern agricultural inputs and services. The extent to which local farmers use agricultural inputs and extension services, and whether the small towns are sources of these services to the local farmers will reveal the impact of small towns on the nearby farmers. It will also reveal the nature of backward linkages the hinterlands may have with the small towns (Tegegne, 2001).

In the study area farm practices such as intercropping, crop rotation and fallowing are not common as most of the households have inadequate land to spare. Organic manuring and composting of the farm land is also limited due to declining number of livestock per households and the use of crop residues for fuel and animal feed. Even though, over cultivation (frequent cultivation of lands without fallowing for a long period of time), soil erosion and fertility decline and poor cultural practices (such as little or no use of agricultural inputs and soil conservation techniques), long history of habitation and cultivation of land without adequate fertilization and fallow system has been among the major reasons for low agricultural productivity, poverty and food insecurity in the study areas, the rural household sample survey result indicates that, there was low utilization of modern agricultural inputs.

Only irrigators utilize some inputs and the predominant types of input used were improved seeds and seedlings, very small amount of insecticides and insignificant amount of fertilizers (mostly Urea) were applied only for vegetables at seedling stage. It was observed that, all of the irrigators used improved seeds and seedlings. These inputs were mainly supplied and distributed by farmer's own cooperatives (organized and supervised by Kobo *Wereda* Agriculture and Rural Development Bureau) found in their *Kebeles* and other town-based institutions like KGVDP and Kobo *Wereda* Agriculture and Rural Development Bureau found in Kobo town. However, it was found that due to low level of capital generation and managerial capability, knowledge and experience of cooperative leaders and members, the volume and types of services provided to the farmers were very limited. The role of private urban traders in supplying and distributing agricultural inputs in the study area was also found to be minimal; which further indicates, the limited role (since it is monopolized by government institutions) of the town in supplying and distributing agricultural inputs to the surrounding rural *Kebeles*. As outlined by input utilizers, sometimes governmental organizations deliver the goods in off seasons or when it was not useful. Thus, the involvement of private merchants in supplying and distributing modern agricultural inputs should be encouraged so as to enable farmers to get inputs at the right times with fair and flexible price.

On the other hand, all of the sample non-irrigators mentioned that, they never used modern agricultural inputs except tractor for the production of cereals. This might be due to the escalating prices of inputs from year to year and the perception of the rural households that their farm land is fertile. Moreover, the demand for improved seeds by the sample non-irrigators was also very low because of high price of improved seeds and farmers' preference to use own seeds saved from previous harvest, as the improved seeds are claimed not to be significantly superior to own seeds.

*Extension and Veterinary Services:* Extension and veterinary services are the other important components for improving agricultural productivity, which are expected to be provided by the urban areas to their surrounding rural *Kebeles*. Agricultural extension is the major source of information and technology dissemination among the farmers. Nevertheless in the study area, there was little provision of these services to the rural households by the town. This is because according to all respondents' explanation, the extension service workers are found in their own *Kebele* Peasant Associations. Every rural *Kebele* had its own group of three Development Agents (who hold diploma in natural resource management, plant science and animal science) who teach farmers on demonstration sites on high yielding packages of crop and animal production as well as conservation of natural resources. Concerning veterinary services, the respondents mentioned that, even though it was insufficient and costly, they got this service from Kobo town (i.e. from private as well as governmental organizations). Services rendered by the private sector as well as Kobo *Wereda* Agriculture and Rural Development Bureau includes treatment, vaccination, dehorning, dehoofing, castration and artificial insemination. The

major problems regarding veterinary service in the study area includes; inadequate trained personnel, shortage of medicine and shortage of equipment.

*Purchase of Consumption Goods by the Rural Households:* The items out of the domain of daily consumption can be either brought to the urban centers or places of distribution from distant places or might be produced, manufactured or processed locally in the town or at the center.

Rural-urban marketing linkages depend on a sort of exchange of items produced by the rural folk and the products (manufactured and processed items) which are not produced by them. Sometimes such exchange might also be between agricultural produce because every household might not be able to produce everything which is needed by the households. This exchange is done by selling agricultural produce in the market and purchasing of the requirements out of the cash received. The items can, however, be grouped into consumables i.e. for day to day needs or permanents and semi-permanent items purchase once in a year or in several years and non-consumables.

In the study area, in return for the sale of agricultural produces, the rural people obtain manufactured commodities and other crops not produced by them from the nearby urban area markets. The sample survey results revealed that rural households spent a major share of their expenditure on consumable goods such as clothes, shoes, cooking oil, spices and coffee. In this regard, Kobo town plays a very significant role in supplying farmers with these consumable goods. But the matter is that, all such goods are brought from other bigger urban centers; mainly from Woldiya, Dessie and Addis Ababa. Moreover, there are also retailers (shops) in the study rural *Kebelles* which supply consumable goods for the rural residents. But these shops account for an insignificant share from the total expenditure.

On the other hand, it was also observed that, only some rural households (23) spent on non-consumable goods (Tape/ radio, Kitchen utensils, Household utensils, Bed and Jewelry) in the year preceding the survey. Generally speaking, most of the sample rural households spend less on such goods which could be related to their non-affordability to spend on these goods. Even though, Kobo town was mentioned as place of purchase for these commodities none of these goods were produced in the town; rather they are brought from other bigger towns mainly Woldiya, Dessie and Addis Ababa by merchants.

Expenditure on construction material is also very limited. Most of the rural households have grass-roofed houses. Only 4 of the sample rural households reported to have constructed new iron-roofed houses in the last year and bought construction materials like cement, corrugated iron sheet and nails from Kobo town, while the source of eucalyptus tree is used as wood for construction purposes are distant places (Gregera and Woldiya).

*Consumption Linkages of Urban Households:* It is natural that, urban areas supply manufactured and processed goods for rural areas and demand agricultural products from

those areas which could be better achieved if there is a strong rural-urban marketing linkage. The bases for such rural-urban marketing linkages are the availability of surplus agricultural produce (either for food or raw materials for the processing industries).

The urban households' survey result depicted that sample urban households spent largest share of their income for the purchase of cereals, honey, oilseeds, vegetables and fruits. They report to obtain these cereals and vegetables at reasonable prices from the surrounding farmers. Since *teff* and sorghum are the main ingredients for preparing their favorite dishes i.e. "*injera*" (thin, pancake-like, sour, leavened bread), expenditure on these grains was the maximum. Regarding the supply status of these agricultural produces by the local farmers, most of the sample urban households (91%) conformed that, the supply of vegetables (mainly onion, tomato and cabbage) is in excess, while those of cereals (mainly *teff*, sorghum and maize) is sufficient but fruits, pulses, oil seeds, livestock and livestock products and other vegetables are in short supply since these products are not sufficiently produced by the farmers. Thus, Kobo town acts as a primary node as collecting center for agricultural produces from the surrounding rural *Kebeles* and transporting it to distant places such as Wello, Tigary, Afar and so on, which demonstrates that, the exchange of these agricultural products as well as the marketing linkage of Kobo *Wereda* is not limited only within the Amhara region but also at inter-regional level.

*Forward Production Linkages:* If output from agriculture requires processing before it can be sold, or if there is significant value added by processing, forward production linkages are to be expected (Benjamin, et al., 2004). Expansion of vegetable and fruit production could also open up other investment opportunities for the private operators as well as for the urban residents, particularly in processing and packaging, distributing, warehousing and transporting of these perishable commodities. The flat topography of most of the study area coupled with the availability of ground water resource provided proper base for small scale modern irrigation schemes which can serve as a boom for agricultural developments in the *Wereda* valley area (KGVDP, 2007).

Even though, the study area is recently becoming important in vegetable and fruit production through modern small-scale irrigation projects, there were no agro-processing industries established in the town or at the place of production which adds value by processing, packing, distributing, warehousing and transporting of vegetables and fruits produced by the surrounding rural hinterlands. All of the sample rural household vegetable and fruit producers mentioned that, due to the absence of processing and packaging, distributing, warehousing and transporting industries in the nearby urban center and perishable nature of their products, they were forced to sell their products below the reasonable and fluctuating prices to the merchants coming from distant places mainly from Tigray Region and Addis Ababa. Thus, private investors as well as irrigators own cooperatives should try to engage themselves in agro-processing activities in order to improve the rural-urban marketing linkages, to add value for agricultural outputs and ultimately improving the economic conditions of the farmers concerned.

**Market Centers and Pattern of Visits:** Market centers offer different types of opportunities and potentialities for socio-economic development of the market zones. Historically, the development of an urban market center capitalized on the commercial benefits derived from the flow of goods and services from external manufacturing centers to meet the needs of the rural areas and the transaction opportunities created by the flow of labor force. Kobo *Wereda* as a main producer of cereals (*teff*, sorghum and maize) and vegetables (onion and tomato), has a good base for marketing linkages with different towns of Amhara region as well as other regions of the country, mainly Tigray and Afar. All of the sample traders of the study area indicated that, “*Segno Gebeya*” (Monday market), which is found at a suitable place in line with the main direction of the incoming agricultural products and commuters which functions on Monday, Wednesday and Friday is the only periodic market of the town which act as the primary gathering centers of agricultural produce from the surrounding rural *Kebeles* as well as the distributor of manufactured goods gathered from different distant centers.

**Table 4 Distribution of Sample Rural Households by the Frequency of Visits to Market Centers**

Frequency of visiting the market place	Respondents	
	Number	%
More than twice in a week	82	51.25
Twice in a week	36	22.5
Once in a week	26	16.25
Once in 15 days	16	10
Total	160	100

Source: Field Survey, 2014

As observed in Table 4, most of the sample rural households (51.25%) mentioned that, they visit “*Segno Gebeya*” three times in a week (that is on Monday, Wednesday and Friday), while 36 (22.5%) respondents told that, they visit these markets twice in a week on Monday and Friday. Those who visit the markets only once a week that is on Monday numbered 26, whereas, the remaining 16 (10%) respondents visit once in 15 days to sell their agricultural products and to buy the needed goods. All respondents confirmed their preference of these market places due to proximity of their villages (an average distance of 10 Km). Moreover, most of the sample rural households (89%) explained that, they visit these market places for marketing purpose only. The remaining (11%) visit the town for recreation, office work and for other social affairs. As many as (67%) of sample rural households mentioned the foot, pack animals (donkeys and camels) and animal drawn carts as their main mode of transportation. Although, Automobile transport is a recent introduction, it is catching up fast and accounts for 33% of the responses. The average time needed to travel from their villages to the market places on foot and Automobile is 2hours and 30 minutes respectively. Both, the merchants and the sample rural households, pointed to the lack of proper and sufficient storage facilities as main problem at the market centers. Sanitary facilities (absence of toilet houses and solid waste disposals near to the market area), veterinary services to the cattle coming from distant areas, improper drainage

facilities which has an impact on the market places by way of flooding, rugged as well as muddy, narrow market places, lack of recreational facilities, shortage of public transport for different villages and low maintenance and upgrading of roads that connect the rural hinterlands to the market place are the other problems worth mentioning. The improvement of the above conditions is sure to have strengthening the rural-urban marketing linkages between the town and its surroundings.

*The role of local governments to support rural-urban marketing linkages:* In most developing countries fewer attempts are made to create favorable atmosphere for rural-urban integration. Mostly, the rural local governments give due attention to agriculture-related interventions by ignoring the urban areas, as if rural areas exist in isolation. Whereas, the municipalities concentrate on the developments of the urban areas (engaged in the provision of urban infrastructure and facilities only to the urban population) and neglect both its impact and dependence on rural areas (Goitom, 2005).

With regard to rural-urban linkages, local government can play an important role in facilitating positive interactions by limiting negative exchanges between rural and urban areas. In the study area, as explained by most (72%) rural as well as urban households and observed by the researcher, some attempts have been made (such as provision of market information, agricultural inputs, veterinary and credit services and so on mainly for small scale modern irrigation practitioners) by KGVDP to increase agricultural productivity in general and to strengthen rural-urban marketing linkages in particular. Moreover, the municipality has also been engaged in the expansion of the market areas, provision of street lights for the markets, selection and provision of favorable marketing places for livestock which facilitates the rural-urban marketing linkages between the town and surrounding rural *Kebeles*. The above mentioned activities done by the town based institutions as well as Kobo *Wereda* Agriculture and Rural Development Bureau is not sufficient for strengthening rural-urban marketing linkages, rather especially the municipality is also expected to give due attention in the provision of facilities for market places like drainage, toilet, veterinary service for cattle's coming from distant areas, suitable places for the stay of pack animals and maintenance as well as upgrading of roads that connect the town with rural peasant association. In general, the municipality has to improve urban services, amenities, and commodities that are of vital importance to rural well-being.

## **Conclusion**

Until recently, most development and poverty reduction efforts have been focusing either on "urban" or "rural" issues with little consideration on the interrelations between the two. In countries that are at early stages of urbanization and where poverty is predominantly a rural phenomenon, the development agenda has been dominated by rural concerns whereas in countries with higher levels of urbanization, efforts have been biased towards urban interests. However, history of development in general has proved that any planning of urban as well as rural areas in isolation never provided complete solution to the problems. Thus, it is now increasingly recognized that, rural and urban developments are interdependent. There are economic and demographic linkages reflected in the flows of



goods, services, people, labor, capital, and information across the urban and rural spaces. In an economic sense, rural producers need markets, services, information and capital that are mostly found in the urban areas and vice versa. Thus, integrated rural-urban development is the vehicle of balanced socio-economic development for both rural and urban areas. Rural-urban linkage can be understood as the mechanism through which urban and rural areas interact in complimenting one another in existence as well as in development. Such mutual development of urban and rural areas is manifested through rural-urban linkages. In such relationships the rural sector finds market for its outputs, agricultural inputs as well as consumption goods and services from the towns. On the other hand, urban areas receive raw materials, food and demand for its products from rural areas.

The overall output of this study depicts that, there was strong consumption linkage with limited backward linkages but no forward production linkages between Kobo town and the surrounding rural *kebeles*. This was due to inadequate social and economic facilities of the town which undermines further investments to foster forward production linkages and subsistence nature of the rural economy. Moreover, the inadequacy of these infrastructures also hinders the town and the surrounding rural *Kebeles* from exploitation of their comparative advantages of being mutual beneficiaries from trade. Most of the rural households could not produce surplus for themselves as well as for urban residents'. Similarly, Kobo town, constrained by effective demand, capital and technical knowledge, could not produce agricultural inputs as well as manufactured or processed products that would be demanded by the rural society rather, the function of the town is limited only to some basic services and administrations. Accordingly, introduction and expansion of improved breeds which are more productive, disease resistant and have the potential to improve household's income, access to food and motivation for the expansion of agro-processing activities in the town, establishment of long-term stable market links with the nearby urban centers and distant places that enable farmers to get reasonable prices and long-term contracts for their produces, provision of necessary market facilities, development and expansion of irrigation schemes along with agro-processing industries, strengthening the synergy between local rural and urban governments, maximizing the participation of private as well as non-governmental organizations (NGOs) in the provision of modern agricultural inputs and agro-processing industries, as well as promoting the expansion of off-farm activities as well as micro and small scale enterprises are recommended to be considered to foster rural-urban marketing linkages between the town and the surrounding rural areas.

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# GIS IN THE STUDY OF SPATIAL LOCATION AND SERVICE LIMITS OF AMBULANCES IN CIRCLE - 9 OF GREATER HYDERABAD MUNICIPAL CORPORATION, TELANGANA

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## Abstract

*As the population of Hyderabad is increasing year by year due to migration of population from the surrounding towns and other adjacent states, it is causing a major traffic congestion problem on the city roads. Information regarding the spatial standby locations of ambulances, data related to incident-occurring locations and road traffic are very useful and mandatory for routing of ambulance services. All the private ambulance services and ambulances of private hospitals are not into emergency services, but they are mainly for shifting of patients between the hospitals which are interlinked. If these ambulances are kept for emergency services, the areas will be over-served in and around the ambulance service limits. Based on the spatial accessibility, ambulance standby locations must be allocated at selected places in each and every ward for effective and faster services with minimum response time.*

**Keywords:** Spatial, Service, Ambulances, Municipal corporation

## Introduction

Emergency Medical services involve a conglomerate of first aid, acute medical care at the hospital and the transportation of patients - most often by ambulance - in case of medical emergencies. The performance of the emergency services is mainly based on the services provided in least possible time. Performance of Emergency hospitals or operational levels will be best if they can respond or say provide the ambulance services to the accident sites in the golden hour to save the lives of people. The use of GIS based technology will be useful in developing the ambulance routes using the GPS and other real-time technologies. This technology can mostly solve the routing problems in situations like congested roads and high traffic during the peak hours. The ambulance locations can be identified on the road network using GPS coordinates which aids to find the fastest routes to the accident sites.

As the population of Hyderabad is increasing year by year due to migration of population from the surrounding towns and other adjacent states, it is causing a major traffic congestion problem on the city roads. Information regarding the spatial standby locations of ambulances, data related to incident-occurring locations and road traffic are very useful and mandatory for routing of ambulance services.

Data related to ambulances and maintenance persons will be stored in database management system and can be used by GIS when required. GIS provides the information like distance and time for every emergency operations. Various organizations use GIS for better decision-making processes with the help of real-world objects on the map and easy to use spatial tools for carrying out most complicated tasks.

The important aspects performed by GIS in emergency hospitals are as follows:

1. Finding the accident site and ambulance location.
2. Depiction of accident location and ambulance on the concerned city road map.
3. Selecting the closest ambulance service to handle the emergency situation.
4. Routing an ambulance to the accident site and from there to the closest emergency hospital.

An emergency service providing organization Emergency Management Research Institute (EMRI) developed sense-reach-care system for emergency management in Hyderabad. '108 ambulance service' at Byrraju foundation on Medchal road attends an average of 2,200 calls per day from both Secunderabad and Hyderabad regions.

The provision in GIS helps to link the phone call details to the caller's address, zipcode of concerned locality which are georeferenced to road network, ward boundaries and zip code centroids so that appropriate health care agency can respond in proper time.

### *Global Positioning System*

Global Positioning system (GPS) is the technology used for locating an accurate position on the earth's surface using the satellite signals. The information related to the location and speed of vehicle can be obtained and monitored at any point of time and in almost all the climatic conditions. GPS receiver is a small mobile type of device which is hand held or installed on any of the transportation carriers like cars, aeroplanes, ships and trucks. GPS receiver detects, decodes and processes satellite signals to find the real-time position on the earth. This facility or provision of GPS makes the tracking and functioning of ambulances very effective during emergency services. This real-time data provided by the GPS is spatially analyzed using GIS.

After receiving a call from an accident site, the control room intimates to the nearest ambulance service or emergency hospital. Then the ambulance starts and moves towards the accident site. The following information is provided to ambulance driver which is as follows:

- ☒ Shortest and fastest path from nearest ambulance location to accident site and then from accident site to nearest hospital.
- ☒ During the peak hours, GIS provides different alternative routes than the normal time, so that the ambulance can move and serve faster.

### *Ambulance Services*

Ambulance services is one of the service providers and a type of emergency medical service for providing acute medical care prior to reaching the hospital, transporting the patients to definitive care, these services are manned by paramedical staff who can administer first aid. Among these, '108' is a well-known GPS enabled ambulance service serving the people through public-private partnership with particular state governments for medical emergencies. The communication officer collects and records the call data of emergencies and then transfers the data to dispatch officer who finds the closest ambulance service near to the place of emergency.

The following database is required for emergency ambulance services:

1. Road Network: For road network, the attributes like road name, speed limits, road length, road category, one-way/two-way roads and drive time are required.
2. Hospitals: For hospitals, the attribute data like hospital name, hospital label and hospital category (government/private) are required.
3. Ambulances: For ambulances, ambulance ID number and ambulance employee details are required.
4. Global Positioning System (GPS): For finding out the location of ambulance on road network, GPS instrument is mounted on the ambulance.
5. Accident site: The accident site must be provided with nearest landmarks, cause of accident, time of accident and hospital name where the patient has to be moved.
6. Police station: Details of nearest police station, station name and locality are also required.

Apart from general ambulance services, Apollo hospital has started two-wheeler ambulance service which aims at reaching the accident victims in the golden time (first one hour) or platinum time (first 10 minutes). This two-wheeler service helps to travel faster in the peak hours when compared to four-wheeler. This system has shown good results in reducing the number of deaths due to accidents on congested city roads. The two-wheeler ambulance has the provision of inbuilt splints to immobilize broken bones and stabilize the cervical spine of the injured persons at accident sites.

### *Types of Ambulance Services*

1. Basic Life Support (BLS): It includes the requirements for emergencies such as bone fractures, high fever etc. The medical equipment on board includes an Oxygen cylinder, Blood pressure instrument and stethoscope.
2. Advanced Life Support (ALS): It includes the emergency instruments to attend to heart attacks, pregnancy emergencies, severe road accidents, burn cases, unconsciousness and animal attacks. The medical equipment includes a defibrillator-monitor, electro cardiogram, syringe pump, pulse oximeter, resuscitation kit, suction machine and nebulizer.

Regarding the shifting of patients to medical services, the patient is taken to the nearest hospital, overlooking its diagnostic and treatment capabilities. This results in multiple referrals and wastage of time in shifting of patient from one hospital to another.

This should be prevented; an organized emergency management system can solve this problem.

The use of GIS in ambulance services will improve the service levels of ambulances and hospitals by providing the treatment in time. It also helps in ambulance station allocation and deployment planning for many ambulance services. Previously, location of ambulance stations depended upon population and minimum distance between stations. For maintaining the ambulance service for the population, they follow a plan called as standby location, which is defined as a midway point between two stations or an area of major intersections.

In terms of road connectivity, circles 9 has good and well-connected road network with good transportation facilities except in some parts of Ramanthapur and Uppal area. The travel time decreases in the places of high quality road network which provides high accessibility and acceptable response time. The Advanced Life Support (ALS) ambulance services are extremely less in number when compared to Basic Life Support (BLS) ambulance and it also has longer response time for services in other areas because of wider service coverage in urban areas. The main objective of the study is to identify under-covered (under-served) and overlapping (over-served) zones of ambulance services and to decrease response times and increase quality of service.

### **Data Sources**

The data sources are from municipal circle and ward boundaries, population data, ambulance service locations and road network.

### **Study Area**

Circle-9 is located in the central zone of Greater Hyderabad Municipal Corporation with 16 wards of Musheerabad, Bholakpur, Adikmet, Gandhinagar, Golnaka, Nallakunta, Baghlingampally, Bagh Amberpet, Amberpet, Ramnagar, Kachiguda, Barkatpura, Vidyanagar, Domalguda, Himayatnagar and Kavadiguda. Figure 1 represents the dot density map of Circle-9.

#### *Circle 9 Ambulance Locations*

A total of 65 ambulance services are found in circle-9 in which most of the ambulances are only restricted to concerned hospitals and mostly belong to (BLS) Basic Life Support category. Figure 2 represents the ambulance services in circle-9 mostly concentrated in Kachiguda, Barkatpura, Himayatnagar, Gandhinagar, Musheerabad,

Adikmet, Baghlingampally and Nallakunta. Except these areas the remaining areas have no ambulance services.

Figure 2 represents the ambulance services of private hospitals, though these ambulances are not frequently used for emergency services, the service limits are overlapping in the region. If each ambulance is given the service area of 1 km radius from the point of its location, then these service zones overlap in the region up to a large extent.

**Table 1. Circle-9 Wards and Population**

S.No	Ward Name	Population Density (Persons per square kilometre)
1	Kavadiguda	19,922
2	Himayatnagar	22,798
3	Domalguda	23,861
4	Vidyanagar	23,895
5	Barkatpura	25,972
6	Kachiguda	26,848
7	Ramnagar	27,479
8	Amberpet	29,380
9	Bagh Amberpet	30,275
10	Baghlingampally	32,040
11	Nallakunta	33,194
12	Golnaka	33,452
13	Gandhinagar	34,990
14	Adikmet	36,876
15	Bholakpur	46,613
16	Musheerabad	55,737

Source- Census of India 2011



**Fig. 1. Population Distribution**



Fig. 2. Ambulance Location Map

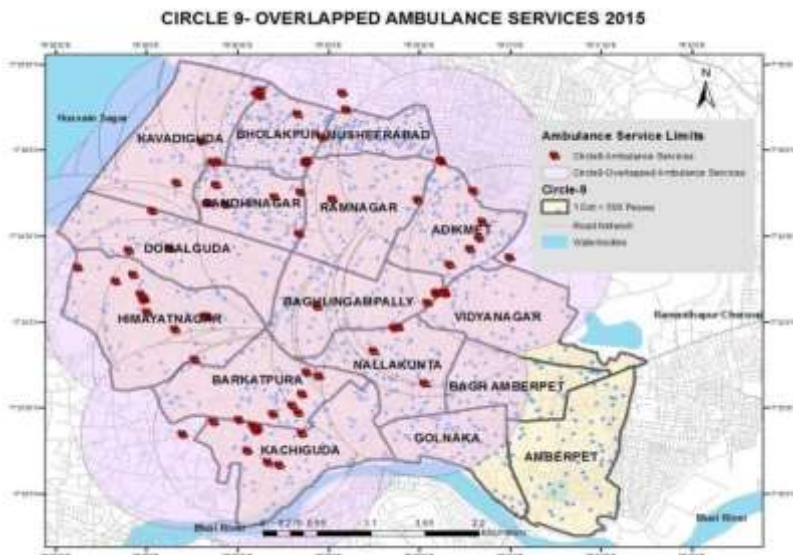


Fig. 3. Overlapped Ambulance Services

*Circle 9 Overlapped Ambulance Services*

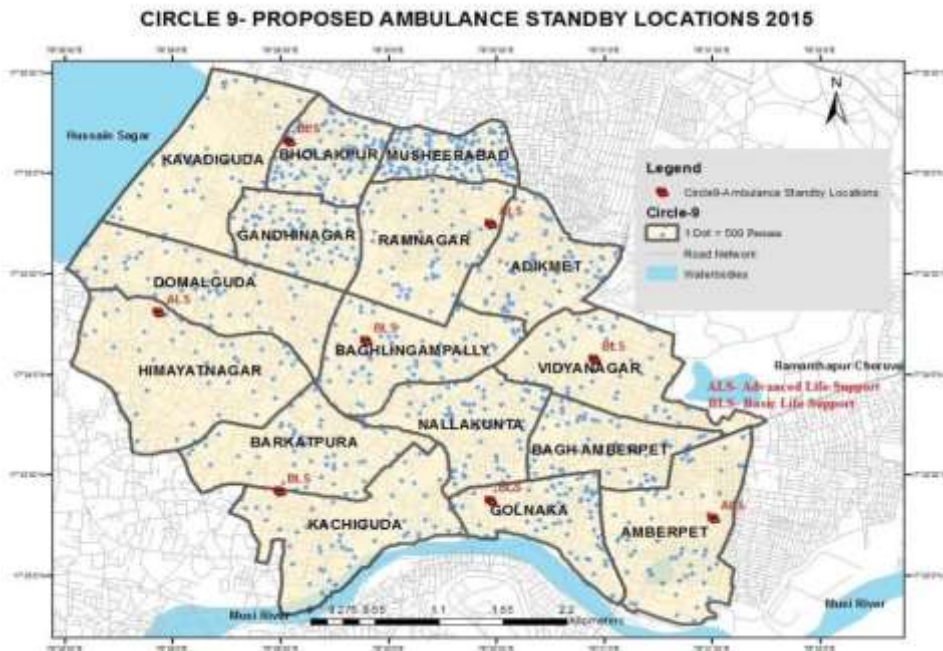
The circles in the Figure 5 represents the overlapped ambulance service zones.

*Circle 9 Proposed Ambulance Standby Locations*

To overcome the problem of delayed overlapped and under-served ambulance services, few ambulance standby locations are proposed in circle-9. These proposed



locations are set such that they have easy access to road network and can have minimum response time. Figure 4 represents the proposed ambulance standby locations in circle-9.



**Fig. 4. Ambulance Standby Locations**

The main aim of the study is to maximize the population covered by ambulance services and to minimize the service overlap areas as much as possible.

*Circle 9 Proposed Ambulance Standby Locations and Service Limits*

The ambulance standby locations are proposed such that it can provide services to highest population within very minimum response time of 8 to 9 minutes in the urban areas. Figure 5 represents the ambulance service areas of 1 km radius from the point of each ambulance locations.

*Circle 9 Proposed Advanced Life Support Services*

Figure 6 represents the location of 3 newly proposed Advanced Life Support ambulance services in circle-9, each located in Himayatnagar, Ramnagar and Bagh Amberpet area. One ambulance can cover a distance or service area of 2 kms radius from the point of its location. Therefore, these three ambulance services can serve the people of circle-9 with minimum response time in the zone of red-yellow shades and with some longer time in green zone (Fig. 6).

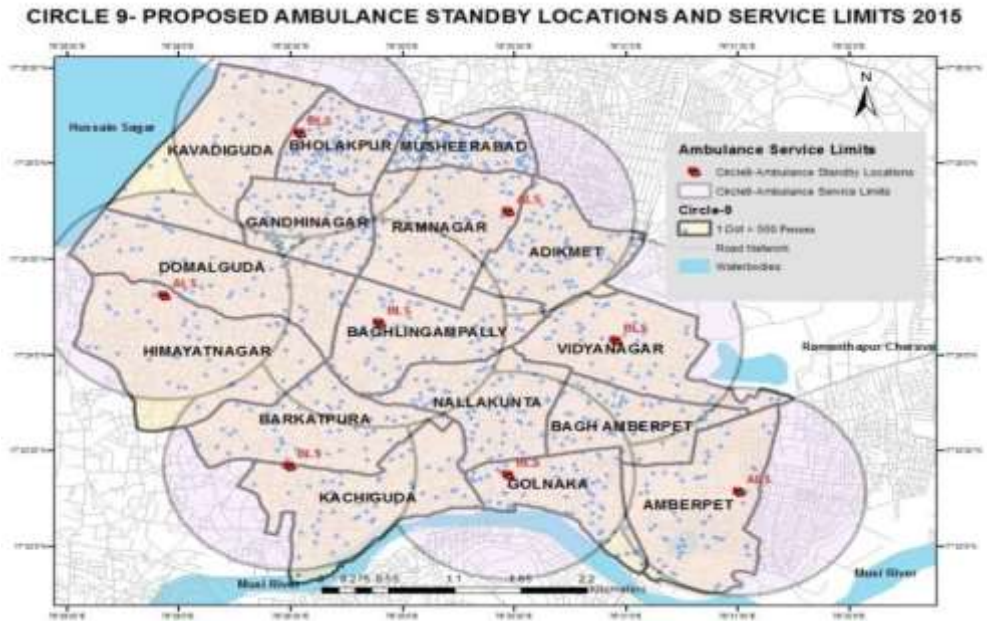


Fig. 5. Ambulance and Service Areas

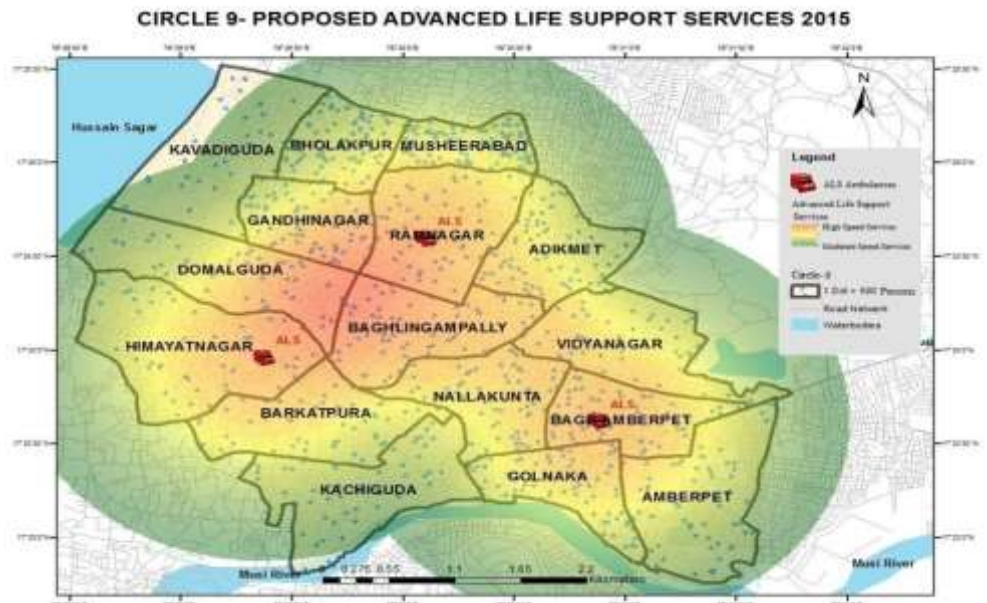


Fig. 6. Service Areas of Advanced Life Support Ambulance Services

## **Conclusion**

All the private ambulance services and ambulances of private hospitals are not into emergency services, but they are mainly for shifting of patients between the hospitals which are interlinked. If these ambulances are kept for emergency services, the areas will be over-served in and around the ambulance service limits. Based on the spatial accessibility, ambulance standby locations must be allocated at selected places in each and every ward for effective and faster services with minimum response time. The use of GIS and GPS technology must be improved in all the ambulance services for easy access and faster response from the ambulance driver. Advanced Life Service (ALS) ambulance services must be increased so that it saves the lives of people during severe accidents and disasters in the city. As of now, only '108' ambulance service is working well in the city and the number of vehicles needs to be increased in the city for improvement in the service levels. Separate ambulance lanes must be allocated in the upcoming city development to avoid traffic problems for ambulances. Blood banks must maintain required amount of stock every time in all the wards. State government should start the government blood banks in all the wards so that it will help the patients during emergencies. 24-hours pharmacy services are very important because patients may require medicines at any point of time. At present only Apollo pharmacy is providing 24-hours medical facilities in the city and still some more stores need to be opened in the study area.

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# URBAN ENVIRONMENT AND HEALTH IN AN AREA OF INCREASING URBANISATION: A CASE STUDY OF KAMARHATI MUNICIPALITY, WEST BENGAL

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## Abstract

*Environmental issue is a most important topic now-a-days as almost all the countries are aware of it. Due to increase in climate variability, public awareness about environmental problems is continuously increasing over the past few decades. Urban areas are more vulnerable to this climate variability. The promise of jobs, better standard of living and greater urban amenities pull people to the cities. But poverty and environmental degradation, the two major problems which the cities are facing now. With increase in population density, poor air and water quality, poor standard of living in the urban slums, waste-disposal problems, and high energy consumption will enhance. Racial segregation, less physical activities and difficulties in accessing healthy diets are the immediate consequences of urbanization. In the present study an attempt has been made to identify the impact of urban environment on health in some selected wards of Kamarhati Municipality, West Bengal.*

**Keywords:** Urbanisation, Racial Segregation, Green Marketing, Waste Disposal, Green Space.

## Introduction

Urbanisation shall be defined simply as referring to the process of increasing agglomeration of people in a human settlement such that the settlement graduates from a particular level of complexity (economic, social, etc.) to the other. Around the world, populations are experiencing unprecedented demographic changes (Jelili, 2012). Asia is the foremost victim of rapid urbanization on the global forum and it is happening throughout the region with great pace (Malik et al., 2014). With the increase in climatic variability, urban areas have become one of the most vulnerable areas in the world. Poor air and water quality, poor standard of living in the urban areas, waste disposal problems are the immediate consequences of urbanization. Municipalities have been facing difficulties in managing the solid waste particularly in respect of lack of efficient labors, absence of segregation facility, insufficient funding on solid waste management, absence of new dumping grounds, lack of awareness in people and so on (Chakraborty et al., 2016). Urbanization has a direct connection with economic development. The paucity of urbanization will stop the social and economic development. Rapid urbanization and its problems and challenges for adequate housing in Pakistan was described by Malik and Wahid in 2014. Polidoro et al. (2012) described urban sprawl and the challenges for urban planning. Due to easier access to energy dense processed food and decline in outdoor

activities and walking in the urban areas, the increase in the incidents of obesity will be obvious. Waste disposal is a problem of an urban area. Several studies are there regarding waste disposal problem and management (Das & Bhattacharyya, 2013; Chakraborty & Daspattanayak, 2016).

### Study Area

Being located at 22.67°N and 88.37°E about 10-15 m. above mean sea level, Kamarhati municipality is one of the most important municipalities in the state of West Bengal (Fig. 1). Hooghly is the main river forming its western boundary. It covers an area of about 11.348 Sq. Km. containing 331163 populations according to 2011 census. It contains 35 wards. For the present study ward number 21, 26, 32 and 33 have been selected with total population of 8644, 8163, 5068 and 10714 respectively. Mainly high to middle income group of people are inhabited over there. The study has been initiated to fulfill the objectives such as to identify the impact of urban environment on the health of the inhabitants of some selected wards; to bring out the potential impact of urbanization; to investigate the major causes of hospitalization and finally to reveal the level of peoples' awareness about green products which is related to people's health of Kamarhati Municipality of Belgharia and adjoining region.



Fig. 1 Location of Kamarhati Municipality of West Bengal

### Materials and Methods

The study is based on both secondary as well as primary sources of data. Relevant data have been collected through field survey and published literatures. The preliminary

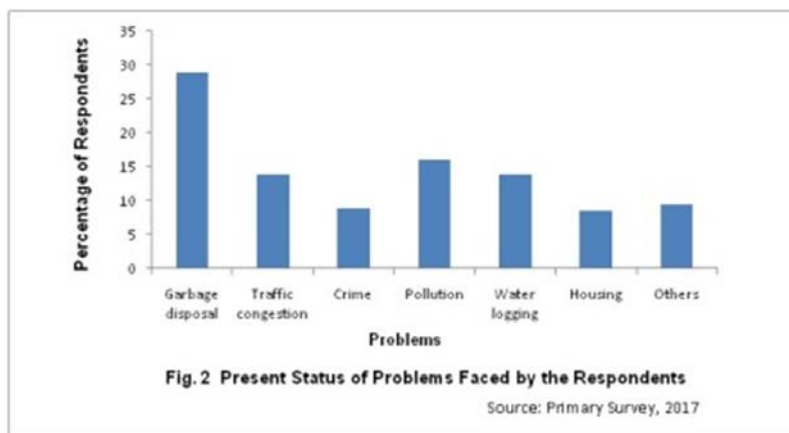


knowledge about the study area has been collected from the municipality officials. Relevant data of the study area has been gathered from published literatures in the form of books and journals. Secondary data viz. population and land use data were collected from the municipality. For the purpose of identifying the impact of urban environment on health in some selected wards of Kamarhati municipality primary survey has been conducted in the respective wards with questionnaire schedule. The selection of households and respondents were mainly based on random sampling.

## Analysis

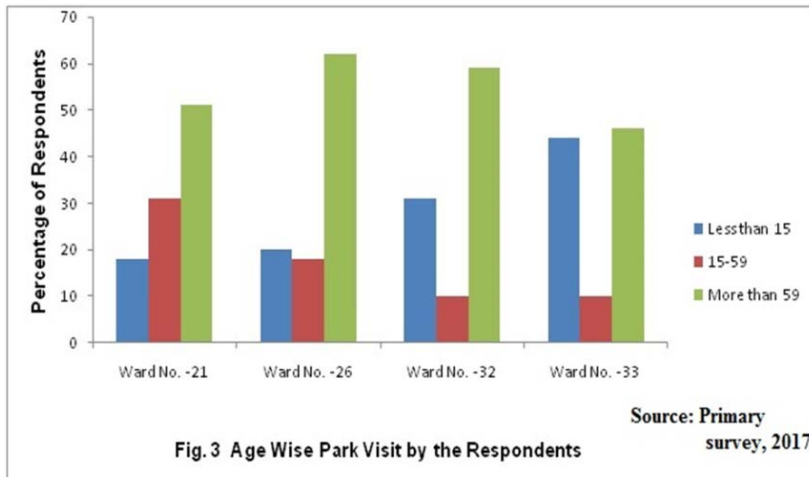
### (a) Present Status of Problems Faced by the Respondents

This study deals with the present status of various problems faced by the inhabitants of some selected wards of Kamarhati Municipality viz. ward no 21, 26, 32 and 33. People are asked to rank the steps taken by the municipality to mitigate different types of problems in the city. According to the respondents, previously the flood water carried solid wastes on the road during peak monsoon period. But now the respondents are happy with the present garbage disposal procedure by the municipality. Garbage disposal is followed by environmental pollution encountered by the local inhabitants which accounts for air, water and noise pollution. According to 16 percent of total respondents, municipality has taken initiatives to reduce the pollution level in the city. Water logging is an another issue encountered by the inhabitants. Majority of the respondents are happy with present steps taken by the municipality for reducing the water logging problem i.e. about 14 percent of the total respondents (Fig. 2).



### (b) Age Wise Park Visit by the Respondents

Parks and open space and other forms of green spaces provide essential service in the urban areas. Figure 3 shows that in case of all the respective wards (ward number- 21, 26, 32 and 33), old people whose age are more than 59 are going to parks regularly during afternoon and evening. A very little percentage of young and middle aged people get the time to visit the nearby parks thereby increasing the chance of physical and mental illness among them (Figure 3).



*(c) Level of awareness about green products*

Awareness about green products is closely related to the income of people. Maheshwari et al. (2014) described the awareness of green marketing and its influence on buying behavior of consumers with special reference to Madhya Pradesh in India. It may not be out of place to mention that people with higher income will have greater awareness about green products and vice versa. It is also seen that most of the Consumers have been worried about health problems arisen due to lower level of awareness of green products. People with higher income i.e. more than rupees 50000 per month are willing to pay an extra amount for the green products offered in the market. Primary survey brings out the fact that people with income less than rupees 5000 per month are not very much aware about the green products. They are consequently the most vulnerable groups to the environmental degradation in the urban areas (Figure 4).

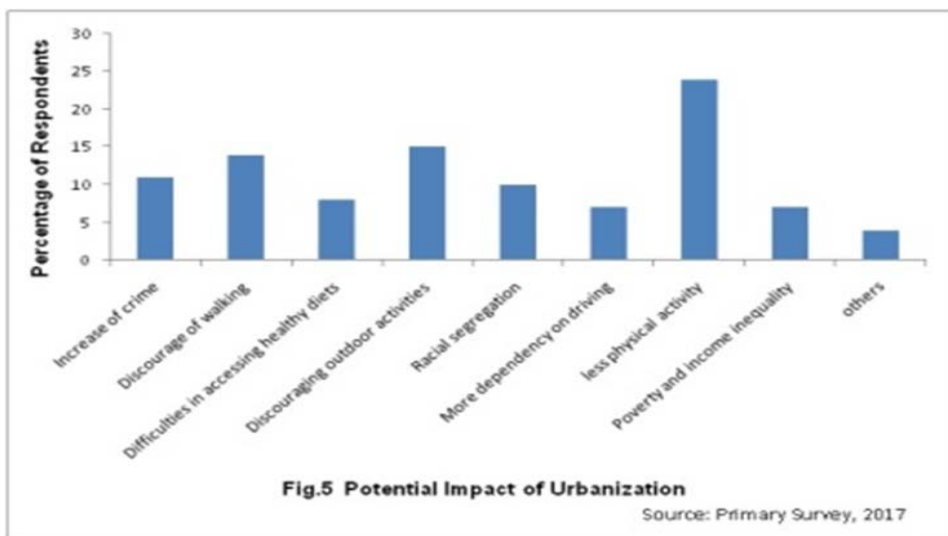


#### (d) Potential Impact of Urbanisation

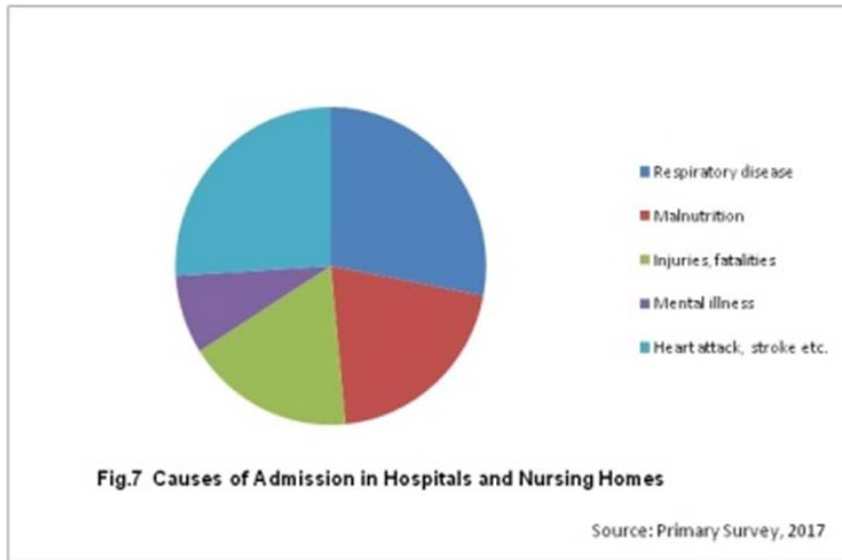
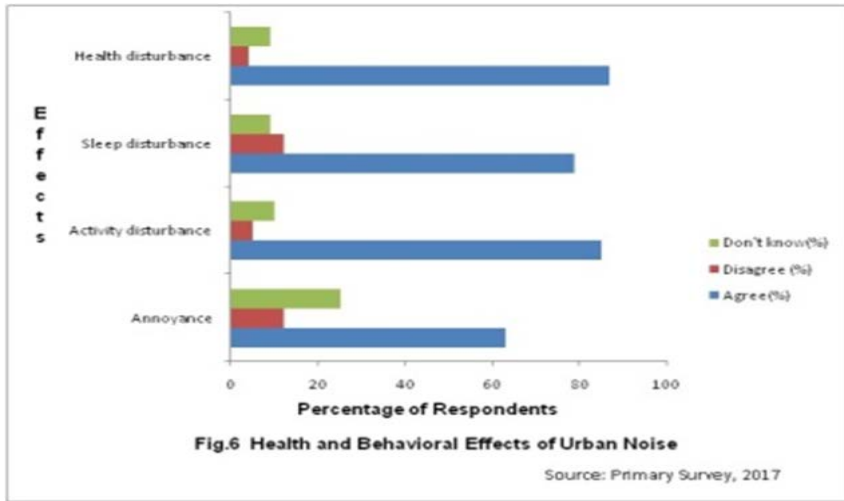
The promise of jobs, better standard of living and greater urban amenities pull people to cities. But poverty and environmental degradation, the two major problems which the cities are facing. With increase in population density, poor air and water quality, insufficient water availability, waste-disposal problems, and high energy consumption will enhance. As the prime objective of the study is to correlate urbanization and health, inhabitants of the aforesaid wards were asked to rank the potential impact of urbanization. According to the respondents higher level of urbanization will reduce the physical activity (24%) followed by outdoor activities (15%) and walking (14%). Increase of racial segregation (10%), social crime (11%) and difficulties in accessing healthy diets (8%) will be the other consequences of urbanization (Figure 5).

#### (e) Health and Behavioral Effects of Urban Noise

Due to rising population pressure in the urban areas of India, transportation demand will continue to rise. Traffic related noise pollution accounts for nearly two third of the total noise pollution in an urban area (Tandel et al., 2011). Evaluation of noise pollution in major cities is important as it will evaluate governmental effort to tackle this pollution. Noise pollution is still considered a big problem in most major cities in the world (Ehrampoush, 2011). The present study is conducted to identify health and behavioral effects of urban noise. More than 60 percent of the respondents believe that health and activity disturbance and annoyance are the major effects of urban noise. It also affects the quality of sleep and day drowsiness in children. According to the respondents old vehicles with poor maintenance and bad driver habits are primarily responsible for noise pollution in the study area (Figure 6).







(f) Causes of Admission in Hospitals and Nursing Homes

Szekendi et al. (2015) identified the characteristics of patients frequently admitted to academic medical centers in the United States. McMichael (2000) discussed the urban environment and health in a world of increasing globalization with special reference to developing countries. The present study investigates the causes of admissions in hospitals and nursing homes. The survey was carried out in the respective wards and validated by the hospital and nursing home officials. About 28 percent of the total respondents replied that the major cause of hospitalization is the respiratory disease, which is mainly due to urban pollution and obesity caused by less physical activity. Heart attack and strokes are the second most common cause of hospitalization followed by malnutrition, injuries and mental illness (Figure 7).

## **Conclusion**

This paper highlights the impact of urban environment on human health in some selected wards of Kamarhati municipality. As environmental issues continue to affect human activities, urban society will treat these issues with great concern. As stated earlier that the urban areas are more vulnerable to the climatic variability, creation of green belts and traffic management have become immediate necessity. Removal of old motor vehicles especially motorbikes may be considered as an important initiative to control the noise pollution level on the streets. The primary survey reveals the fact that the respondents are happy with the present garbage disposal and recycling procedure but there is requirement of efficient traffic management. This paper indirectly highlighted the importance of green space for public health. Parks and open space and other forms of green spaces provide essential service but the study points out that the children occasionally go to the parks and play grounds. It causes obesity and mental illness even among the children whose age are less than five.

## **Acknowledgement**

The author is grateful to the officials of Kamarhati municipality for providing useful data. The author would also like to offer his deepest sense of gratitude to Dr. Ashis Kr. Paul (Professor, Dept. of Geography, Vidyasagar University), Dr. Swadesh Mishra (Former Agro-Meteorologist, Govt. of West Bengal) and Dr. Asitendu Roychoudhury (Associate Professor, Dept. of Geography, Bhairab Ganguly College ) for giving valuable suggestions, guidance and supervision during his entire field study.

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# URBAN GROWTH AND MASS RAPID TRANSIT SYSTEM (MRTS): A STUDY OF DELHI METRO IN METRO CITY OF DELHI

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## Abstract

*Delhi is the second largest metropolitan city of India after Mumbai which is still growing. In any city smooth traffic movement is a prerequisite for its development but it is very difficult to achieve because of increase in population, commercial and industrial activities. Besides this high vehicle ownership and poor supporting public transport facilities cause serious problems of transport. Primary data related to user satisfaction is collected through a structured interview done in the area of Hauz Khas metro station in Delhi in June 2018. It is seen in the study that there is rapid growth of population in Delhi i.e. 5.64% average annual growth rate between 1981 and 2011 and the number of vehicles and road length also increased during this period but increase of length of road is not as much as the increase in the number of vehicles. Vehicles increased with about 49% annual average growth rates whereas length of road increased at about 4% annual average growth rate. It is found in the study that people are satisfied with the service as it provides a safe, secured and fast mode of transport.*

**Keywords:** Rapid mass transit system, Population growth, Public and private vehicles, Delhi metro user satisfaction

## Introduction

Urban growth in the world is on its peak especially in the countries of the developing world such as India (Kumar et al., 2007). India is the second largest country in the world in terms of population and seventh largest in terms of area and the population and population is still growing rapidly with an average annual growth rate of 1.64 per cent. According to the 2011 Census, the urban population of India is about 377.11 million which is about 31.16% of total population and there are 53 million plus cities in India where Mumbai, Delhi, Kolkata and Chennai are the four largest million plus cities. The population in Delhi has grown from about 1.74 million in 1951 to about 16.75 million in 2011 and the population density was 1,176 in 1951 which rose to 11,297 in 2011 (Directorate of Census Operations, 2011).

The major components of urban growth are natural increase of population, net migration to the cities, reclassification of settlements as urban and extension of boundaries

of cities and towns (Bhagat and Mohanty, 2009). The main cause of urban growth of Delhi is immigration from surrounding areas of Uttar Pradesh, Bihar, Haryana, Rajasthan etc. (Rahman et al., 2012). Urban growth directly influences the urban development processes such as housing, built up area, transport network etc. (Bhatta, 2009). Most Asian cities are experiencing rapid urbanisation, which results in urban congestion and increasing demand for mobility and an increase in motorized vehicle ownership (Alam and Ahmed, 2013). Transport plays an important role in the development of urban areas by providing options for travel and transport and by influencing the economic development through accessibility which it provides (Meyer and Miller, 2001).

The demand for transport in Indian cities is increasing due to the population growth and increasing household income and easy availability of motor vehicles have raised the private motor vehicle ownership in Indian cities (Singh, 2005). Due to rapid and haphazard growth of urbanisation, problems of congestion and traffic have emerged in most Indian cities. Singh (2005) noted that, during 2000, nearly 12.7% motor vehicles of India were running in four mega cities (Mumbai, Delhi, Kolkata and Chennai), while Delhi, which contains nearly 1.4% population of the country constitutes about 7% motor Vehicles of the country. Only four major cities of India have local rail system and they are Mumbai, Delhi, Chennai and Kolkata (Singh, 2005), of which Delhi's local train system holds less than 1% daily riders. The vehicle population was increased about 8.9% in India (Sausanis, 2011).

During the past few decades, there is a sudden increment in the private transport in Delhi. Till December 2002, Delhi was the only megacity in the world which was dependent almost entirely on roads as the sole mode of transport. After 2002, metro rail project gave Delhi a world-class mass rapid transit system. It is developed in three phase which was at first operational from 24th December 2002. At present all three phases are operational and it is expected that the third phase will be fully operational by end of 2018 (Fig. 1). The beginning of Metro-rail system has reduced some pressure of traffic in Delhi, but the situation is still not much in control. According to a UN report the population of Delhi got doubled between 1990 to 2014 as becomes 25 million whereas the rate of increase of DTC buses is just 43.39% from 3286 in 2000-01 to 4732 in 2014-15. Delhi has now become the fourth most polluted city in the world, with automobiles having contributing about two third in total atmospheric pollutants (HT, 2018). So there was a need of rapid, less polluted, congestion free mass transit system and Delhi metro plays an important role in this regard. So there is a need to study the role of metro for rapid mass transport system. Urban growth and transport are closely related as development of transport infrastructure leads to urban development in one way and the urban growth causes increase in demand for transport facilities in another way (Aljoufie et al., 2011). The population of Delhi is still growing and will be growing in near future, which will require more transport facilities (Goyal et al., 2006). Thus the main objective of this paper is to i) analyse the demand of rapid mass transit system in Delhi and ii) to assess the role of Delhi metro in fulfilling the demand of rapid mass transport system for easy and better movement of the people within the city.

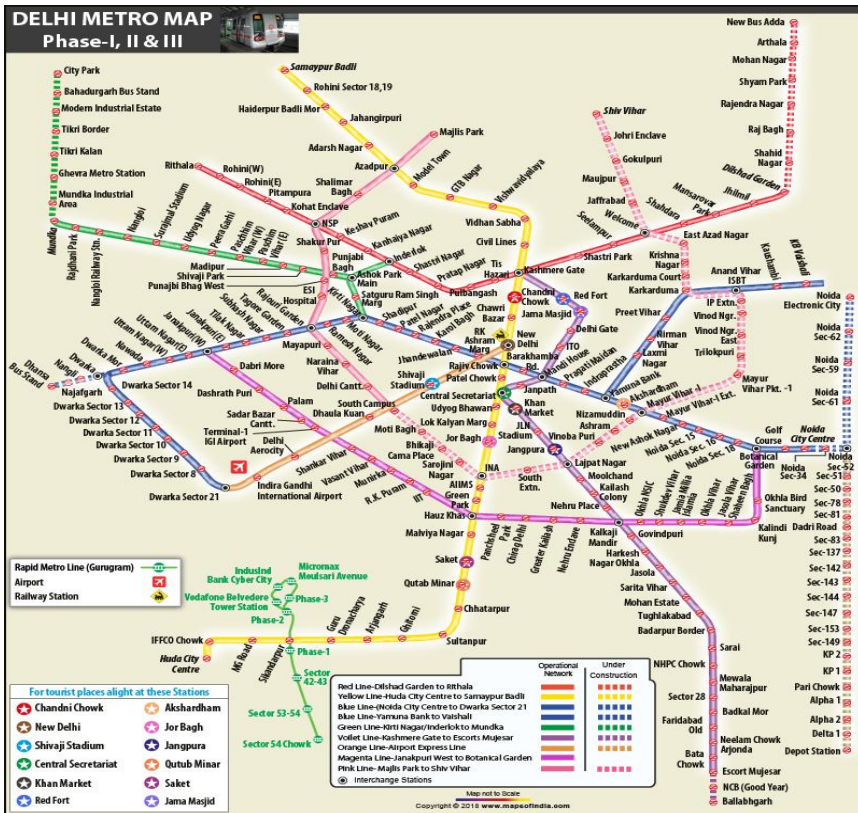
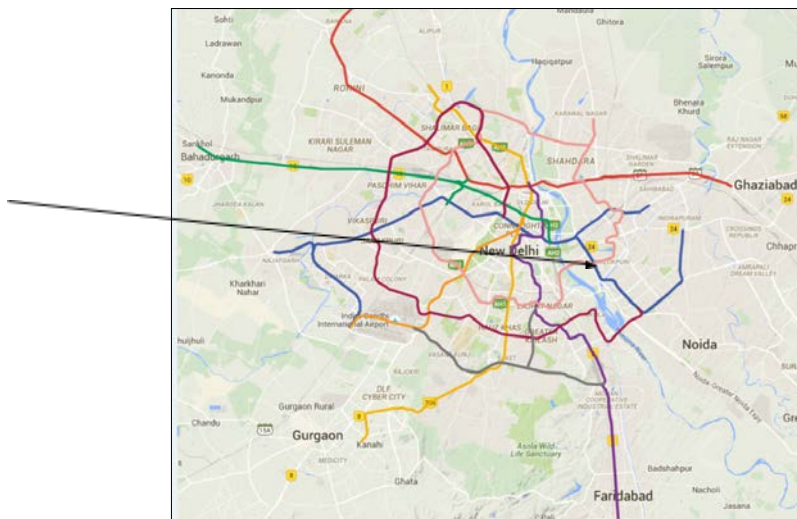


Fig. 1. Delhi Metro Route

Source: <https://www.mapsofindia.com/maps/delhi/delhi-metro-phase-3-map.html>

### Study Area

Delhi is among the fastest growing cities of India and it also has the largest rapid mass transit system in India. So Huaz Khas, the junction of Delhi metro’s Yellow and Magenta line (Fig. 2) has been chosen for the field survey. Yellow line was developed in First phase whereas Magenta line was developed in Third phase of Delhi metro. The total population of Delhi is 16.8 million and it is the second largest city of the country. It is located in northern plains and is the centre of National Capital Region (NCR). The climate of Delhi is of continental type due to distance from sea coast. River Yamuna and Aravalli range are the two main geographical features of city. Aravalli hills covered with dense vegetation act as lungs of the city (Krishen, 2006), while Yamuna River provides water for drinking and other purposes. The total area of the Delhi is about 1483 sq. km and the population density of the city is about 11,312 persons per sq. km.



**Fig. 2. Location of the Study Area, Yellow and Magenta line Delhi Metro**

**Database and Methodology**

The data used in this study is collected from both primary survey as well as from secondary sources. Primary data related to user satisfaction is collected through a structured interview done in the area of Hauz Khas metro station in Delhi in June 2018. Convenient sampling is done in this study where everyday passengers who were willing to answer the questions are surveyed. Secondary data related to growth of population, urbanisation, growth of vehicles, and DTC buses and evolution and growth of Delhi metro are collected from Delhi Metro Rail Corporation (DMRC), Central Road Research Institute (CRR), Economic Survey of Delhi and Statistical handbook of Delhi (Table 1). The analysis has been done to assess the population growth, rate of urbanisation, demand for mass transport and user satisfaction with metro services on Yellow-Magenta line.

**Table 1. Data Source and Parameters Derived**

S. No	Data Source	Year	Parameters
1	Delhi Metro Rail Corporation (DMRC)	2004 to 2018	<input type="checkbox"/> Ridership, <input type="checkbox"/> Length of metro line <input type="checkbox"/> Number of stations
2	Central Road Research Institute (CRR)	1980 to 2016	<input type="checkbox"/> Number of public and private vehicles <input type="checkbox"/> Availability of vehicles per thousand population
3	Economic Survey of Delhi	2001 to 2015	<input type="checkbox"/> Number of DTC buses <input type="checkbox"/> Fleet utilization <input type="checkbox"/> Vehicles utilization <input type="checkbox"/> Passenger per bus per day
4	Delhi Statistical Handbook	1980 to 2016	<input type="checkbox"/> Length of road network

## Results and Discussion

Rapidly increasing demand for public transport in Indian cities have put tremendous pressure on the existing public transport (Pucher et al., 2004) and the situation in the most metropolitan city like Delhi is rapidly deteriorating because of it. Indian cities of all sizes are facing the same issues related to transport. Despite investments in road infrastructure and plans for land use and transport development, each city faces the problem of congestion, traffic, accidents, noise and air pollution and the problems continue to grow day by day (Singh, 2012). Megacities are facing a record growth of motorized vehicles ownership (two wheelers and cars) whereas medium and small cities with different forms of intermediate public transport provided by informal sector are struggling to meet the mobility demands of city resident. In Delhi, the number of two wheelers and cars continue to rise at a very fast rate. Despite construction of flyovers and roads, the roads continue to face congestion at peak hours. In big cities like Delhi, the concept of peak hour is an old saying and it appears that all the time is peak hour. This large number of motor vehicles causes extreme congestion on roads, ever slowing speed, wastage of fuel, environmental pollution and an unacceptable level of road accidents, in spite of the roads occupying 21 per cent of the total city area.

### Population Growth in Delhi

Delhi being one of the largest cities of India is also one of the largest growth centers; therefore, it attracts a large population who came to Delhi in search of livelihood, education, better standard of living and better infrastructure etc. So unprecedented growth of population takes place in Delhi, NCR. The average annual growth rate of urban population in Delhi during 1981-91 was 5.14% which became about 2% between 2001 and 2011. The 2% average annual growth is also quite high because of large population base. Share of urban population to total population of Delhi was 92.10% in 1981 which becomes 97.50% in 2011. Average annual growth rate of urban population in Delhi was quite high during 1981-91 and 1991-2001 i.e. 4.79% and 5.23% respectively. Because of decentralization of population and economic activity in Delhi NCR region average annual growth of urban population of Delhi decreased during 2001-11 (Table 2).

**Table 2. Delhi- Urban Population and Urban Growth**

S. No	Year	Population	Average Annual Population Growth rate (%)	Urban Population	Share of Urban Population (%)	Average Annual Urban Population Growth rate (%)
1	1981	62,20,406	-	57,29,283	92.10	-
2	1991	94,20,644	5.14	84,71,625	89.93	4.79
3	2001	1,38,50,507	4.70	1,29,05,780	93.18	5.23
4	2011	1,67,53,235	2.10	1,63,33,916	97.50	2.66

Source: Census of India (1981, 1991, 2001 and 2011)



Similarly, the annual growth of vehicles in Delhi has also increased from 4.72 per cent in 1999-2000 to 6.89 per cent in 2014-15. During the same period the number of vehicles per thousand population increased considerably i.e. from 253 to 487 (Table 3).

**Table 3. Availability of vehicles per thousand populations in Delhi**

S. No	Years	Number of Vehicles	Annual Growth of Vehicles (%)	No. of Vehicles per 1000 Populations
1	1999-2000	31,63,565	4.72	253
2	2000-2001	33,75,153	6.69	244
3	2001-2002	36,17,853	7.19	256
4	2002-2003	38,86,072	7.41	270
5	2003-2004	41,60,760	7.07	284
6	2004-2005	44,67,154	7.36	299
7	2005-2006	48,30,136	8.13	317
8	2006-2007	52,32,426	8.33	337
9	2007-2008	56,27,384	7.55	356
10	2008-2009	60,26,561	7.09	374
11	2009-2010	64,66,713	7.30	393
12	2010-2011	69,47,536	7.44	415
13	2011-2012	74,52,985	7.27	436
14	2012-2013	77,85,638	4.46	446
15	2013-2014	82,58,284	6.07	465
16	2014-2015	88,27,431	6.89	487

Source: Central Road and Research Institute (CRRI), 2016

#### *Private and Public Vehicles in Delhi*

Population of Delhi and its nearby cities almost doubled during 1991 and 2011, at the same time the number of registered motorized vehicles increased more than three times (SoE- Delhi, 2012). In Delhi there is mixed type of traffic composition. A large variety of about a dozen types of both slow and fast moving vehicles are plying on the road where 2-wheelers and cars/jeeps constitute the highest share amongst them (Singh, 2005). The study shows that there is increase in all categories of vehicles like cars/jeeps, 2 wheelers, auto, taxi, buses and good vehicles between 1980 and 2016. It is seen that during 1980 and 2016 share of buses decreased from 1.52% to just 0.45% whereas share of cars and jeeps increased from 22.48% to 30.77%. Another most important issue is the share of goods vehicles also decreased from 6.85% to 2.90%. The share of two wheelers is highest which is also more or less same and there is just about 2% change in their share i.e. 64.13% to 62.90% (Table 4). The analysis of data related to public and private vehicles and change in their numbers bring out the fact about issue of higher dependency on privately owned vehicles which are the major cause for traffic congestion and lack of parking space etc. So these facts shows that there is an urgent need of development of public transport system in Delhi.

Average annual growth of public and private transport have increased by 23.84% during 1981-91 and 4% during 2011-2016. The number of cars / jeeps increased at 22.73%

during 1981-91 and 3.74% during 2011-16, whereas the number of buses increased by 17.72% during 1981-91 but it decreased by 2.89% during 2011-16 (Table 5). The study also shows that there is an increase of 21.56% in taxi, this mainly because of the introduction of various cabs and after 2011 app based cabs i.e. Ola and Uber etc.

**Table 4. Numbers of Public and Private Transport Vehicles in Delhi**

S. No.	Year	Cars/Jeeps	Two Wheelers	Auto	Taxi	Buses	Goods Vehicles	Total
1	1980-1981	1,17,213 (22.48%)	3,34,389 (64.13%)	19,947 (3.83%)	6,255 (1.20%)	7,912 (1.52%)	35,741 (6.85%)	5,21,457 (100%)
2	1990-1991	3,83,610 (21.74%)	11,91,186 (67.51%)	62,007 (3.51%)	10,026 (0.57%)	18,651 (1.06%)	99,078 (5.61%)	17,64,558 (100%)
3	2000-2001	9,20,723 (26.64%)	22,30,534 (64.53%)	86,985 (2.52%)	18,362 (0.53%)	41,483 (1.20%)	1,58,492 (1.20%)	34,56,579 (100%)
4	2010-2011	21,73,323 (31.35%)	43,42,403 (62.64%)	88,181 (1.27%)	57,958 (0.84%)	61,471 (0.89%)	2,09,370 (3.02%)	69,32,706 (100%)
5	2015-2016	29,86,579 (30.77%)	61,04,070 (62.90%)	1,98,137 (2.04%)	91,073 (0.94%)	43,723 (0.45%)	2,81,159 (2.90%)	97,04,741 (100%)

Source: Central Road and Research Institute (CRRI), 2016

**Table 5. Average Annual Growth of Public/Private Transport Vehicles in Delhi (in %)**

S. No	Year	Cars/Jeeps	2 Wheelers	Auto	Taxi	Buses	Goods Vehicles	Total
1	1981-91	22.73	25.62	21.09	6.03	13.57	17.72	23.84
2	1991-01	14.00	8.73	4.03	8.31	12.24	6.00	9.59
3	2001-11	13.60	9.47	0.14	21.56	4.82	3.21	10.06
4	2011-16	3.74	4.06	12.47	5.71	-2.89	3.43	4.00

Source: Central Road and Research Institute (CRRI), 2016

#### Road network

In contrast to the increase in the number of vehicles i.e. about 48.92% per annum from 1981 to 2016, the road length in Delhi has meagerly increased at the rate of 3.68% per annum (Table 6). In Delhi density of road is about 155 km per 100,000 population and is accommodating about 80 vehicles per kilometer. In Delhi the fringe area, which is under-developed and sparsely populated, has the maximum share of absolute road length (34%) while Trans-Yamuna, with one-fourth of the population, has only 14% of absolute road length (Economic Survey of Delhi, 2014-15).

#### Public Transport System Scenario in Delhi:

More and more people are depending on private vehicles for commuting between their work-place and home, because the provision of transport infrastructure has not kept pace with the demand for transport services, which leads to the problem of congestion and traffic. Besides traffic and congestion, these insufficiencies in public transport have resulted in delays and consequent reduction in speed and finally a high rate of road traffic fatalities, making driving and travelling conditions in Delhi highly unsafe.

**Table 6. Growth of Road Network in Delhi (2008-15)**

3	Year	Length of Road (kms)	Average Annual Growth Rate (%)
1	1980-81	14,316	-
2	1990-91	21,564	5.06
3	2000-01	28,508	3.22
4	2010-11	32,442	1.38
5	2015-16	33,260	0.25

Source: - Delhi Statistical Handbook 2016

DTC is the largest public transport entity in the Delhi NCR region. 3781 low floor AC and non-AC CNG buses and 924 standard floor buses carry about 39 lakh passengers daily by covering 7.87 average km daily (Economic Survey of Delhi, 2014-15). Study shows that between 2001 and 2015 there is an increase in the number of DTC buses but fleet utilization of DTC buses is not good compared to other cities such as Bangalore (91%) and Hyderabad (99%) (The Hindu, 2017). Utilisation of vehicles also reduced between 2001 and 2015 from 211 km/bus/day to 188 km/bus/day. On an average daily passenger carried per bus by DTC is 890.57 (Table 7).

**Table 7. Performance of Delhi Transport Corporation (DTC)**

S. No	Years	Fleet (No)	Fleet Utilisation (%)	Vehicle Utilisation (Km/Bus/Day)	Passengers Carried per Bus Daily
1	2001-02	3,286	71.68	211	854
2	2002-03	3,082	79.85	214	1,008
3	2003-04	3,656	85.49	224	906
4	2004-05	3,470	83.98	230	962
5	2005-06	3,469	90.51	226	973
6	2006-07	3,444	81.47	199	951
7	2007-08	3,537	82.47	177	848
8	2008-09	3,804	77.03	171	772
9	2009-10	4,725	80.99	184	776
10	2010-11	6,204	75.03	185	700
11	2011-12	5,892	84.27	199	863
12	2012-13	5,445	85.77	202	973
13	2013-14	5,223	85.51	190	952
14	2014-15	4,712	83.99	188	930

Source: Economic survey of Delhi, 2014-15

#### Mass Rapid Transit system (MRTS): Delhi Metro

The Mass Rapid Transit System (MRTS) is a very ambitious project, which is developed for provision of a non-polluting, capable and well-organized rail-based transport

system that is properly integrated with the road transport system. Under MRTS project Delhi metro is developed in three different phases, i.e. phase I, II and III. In 1984 planning for the metro started at that time the Delhi Development Authority (DDA) and the Urban Arts Commission (UAC) came up with a framework for development of a multi-modal transport system for the city. In May 1995, Delhi Metro Rail Corporation (DMRC) was incorporated and in 1998 construction of the Delhi metro project was started and in 2002 the first section, on the Red Line was opened. The development of the network was divided into phases, Phase I containing 3 lines was completed by 2006, and Phase II in 2011. Phase III is scheduled to be mostly completed by 2018 (Sidharatha, 2017). Total length covered by metro increased from about 74 kms to about 296 kms i.e. around 298% in a duration of fourteen years. Total ridership of Delhi metro increased at about 2065.32 % from 1.24 lakh to 26.85 lakh and the number of stations covered increased from 58 to 214 i.e. about 269 % rise between 2004 and 2018 (Table 8).

### *Delhi Metro User Satisfaction*

To know the satisfaction of people with the service of Delhi metro, metro user survey is done near Hauz Khas metro station where Magenta and Yellow line meets. Survey of Delhi Metro passengers was conducted during the month of June, 2018 through structured questionnaire. During morning and evening peak hours of travel i.e. starting at 8 AM and 6 PM respectively, the survey was conducted. In total, 1,082 respondents have been surveyed. The survey consisted of nine questions regarding access and egress modes, origin and destination metro stations, auto ownership, alternative modes, and a question to investigate induced trips. The following sections describe the results from the different survey questions.

**Table 8. Development of Delhi Metro Service**

S. No	Year	Length (km)	Stations	Ridership
1	2004-05	74.40	58	1,24,000
2	2005-06	124.24	102	2,68,000
3	2006-07	124.24	102	4,84,000
4	2007-08	124.24	102	6,25,000
5	2008-09	124.24	102	7,22,000
6	2009-10	132.98	110	9,19,000
7	2010-11	225.40	163	12,59,000
8	2011-12	228.72	171	16,60,000
9	2012-13	228.72	171	19,26,000
10	2013-14	228.72	171	21,90,000
11	2014-15	228.72	171	23,86,000
12	2015-16	228.72	171	25,90,000
13	2016-17	228.72	171	27,60,000
14	2017-18	296.10	214	26,85,000

Source: Delhi Metro Rail Corporation (DMRC), 2018

### Access and Egress Modes

During the survey respondents were asked about the modes used to access their metro boarding station, and the modes used after de-boarding the metro station. More than 50% of the respondents (52% - access, and 57% – egress) answered that they prefer non-motorized modes (walk, cycle and rickshaw) for their access-egress trips – with almost 44% of respondents walking. About one-fifth and one-tenth of the respondents answered that they prefer autos and buses, respectively. The preference for motorcycles and cars differs in access and egress trips. For access trips, motorcycles were used by 4.25% respondents, while cars were used by 12.20%, for egress trips, motorcycle usage reduced to 2.96 % and car usage reduced to 7.21% (Table 9).

A majority of the respondents using non-motorized modes for the connectivity of their metro trip which underscores the importance of infrastructure, which could provide safe movement of non-motorized modes and augment the current metro ridership. Moreover, the smaller share of bus use for access (11.18%) and egress trips (11.37 %) may be an indicator of inconvenience, due to the changing of modes, additional wait times and expenses.

**Table 9. Access and Egress Mode in Delhi Metro**

S. No	Mode	Access mode		Egress mode	
		Number of Respondents	Per cent of Respondents	Number of Respondents	Per cent of Respondents
1	Walk	473	43.72	477	44.09
2	Cycle	17	1.57	5	0.46
3	Rickshaw	70	6.47	142	13.12
4	Motorcycle	46	4.25	32	2.96
5	Auto	223	20.61	225	20.79
6	Bus	121	11.18	123	11.37
7	Car	132	12.20	78	7.21
<b>Total</b>		<b>1,082</b>	<b>100.00</b>	<b>1,082</b>	<b>100.00</b>

Source: Primary survey, 2018

### Alternative Mode

During survey respondents were asked about the alternative mode they use for the trip if metro facility is not available. About 37.52% respondents said they use their own vehicle for the trip and about 13.31% use bus. Auto is the most preferred choice in the absence of metro as 48.06% respondents said they use auto as an alternative mode for the trip (Table 10). Auto is the most preferred mode of transport other than metro because there is no need to wait for auto whereas in the case of bus one may have to wait for 10-15 minutes. Besides this it also helps to avoid crowd whereas DTC buses are very crowded especially during office hours.

### Vehicle Ownership

Vehicle ownership is mainly enquired to know the reality and compare the secondary data collected from CRRRI to the primary data. The commuters were further asked to mention the type of vehicle, which they own. About 40.30% mentioned having no vehicles, about 59.71% mentioned that they have their own vehicles to commute i.e. cycle, motorcycle and cars (Table 11).

**Table 10. Alternative Mode of Travel in Delhi**

S. No	Mode	Number of Respondents	Per cent of Respondents
1	Walk	9	0.83
2	Cycle	4	0.37
3	Rickshaw	3	0.28
4	Motorcycle	165	15.25
5	Auto	520	48.06
6	Bus	144	13.31
7	Car	237	21.90
<b>Total</b>		<b>1,082</b>	<b>100.00</b>

Source: Primary survey, 2018

**Table 11. Vehicle Ownership in Delhi**

S. No	Mode	Number of Respondents	Per cent of Respondents
1	None	436	40.30
2	Cycle	16	1.48
3	Motorcycle	318	29.39
4	Car	312	28.84
<b>Total</b>		<b>1,082</b>	<b>100.00</b>

Source: Primary survey, 2018

### Metro Ridership (Induced Trip)

The surveyed respondents were asked whether they would still commute from one end to another end of the city or they would prefer to stay in close - by areas of their work place (known as induced trip), if the metro services were not available. In order to estimate the number of trips that an individual takes a Metro ride, almost 13% of respondents said they would not travel if metro facility is not available (Table 12). Whereas a large part of the respondents i.e. 83.46% said yes, they will travel from one end to another end of the city for work and for other activities also even if the metro is not available. In Delhi private cabs (other than app based) are also available which people use to commute on sharing basis especially for satellite townships like Gurgaon, Noida and Faridabad etc.

**Table 12. Metro Ridership**

S. No	Response	Number of Respondents	Per cent of Respondents
1	Yes	903	83.46
2	Maybe	39	3.60
3	No	140	12.94
<b>Total</b>		<b>1,082</b>	<b>100.00</b>

**Average Trip Length**

To determine the travel distance of the commuters, respondents were asked during the survey to point out their boarding and destination metro stations. Travel distance on the metro route has been calculated using this information. For this the latitude and longitudes of all metro stations were located on Google Earth and then the distance between two

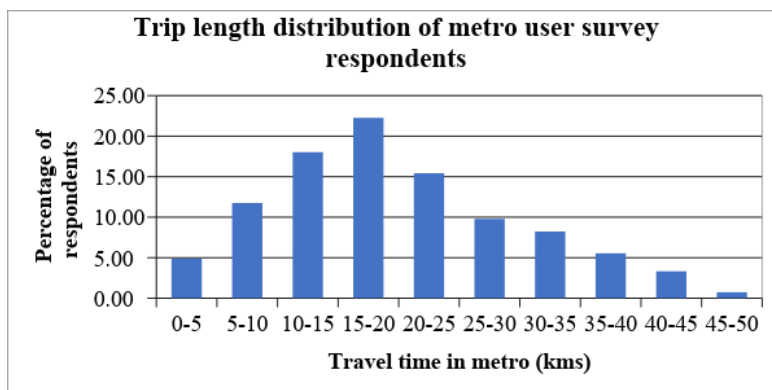
consecutive metro stations were calculated by drawing the straight line between the two stations. This is a safe approximation because the alignment of metro stations is mostly made as a straight line between two stations. It is seen in the study that on an average, a commuter of Delhi metro travelled a distance of 19.85 km with 7.95 standard deviation (Table 13).

**Table 13. Percentage of Respondents for Different Travel Distance Categories**

S. No.	Distance (km)	Number of Respondents	Per cent of Respondents
1	0-5	53	4.90
2	5-10	127	11.74
3	10-15	195	18.02
4	15-20	241	22.27
5	20-25	167	15.43
6	25-30	106	9.80
7	30-35	89	8.23
8	35-40	60	5.55
9	40-45	36	3.33
10	45-50	8	0.74
<b>Mean (<math>\mu</math>)</b>		<b>19.84</b>	<b>10</b>
<b>Standard Deviation (<math>\sigma</math>)</b>		<b>7.95</b>	<b>11</b>

Source: Primary Survey, 2018

About 83.37% of all the respondents travelled more than 10 km of distance on the metro, with about 65.52 % in the 10 to 30 km range. These results provide important insight into the travel characteristics of metro users where only 15% people take a trip of less than 10 km. So it can be said that metro users travel longer distances (Fig. 3).



**Fig. 3. Metro Trip Length**

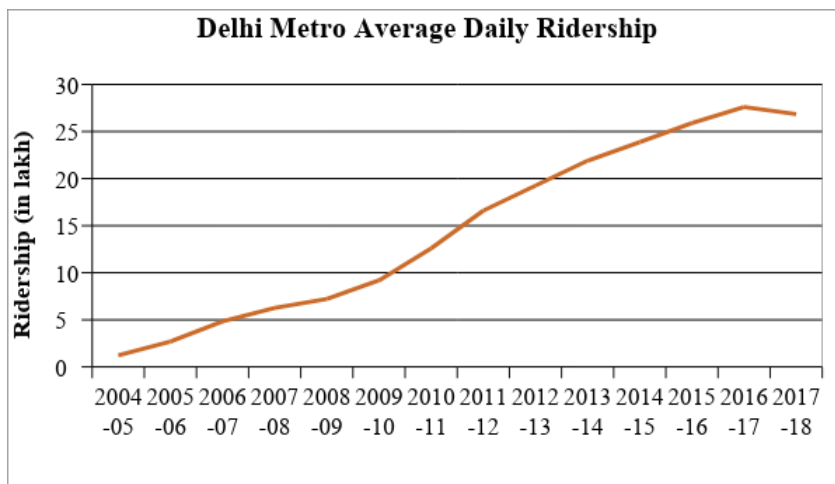
Average Trip Fare

Applying the information of the origin and destination of metro stations, the fare paid for each trip was calculated using the fare chart available on the Delhi Metro website. About 92% respondents spend more than 20 rupees and about 54% respondents spend more than 30 rupees on travelling in Delhi metro. Respondents who spend between 20 to 30 rupees are highest i.e. 37.80 % (Table 14). If we compare the average metro fare with AC city bus fare, the metro fare is higher by 15-20 rupees, but still people prefer to travel by metro because of lesser time and smooth ride by metro compared to the bus.

**Table 14. Metro Fare Paid by Respondents**

S. No.	Fare (in Rupees)	Number of Respondents	Per cent of Respondents
1	< 10	21	1.94
2	10-20	66	6.10
3	20-30	409	37.80
4	30-40	301	27.82
5	>40	285	26.34
<b>Mean (<math>\mu</math>)</b>		<b>32.1</b>	-
<b>S.D (<math>\sigma</math>)</b>		<b>3.8</b>	-

Delhi metro is the second most unaffordable metro in world after Hanoi (Roy and Gandhiok, 2018). A study carried out by the Centre for Science and Environment (CSE) suggested that because of increase in metro fare in 2017, the average commuters in Delhi spend about 14% of their household income on metro fare and the fare hike had led to 46% drop in ridership (TOI, 2017) because the projected ridership of Delhi metro is 39.5 lakh riders for the year 2016 but it is only 27 lakh in 2018 (CSE, 2018). If we compare the ridership of 2017 and 2018, it is seen that there is about 2.72% decline in riders (DMRC, 2018) as shown in Fig. 4.



**Fig. 4. Average Metro Riders in Delhi**



## Conclusion

Transportation in metropolitan cities is seen as lifeline because it can improve the speed and efficiency of the city and help in progress. This study focuses on analysing the need of mass rapid transport service (MRTS) in Delhi and its viability as an alternate option for better commuting. It is seen in the study that there is rapid growth of population in Delhi i.e. 5.64% average annual growth rate between 1981 and 2011. At the same time the number of vehicles and road length also increased during this period but increase of length of road does not take place as compared to the number of vehicles. Vehicles increased with about 49 % annual average growth rate whereas length of road increases with about 4% annual average growth rate. Therefore, the problem of traffic congestion increased which can be solved by promoting the public transport facility especially underground metro. But in Delhi DTC is the body responsible for public transport but sufficient number of DTC buses are not plying. In such a situation, mass rapid transit system is developed in the form of Delhi metro which is showing fast increase in ridership. At present it is approximately 27 lakh but it was expected that there will be 45 lakhs ridership by 2019. To know the satisfaction of people with the service of Delhi metro, Delhi metro user survey is done near Hauz Khas metro station where magenta and yellow line meets. It is found in the study that people are satisfied with the service as it provides safe, secured, smooth and fast mode of transport. But it is seen in the study that to avail the service of metro still users have to be dependent on the road network to reach the metro (access mode) and from metro to their destination place (egress mode). But the most important benefit of metro service according to the respondents is that it reduces the time travel on an average, survey respondents travelled a mean distance of 19.85 km. So Delhi metro helps to some extent in hustle free movement of people, traffic congestion and also helps in reduction in choking air pollution of Delhi. Therefore, it can further be concluded that metro transport is the best option in future for city transportation be it medium or big cities of India.

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# MONITORING URBAN GROWTH AND LAND USE CHANGE DETECTION IN THE SOUTHERN FRINGES OF KOLKATA METROPOLITAN AREA

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## Abstract

*This study attempts to evaluate land use/land cover changes and urban growth in the southern fringe of Kolkata Metropolitan Area (KMA) from 1980 to 2015 using landsat satellite images and socio economic data. This paper attempts to study the spatio temporal changes of land use/ land cover pattern of Pujali Municipality from 1980 to 2015. It also attempts to evaluate the intensity, dynamics and integration of land use/land cover changes. Pujali Municipality is located in the south western part of Kolkata Metropolitan Area (KMA) and it is one of the smallest municipalities in the southern part of KMA in terms of area and also population. In this paper the spatio-temporal dynamics of land use and land cover changes were quantified using five landsat images, using supervised classification algorithm and change detection techniques. This analysis revealed that substantial growth of built-up areas or residential area in the south western part of Kolkata city over the study period resulted in significant decrease in the area of water bodies, cultivated land, vegetation and wetlands. Urban land conversion has been largely driven by huge population growth and economic and infrastructural development like the construction of new flyovers, real estate projects which has led to huge land transformation in this area.*

**Keywords:** LULC Change, Urban Growth, Spatial-temporal dynamics, Land Transformation.

## Introduction

Urbansation is one of the dynamic process which is mainly induced by the human activities and it leads to loss of agricultural land (Lopez, Bocco, Mendoza, & Duhau, 2001), habitat destruction (Alphan, 2003) and destruction of the natural vegetation cover. The conversion of rural areas to urban areas through the process of Urbansation now a days occurring at an unprecedented rate and is having a marked effect on the natural functioning ecosystems (Turner, 1994). The rate of population growth, mainly because of Urbansation is very high in developing countries rather than the developed countries. The population of urban areas is expected to exceed 60% by 2030, with 90% of the projected increase occurring in low income countries i.e. developing or under developed countries, which have urban settlements that are growing five times the rate of those in developed countries (United Nations, 2005). In the last decade, most of the cities in the world have experienced high growth, especially in developing countries. This urban growth is characterized by the conversion of land use/land cover (LULC) to accommodate the increased activity of the city (Yu & Qingyun, 2011).

This rural to urban transformation is caused by an increasing population and economic development which leads to change in socio economic environment and it results into city change (Bounoua, 2009). Although urban areas currently cover only 3% of the Earth's land surface, they have marked effects on environmental conditions at both local, regional and also in global scales (Herold, Goldstein, & Clarke, 2003; Liu & Lathorp, 2002). Such studies are particularly important because the spatial characteristics of LULC are crucial for understanding the various impacts of human activity on the overall ecological condition of the urban environment (Yeh & Li, 1999). Spatio-temporal, historical, and detailed information about the LULC changes of the Earth's surface is extremely significant for any kind of sustainable development program or to take different planning program and policies, because LULC serves as one of the major input criteria in the earth's surface. So analysing and mapping both the present and past LULC situation is very crucial to provide the proper solutions for social, economic, and environmental problems (Das, 2009; Pelorosso, Leone & Boccia, 2009)

Geographic Information Systems (GIS) and Remote Sensing (RS) are very powerful and cost-effective tools for assessing the spatial and temporal dynamics of LULC (Lambin, Geist, & Lepers, 2003; Serra, Pons, & Sauri, 2008). In case of developing countries satellite data are particularly useful due to the cost and time associated with traditional survey methods (Dong, Forster, & Ticehurst, 1997), and these techniques have become viable alternatives to conventional survey and ground-based urban mapping methods (Jensen, 1996). Satellite data provide valuable multi-temporal data on the processes and patterns of LULC change, and GIS is very much essential for mapping and analysing the patterns of LULC (Zhang et al., 2013). This is the most common data source for change detection, quantification, and mapping of LULC patterns and changes because of its spatio-temporal analysis, data acquisition, digital programming through computer, and accurate geo-referencing procedures (Chen, Vierling, & Deering, 2005; Jensen, 1996; Lu et al., 2004). Retrospective and consistent synoptic coverage from satellites is particularly useful in areas where changes have been rapid (Blodget, Taylor, & Roark, 1991). Pre and post-classification comparisons have been extensively used (Coppin et al., 2004; Singh, 1989). In the pre classification approach, procedures such as image differencing (Toll, Royal, & Davis, 1980; Cohen and Fiorella, 1998), band rationing (Eastman et al., 2005), change vector analysis (Johnson & Kasischke, 1998; Lu et al., 2005) vegetation index differencing.

The basic premise of these procedures is that changes in LULC result in differences in the pixel reflectance values between the dates of interest. However, while these techniques are effective for locating change, they cannot identify the nature of change. However, one of the disadvantages associated with this approach is that the accuracy of the resultant LULC change maps depends upon the individual classification, meaning that such techniques are subject to error propagation (Yuan, Sawaya, Loeffelholz, & Bauer, 2005). Nevertheless, such post-classification techniques are particularly useful for generating 'from-to' maps (Jensen, 1996), which can be used to clarify the magnitude, location and nature of the changes shown. In addition, the technique can be employed

using data acquired from sensors with different spatial, temporal and spectral resolutions (Coppin et al., 2004).

During the last 50 years the population of India (nearly 1.3 billion in 2015) has grown two and a half times, but the urban population has grown nearly five times. After the year 2021 there will be six mega cities in India. Those are Mumbai, Delhi, Kolkata, Bangalore, Chennai and Hyderabad. Kolkata city is located in the eastern India, where study has been conducted, is the fastest growing and the third largest in the country. This city experienced with population growth of 10.30% according to census 2011. Kolkata city is now expanding towards southward as the researchers has seen from the classification of satellite images. The urban growth, however has posed serious threats to the livelihood of the small-scale farmers who earn their living by farming the productive agricultural tract located at the urban fringe. In this study the spatial analysis function of GIS is used to specify LULC characteristics in the southern fringe of Kolkata from 1980 to 2015 using satellite images.

This study (1) detects and analyses the spatio-temporal changes in the urban land use and land cover of Pujali Municipality between from 1980 to 2015, (2) to assess the areal extent and conversion of LULC induced by the urban expansion, (3) to determine the extent and rate of land use change from 1980 to 2015.

## Study Area

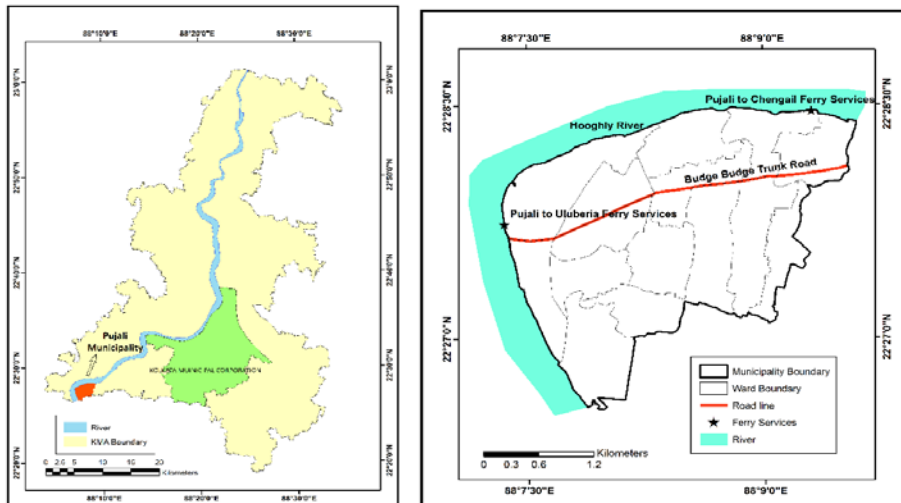
Kolkata Metropolitan Area (KMA) is one of the largest metropolitan area in the eastern part of India. Its population is nearly 15.90 million (according to Census Report, 2011) with a growth rate of 10.30, which is relatively higher than any other major cities in India. The rate of increase in population and the development in urban areas leads to a migratory movement of the people from rural areas to the cities; the demand for serviced land perpetually outstrips its supply leading to ever rising price of land (TCPO, 2006). KMA is under the jurisdiction of Kolkata Metropolitan Development Authority (KMDA). After the journey of nearly 50 years, KMDA still plays a vital role for all types of planning and developmental activities within KMA. Kolkata city is now growing towards south-west direction as the researcher has seen through the analysis of satellite images. Pujali Municipality is one of the smallest and also the newest municipality in the south western fringes of KMA and also in West Bengal which plays a leading role for this southward expansion.

## Data and Methods

The data set for this study is comprised of five Landsat images recorded from 1980 to 2015. Detailed description of those images discussed below (Table 1)

Five sets of landsat satellite images were used here. First, Landsat MSS, two Landsat Thematic Mapper (TM) images and Enhanced Thematic Mapper (ETM+) image and Landsat OLI 8 image (with path/row 138/45).At the time of layer stack thermal band has been excluded. Second, digital topographic maps published from the Survey of India,

has been digitised from hardcopy topographic maps with scale of 1:50,000. This map has been used as a reference image. It is mainly used for geometric correction of the satellite images and for some ground-truth information. Finally, ground information was collected between 1980 until 2015 to get land use or land cover information by the supervised classification algorithm and for accuracy assessment.



**Fig. 1a and 1b Location of Pujali Municipality and Wards of Pujali Municipality in Kolkata Metropolitan Area**

**Table 1. Detailed information of utilised satellite imagery**

Satellite	Acquisition Date	Sensor	Spatial Resolution	Projection
Landsat 8	08-03-2015	OLI-TIRS	30m	WGS 84 UTM 45 N
Landsat 7	21-01-2010	TM	30m	WGS 84 UTM 45 N
Landsat 7	17-11-2000	ETM+	30m	WGS 84 UTM 45 N
Landsat 5	14-11-1990	TM	30m	WGS 84 UTM 45 N
Landsat 3	21-02-1980	MSS	60m	WGS 84 UTM 45 N

Source: US Geological Survey, 2015

### Image Processing

The images were geometrically corrected and geocoded to the Universal Transverse Mercator (UTM) coordinate system by using a reference image which has been geo-referenced previously by the topographical sheets which were provided by the Survey of India (SOI). This minimum of 20 randomly distributed ground control points (GCPs) were selected from the topographical sheets for geo-referencing the image. Resampling technique was performed using a nearest neighbour algorithm. The image transformation had a root mean square (RMS) error of 0.1 pixels indicating that the image was accurate to within one pixel. Images acquired on the post monsoon period usually have different amounts of haze and dust in the atmosphere. To overcome this problem different digital image processing has been done i.e. atmospheric correction, haze reduction etc.

### *Image Enhancement and Visual Interpretation*

Image enhancement is basically the modification of image by improving clarity and visual interpretability. The process of visually interpreting digitally enhanced imagery attempts to optimize the complementary abilities of the human mind and the computer. The mind is excellent at interpreting spatial attributes on an image and is capable of identifying obscure or subtle features. Generally these images are used for visual analysis while original images used for automated analysis. (Lillesand & Kiefer, 1994; Eastman, 2005). By the process digital image processing five false colour composites (FCC) were produced for supervised classification. These FCC were visually interpreted using on screen digitizing by the feature space tool to delineate the land cover classes which could be easily interpreted such as built up features. Some of the classes were spectrally confused in the image of 1980 because of very low resolution of image. So it could not be separated well by supervised classification. For this reason visual interpretation technique was required to separate them.

### *Image Classification*

Land cover classes are typically mapped from digital remotely sensed data through the process of a supervised digital image classification (Campbell, 1987; Thomas, Benning, & Ching, 1987). The overall objective of the image classification procedure is to automatically categorize all pixels in an image into land cover classes or themes (Lillesand & Kiefer, 1994). The maximum likelihood classifier quantitatively evaluates both the variance and covariance of the category spectral response patterns when classifying an unknown pixel so that it is considered to be one of the most accurate classifier since it is based on statistical parameters.

**Table 2. Identified Classes by Supervised Classification**

No	Land use Classes	Description
1	Built-up Area	Residential, Commercial, Industrial, Roads, Railway, mixed urban or built-up area
2	Vegetation	Vegetative areas, Agricultural areas
3	Water body	Pond, Canal, Reservoir
4	Fallow land	Waste land, Fallow land

### *Supervised Classification*

The researchers used ERDAS IMAGINE 9.2 (Leica Geosystems, 2008) software for digital image processing and image classification of the 5 sets of Landsat images described above. Training samples were selected for each of the predetermined LULC types by delimiting polygons around representative sites with the help of feature space tool. Using those polygons the researchers derived spectral signatures for the respective land cover types which is recorded on the satellite images. A spectral signature is considered to be satisfactory when 'confusion among the land covers to be mapped [is] minimal' (Gao & Liu, 2010).



After collecting spectral signatures the researchers entered into the classification process and used the supervised maximum likelihood method as a classification method. Maximum likelihood algorithm is one of the common parametric classifiers used for supervised classification. The algorithm is used for computing the weighted distance or likelihood (D) of unknown measurement vector (X) belonging to one of the known classes ( $M_c$ ) which is based on the Bayesian equation.

$$D = \ln(a_c) - [0.5 \ln(|\text{cov}_c|)] - [0.5(X - M_c)^T (\text{cov}_c^{-1})(X - M_c)]$$

The class is assigned with the unknown measurement vector in which it has the highest probability of belonging. The advantage of maximum likelihood algorithm is that it considers the variance covariance matrix with in the class distributions. In case of normally distributed data, this performs better than the other known parametric classifiers, though the results may be unsatisfactory for the data not having normal distributions. (Mukhopadhyay et al. 2013) . it may be of two types parametric and non-parametric. By the supervised classification a raster layer i.e. the classified image and a distance file originates. Both the thematic layer and the distance file were used for post-classification thresholding. Four initial LULC maps were produced. Because these are the major land use land cover types of this area (Table 3).

#### *Classification Improvement*

Some LULC classes were spectrally confused because of mixing of different colours of pixels and it could not be properly separated by supervised classification. For instance, confusion between the water bodies and wetland in some portions of the area. Because in areas of discontinuous free water bodies, significant numbers of pixels were misclassified to the fallow class due to the existence of aquatic plants which are hydrophytes in nature. To improve the level of accuracy and to reduce misclassifications, the researchers integrated the initial LULC maps resulting from supervised classification with the maps resulting from visual interpretation. Visual interpretation was very important for increasing classification accuracy and, consequently, the quality of the LULC maps produced. In case of MSS Landsat images due to the low resolution image correction techniques were used. Finally, The researchers produced accurate LULC maps which the researchers compared with the reference data (the archived data, historical maps, topographic maps, and ground control points).

#### *Classification Accuracy Assessment*

Accuracy assessment method is very useful for individual classification when resulting data are used for the change detection analysis (Owojori & Xie, 2005). Accuracy assessment technique was performed based on using a random sample method of more than 100 check points i.e. ground control points, old sketch maps, topographic maps as a referenced map in ERDAS Imagine 9.2 software to characterize land use or land cover classes of the area.

## Detection of LULC changes

Post Classification Comparison (PCC) method was applied to compare and analyze the LULC maps resulting from the integration of the results of visual interpretation and supervised classification. PCC was employed to detect the differences between each pair of LULC maps (i.e., 1980 to 1990, 1990 to 2000, 2000 to 2010 and 2010 to 2015).

To evaluate the intensity, dynamics and integration of land use/land cover different indices has been used like AI, CI index etc. With the help of these two indices LD<sub>i</sub> i.e. land use integrated index has been developed.

### Rate of Changes LULC(AI)

Rate of changes of Land use land cover may be defined as follows

$$A_i = \frac{U_{bi} - U_{ai}}{\sum (U_{bi} - U_{ai})}$$

Where as  $A_i$  represents rate of changes of  $i^{\text{th}}$  land use/ land cover

$U_{ai}$  denotes  $i^{\text{th}}$  LULC area at the beginning of the study period and  $U_{bi}$  shows  $i^{\text{th}}$  LULC area at the end of the study period.

### Land use/ Land cover change Intensity Index (CI)

$$C_i = \frac{U_{bi} - U_{ai}}{B}$$

Whereas  $i$  represents (1,2...6) no of LULC classes,

$C_i$  denotes LULC intensity index of  $i^{\text{th}}$  land use type

$U_{ai}$  denotes  $i^{\text{th}}$  LULC area at the beginning of the study period,

$U_{bi}$  shows  $i^{\text{th}}$  LULC area at the end of the study period

$B$  depicts total study area

### Land use/ land cover Integrated Index (Id)

$$I_d = 100 * \sum A_i * C_i$$

Whereas  $i$  limits (100-600)

$I_d$  indicates LULC integrated index

$A_i$  represents percentage of  $i^{\text{th}}$  level LULC

$C_i$  denotes level of land use/ land cover (Nayak, 2014).

The extent and direction of the city's expansion for the years of 1980, 1990, 2000, 2010 and 2015 were analysed by superimposing the different time series maps. Decadal rate of urban area expansion (AGR) for the periods: 1980-1990, 1990-2000, 2000-2010 and 2010-2015 was calculated using the following relationship

$$AGR = \frac{UA_{n+1} - UA_i}{nTA_{n+1}} * 100$$

Where  $TA_{n+i}$  is the total land area of the target unit to be calculated, at the time point of  $i+n$ ;  $UA_{n+i}$  and  $UA_i$  the urban area or built up area in the target unit at time  $i+n$  and  $i$  respectively and  $n$  is the interval of the calculating period(in years) (Haregeweyn et al. 2012).

To evaluate the rate of land consumption for the years 1980, 1990, 2000, 2010 and 2015 were calculated by using this method. The proportion of land consumption in each urbanized area can be expressed as:

$$a = A/P$$

$a$ = area of urbanized land for the average resident or per person land consumption

$A$ = Area of the total urbanized land in a city and its suburbs

$P$ = Population of that city and its suburbs (Kumar et al. 2011)

Expansion speed( $S$ ) and intensity ( $I$ ) were employed to describe the growing status of residential lands over the years from 1980 to 2015, and to compare the intensity, speed and tendency of residential land expansion in different periods. The equations was used

$$S = \Delta U_i / (\Delta t * ULA_i * 100\%)$$

$$I = (\Delta U_i * 100) / (TLA * \Delta t)$$

Where  $i$  is the  $i^{\text{th}}$  period,  $\Delta t$  is the same distance of a study period;  $\Delta U_i$  is the expansion quantity of residential land during the  $i^{\text{th}}$  period;  $UAL_i$  is the total residential proportion at the beginning of the  $i^{\text{th}}$  period; and  $TLA$  is the area of each study unit.

The expansion speed of residential land refers to the average annual growth rate of the built up area during different study periods that shows the general expansion scale and trend at different stages and the expansion intensity indicator is to standardize the average annual expansion rate with land proportion of each study unit (Jinlung, Jiangang, & Shu, 2007).

## Results and Analysis

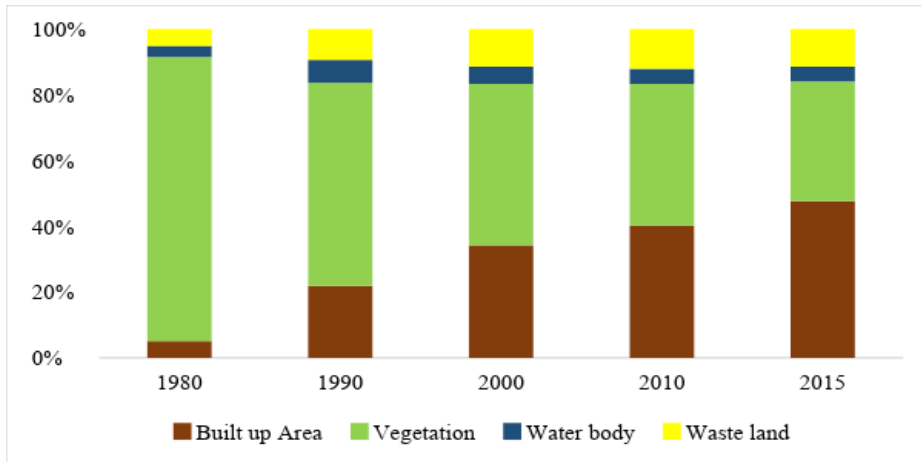
### *The Extent and Direction of Urban Area Expansion during 1980-2015*

Fig.3. shows an overlay of Pujali Municipality administrative boundaries in 1980, 1990, 2000, 2010 and 2015. The total urban areas for the five respective periods were estimated at 0.70 sq.km. 1.23 sq.km. 1.97 sq.km., 2.27 sq.km. and 2.44sq.km. (Table 3). Analysis of decadal rate of change between the four periods (1980-1990), (1990-2000), (2000-2010), (2010-2015) showed that the built up area expanded by 76%, 60%, 15%, 7.5% respectively, with an average rate of 40% for the whole study period, from 1980 to 2015.

**Table 3. Trends of Land use and Land cover (sq.km.) in Pujali Municipality**

Year	1980	1990	2000	2010	2015
Built up area	0.70	1.23	1.97	2.27	2.44
Vegetation	5.21	4.20	3.97	3.91	3.43
Water body	0.30	0.33	0.27	0.19	0.15
Fallow land	2.10	2.55	2.11	1.96	2.30

Source: Compiled by Authors.



**Fig. 2. Percentage of Land use/Land cover**

The expansion occurred to the east (Budge Budge area along the budge budge trunk road and towards the west because of Pujali Chengail and Pujali Uluberia ferry services. Eastward expansion and also the westward expansion was the greatest because of good connectivity along road and the availability of abundant flat land which was suitable for housing construction. Budge budge trunk road plays a major role for the growth and development of this area.

#### *Land use/Landcover change for the period 1980-2015*

The four LULC classes (built up areas, vegetation, water bodies and fallow land) were identified for the years 1980, 1990, 2000, 2010, 2015 (Fig. 3a-e) and the area for each LULC classes has been shown in (Table 3). In 1980, the majority (62%) of the study area was categorized as vegetation, whereas built up areas, water bodies and fallow land accounted for 8%, 3% and 25% respectively. For the year 1990, vegetation area accounted for 51% of the study area, whereas built up area, water bodies and fallow land covered 15%, 4% and 31% respectively. In 2000, vegetated area covered 48% of the study area, whereas built up area, water bodies and fallow land accounted 24%, 3% and 25% respectively. In 2010, vegetation area accounted for 47% of the study area, whereas built up area, water bodies and fallow land covered 27%, 2% and 24% of the study area. But after the five years i.e. in the year 2015, 29% of the study area was categorized as built up area and vegetation, water bodies and fallow land were i.e. 41%, 2% and 28% respectively (Fig. 2). The observed difference of the LULC classes of Pujali area as shown in Table 4.

The analysis of the horizontal expansion is important in understanding how rapidly the study area expanded horizontally as described in section 4.1, its importance in helping us understand conversion from one LULC class to another is limited as the urban area has also varied simultaneously. Hence analysis of LULC change resulting from the intensification can offer a better picture of LULC conversion.

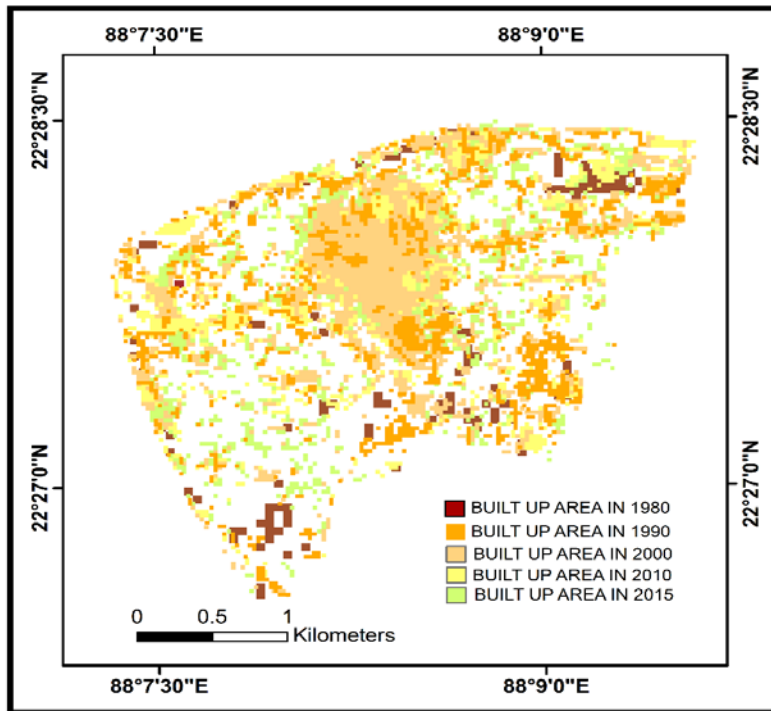


Fig. 3. Expansion of Built up Area in Pujali Municipality from 1980 to 2015.

Table 4. Differences in the land use and land cover from 1980 to 2015

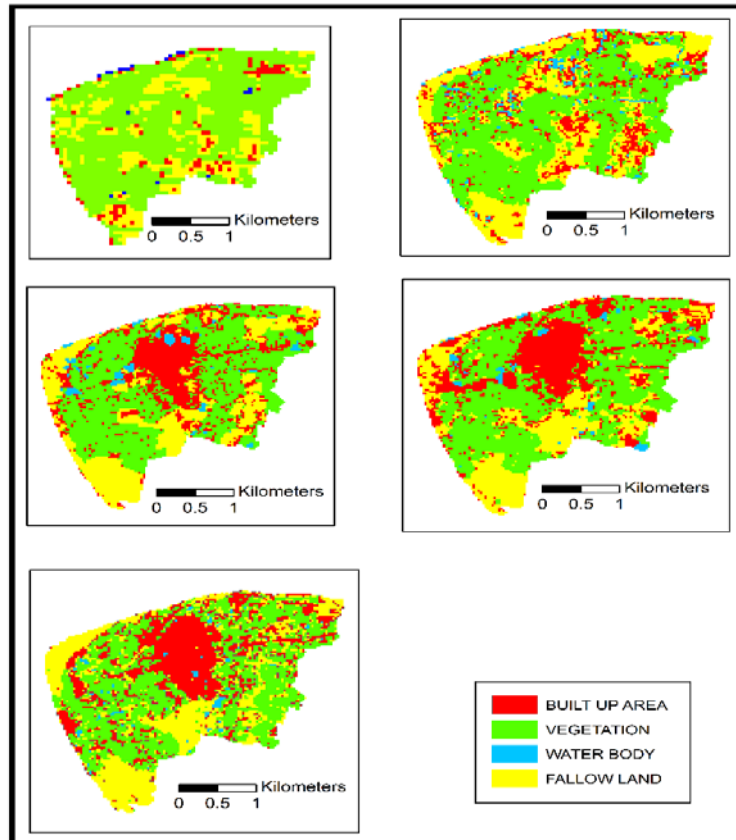
Land use categories	Changes in percentage				Changes in Area (Sq. km.)			
	1980-1990	1990-2000	2000-2010	2010-2015	1980-1990	1990-2000	2000-2010	2010-2015
Built up area	0.53	0.75	0.29	0.18	26.24	49.34	50.55	17.00
Vegetation	1.01	0.24	0.05	0.48	50.15	15.79	9.22	46.15
Water body	0.03	0.08	0.08	0.04	1.43	5.50	14.31	3.68
Fallow land	0.45	0.44	0.15	0.34	22.40	29.28	26.26	32.84

Source: Compiled by Authors.

#### Spatial Distribution of Urban Expansion Intensity

The spatial distributions of urban expansion intensity during different periods are illustrated by the index of decadal urban growth rate (Fig. 5). During 1980 to 1990 the mean value of urban growth rate was 5.2Sq km per decades. This is because of migration factor. After the partition of India, people from Bangladesh and different parts of South 24 Parganas district settled in this municipal areas. From the year 1990 to 2000 urban area

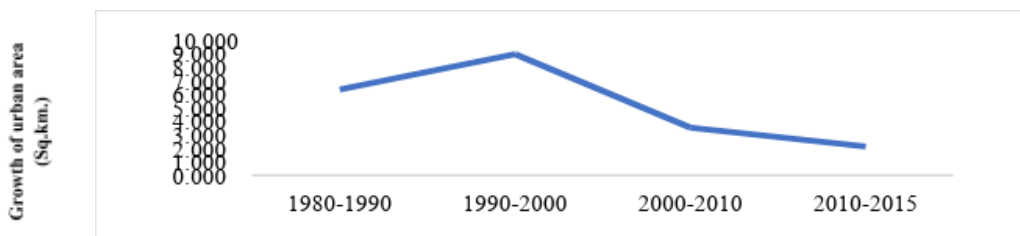
increases nearly 23% which records maximum in this study area. The rapid change of this urban growth rate was mainly because of addition of surrounding gram panchayats with this municipality. But after the year 2010, annual urban growth was decreased, which is mainly lack of open spaces or vacant land in this municipality areas.



**Fig. 4. The Land use/ Land cover of Pujali Municipality; (a) 1980, (b) 1990, (c) 2000, (d) 2010, (e) 2015**

#### *Spatial Distribution of Urban Expansion Intensity*

The spatial distributions of urban expansion intensity during different periods are illustrated by the index of decadal urban growth rate (Fig.5). During 1980 to 1990 the mean value of urban growth rate was 5.2Sq km per decades. This is because of migration factor. After the partition of India, people from Bangladesh and different parts of South 24 Parganas district settled in this municipal areas. From the year 1990 to 2000 urban area increases nearly 23% which records maximum in this study area. The rapid change of this urban growth rate was mainly because of addition of surrounding gram panchayats with this municipality. But after the year 2010, annual urban growth was decreased, which is mainly lack of open spaces or vacant land in this municipality areas.



**Fig. 5. Urban growth rate from 1980-2015 obtained from the classification of satellite image**

Source: Compiled by authors

*Magnitude, Rates and Nature of the Land cover change*

The rate of changes of LULC, intensity, and integrated indices are shown in Table 5, Table 6 and Table 7 respectively. The rate of changes of LULC in case of Built up area was highest from the year 1990 to 2010 and it continues up to the study period. Amount of changes of vegetation cover is high between the year 1980-1990. But from the year 1980-2000 most of the wetland and water bodies were converted into built up area. LULC intensity index of built up area from the year 1990-2000 was maximum. In this time period maximum growth of the built up area took place in this municipal area.

**Table 5. Rate of changes of LULC**

Land use categories	AI INDEX			
	1980-1990	1990-2000	2000-2010	2010-2015
Built up area	0.26	0.49	0.51	0.17
Vegetation	0.50	0.16	0.09	0.46
Water body	0.01	0.05	0.14	0.04
Fallow land	0.22	0.29	0.26	0.33

Source: Compiled by Authors.

**Table 6. Land use/Land cover Intensity Index**

Land use categories	CI INDEX			
	1980-1990	1990-2000	2000-2010	2010-2015
Built up area	0.06	0.09	0.04	0.02
Vegetation	0.12	0.03	0.01	0.06
Water body	0.00	0.01	0.01	0.00
Fallow land	0.05	0.05	0.02	0.04

Source: Compiled by Authors.

**Table 7. Land use/Land cover Integrated Index (LDI)**

Land use categories	1980-1990		1990-2000		2000-2010		2010-2015	
	<i>Ai*Ci</i>	<i>Ldi</i>	<i>Ai*Ci</i>	<i>Ldi</i>	<i>Ai*Ci</i>	<i>Ldi</i>	<i>Ai*Ci</i>	<i>Ldi</i>
Built up area	0.02	1.66	0.044	4.42	0.02	1.78	0.004	0.36
Vegetation	0.06	6.08	0.005	0.45	0.00	0.06	0.027	2.66
Water body	0.00	0.00	0.001	0.05	0.00	0.14	0.000	0.02
Fallow land	0.01	1.21	0.016	1.56	0.00	0.48	0.013	1.35

Source: Compiled by Authors.

**Table 8. Speed and Intensity of Urbanisation**

Year	Speed of Urbanisation				Intensity of Urbanisation			
	1980-1990	1990-2000	2000-2010	2010-2015	1980-1990	1990-2000	2000-2010	2010-2015
Amount of built up area	0.63	0.90	0.39	0.43	0.63	0.90	0.35	0.43

Source: Compiled by Authors.

Table 8 shows the difference of Urbanisation speed of four different periods i.e. 1980-90, 1990-00, 2000-10, 2010-15. The speed of Urbanisation is very high from the year 1990 to 2000 and it continues up to 2015. So the intensity of Urbanisation was also maximum between the year 1990-2000 which increases in recent times. After the year 2000, the speed and intensity of Urbanisation decreases because of lack of open spaces in the municipal areas. To explore the time of major land use change, each period are spatially categorized with Nature Break Method according to its intensity of Urbanisation. But the intensity of Urbanisation is very high from the year 1980-2000. Annual urban growth rate for the consecutive periods i.e. 1980-90, 1990-00, 2000-10, 2010-15 were 6.34 percent, 9 percent, 4 percent, 2 percent which increases in recent decades because of huge real estate development.

## Conclusion

The urban growth pattern in the fringes of Kolkata differs from large cities of India, such as Mumbai, Delhi. In the fringes of Kolkata ring shaped type of urban growth takes place with punctual dispersed pattern and Kolkata's growth pattern is highly dispersed urban fabric (Taubenbok et al., 2008). Transport factor plays a vital role for the substantial growth of urban area in the southern fringe of Kolkata because most of the land use transformation took places beside the railway station or beside the major road. Most of the people of those area are completely dependent upon the Kolkata city because of their job purposes. Using those roads and railway stations workers commute to city for their daily work. Pujali Municipality was found to have experienced rapid changes in LULC, particularly in built-up/urban areas. Analysis revealed that urban areas increased by 0.70 sq.km. during 1980 to 2.44 sq.km. in 2015, which resulted in a substantial reduction in the area of water bodies, vegetation, cultivated areas and wetlands/lowland/waterbodies. The dramatic changes of LULC in this municipal area exhibited clear spatio-temporal differences from 1980 to 2015. The conversion of water bodies, vegetation and low-lying areas to urban land has caused extensive and the growth of unplanned settlements has been the main negative outcomes associated with the rapid urban development of this region. The interpretation and classification of satellite data were useful for estimating the rate and spatial pattern of LULC in the southern fringe of Kolkata. As reliable and current data are lacking for micro level, the land use maps produced in this study will contribute to both the development of sustainable urban land use planning decisions and also for forecasting possible future changes in growth patterns.



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# NOSTALGIA'S URBAN JUNGLE: A REFLECTION ON THE EVOLVING BUILT ENVIRONMENT IN SHILLONG

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## Abstract

*The disappearance of the archetypal Assam-type built-form in Shillong, is one of the most visible and manifest links that connects to a chain of associated events and sensibilities in a fast changing and dynamic cultural landscape of the city. This article attempts to capture this phenomenon as a cultural process that spans across historical episodes and economic develop mentalities alike, to explain the evolving built environment of this city as a conjunct of the formal/material and ideological/non-material aspects of culture that shape it as much as they are shaped by it. In this, it brings together a number of factors that play a crucial role in the evolving dynamics of the urban landscape of Shillong; while the article is centred on Shillong, in order to highlight their interplay in a restricted land-market as obtains in the city, some aspects have been analysed on a comparative basis as to how they pan out in Guwahati which exemplifies an open land-market. These factors are also located against the larger backdrop of develop mentalities that have, from time to time, moulded urban policies at the level of governance and perceptions that underline how the city-space is to be re-created or re-developed, sold and consumed.*

**Keywords:** Archetypal, Jungle, Landscape, Urban

## Introduction

The spaces that experienced liberalised, tertiary-driven development in India were typically the metropolises or 'forward cities' of the mainland. From the earliest transformation of Mumbai as the financial capital of the country to the emergence of the Southern block as a major economic entity by the advent of the twenty first century, the discourse of urban development had not included India's north-eastern states (Shaw, 1999; Saikia, 2003; Mohapatra, 2006). With the Look East Policy (LEP) of the Indian government, the urban logic of development was extended further eastwards and it became imperative for the centre to include the cities of the North-East in its developmental ambit.<sup>1</sup> Despite the fact that most of these states, as Meghalaya, fall under the Sixth Schedule where the 74<sup>th</sup> CAA does not apply, the past one decade has been witness to persistent attempts on part of the Indian government to bring them under the folds of the new paradigm of urban development. Shillong, or the Shillong Urban Agglomeration (SUA), the capital city of

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<sup>1</sup> It must be added here, that although the Structural Adjustment Programme (SAP) with its attendant city development regimes was not formally related in terms of policy to the LEP, the relation between the two cited here is a tentative one which attempts to point at the temporal coincidence of the two policies and to highlight the North-East's regional importance in the context of the LEP, as a geo-strategic gateway or link to South East Asia.

Meghalaya and district headquarters of the state's East Khasi Hills district, holds almost 60 per cent of the state's urban population and greatly influences the trajectory of urban development in the state. In this context, it is interesting to note that this premiere urban centre of the North-East represents a restricted or quasi land-market in the Shillong Municipal Area (SMA), the commercial and administrative core of the SUA. Located between 25° 35' to 25° 32' N and 91° 51' to 91° 54' E, the SMA has a total area of 10.36 sq. km only which is divided into 27 wards. According to the Census of 2001, the SMA had a population of 1, 43, 007 as per the Census of 2011, which is 24 per cent of the total urban population of the state. Locating this city in the larger debate of liberalisation-ushered urbanism brings forth the interplay of the extremely local and national or even global urban agendas that raises questions about the so-called homogenising effects of globalisation.

### *Home Loans and its Relation to the Land Market*

Whereas the land-market reflects foremost on the physical built-environment in terms of how it plays as a base for housing activity, it subsequently has significant bearing upon home-ownership rates, renting choices and tenancy patterns. In SMA, a higher percentage of tenancy in the surveyed area may indicate the effects of a restricted land market upon home ownership. In terms of availing home loans, the inhibitive role of a restricted land-market is markedly observable in SMA (Tables 1 & 2). Another very important differentiating feature in availing home loans among the two sets of respondents is the fact that in Guwahati the popularity of nationalised bank loans has been observed whereas almost all of the loanees in SMA (97.7 per cent of 43 respondents) have availed housing loans from government sources, as office emoluments (Table 3).

**Table 1. Home Ownership Profile**

	<b>SMA</b>	<b>%</b>	<b>GMCA</b>	<b>%</b>
Total Home Owners	154	57.0	190	70.4
Tenants	116	43.0	80	29.6
<b>Total respondents</b>	<b>270</b>	<b>100.0</b>	<b>270</b>	<b>100.0</b>

**Table 2. Home Loan Profile of Home Owners**

	<b>SMA</b>	<b>%</b>	<b>GMCA</b>	<b>%</b>
Availed Home Loans	43	27.92	94	49.47
Not Availed	111	72.08	96	50.53
<b>Total</b>	<b>154</b>	<b>100.00</b>	<b>190</b>	<b>100.00</b>

One of the main links which the capital, land and built-environment circuit has manifested itself through in the post liberalised financial climate, is that of private sector banks which gained considerable ground in terms of direct housing finance disbursements, while at the other end, investments by banks into National Housing Bank (NHB)/HUDCO were decreasing in the same period (Sodhi, 2008).

Increased competitiveness among banks spurred the housing finance market into frenzied activity and home loans emerged as a key motivational tool with which banks sought to play in the liberalised market, through sustained efforts to enhance the potentiality of customers for home ownership (Gupta and Varma, 2008). Easy access to home loans in the 1990s has been found to be closely correlated with increased homeownership rates among the high and middle income groups. Thus the profile of home loans not only acts as a quotient of income and consumption, it underlines a key feature of the associated land-market and built environment in terms of the location of financial outlets, banks, offices and related services and also how through these channels, it finally translates into the built space by enabling consumers' to fulfil their financial requirements for home ownership (Kanungo, 2015). In terms of home-ownership the surveyed areas in Shillong reveal a higher percentage of tenancy, indicating the effects of a restricted land market upon home ownership (Table 3.5). It is understandable that such a land market hinders the development of a mature housing market with diverse players (especially private developers) and thereby restricts ownership to a small number of people. For, conversely, the surveyed areas in Guwahati reveal a much higher rate of home ownership which, due to a mature housing market, allows for the burgeoning of the apartment-type dwelling, and in effect offers ownership to people who were formerly tenants. It is not remarkable that in Guwahati there is a larger section of respondents who were formerly tenants as compared to SMA. This also indicates that whereas the nature of the land market reflects foremost on the physical built-environment in terms of how it plays as a base for housing activity, in effect it also has significant bearing upon home-ownership rates.<sup>2</sup> Another correlate of this effect is the significant difference observed between the respondents of the two cities in terms of their behaviour in accessing and utilising home loan facilities. Thus, Guwahati reveals a much higher percentage of home owners who have availed of home loans compared to SMA (Table 2). It may be inferred then, that the open land market in Guwahati not only facilitates the burgeoning of the housing market, it also creates financial avenues for consumers to fulfil their demand for housing.

Banks insist on guarantees vouched by the Autonomous District Councils (ADC) that in case of default would have the right to mortgage land of the borrower. However as per the provisions of the Land Transfer Act, 1971, the bank is required to sell the property to a tribal only. The anomalous regulations of land tenure and nature of land transfer in the state, subjects the legal documentation process to vagueness and reduces its legal credibility as a guarantee against which loans can be disbursed. The restricted land market thus bears upon the system of issuing *pattas* to potential borrowers, which, as legal documents, are crucial for procuring home loans.

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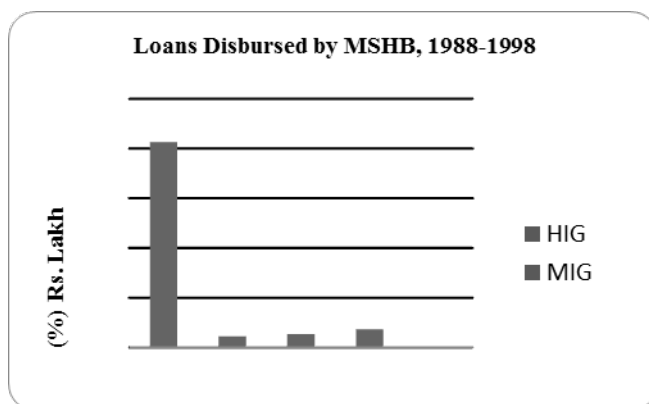
<sup>2</sup> This pattern of ownership is also reflected in the commercial spaces of the two cities. Whereas GMCA has a higher percentage of privately owned commercial units, SMA's share of leased establishments is higher. Again, apart from the overwhelming share of privately owned commercial buildings in GMCA, the surveyed area reveals traces of government and corporate-owned buildings as well. Contrary to this in SMA, the surveyed areas are dominated by privately owned buildings.

Banks and even the Meghalaya State Housing Board have had a high default rate due to this problem which hinders their recovery rates and discourages them from disbursing further housing loans. Further, the potential loanees are limited to the local Scheduled Tribe community only, since non-tribals living in SMA cannot get landed property transferred in their name and therefore, hold no security for financial institutions for mortgaging the land or built property against sanction of housing loans in their favour.

**Table 3. Sources of Home Loans, SMA and GMCA**

Sources of Home Loans	SMA	%	GMCA	%
Emolument from Govt. Office	42	97.7	0	0.0
Relatives	1	2.3	4	4.3
Bank, HUDCO, LIC, Housing Board	0	0.0	86	91.4
Private Financing Agency	0	0.0	4	4.3
<b>Total</b>	<b>43</b>	<b>100.0</b>	<b>94</b>	<b>100.0</b>

Source: Fieldwork, 2009-10



**Fig. 1. Loans Disbursed by MSHB Under Various Income Categories in SMA, 1988-1998**

An elucidation of the above may be found in the limited role of the state government in the housing-loan market. In Shillong, the government has not been able to play a major entrepreneurial role in the housing market owing to limited government land in the key commercial areas of Shillong Municipality, (the European ward) owing to the problems in acquisition of land that the restricted land market poses. Many public agencies have faced this problem in their misadventures of diversifying the housing market in Shillong. A socio-economic report on the urbanisation of Shillong published by Socio Economic Research Foundation (SERF) Delhi, in 1994, notes that after six years of its inception in 1986, the Meghalaya State Housing Board had been able to grant loans to only 153 beneficiaries which is negligible compared to the deficit in the urban housing stock. This has been ascribed mainly to the failure of the Board to acquire land for developing residential units. The Meghalaya Urban Development Authority (MUDA), established in 1990, faced the same hurdles in conducting its plans.

The report elucidates the urban bias of housing activity by further stating that three (out of the thirty Co-operative Societies for Housing in Meghalaya) are in urban areas which, as members of the apex body, the Meghalaya state Housing Finance Co-operative Society Ltd., have disbursed the lion's share of housing loans to the upper income groups; the new units constructed by these co-operatives indicate that between 1981 and 1992, the largest number of constructions (75 out of 110) were of the HIG group. The report cites the Annual Report of the Ministry of Urban Development, 1993-94, in stating that among the number of dwellings constructed in this period, the highest percentage of new construction (47.5 per cent) was availed by the Middle Income Group (MIG) and 20.17 per cent, by the High Income Group (HIG).<sup>3</sup> This trend is reiterated by an analysis of data for this research from the Meghalaya State Housing Board (MSHB), a significant state-level functionary of the Housing and Urban Development Corporation, India (HUDCO). Housing loans disbursed by the MSHB between 1988 and 1997 reveals that the LIG and EWS groups have not been the larger beneficiaries in Shillong. A much as 61.74 per cent and 21.01 per cent of the total allocated amount allocated as loans in this period was availed to the HIG and the higher MIG groups respectively (Fig.1). Thus the larger beneficiaries of housing funds in Shillong were the upper and higher middle class urban elite. This segregation of the urban space clearly indicates that over the years, the housing market has shifted in favour of the HIG and MIG. This, if not completely, adequately reflects that there has been more investment in the high income areas of the city which has materialised as pockets of affluence and commercial expansion.<sup>4</sup>

#### *Individual Norms of Consumption, Tenancy Patterns and the Formal City*

The above sections, in more ways than one, bring to our attention the importance of the emergence of a new urban elite and addressing as well as analysing it as a significant socio-cultural agency in the land-housing-consumption circuit — a point in the discussion which relates to the individual's relationship with the built environment, primarily in terms of ownership of residential space and its modification, renting and dynamics of tenancy, possession of personal vehicles and the attendant demand for parking spaces, etc. While this relates to the housing component of the built environment (as a personal space), the culture of consuming public spaces as that of recreation and shopping may be gauged by an assessment of individual capacity and choices of accessing such spaces. Portraying choices vis-a-vis income categories reflect the segregation of the urban space and highlight which income category is dominant and thereby most likely to be the main agency and beneficiary of shifts in the built environment. This section also explores

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<sup>3</sup> Final Report of Study on Urbanisation of Shillong, 1994, Socio-Economic Research Foundation, New Delhi, p. 34

<sup>4</sup> During the Structural Adjustment Programme, the market for apartments in Ahmadabad remained more active and the property market activity showed a pronounced shift towards meeting the demand for apartments in the high-income areas (Mahadevia and Bhatt, 2001).



consumers' aspects of home-ownership, home-upgradation and renting patterns and possession of vehicles against their income in the ways these variables relate to modification of one's dwelling unit, positing individual agency and choice a crucial parameter of the consumption-driven re-creation of urban space.

A majority of respondents (51.10 per cent) in the surveyed area in Shillong were found to belong to the high and very high income groups (Table 4) and it is of no surprise that this group is found to respond positively to having modified their residential space in various ways, besides exhibiting up-graded norms of consumption in terms of ownership of personalised vehicles and choices regarding recreation and shopping. In SMA, of the 154 home owners, 68.83 per cent have upgraded or modified their houses and out of this, 55.7 per cent have rented out or let out their houses as well. Not surprisingly, modification of one's residential space was done for the sole purpose of renting or letting out a section of the house, especially as sub-residential units (Table 5).

**Table 4. Percentage Distribution of Income Category of hhs**

hh Income/month (Rs.)	SMA	GMCA
<10,000 (L)	14.80	17.80
10,000-25,000 (LM)	12.20	14.80
25,000-50,000 (M)	21.90	21.10
50,000-1,00,000 (H)	24.40	23.00
>1,00,000 (VH)	26.70	23.30
<b>Total</b>	<b>100.00</b>	<b>100.00</b>

Note: L: Low, LM: Lower Middle, M: Middle, H: High, VH: Very High

Source: Fieldwork, 2009-10

**Table 5. Dynamics of Up-gradation and Renting out among Home Owners, SMA**

	SMA		GMCA	
	No.	%	No.	%
1. Owners who have upgraded their homes (total)	106	68.8	122	64.2
Have not upgraded	48	31.2	68	35.8
<b>Total</b>	<b>154</b>	<b>100.0</b>	<b>190</b>	<b>100.0</b>
2. Have upgraded and rented out their homes	59	55.7	87	71.3
Have upgraded but not rented out	47	44.3	35	28.7
<b>Total</b>	<b>106</b>	<b>100.0</b>	<b>122</b>	<b>100.0</b>
3. Out of 1, those who have availed Home loans	29	27.4	66	54.1
Those who haven't	77	72.6	56	45.9
<b>Total</b>	<b>106</b>	<b>100.0</b>	<b>122</b>	<b>100.0</b>
4. Out of 2, those who have availed Home Loans	23	39.0	38	43.7
Haven't availed	36	61.0	49	56.3
<b>Total</b>	<b>59</b>	<b>100.0</b>	<b>87</b>	<b>100.0</b>

Source: Fieldwork, 2009-10

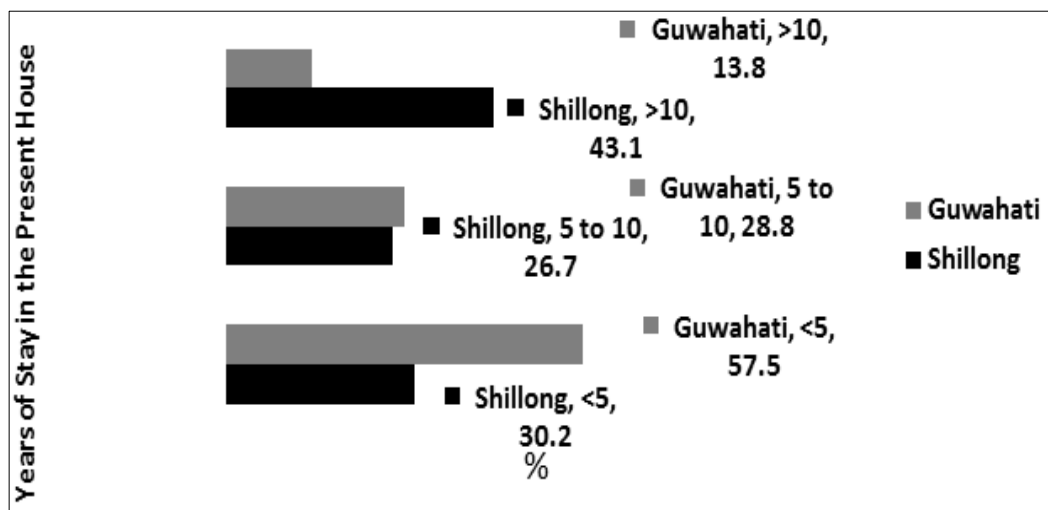
In this context, it is worthwhile to note that building activities which have been the most important quotient of the changing residential built-space in SMA, are those of vertical extension of former single/two storied RCC structures and up-gradation of older Assam type structures into RCC ones, undertaken solely for the purpose of renting out units.

Further, the event of a shifting home loan market towards the higher income groups can be better highlighted in the context of income differentials. It is observed that most high-end aesthetic up-gradation activities as re-designing and interior decoration and combined activities involving more than one manner of up-gradation, were undertaken by loanees who fall in the very high and high income groups (Table 6). This sufficiently explains the role of a well-to-do, relatively affluent bourgeoisie of urban elites in Shillong—a class, which has emerged as the main driver of change in the city’s residential built environment. Under a land market restricted by an ethnic ceiling which favours this majority, urban land in Shillong increasingly becomes the conduit through which the political and social capital is further appropriated via the land-market.

**Table 6. Up-gradation by Home-owners availing Home Loans, SMA**

Monthly hh Income (Rs.)	Type of Up-gradation						Total	%
	E	EU	EUR	R	RI	U		
<10,000	3.4	0.0	0.0	0.0	0.0	0.0	1	3.4
10,000-25,000	0.0	3.4	3.4	0.0	0.0	3.4	2	6.9
25,000-50,000	10.3	10.3	0.0	0.0	0.0	0.0	6	20.7
50,000-1,00,000	3.4	31.0	0.0	0.0	0.0	0.0	10	34.5
>1,00,000	3.4	17.2	3.4	3.4	3.4	3.4	10	34.5
<b>Total (%)</b>	<b>20.7</b>	<b>62.1</b>	<b>3.4</b>	<b>0.0</b>	<b>3.4</b>	<b>6.9</b>	<b>29</b>	<b>100.0</b>

Note: E: Vertical Extension, U: Simple Up-gradation from Assam type to RCC, R: Redesigning; I: Interior decoration



**Fig. 2. Tenants' Duration of Stay at Shillong and Guwahati**

*Tenants' Duration of Stay, Rent and Types of Dwellings*

Another important aspect of the land-market reflects on tenancy patterns, especially in terms of the duration of stay of tenants in the two cities. Renting out a part of the house to augment income may have its own peculiar features which can be eventually traced to the land market. For instance, in open land markets (as in Guwahati), which have mature housing markets and thus more residential options for potential and existing tenants, one may observe a preponderance of new tenants. This does not however altogether mean that new tenants are new *entrants* into the city. This indicates that the duration of stay of a tenant-household in any one residential accommodation is likely to be less in an open market, due to the fact that availability of multiple choices of housing allows for easier and more frequent shuffles within the city. This condition is reflected well in Guwahati where 57.5 per cent of the tenants have been residing in their present rented accommodation for less than five years only and where the share of very old tenants (those residing in their present accommodation for more than 10 years) is only 13.8 per cent. In contrast to the above, in a quasi land market, there may be a preponderance of very old tenants whose duration of stay in one accommodation tends to be longer, as limited housing options makes them stay in one accommodation for longer periods of time. This condition is reflected in SMA which has a far higher share of very old tenants (43.1 per cent) and a much lower percentage share of new tenants (30.2 per cent) than in Guwahati (Fig. 2).

The above makes it worth exploring as to what kind of dwellings tenants live in as it allows for the assumption that the dynamics of rent, varying between new, old and very old tenants, also relate to the type of dwelling they occupy. The duration of tenants' stay in a particular dwelling-unit may also indirectly indicate the antiquity of the built-form besides signifying the dominant forms availed by tenants. The underlying assumption here is that old tenants, significant sections among whom pay low rents, stay in older structures such as Assam-type houses (Plate 1), whereas new tenants who pay higher rents would be dwelling in houses that exemplify more recent up-gradation into single-storied RCC structures or vertically extended RCC structures (without the ground floor parking space as typified by apartment-style high rises) specifically developed for renting out by owners (Plates 4 & 5). The cities expectedly differ in terms of the share of new tenants living in high-rise apartments which is significantly higher in Guwahati than Shillong where the relative absence of the typical flat-type apartment is compensated for by these extended RCC type of structure. Contrarily, among the old tenants, the share of those living in single plot Assam-type and RCC structures is much higher in Shillong than in Guwahati, where most of this category lives in apartments. The fact that the apartment type of dwelling entered the housing scenario in Guwahati earlier, could explain how most of the old tenants here occupy this type of dwelling. Also, the share of old tenants living in huts and shacks is much higher in Guwahati than in SMA. In terms of very old tenants, both the study areas show a preponderance of the hut, shack or tenement type of dwelling and a significant share also lives in the old Assam type structures (Table 7).

This in many ways elucidates the gradual obsolescence of the fabled Assam-type style of housing in Shillong, which unlike in its glory-days as the most iconographic built-form since the colonial era, has now been reduced to a nostalgic relic of that past, or at best a symbol of dereliction in old, depressed quarters of the city.

### Vehicle Ownership and Parking Space

The overwhelming increase in ownership of personal vehicles has been considered as an important feature of upgraded consumption in the liberalised era. Ownership of personal vehicles has been studied from diverse perspectives ranging from post-Fordist production cycles, increased income levels, increasing pressure on public transport in million-plus cities and a host of other conditions. Studies have also extended to the pressure that personal vehicles exert on the physical infrastructure of cities, as roads, demand for parking space and the state-imperative of improving the same through policy, which in turn benefits a particular income group. So, just as this aspect of consumption has the potential to change the built profile of cities in terms of public space, it also becomes instrumental in affecting changes in the personal built-space, by creating demand for parking space of personal vehicles.

**Table 7. Types of Houses occupied by New, Old and Very Old Tenants, SMA and GMCA**

Forms of Dwelling	Duration of Tenants' Stay (Years) in SMA and GMCA					
	<5 (New)		5 to 10 (Old)		>10 (Very Old)	
	SMA	GMCA	SMA	GMCA	SMA	GMCA
Multi-storeyed Apartment	11.43	23.91	9.68	47.83	2.00	9.09
RCC (Single Plot)	28.57	30.43	29.03	17.39	22.00	18.18
Assam Type	31.43	26.09	29.03	4.35	22.00	27.27
Hut/Tenement/Shack	2.86	19.57	12.90	30.43	38.00	45.45
Extended RCC	25.71	0.00	19.35	0.00	16.00	0.00
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>99.99</b>	<b>100.00</b>	<b>100.00</b>	<b>99.99</b>

Source: Fieldwork: 2009-10

**Table 8. Mean Per Capita Income, Family Size and Number of Vehicles per hh**

Mean	SMA	GMCA
Per Capita Income (PCI)	16209.92	16545.10
Total Household Income	68685.18	62703.70
Family Size	4.72	4.14
No. of Vehicles/hh	1.77	1.57

The respondents' proclivity and capacity to possess automobiles and their income background reveal interesting correlations. In general, the very high income group was found to have a much greater presence in terms of personal vehicle consumption in Shillong than in Guwahati. This, it appears, is largely determined by the total hh income

which in turn is dependent on the size of the hh. In this context, it was observed that the average family size, (total) household income and number of vehicles per hh is higher in Shillong than in Guwahati (Table 8). Also, the overwhelming emphasis on four-wheeler possession in Shillong (76.7 per cent, as compared to Guwahati where it is 52.4 per cent), shows the predominance of four-wheeler vehicle consumption in SMA which relates to the higher mean income and size of family, possibly due to a tendency for households with large families to have more vehicles.<sup>5</sup> A better glimpse of the same may be obtained by analysing the distribution of vehicle-owning households across various income brackets. In the surveyed areas of Shillong, an overwhelming 71.78 per cent of the households owning vehicles fall in the very high and high income group (in Guwahati a total of 55.71 per cent of vehicle-owning hhs that fall in these income brackets). More importantly, the share of households having more than one vehicle is significantly higher in Shillong. While the general correlates of income-vehicular ownership prevail in both cities, the role of the lower-middle and middle income groups has a less significant presence in Shillong than in Guwahati (Table 9).

The possession of personal vehicles necessitates a sufficient, secure place for parking personal vehicle/s. This has its own effects on the built environment as it creates the demand for private parking space which has to correspond to the form of the building which the car-owner uses for residence. For instance, the high-rise or apartment type of residential units invariably has the in-built facility of a basement or ground-floor parking space whereas the Assam type house would typically have a garage. The close concomitance between the form of dwelling and private parking space is also reflected in the vertically extended forms of RCC structures (without basement or ground-floor parking facility) with their unique parking requirements and problems.<sup>6</sup> For the residents of such spaces, the possession of a personal vehicle may necessitate availing of improvised services such as that of rented parking space within a comfortable distance from one's own residence, space offered by individuals (as neighbours, relatives, etc.) or organisations (local welfare associations etc.).

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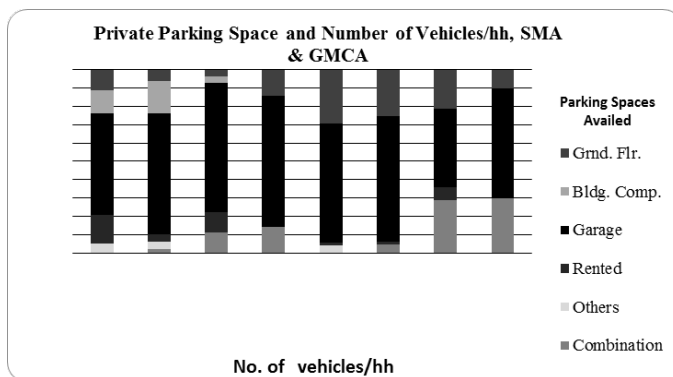
<sup>5</sup> For interested readers, it may be mentioned here that both parametric and non-parametric correlation techniques were applied here to analyse the strength of relations between income (per capita and total hh) with the number of vehicles per hh. It was observed that although both are positively correlated with the number of vehicles per household, the correlation is weaker between per capita income and the number of vehicles per hh than between the total household income and the same. Similar relations prevailed upon the number of vehicles in a hh and the size of the hh. Hence, the total hh income, rather than per capita income was considered to arrive at subsequent income-related correlations, as it was found to significantly determine the purchasing power of respondents.

<sup>6</sup> It has been explained previously that these buildings are most observable in Shillong and do not have the typical ground-floor/basement parking spaces that are an indispensable feature of the high-rise apartments in Guwahati. The occupants of such flats usually park their vehicles in the compound of the building or choose other options to fulfil their demand for parking space.

From Fig. 3, it may be observed that facilities/arrangements for parking of personal vehicles directly relate to not only the form of residential building but also the number of vehicles possessed by a household. In both the cities, households having three and more than three vehicles have to resort to a combination of parking options. Further, among households who use rented parking space, a larger section in Shillong has only one vehicle whereas, in Guwahati the larger section comprises of those who have three vehicles. This obviously indicates a greater deficit in private parking space in the former. This is further established by the fact that in Shillong, those using rented space is much higher (10.40 per cent) as compared to Guwahati (1.90 per cent).

**Table 9. Relationship between Income and Number of Vehicles per hh, SMA**

Monthly hh Income (Rs.)	No. of Vehicles per hh in SMA				Total	Per cent
	One	Two	Three	>Three		
<10,000	4	0	0	0	4	2.45
10,000-25,000	9	1	1	1	12	7.36
25,000-50,000	19	8	3	0	30	18.40
50,000-1,00,000	26	16	7	2	51	31.29
>1,00,000	21	25	16	4	66	40.49
<b>Total</b>	<b>79</b>	<b>50</b>	<b>27</b>	<b>7</b>	<b>163</b>	
<b>Per cent</b>	<b>48.47</b>	<b>30.67</b>	<b>16.56</b>	<b>4.29</b>		<b>100.00</b>



**Fig. 3. Private Parking Space and Number of Vehicles/hh, SMA & GMCA**

Source: Fieldwork, 2009-10

*New Urbanism, its Culture and Spaces of Consumption*

The advent of new landscapes of consumption was first observed during the 1950s and 1960s with emergent spaces as the suburban shopping centre, departmental store in the USA, and the mall and super market, in the U.K. in the 1990s. The commercial built space of many cities witnessed sweeping changes thereafter as cities were vigorously redesigned to attract foreign and tourist capital. The early 2000s saw the arrival of chain-stores, flagship and franchise outlets. Instances may also be cited of *themeing* the shopping experience as in Gatwick village, Canary Wharf and Merry Hill Centre and taking

consumption to the consumers as home-shopping in the U.K. by agencies such as Little Woods, Kays, Freemans and Racing Green. These hyper-markets emerged due to the driving mechanism of intensifying consumption through a calculated reworking of space, revolutionising the commercial built environment both in aesthetic and functional terms. The first most important effect of such structures was the recasting of cities as sites of consumption and leisure which could be increasingly accessed by only the high and upper-middle income groups. The growth of hyper-spaces has also been associated with increased ownership of cars and an emergent culture of consumption which necessitated possession of multiple cars for periodical shopping in downtown or suburban areas for extended hours (Wrigley & Lowe, 1999; Thorns, 2002). The phenomenon of the 'mall' is thus closely associated with the restructuring of the city space and very much in tune with the growth of the organised retail sector in India in the liberalisation era. Not only did liberalisation lead to a marked increase in income and spending in urban areas, it heralded as much as it signified sweeping changes in the culture of consumption in cities and the attendant fixes in their retail built environment. Heightened awareness of global brands incited multi-national corporations to engage in market tactics that oligopolise and monopolise fastest growing sectors (as the retail industry) of developing countries, through short-term investments in FDI. The Indian commercial city-scape thus witnessed phenomenal transformation of traditional markets giving way to departmental stores, hypermarkets, supermarkets and speciality stores (Sharma & Sharma, 2004; Sachdeva & Tripathi, 2008).

### *Recreational and Shopping Spaces*<sup>7</sup>

As the up-gradation of the commercial built environment changes in favour of hyper spaces, the whole underlying circuit of services and products gets up-graded along with it, ultimately culminating in shifting consumer preferences in its favour. The strategy behind such up-gradation is to transform the act of shopping in a mall or a self-service departmental store, from a simple act of purchasing necessary supplies, to purchasing identity. Super speciality stores, franchise outlets, malls, marts, are the material expression of a complex and long corporate chain of activities that aim to transform cities by promoting it as a centre of consumption and leisure for tourists as well as well-to-do city dwellers. The changing city-scape owes much to this phenomenon. However, the extent and manner in which the articulation of this logic takes place at the grassroots level, may be textured by

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<sup>7</sup> An important way of gauging the effects of the above changes in the built environment is to understand people's attitudes towards recreation and the recreational options they access. It may be argued that the articulation of the liberalised consumption norms is centered around the re-creation of urban commercial space with focus on such hyper spaces. It is also arguable that in open land market regimes this articulation may be more easily observable than in the built fabric in quasi land markets. This is not to say however, that quasi markets will not have hyperspaces; these may belong to a different order, of smaller scale which do not require very large areas to operate

local conditions of the land market, which may inhibit or freely allow privatisation by dint of its nature. In open land markets as in Guwahati, the commercial built space may change drastically in tune with the prevailing tenets of an overtly liberalised architectural and aesthetic iconography. However, in restricted markets as obtains in Shillong, a slightly different trend may ensue. The local variations and attendant complexities in the land market of cities may lead to corresponding variations in the kind and scale of hyper structures that shape their sky-line. These variations may ultimately, reflect on the choices the target city dwellers make in their shopping habits.

Hyperspaces that typify the liberalised commercial built environment of cities such as the mall and cinema-halls (multiplexes) have a greater impact on the recreational choices of the respondents in Guwahati than those in Shillong. Since dynamics of land-market reflect most starkly on the commercial built-space, translation of globalised consumption norms (along lines of a liberalised economy) also takes effect most evidently in the commercial space of cities. The manifest aspects of this may be understood for instance, from the kind of goods and services offered by establishments, their relative scale of operation (both in terms of area, rent and monthly turnover) and extent of corporate ownership and involvement, among other parameters. Expectedly, the greater number of singular iconographic high-end outlets and hyper-spaces occupying areas as large as 10,000 sq.ft., pay a comparatively higher mean rent, and earn very high monthly turnovers (Rs.70 lakhs and more per month), characterise the commercial space of Guwahati more obviously than that of Shillong, where these very enterprises, offering the same brands, operate at a much smaller scale with moderate and moderate to high monthly turnovers. The scale of establishments was also found to correspond to locational advantages, especially wide roads and larger, open spaces which offer the potential to physically expand the establishments. Thus in Guwahati, most of large establishments are located in prime road-frontage sites, whereas in Shillong these are cramped in the traditional commercial areas. The fast-changing skyline of Guwahati's commercial space owes itself primarily to these establishments which are constantly involved in up-grading their built, aesthetic and functional aspects by various means. It may be added here in this context, that the demand for parking space was found to be high among owners of large scale establishments in both cities; they also perceived central-city locations, buildings with road frontage and ground-floor space in the building or nearby parking facilities as extremely advantageous for increasing consumer foot-fall.

While boxy malls swept respondents' choices for recreation and shopping in Guwahati, in Shillong, restaurants and cafes dominated as primary choices. Here, public spaces (such as the Lady Hydari Park and the Ward's Lake), and distant riverside locations and outskirts as options for leisurely retreats (mostly for picnics and angling) were found to be most preferred for recreation, by a cross section of income groups with a significant presence of the lower-middle and low income groups. Responses in favour of visits to the city's outskirts as viable recreational options derive almost exclusively from the very high and high income groups in both cities, which enjoy greater mobility owing to the possession



of personal vehicles. The negotiations of income into the way a city's recreational spaces are imagined and accessed are also manifest in the choice of spaces such as restaurants and cafes, clubs and community organisations which are mostly accessed by the very high, high and middle income groups. Apart from public spaces, leisure-walks around the nearest market and intra-city social visits (which may be a more economical option for leisure) were chosen as the most preferred by the lower income group and. It is not surprising at all that these markets with their small roadside food and garment stalls, flea markets and footpath stalls should animate the recreational imagination of the poor in both cities.

Garments, as products, are one of the most important pivots around which the retail built environment has been sought to be up-graded. Flagship stores, designer outlet-chains and franchise outlets of global brands of apparel form one of the most important components of the globalised commercial retail urban-scape. Large sections of malls are devoted to the sale of garments of different global brands and shopping for garments forms one of the most important quotients of urban sensibilities and consumption and respondents in both the cities reveal this important connection between the commercial-built environment and the choices they make thereof. As has been observed in the case of recreational spaces, the mall along with specialised flagship stores has a much stronger presence in Guwahati when it comes to shopping choices of the very high and high income groups. In Shillong on the other hand, where the restricted nature of the land market inhibits large corporate ventures, the typical, expansive mall is closely approximated in Shillong by lesser garment 'arcades' which do not necessarily deal in global brands. Barring one or two, the typical mall has only but begun to make a statement in the urban landscape of Shillong (though very recently Pantaloons and Reliance have developed units in Shillong. While large corporate chains of garment outlets like Westside, Pantaloons, Reliance etc. thrive operating on a grandiose scale (spatially and functionally) in the open land market in Guwahati as emphatic built iconographies that appropriate large areas to their advantage, in Shillong's urban landscape, they operate on relatively smaller scales and area. Shopping for grocery too reveals similar trends with the brand-conscious urban consumerist sensibility of the high-income groups being largely attended to by specialised, self-service outlets. In stark contrast a very large section of responses in favour of the wholesale market come from the low income groups. Hence, high-end outlets in both cities largely cater to the affluent group of people whereas those belonging to the lesser end of the income spectrum largely depend on the non-branded market, wholesale stores and flea-markets. The recreation of the commercial built-space being geared specifically to cater largely to the high middle income groups not only eventually translates into the segregation of the physical urban space but indicates a more subjective aspect of segregation in the way the city is moulded in the imagination of those who are able to access the such spaces or not.

### *The 'Ideal' Home*

Aspirations for the ideal home revealed myriad dimensions to the colonial memory, especially in the way it still stirs nostalgic visions of old-world, cottage-type and Assam type

bungalows, complete with plotted gardens and lawns. The range of imagination here often transcended the limits to one's income and defied an income-based generalisation. What seemed to be playing as a *tour de force* here was a lost way of life which such a built-form (especially the Assam-type) typified in both cities until the 'uninspiring' boxy ugliness of RCC structures took over. The disappearance of the Assam-type structure from the physical landscape of both cities is perhaps not more manifest anywhere else than in this *terrae incognitae* of visions and aspirations for the ideal home. Notwithstanding a few examples however, the background of income was found to add its share of realism to such an imagining of one's sense of the ideal home. In both the cities, the allure of living in plotted Assam-type bungalows textured the aspirations of a large section of the high income groups.



**Plate 1. A typical Assam-type house**

**Plate 2. A former Assam-type unit, up-graded into an RCC one, while preserving its essential cottage style**

**Plate 3. A single-plot Assam-type unit with an up-graded RCC section (background); the latter built for renting out to tenants**

**Plate 4. A typical Extended RCC building with apartment-like features but without ground-floor parking; these buildings are meant specifically for renting out as residential units (SMA)**

**Plate 5. Another example of an Extended RCC building**

The antecedents of a certain neo-rich farmhouse-suburbia, far from congested city centres, may be traced here along with improvised built-forms that are reminiscent of the Assam-type form. For, it must be remembered, that with the obsolescence of the Assam-type structure, an entire tradition of skill and work-force has also been made wholly redundant in a concrete economy of house-building. Hence, surrogates such as the 'Bombay-type'<sup>8</sup> structure (one, which combines an older section of the Assam-type with an RCC section; see Plate 3) and what can be, for want of a formal term, be called an RCC-cottage, with the

<sup>8</sup> The term cannot be confirmed as a recognised, formal way of referring to such structures. At best it may be colloquial with uncertain origins.

typical Georgian-Tudor elements of a turreted chimneys, a veranda, a porch, sloping gabled roof, timbered windows and doors—trappings of a typical Assam-type structure (Plate 2). However, when we envisage potential changes that may be brought into the residential built-environment, the singular role of the lower middle and middle income groups who strongly aspired to up-grade their residential space, becomes evident; respondents living in semi-pucca houses and shacks belonging to the low income group, expectedly either aspired to have a pucca house or up-grade their houses into RCC type dwellings to better their living conditions, while those from the middle income group (especially those dwelling in old Assam-type houses) aspire to convert their dwellings into RCC structures mostly to rent it out or to do away with periodical and high expenses that accrue from long term maintenance of Assam-type houses.

## **Conclusion**

The above lays forth the case to consider a situation in Shillong where the restructuring of the city is showing close consonance with the restructuring of capital and its polarisation—a phenomenon that is underlined by deeper socio-political spatialities. The gradual dereliction of the fabled Assam-type houses is a manifest aspect of a chain of events whose interplay forms the matrix of this change. While this archetypal built-form, despite its obsolescence in the wake of an emergent commercialised, rent-based construction dynamic, still assumes a prized place in the nostalgic imagination of the people and cultural productions alike, it nevertheless powers latter-day popular projections of Shillong's consumable image in the tourism industry and thereby, the larger national imagination. Various themed under different regimes, in tune with dominant cultural narratives of their time—from nostalgic colonial signifiers as “Queen of the Hills” and “Scotland of the East” to contemporary ones with global appeal as the “Rock Capital of India” and “Pine City”, is a long interwoven saga of culturally and politically idiomatic representations and nostalgias which have converged in these times in the deployment of the ethnic-cultural capital, and the appropriate spatial fixes thereof that fit it into the larger neo-liberal, extra-local economy. Post-liberalisation city development schemes that deign to homogenise with urban reform, as envisaged under the JNNURM, have only exacerbated the difficulties of bringing within the folds of post-liberal development logic, a city, which is yet to come to terms with its historical land relations and its present human profile. The leanings of such schemes, especially in cities where localisms play a pivotal role in the tenure of land, its market and the politics thereof, tend to favour a select group of landed elites. A weak sub-stratum of unrecorded and informal land transactions when super-imposed upon by new-age, finance-driven reformist schemes, offers at best a spring-board for further politicisation of urban land and deepens its contestations in a restricted land-market. The often valorised rhetoric of common ownership and user rights on land is thus subverted in real time, for the deployment of a neo-tribal capitalist order which, as a major stake-holder, appropriates land and property resources and introduces shifts at both policy and physical-infrastructural levels, to ultimately secure its position as the major beneficiary of the same.

As obtains in the current study of the evolution of the built environment of Shillong, it may be concluded that the nature of the land-market plays a pivotal role in determining the trajectory of liberalised development especially in the way it underlines the evolution of the built environment of a city in a Sixth Schedule area. The anomalous regulations of land tenure and nature of land transfer in Shillong's restricted land-market situation subjects the legal documentation process to vagueness and reduces its legal credibility as a guarantee against which loans can be disbursed (on the contrary, in open land market situations like in Guwahati where free and open transaction allows for easy legal documentation of the process, there may be expectedly a more thriving loan market which complements a flourishing housing market, in effect and draws a greater number of housing loan beneficiaries). It may therefore be stated that in such land markets, this particular process will operate to promote home-ownership more vigorously than in quasi or restricted markets, where neo-liberal capitalism does not typically play to its expected potentials, but may operate in a hybrid form, as neo-tribal capitalism, where ethnic-ceiling on its transaction renders a monopoly market condition thereby enabling a section of indigenous tribal landed elite to own and re/develop large swathes of land. The attendant dynamics of personal consumption of home within such a market may also translate into higher rates of tenancy characterised by a greater incidence of very old tenants, since home-ownership is not an option with land not being a freely traded commodity.

The emergence of a new indigenous elite and its role in liberalised consumption of housing via accessibility of home finance as well as the ecological fracturing of the city, emerges in certain relationships of income segregation observed with regard to the housing loan market vis-a-vis the built environment, which may generally (irrespective of the nature of land market and individual peculiarities of housing-loan markets) shift towards the HIGs and high MIGs. The gradual redundancy of welfare housing for the benefit of the LIG and EWS groups has also been found to be caused by the problem of non-recovery of loans and unprofitable enterprises into such schemes by the State Housing Boards which act as the main nodal agencies for the disbursement of housing loans to individuals. This adds to the reasons why such agencies gradually shift their attention towards catering to the housing needs of the high income groups, who become the chief beneficiaries of the process as well as the dominant agency in the changing built environment of the city. In terms of individual role in the re-creation of the urban space, dynamics of home-upgradation reiterate the appropriation of home-loans by the high income group; as rent is the chief driver of endeavours to home upgradation, vertically extended RCC structures, developed specifically as rentable units, dominate the built-form of the city, gradually leading to the obsolescence of the city's erstwhile Assam-type iconography.

The overall effect on the built environment is reflected in the proliferation of commercial buildings on prime urban land, especially road frontage sites which mostly offer high-end services; in terms of their residential counterpart, one observes the emergence of affluent 'gentrified' pockets. Speciality stores dealing with branded products and services, high end restaurants and lodges have cropped up close to important government and

private offices and financial institutions, reflecting the emphasis on changing the built environment in favour of the high income groups, thus fostering the urban design necessary to sustain the essential logic of such a development. The heightened crunch in available urban space (which further raises the value of land in both commercial and residential areas) enables only the extremely affluent tribals to purchase land in these areas. The amendment to the Meghalaya Building Bye-Laws Act of 2011, which increased the FSI for both commercial and residential buildings, highlights the rent-based emphasis of commercialisation of the urban built space at the policy level.<sup>9</sup>

The fragmentation of urban space thus not only deepens the exclusion of landless minorities and urban poor from the gamut and process of urban governance, it is also kept beyond the range of critical visibility. The built environment, especially housing increasingly favours the upper income classes. In all, it may be argued that although the peripheral cities of India's North-East were late to be involved in the liberalised developmental policy, they have begun to reflect certain broad similarities in as far as land-politics and the restructuring of the built environment is concerned. However, the extremely local peculiarities of the land market have been re-invented or hybridised to favour local power groups and landed elites as stake-holders within the evolving paradigm of urban development. Thus, it is finally the embedded political potential of such a developmental logic that unfolds in the local space and creates, deepens and de-democratises urban processes. This is a disturbing facet of post-liberal development in these cities that is (or is kept so) beyond the range of the national imagination.

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<sup>9</sup> The raising of the Floor Space Index is one of the chief features of city restructuring which in turn indicates increased commercialisation of the built environment (Kundu: 2003, Mahadevia & Bhatt: 2002, Banerjee-Guha:2006) .

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## News and Notes

# THE INDIAN GEOGRAPHICAL SOCIETY

Department of Geography, University of Madras, Chennai – 600 005

Conduct of 8<sup>th</sup> Talent Test - 2018 for Geography students on  
21<sup>th</sup> February, 2018

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The Indian Geographical Society is organizing the state wide **Eighth Talent Test - 2018** for final year UG and PG students of the Geography Departments in Tamil Nadu on **Wednesday, 21<sup>th</sup> February, 2018**. The Executive Committee of the Society has identified the following coordinators to organise this event successfully with the support of Principals of the respective colleges and Heads of Geography Departments.

### Regional Coordinators

#### 1. Dr. G. Bhaskaran (Chennai Region)

Assistant Professor, Department of Geography, University of Madras,  
Chennai - 600 005, **Mobile:** 9444414688, **E-mail:** grbhaskaran@gmail.com

#### 2. Mr. K. Balasubramani (Rest of Tamil Nadu)

Assistant Professor, Department of Geography, Bharathidasan University,  
Tiruchirappalli - 620 024, **Mobile:** 9944060319, **E-mail:** geobalas@gmail.com

The Heads of the Geography Departments to contact the coordinator/regional coordinators and conduct the Talent Test successfully.

### General Information

1. Talent Test **will be conducted in English language only** for 1.30 hours consisting of 100 questions without any choice.
2. Syllabi for UG and PG talent tests are UGC NET Paper II & III respectively.
3. Final year UG and PG students of Geography are eligible for Talent Test.
4. The students should enroll their names with the concerned Heads of the Geography Department on or before 19<sup>th</sup> February, 2018.
5. The co-ordinators would contact the Heads of nearby Geography Departments and send the representatives for conducting Talent Test.
6. The Head of the Geography Departments would collect the registration fee from the students of their Department and inform the coordinators accordingly.
7. Talent Test is scheduled on **21<sup>th</sup> February, 2018 (Wednesday) between 11.00 a.m. and 12.30 p.m.**
8. Registration fee for UG Students is Rs.50/- and for PG Students it is Rs.75/-. Only Cash should be collected from the interested candidates.

### Details of Awards and Prizes

Prize	Award and Prize Amount	
	UG The IGS Founder Prof. N. Subrahmanyam Award	PG Prof. A. Ramesh Award
I	Rs. 5,000/-	Rs. 7,000/-
II	Rs. 3,000/-	Rs. 5,000/-
III	Rs. 2,000/-	Rs. 3,000/-

Prizes will be awarded to the winners of Talent Tests during 93<sup>rd</sup> Annual Conference of the IGS and *National Seminar* on Geospatial Technology for Land Use Analysis organised between March 01 and 02, 2018 at Department of Geography, Bharathidasan University, Tiruchirappalli. All other participants will be given Certificate of Participation. Please visit IGS website for registration forms and further information: <http://www.igschennai.org/>

### Dates to Remember

**Last Date for the Enrolment: 19-02-2018 (Monday)**

**Date of the Talent Test: 21-02-2018 (Wednesday)**

### **New Geography Departments in University and College in Tamil Nadu**

- 1) Department of Geography, Central University of Tamil Nadu, Thiruvarur – 610 005
- 2) Department of Geography, Sri Vijay Vidyalaya College of Arts & Science, Nallampalli, Dharmapuri – 636 807.