Rural to urban transitions and the peri-urban interface

Identifying, mapping, and understanding peri-urban areas in India and Pakistan

Identifying, Mapping and Understanding Peri-urban Interface in India: Technical Report

Poulomi Banerjee, Chinmoyee Mallik, Nani Babu
2013

SaciWATERs

Identifying, Mapping and Understanding Periurban Interface in India

Technical Report

Citation

Table of contents

List of Tables

List of Figures

Executive Summary

The study of peri urban interface is increasingly becoming an important topic of academic and policy research. There is a growing sensitivity towards the fact that rural, periurban and urban environments operate as a system rather than independently and change in one will affect the other. Although significant in the literature and in policy discussions, the concept of periurbanization or interface is filled with ambiguity with several conceptual connotations and different mental images attached to it. Nevertheless, the word 'periurban' is used in two main ways, namely, as a place, or as a process. The notion of periurban as 'place' is perhaps the most widely understood conceptualization of the term. As a place it is defined as rural-urban fringe, urban outgrowth or hinterland. Since they bear the spillover of urban expansion, they are considered to be an extension of the main city. Conversely, the periurban zones are also considered as part of the adjacent rural area for purposes of a holistic approach to rural research and development since there are two-way influences and interactions.

Place-based definitions of periurban however are questioned by many periurban scholars; they see the emphasis as not simply on a geographical space but focus instead on underlying features and processes. This means that proximity to the towns in itself does not define periurban; rather it is the co-existence of both rural and urban characteristics, rural-urban linkages and the flows of goods and services between them.

The following study assumed that periurban as a juxtaposition of both place and process. It is a space around urban spaces, and is clearly different from the rural counterparts. The type of town or a village, their socio-economic characteristics, constitute a factor that explains the more or less distinct presence of a periurban space. Nevertheless this space is not homogeneous and present uniformly around all towns or cities. This periurban space is itself structured by communication links, which create new inequalities within it. As a matter of fact, the distributional pattern of periurban interface does not necessarily assume a concentric pattern, rather the periurban reality is more fragmented.

With this conceptual understanding, the study has measured periurbanization at two different levels- household and sub-district. Mapping of the periurban interface has been done across 40 taluks of Hyderabad Urban

Agglomeration. Villages for the case study are selected from Nakka Vagu Watershed that falls within the Hyderabad Urban Agglomeration and located across urban, periurban and rural zones.

The findings reveal that periurbanization is a process that is marked by association if specific attributes which may be omnipresent at any location irrespective of its distance from the urban centre. Hence, distinctive characteristics of any households, rather than their mere location that defines them as being urban, periurban or rural. There is certainly a periurban space within the Hyderabad Metropolitan Development Authority's jurisdiction. The socio-economic characteristics, as taken in the study constitutes a factor that explains the more or less distinct presence of a periurban space distinct from its rural and urban counterparts. The study recommends that there is an official reorganization and availability of disaggregated data on periurban interface. Further, creating a specialized formal institutional mechanism to deal with periurbanization processes would help in meeting some of the challenges outlined in this report.

Chapter 1

Introduction

1.1. Understanding Periurban Interfaces: Theoretical Underpinnings

"The perceived link between the city and the countryside is evolving rapidly, shifting away from the assumptions of mainstream paradigms to new conceptual landscapes where rural-urban links are being redefined" (Oliveau 2005:3). In this conceptual field, the word 'periurbanisation' seeks to describe the urbanisation of the countryside on the periphery of cities and the periurban interface (PUI) is considered as a transitional zone wherein urban and rural development processes meet, mix and inter-react (Narain 2010). It is often not a discrete area, but rather a diffused territory identified by combinations of features and phenomena, generated largely by two-way interaction processes between rural and urban centers (Nottingham and Liverpool Universities, 1998, Adell 1999). They are zone of multispatial households, where urban and rural activities are juxtaposed, and landscape features are subject to constant modifications and reconstitutions (Dauglas 2006). It is not only portrayed as a space in itself, but one that envelopes dynamic interaction processes between the population and the landscape and their associated land uses and livelihoods (Narain 2012). They are mosaics of temporary, new residents and activities mingled with rural

urban linkages and support a vibrant two way flow of agricultural goods and ecological services between traditional villages and urban centers (Lasada et al 1998, Iacquinta and Drescher 2000, Bowyer and Bower 2006, Dauglas 2006, Lerner et al., 2011). In the words of Tacoli they are zones of sectoral interaction wherein there is complex mix of typically urban and rural activities. Like rural activities taking place in urban areas (e.g. urban agriculture) or traditionally 'urban' activities as manufacturing and services taking place in rural areas, or even the periurban flows to and from rural industries that are spatially concentrated around urban areas (Tacoli, 1999, 2002, 2003 and 2006). In the words of Garreau, (1991) PUI is conceived as edge-cities or post-suburban landscapes imagery, where not only flows of people, but of capital, labour, commodities and information leave the central urban context for a restless and place-less periphery (Garreau, 1991; Soja, 1992; Beauregard, 1995).

Although periurbanization and PUI are relatively recent terms coined by the western world, its origin dates back to early 50s and 60s. Since then several theorist have tried conceptualizing these, giving rise to a plethora of terms like urban fringe, suburban, exurban, urban tract, rurban, and semiurban (Iaquinta and Drescher 2000,Nottingham

and Liverpool Universities 1998, Rakodi, 1998). Jean & Calenge 1997, stressed on one aspect, which results in a variable terminology, reflecting the vagueness of space. The richness of the terminology reflects the numerous and multiple patterns of settlement that are found, urging each writer to qualify this notion (Oliveau 2005).The traditional theoretical models of economic development, urban geography and planning in the early decades of the present century gave a simplistic model of growth poles and urban diffusion where cities became the determining factors for evolution of the fringe. The theories were more urban biased and the concept of space was not integrated into it. However, most of these traditional theories considered core-periphery relationship a linear concept. Such theories often failed to explain such complex processes and features that shape up the PUI. Arguments and debates in the international discourse were either urban biased (Rondinelli, 1991; Unwin, 1989) or more rural oriented (Friedmann and Douglass 1975 and 1978, Karshenas, 1997, Rondinelli, 1984; Unwin, 1989, Stöhr and Taylor, 1981, Lipton, 1977, Douglass, 1998, Firman, 1996, Lofchie, 1997, Bates 1981). PUI was more of a 'place' based concept confined to outer fringe of the fast growing urban core. They stipulated explicitly or implicitly that the city is the source of growth and, market mechanisms played the determining role to disperse the growth impulses to the rural hinterland and thus balances the regional development in any country. Such theoretical construct was

inadequate to give a comprehensive picture about what the periurban signifies (Narain, 2009a,b). One of the consequences of this rural-urban conceptual dichotomy is the very existence of a curious divide in planning: on one side urban planners that keep considering urbanisation the key to achieve regional integration. Their policies have a decisive "urban bias". On the other side, rural development planners tend to view cities as parasitic or alien to rural interests. Their policies have a rural bias, with little or no interest in investigating how cities might be better brought into rural planning frameworks. However, for a rural household, daily life includes both rural and urban elements (Narain, 2009a,b).

Such place based approach was contested by an alternate school of thought where PUI was viewed more as a process or contract. Unwin (1989) and Douglass (1998) first gave the conceptual understanding of PUI by positing interactions, linkages and flows between rural and urban areas. They stated that rural-urban linkages are becoming much more multi-faceted, multi-layered and spatially far-reaching. Douglass 1998 argued that rural-urban linkages are changing into more elaborate and complex patterns, giving rise to distinct sphere of influence. This has led to reinterpretation of spatial understanding within core and centrality model. The concept of 'processes', interaction, linkages between rural and urban   areas brought a paradigm shift in the urban and rural discourses, wherein considerable

importance was given to urban-rural relationships (Unwin 1989).

The general move towards dispersal and location of growth on the peripheries or fringes of cities (Ingram 1998) has led to emergence of complex heterogeneous structure of PUI. There has been fast land conversion from agriculture to industrial and residential purposes. This process has been led by domestic and foreign investment in the manufacturing, finance and service sectors, and has also been encouraged by a series of financial deregulation policies from the 1980s, aiming to stimulate economic growth. The periphery has ceased to be an open space, and in this sense it ceased to be a frontier of the urban core, as understood by the earlier theorists. They argued that, periurban cannot be understood based on the traditional dichotomy of urban and rural, more so because these spaces themselves are fluid and with geographically shifting boundaries. The urban fringes expand and shrink geographically, 'eating' their way into the countryside, while they are swallowed by the expanding urban core area. Shenk suggests 'the concept of a two-fold dynamism in a rolling fringe. In a similar vein, Simon (2008) asserts that the classic urban-rural dichotomy no longer exists and the peri-urban area is now a recognized entity for both study and policy planning.

Albeit, paradigm shift from spatial definition (assuming a central urban point surrounded by a de-densifying periphery) to a more functional focus on diverse flows between the rural and urban sectors, ambiguity still remains about its physical and conceptual boundaries (Adell 1999). Spatial dimension models developed by economists, geographers and regional planners fell short of comprehensive theory of location. Kundu et.al. 2002 argued about the gross inadequacy of the marginalist framework of the distance decay model that conceived peri urban areas as zone of decay characterized by social and economic backwardness. They further argued that the values of socio-economic indicators around a city or town do not necessarily follow a smooth pattern. According to Adell 1999, although globalisation processes tend to "de-emphasise" place, it is important for delineating periurban interface of the global south. More so, with the emergence of functionally integrated territorial structures where agricultural and non-agricultural activities are increasingly found in complex spatial mixes, evidence from other developing regions may suggest that in physical terms the distinction between rural and urban landscapes is still relevant. In this regard Ginsburg and McGee 1991, have given a new dimension to the conceptual understanding of the PUI. McGee describes PUI as distinctive areas of agricultural and non-agricultural activities emerging adjacent to and between urban cores, which are a direct response to pre-existing conditions, time-space collapse, economic change, technological developments, and

labour force change (McGee, 1991). McGee has proposed a territorial model named desakota, and a word to describe the process that lead to the formation of such territorial patterns: desakotasi. These terms were coined from the Indonesian words Desa (village) and Kota (town), to describe the intense mixture of agricultural and non-agricultural activities that characterises these regions. The uneven distributional patterns of multitude of socio-cultural indicators, territorial restructuring determines the attribute and location of PUI, making it a region simultaneously rural and urban, continuous or fragmented; geographically occurring anywhere - in the core of the city, at its periphery or in a village thus, calling for a new definition of the rural-urban relationship.

1.2. Objectives

In the view of the above perspective the study assumes PUI is a combination of both space and processes. The spatial dynamics is embedded within the processes. It is the space that gives the mental construct of a PUI. It argues periurbanization processes as a complex mix of both spatial and 'a-spatial' phenomenon that may be observed at the level of the household, village, taluk or district. Periurban as a 'place' helps to identify features and processes that effectively correspond with ways that stand mid-way between completely rural and purely urban. However as 'a spatial' phenomena it corresponds to processes wherein its location is not restricted to the fringe areas but can occur anywhere.

With this understanding it aims to construct an analytic framework for identifying and measuring PUI based on its various dimensions. The objective is to determine the thresholds that meaningfully distinguish between the urban, periurban and rural areas. The idea is to go beyond the conventional spatial analysis to a process based economic modelling wherein the social dynamism and flux can be clearly brought out.

1.3. Structure of the report

The following technical report is divided into five chapters including the introductory one. This is followed with analytical framework and methodology. The main focus of the chapter is to craft out the research framework that forms the backbone of the analysis. Chapter 3 talks about measuring the level of periurbanization processes across households at a pan India level. Chapter 4 gives a detailed account of identifying, measuring and mapping the PUI within Hyderabad Urban Agglomeration. Chapter 5 concludes with summary and policy implications.

Analytical framework and Methodological Approach

2.1. Introduction

Periurban interface (PUI) as a concept has undergone several modifications and redefinitions. Much of these have been discussed in the previous chapter. In fact, examination of the literature evidences a number of distinct patterns in the way researchers have addressed PUI. Consequently, the concept of periurban has become "trivialized and tautological, its analytical and practical utility severely compromised" (Iaquinta and Drescher 2000:2). Under such circumstances it becomes increasingly critical to develop a conceptual framework to actually identify and measure PUI in reality. Arguably, the study considered PUI as a juxtaposition of place and processes. As a place it assumes a distinct pattern reflecting a definite composition of economic, social and psychological characteristics. With increasing distance from the urban core the nature and degree of composition changes. Thus there is certainly a periurban place around urban spaces, and is clearly different from the rural. The type of town or a village, their socio-economic characteristics, constitute a factor that explains the more or less distinct presence of a periurban place.

However this space/place is not homogeneous and uniform, and is structured by links, processes, communication and interaction. As a matter of fact, beyond the ideal concentric pattern, the periurban reality is more fragmented. So it makes way not only for spaces, whose urban characteristics are highly developed, but also for processes. Following Narain (2010), this study argues that, periurbanization is a process that embodies a transition from attributes that symbolize rural to those that signify urban and that geographically, it can occur anywhere - in the core of the city, at its periphery or in a village. So, there may be some households located within an urban area and yet representing attributes that symbolize a rural way and vice-versa. So, periurbanization process is typically 'a-spatial' and a phenomenon that may be observed at the level of the household. It therefore suggests that households that effectively correspond with ways that stand mid-way between completely rural and purely urban would be considered as periurban.

Abovementioned conceptual understandings and the measurements of PUI are depicted through step wise methodological outline and analytical framework given in table 2.1 and figure 2.1.

Based on the typology given by Iaquinta and Drescher (2000), the study conceptualizes PUI as a manifestation of three basic components- economic, social and

Table 2.1: Step wise Methodological Outline

Steps	Actions
Step 1	Conceptualizing periurban as a juxtaposition of place and process
Step 2	Measuring periurban as a process taking household indicators of India Human Development Survey
Step 3	Measuring periurban as a place taking sub district level indicators of Census of India
Step 4	Mapping four zones namely urban core, urban, transitional and traditional within Hyderabad Metropolitan Development Authority
Step 5	Delineating watershed cutting across urban, transitional/periurban and traditional/rural zones
Step 6	Identifying villages and towns falling within the watershed boundary for detail field survey

Source: conceptualized by the authors

Figure 2.1: Analytical framework of the study
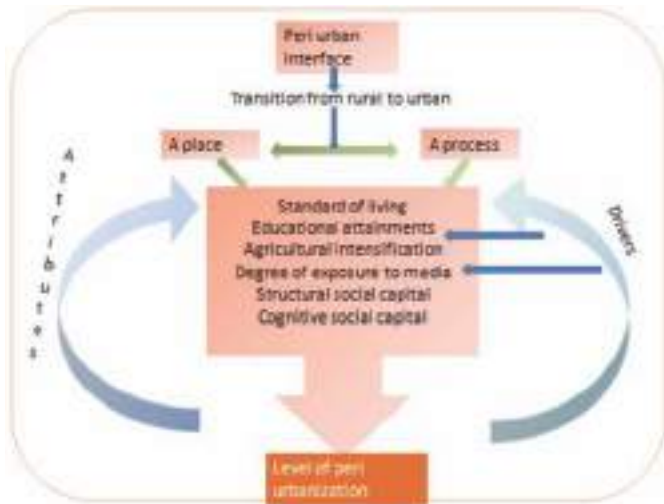
psychological. Among these, economic factors have always been considered as crucial in determining the urban-ness or rural-ness. However Iaquinta and Drescher 2000 pointed out that social and psychological factors too, are critical in identifying the PUI. Following Iaquinta and Drescher the study has taken six attributes falling under economic, social and psychological categories. The detailed list of indicators is given in section 2.3. Table 2.2 gives description of the characteristics of each of these attributes in three different zones, namely urban, periurban and rural.

2.2. Data base

The first part of the analysis uses India Human Development Survey 2005-06 (IHDS), undertaken by NCAER, which is a nationally representative, multi-topic survey comprising of 41,554 households in 1503 villages and 971 urban neighbourhoods across India. In the IHDS, the selection of a

Table 2.2: Conceptualization of periurbanization taking Economic, Social and Psychological attributes

	Standard of Living	Educational attainments	Agricultural Intensification	Degree of exposure to media	Structural social capital	Cognitive social capital
Urban	High/medium	High/medium	Low	High/medium	High/ medium	Low/ medium
Periurban	High/medium/ low	High/medium/ low	High/medium	High/medium/ low	medium	Low
Rural	Low/medium	Low/medium	Low/Medium	Medium/Low/ Absent	Medium/low	High/ Medium

Source: developed by the authors

sample household was based on unequal probabilities. A multi-stage sampling design with district as first stage unit, villages as the second stage unit and households as the third stage unit was adopted. The IHDS sample (N=41,554) is a composite of several separate sub-samples that were each drawn somewhat differently. The basic division is between a re-interview sample of households previously interviewed mostly in 1994-5 for the Human Development Profile of India (HDPI), N = 13,900, and new households, N=27,654, but each of these divisions are themselves comprised of distinct components.

The second part of the report is based upon the Census 2011 H-Series pertaining to data

on house listing and household amenities, Andhra Pradesh (mandal level consisting of household amenities only) and Agriculture Census of India, Andhra Pradesh, tehsil tables for the years 2005-06. Mapping is being done from toposheet of 1:25000 scales with superimposition of village boundaries.

2.3. Methodology

As explained previously in the table 2.1 the methodology pertaining to conceptualization and measurement of PUI can be grouped into 6 steps. Box 2.1 gives an elaborate account of the methodological outline.

A major issue pertains to the problem of aggregating a range of different variables to derive a uni-dimensional measure summarizing the level of peri-urbanization and producing a range of critical points differentiating socio-economic levels. This is because each variable, used individually, may

Box 2.1: Methodology in Measuring Periurbanization: Concept to Quantification

Measuring periurbanization as a process

Considering periurbanization as a process representing transition of attributes from rural to urban that is typically 'a-spatial', it is conceived as a phenomenon that may be observed at the level of the household. Using the nationally representative India Human Development Survey 2005-06 (IHDS) undertaken by NCAER, household level attributes like standard of living, educational attainment, extent of exposure to media and agricultural intensification have been considered as they poignantly divide the rural from the urban.

Periurbanization as a juxtaposition of place and process

If periurbanization is a process, it would be identified through the coexistence of certain specific attributes like moderate levels of living and educational attainments along with extremely intensive agriculture. Thus, locales noted with such association of phenomenon would represent the periurban. The Population Census data pertaining to 2011 on household amenities and Agricultural Census (2005-06) information aggregated at sub-district level for the neighbourhood of Hyderabad has been used to identify the thresholds that would be deployed to further distinguish between the mandals that characterize urban, rural and periurban characteristics. Performing a K-mean non-hierarchical cluster

analysis, the three respective thresholds have been delineated.

Locating the periurban

Following the identification of the mandals that have been categorized as urban, periurban and rural, they have been mapped on a GIS platform to locate them over space in relation to the Hyderabad megacity.

Selecting villages for case study

Villages are being selected from the Nakka Vagu Watershed. The selection of the study villages was based upon three broad criteria: (a) Literacy rate, (b) Share of workforce engaged in non-agricultural pursuits, and (c) proximity to water bodies.

not be sufficient to differentiate households. By using multivariate statistical modelling, cluster analysis and GIS, the study attempted to identify, delineate and map the PUI at different levels.

2.3.1 Principal Component Analysis (PCA)

PCA is a multivariate statistical technique used to reduce the number of variables in a data set into a smaller number of 'dimensions'. In mathematical terms, from an initial set of n correlated variables, PCA creates uncorrelated indices or components, where each component is a linear weighted combination of the initial variables. For example, from a set of variables X1 through to Xn,
Pc1= a11X1 + a12X2 +………….. + a1nXn
PCm= am1X1 + am2X2 + ………… + amnXn

Where amn represents the weight for the mth principal component and the nth variable. The weights for each principal component are given by the eigen vectors of the correlation matrix, or if the original data were standardized, the co-variance matrix. PCA works best when asset variables are correlated, but also when the distribution of variables varies across cases, or in this instance, households. It is the assets that are more unequally distributed between households that are given more weight in PCA (McKenzie 2003).

Here, the indicators have been built using the information collected through the IHDS survey pertains to are the six critical attributes that would differentiate the rural, peri-urban and urban areas. These indicators are:

- Standard of living/economic wellbeing
- Level of social development

- Agricultural intensification
- Level of exposure to mass media
- Structural social capital
- Cognitive social capital

Each of these variables is continuous data and therefore PCA is an effective tool for computing the composite scores. In some cases, the broad indicator is composed of few other variables where PCA of PCA has been done to obtain the composite of the composite scores. The variables selected to identify each of these dimensions have been outlined below (Table 2.3) in detail elaborating the specific constituent elements and distinctive method deployed in the process of aggregation. The Standard of Living Index is composed of two variables: monthly per capita consumption expenditure and ownership of consumer durables. The variable indicating the ownership of consumer durables is constructed by compositing the number of each of the assets owned from among two sets of assets identified as ordinary and high-end goods. The standard of living index is obtained by doing a PCA of these three variables.

The Social Development/Education Index is obtained through PCA of highest years of education of adult in the household and highest years of education of adult female in the household. The Index of Agricultural Intensification is composed of five variables which have been once again aggregated using PCA. Within this, the Index of Agricultural Capital Owned and Index of Livestock Ownership are the two variables

that have been computed by compositing the number of each items of agricultural capitals and livestock respectively owned by the household while the other three variables viz, expense on fertilizer per acre of operational holding, expense on pesticide per acre of operational holding and irrigation extent are simple. The indicator for understanding the extent of exposure to mass media has been identified as the average number of hours per day of television watched by the men, women and kids. Structural social capital index is calculated by using variables indicating social networking, group membership and association with the panchayat. Cognitive social capital is calculated by taking trust, conflict and crime. The final variable indicating the level of peri-urbanization is obtained by using PCA to aggregate the six dimensions into a single variable.

2.3.2. Cluster analysis or clustering

Clustering is the task of grouping a set of objects in such a way that objects in the same group (called cluster) are more similar (in some sense or another) to each other than to those in other groups (clusters). K-mean clustering is centroid based clustering where clusters are represented by a central vector, which may not necessarily be a member of the data set. When the number of clusters is fixed to k, k-means clustering gives a formal definition as an optimization problem: finds the k cluster centers, and assigns the objects to the nearest cluster center, such that the squared distances from the clusters are minimized. The study has used K-mean

Table 2.3: List of broad and specific indicators taken for PCA

Broad Indicators	Specific indicators	Nature of indicators
Standard of Living	Monthly consumption per capita	numeric
	Index of Ownership of ordinary consumer goods computed through addition of binaries indicating ownership of the following: cycle/bicycle, sewing machine, generator set, mixer/grinder, motor cycle, b/w tv, colour tv, air cooler, clock/watch, electric fan, chair/table, cot, telephone, cell phone, refrigerator, pressure cooker.	categorical
	Index of ownership of high end consumer goods computed through addition of binaries indicating ownership of the following: car, air conditioner, washing machine, computer, credit card	categorical
Social Development/ Education	Highest years of education of adult in the household	numeric
	Highest years of education of adult female in the household	numeric
Index for Agricultural Intensification	Index of agricultural capital owned [Number of tube-wells, electric pumps, diesel pumps, bullock carts, tractors, threshers, bio-gas plants owned.]	numeric
	Expense on fertilizer per acre of operational holding	numeric
	Expense on pesticide per acre of operational holding	numeric
	Irrigation extent	numeric
	Index of livestock ownership [number of milch cows, milch buffaloes, draft animals, goats, sheep, poultry owned]	numeric
Exposure to Mass Media	Average hours per day of television watched by men, women & kids	numeric
Structural Capital Index	Memberships Have you or anyone in the household attended a public meeting called by village panchayat/ nagarpalika/ ward committee in the last year? Is anyone in the household an official of the village panchayat/ nagarpalika/ ward committee? Among your acquaintances/ relatives are there anyone who belong to (a) medical profession; (b) Teaching profession; (c) Government Service	categorical
Cognitive Capital Index	• Conflict in the village • Approach towards solving common problems in the community • Conflict among jatis • Theft during last 12 months • Breaking into home illegally during last 12 months • Attack/threat during last 12 months • Harassment of girls • Confidence in Institutions	categorical

SOURCE: IHDS, 2005-06

Table 2.4: List of indicators used for K-Mean clustering

Attributes	Nature of indicators
Share of households having roof made of asbestos & concrete	Numeric
Share of households using kerosene and LPG as principal cooking fuel	Numeric
Share of households using treated tap water for drinking	Numeric
Share of households owning television	Numeric
Share of households owning both landline telephone & mobile	Numeric
Share of households having drain connection	Numeric
Share of area under all vegetables	Numeric
Share of area under total fruits	Numeric
Share of area under floriculture, spices & condiments, aromatic plants and total sugar crops	Numeric
Share of area under tube well irrigation	Numeric

clustering to differentiate the thresholds across urban, peri-urban and rural. The list of indicators used for K-mean clustering is given in table 2.4.

2.3.4. Mapping

The final task is to identify the villages where the primary survey would be conducted for in-depth study of periurbanization process and the associated issues related to water security and governance. For this exercise the primary task is to locate the different tehsils in relation to the Hyderabad megacity. As the purpose is to obtain a holistic understanding, the selection of study village is done with reference to both the socio-economic as well as the physical setting of the region. Hence, in the outset, a watershed has been identified that cuts across all the three regions, viz, urban, periurban and rural. Overlaying the digital elevation model (DEM) of the watershed along with the major drainage lines over the administrative map, villages have been selected such that they are located in the lower, middle and upper reaches of the principal drainage channel and also in the urban, periurban and rural locations. Final villages and towns were selected taking literacy rate and work participation in non- agricultural sectors.

3.1. Results

Regional analysis has established an urban bias in the clustering of amenities, facilities and benefits and the rural place denoting the position counter to urban. Understandably, while the urban may correspond with high to medium levels of standard of living, educational attainments and degree of exposure to media, the rural would be marked by low to medium level of attainments in all these three aspects. However, the agricultural variable would behave somewhat differently. The urban, by virtue of its detachment from the primary sector, would be marked by very low levels of agricultural activity. If any agricultural activity co-exists with the other three urban attributes, it would be merely for subsistence and far from being intensive, which sooner or later would cease to exist. In the rural interiors too, agriculture is not likely to be very intensive. It is because intensive agriculture would entail large scale investment in the form of mechanization, inputs and most importantly marketing. The last issue of marketability of agricultural products in India is a well known area of concern that discourage the farmers located in rural interiors to undertake high value crops that entail large investments. So, agricultural intensification in the rural interiors would be of low to moderate nature. Clearly defining the rural and urban attributes, the periurban would be that which effectively combines both, yet distinguishes itself clearly from the two entities. So, the aspects of standard of living, educational attainments and degree

Table 3.1: Attributes identifying the Urban, Periurban and Rural

Type of places	Standard of living	Educational attainments	Agricultural Intensification	Degree of exposure to media	Structural social capital	Cognitive social capital
Modern/Urban	1.510	1.160	-1.197	2.080	.621	.004
Transitional/ Periurban	.517	.756	.203	1.852	.027	-.072
Traditional/Rural	-.334	-.487	-.129	.624	-.028	.048

Source: Computed from IHD Survey, NCAER, 2005-06

of exposure to media could be any combination of low-medium high but agriculture would be remarkably intensive. As exposited by Chadha et al (2004), the agriculture in the peripheral areas of urban areas would be devoted to crops that yield high return and therefore generally are intensive. So, the periurban would be the zone where agriculture would be intensive.

This section, based upon the analysis of the NCAER household level data, attempts to suggest a methodology of delineating the urban, periurban and the rural proposing a process-oriented approach. The chief objective is to identify the thresholds of the key indicators that would differentiate the households into the three categories. As outlined in chapter-2, all the households have been categorized into urban, periurban and rural.

The pattern of the six key variables that have been used to identify the three zones have displayed that the periurban marks a sharp break in the distribution of the attributes (Table 3.1 and Figure 3.2). In congruity with what the theoretical outline suggests, the indicators of development, viz, standard of living, social development (particularly educational attainments) and extent of exposure to media has assumed very high values in the zone designated as urban and extremely low values for the rural the break point coinciding with the periurban zone. While the indices representing standard of living has indicated an even rate of decline

from the urban to the rural, the other two variables have registered sharp break at the periurban zone. This actually conforms to the real world situation wherein periurban areas, due to proximity to urban through better road connectivity and exposure, offer better opportunities for education. The proximity factor also encourages association with the urban sources of information and media. Beyond a certain distance the favourable conditions cease to exist and therefore these variables depict conspicuous decline.

Agricultural intensification, however, represents a very distinctive scenario. The periurban is marked by highest level of agricultural intensification followed by the rural and the urban. The two components of social capital have manifested contrasting trends. Structural capital, being composed of social contacts, networks and group memberships, has the propensity to be conditioned by degree of exposure of the individuals and also the educational attainments. Hence, the urban component has registered the highest levels of structural social capital followed by the periurban and rural. The cognitive social capital constituting elements that measure trust, conflict within the community and extent of criminal activities, have revealed lowest levels in the periurban, highest in the rural and the urban, being located at an intermediate level. The periurban, owing to imperfect assimilation of urban and rural forms, is conspicuously subjected to rapid erosion of rural structure

Figure 3.1: Attributes identifying the Urban, Peri-urban and Rural
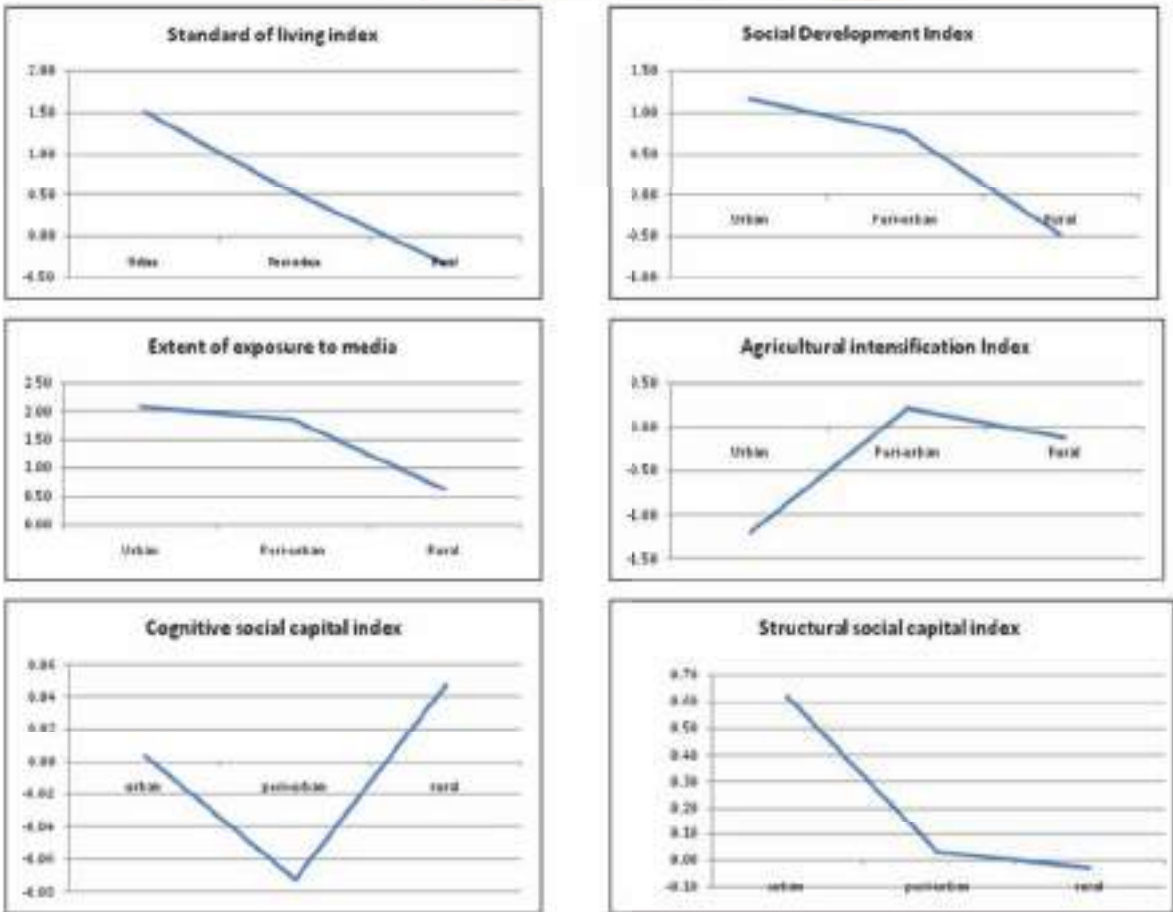
of the social relations that used to constitute the safety net accompanied by lack of integration within the urban system has resulted in the extremely poor social capital of the periurban households.

However, at this point it must be remembered that this analysis being based upon household level information, explicitly does not take account of the spatiality aspect. Hence it represents the macro

process where the households hitherto marked by 'rural attributes' have been undergoing transformation towards urbanity. The section of households which have reached the brink of the transitional phase has embodied the characteristics that represent an admixture of rural and urban features.

From the table 3.2 it may be observed that about thirty nine percent of the households display attributes that relate to the periurban zone indicating rapid pace of urbanization, a process that has affected the lives of a considerable section of the people in India. More than one third of the total households have been subjected to intensified periurbanization process. Based on this assumption, the households in this study have been categorized as having characteristics that are urban, periurban and rural. In India, about 60.8% of the households conform to what has been conceptualized as rural, a meagre 0.1% as urban and the remaining 39.1% as under periurban (Table 3.2). It is extremely noteworthy that that only 0.1% of the total households has displayed urban characteristics irrespective of their location.

3.2. Conclusion

The principal objective of this chapter was to outline a methodology for identifying the urban, periurban and the rural based upon a process oriented approach. This chapter essentially exposits that periurbanization is a process that is marked by association of specific attributes which may be omnipresent at any location irrespective of its distance from the urban centre. Hence, distinctive characteristics of any households, rather than their mere location define them as being urban, periurban or rural.

Table 3.2: Households under differential processes of periurbanization

	Frequency	Percent
Urban	147730	.1
Periurban	75070053	39.1
Rural	116906503	60.8
Total	192124286	100.0

Source: Computed IHD Survey, NCAER, 2005-06

Identifying, measuring and mapping the peri urban interfaces within Hyderabad urban agglomeration

4.1. Results

Understandably, periurban connotes attributes that assume a level intermediate between the urban and rural. As it is conceptualized a rural area undergoing transition to urban the attributes that are nearing urban would define the periurban. By analysing the rural-urban distribution of the household amenities at the state level for Andhra Pradesh, the 'typical urban attributes' have been identified. In the next stage, these attributes and the selected variables of agriculture have been employed in creating three K-mean clusters to identify the thresholds that define the urban, rural and the periurban (Table 4.1). The cluster that revealed very high shares (above 90 percent) of the 'typically urban amenities' have been designated as being urban and the cluster

Table 4.1: Attributes of the Final Cluster Centres

Attributes	Cluster mean		
	Urban	Peri-urban	Rural
Share of households having roof made of asbestos & concrete	93.54	84.12	59.18
Share of households using kerosene and LPG as principal cooking fuel	91.12	74.58	33.68
Share of households using treated tap water for drinking	91.43	77.86	34.52
Share of households owning television	83.80	77.69	61.67
Share of households owning both landline telephone & mobile	11.95	7.88	2.60
Share of households having drain connection	96.76	90.34	69.66
Share of area under all vegetables	5.39	3.68	6.21
Share of area under total fruits	.78	7.14	4.91
Share of area under floriculture, spices & condiments, aromatic plants and total sugar crops	1.40	3.43	2.00
Share of area under tube well irrigation	27.60	83.63	83.65

Source: Census of India, 2011 Census of India, 2011 and Agricultural Census 2005-06

representing lowest mean values in case of the 'typical urban amenities' have been assumed to represent rural. It may be noted that the remarkably low shares of the variables relating to agriculture in the urban cluster centre and the respective lower value in the rural cluster strengthens the nomenclature. The intermediate values of the cluster centres of the 'typically urban attributes' in association with those of the agricultural variables that represent most intensive type of agriculture (with respect to that in the urban and rural cluster) may be designated as the periurban. It must be pointed out that the periurban zone, lying in the proximity of the urban centre, has access to the market and other facilities that encourage the production of perishable goods like fruits and vegetables. Hence the cluster that represents a moderate share of the 'typically urban attributes' in association with intensified agriculture would embody the periurban.

Table 4.2 shows urban, rural and periurban zones across sub districts of Hyderabad Metropolitan Development Authority. From the table it is evident that periurbanization is strongly felt in 12 out of 40 mandals within Hyderabad Metropolitan Development Authority. While representing the same diagrammatically (Figure 4.1) the periurban interface becomes even more vivid.

Table 4.2: Periurban Interface within Hyderabad Urban Agglomeration

S. No.	Mandal	Area Code	Area name
1	Sub-District - Balanagar	1	Urban
2	Sub-District - Qutubullapur	1	Urban
3	Sub-District - Saroornagar	1	Urban
4	Sub-District - Uppal	1	Urban
5	Sub-District - Ghatkesar	2	Periurban
6	Sub-District - Hayathnagar	2	Periurban
7	Sub-District - Ibrahimpatnam	2	Periurban
8	Sub-District - Jinnaram	2	Periurban
9	Sub-District - Keesara	2	Periurban
10	Sub-District - Malkajgiri	2	Periurban
11	Sub-District - Medchal	2	Periurban
12	Sub-District - Patancheru	2	Periurban

13	Sub-District - Rajendranagar	2	Periurban
14	Sub-District - Ramachandrapuram	2	Periurban
15	Sub-District - Sangareddy	2	Periurban
16	Sub-District - Serilingampally	2	Periurban
17	Sub-District - Bibinagar	3	Rural
18	Sub-District - Bommalaramaram	3	Rural
19	Sub-District - Chevella	3	Rural
20	Sub-District - Choutuppal	3	Rural
21	Sub-District - Farooqnagar	3	Rural
22	Sub-District - Hathnoora	3	Rural
23	Sub-District - Kandukur	3	Rural
24	Sub-District - Kothur	3	Rural
25	Sub-District - Maheswaram	3	Rural
26	Sub-District - Manchal	3	Rural
27	Sub-District - Moinabad	3	Rural
28	Sub-District - Mulug	3	Rural
29	Sub-District - Narsapur	3	Rural
30	Sub-District - Pochampalle	3	Rural
31	Sub-District - Shabad	3	Rural
32	Sub-District - Shamirpet	3	Rural
33	Sub-District - Shamshabad	3	Rural
34	Sub-District - Shankarpalle	3	Rural
35	Sub-District - Shivampet	3	Rural
36	Sub-District - Tupran	3	Rural
37	Sub-District - Wargal	3	Rural
38	Sub-District - Yacharam	3	Rural
39	Sub-District - Bhongir	3	Rural

Source: computed by the authors

One of the principle objectives of this study being looking into is, the issue of water security across the urban-periurban-rural areas, the next stage of analysis involved delineation of a watershed that cut across all the three zones. Close examination of the physical map revealed the existence of numerous cascaded lakes and the Nakka Vagu stream that offered a watershed that surpassed the three zones. The watershed as depicted in figure 4.2 encompasses nine sub districts. These are periurban sub districts/tehsils of Patancheru, Sangareddy, Jinnaram, Chandrapuram, Serilingampally,

Figure 4.1: Periurban Interface within Hyderabad Metropolitan Development Authority
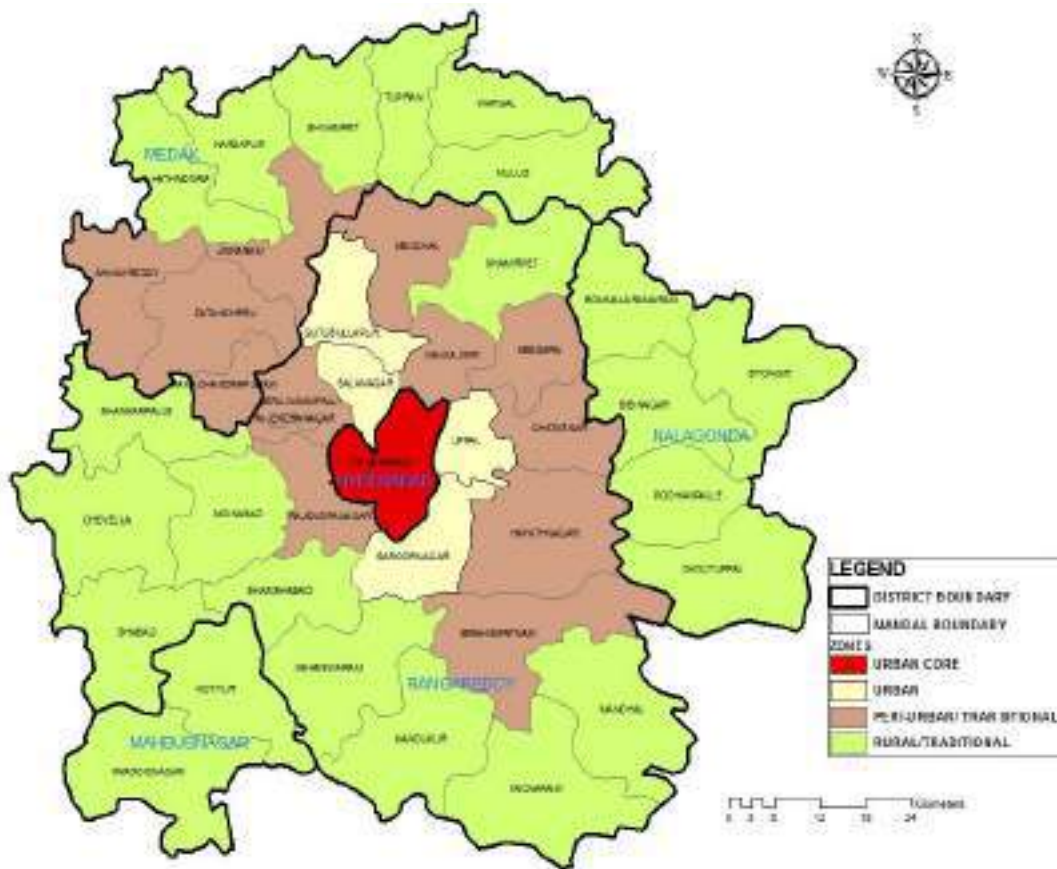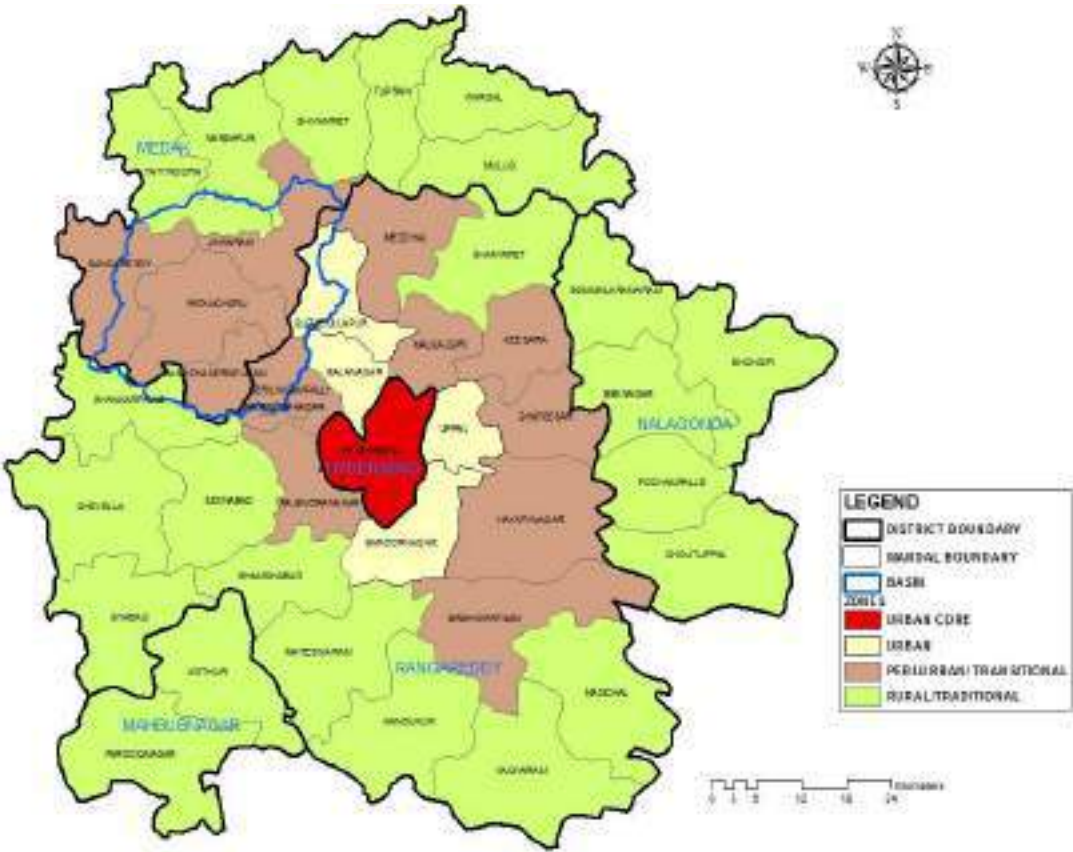

Source: Prepared by the authors

and Shankarpalle. Urban sub district/tehsil includes Qutubullapur and rural sub districts consist of Hathnoora and Narsapur.

Having identified the watershed, the next task is to identify the villages where in depth field investigation is to be carried out. The selection of the study villages is based on three broad criteria: (a) literacy rate, (b) share of workforce engaged in non-agricultural pursuits, and (c) proximity to water bodies. This involved a two step process; in the first place the village primary census abstract of 2001 (Census 2011- village level PCA is not

Figure 4.2: Delineation of Nakka Vagu Watershed cutting across Urban, Rural and Periurban Interface within Hyderabad Metropolitan Development Authority

Source: Prepared by the authors

available for executing this exercise) has been used for computing (a) and (b). The respective mean values for (a) and (b) for the villages lying within the urban, periurban and rural areas respectively is computed to prepare an inventory of the villages that lie close to these mean values. Therefore, villages that represent the region viz, rural, periurban or urban is enlisted. The second stage of the village selection has been executed through investigating the physical map to identify villages that lie in proximity to water bodies.

4.1.1 Nakka Vagu Watershed: A Description

Nakka Vagu, a tributary of the River Manjira in the Medak district of Andhra Pradesh, has a watershed area of 500 square km. Patancheru, an industrial development area (IDA) constitutes the major part of the watershed. There are about 350 industries of varied nature (pulp, plastic, bulk drugs, pharmaceuticals, paints and steel rolling mills) that are engaged in the manufacture/processing of their respective products and that use water extensively. The digital elevation modelling (figure 4.3) of the Nakka Vagu watershed has shown that a major part of the area falls under medium to low altitude range. The watershed has 43 tanks and are largely concentrated in the medium altitudes (figure 4.4). While

overlying the urban, rural and periurban interfaces (figure 4.5), it is clearly evident that periurban interface takes the most of medium to lower ridges while the urban takes the upper, and the rural occupies the lower reaches respectively. Hydro-geological setup of the Nakka Vagu River and the morphological characteristics of the watershed along with unregulated dumping of industrial effluents has resulted in severe pollution of the surface water bodies and groundwater aquifer. This inturn has critical implications on the water security of the middle and lower reaches of the watershed.

### 4.1.2 Selection of Villages and Towns for Field Survey

There are about 106 villages/settlements falling within the watershed boundary. It is evident from the map that settlements are largely concentrated within the periurban zone. Also, the Digital Elevation Model (figure 4.3 and 4.4) depicts that the urban zone coincides with the highest region while the rural and periurban zones lie at the intermediate elevation extending to the lowest parts of the basin. There are numerous tanks with cascading channels strewn all over the basin (figure 4.5).

Figure 4.3: Elevation Modelling of Nakka Vagu Watershed
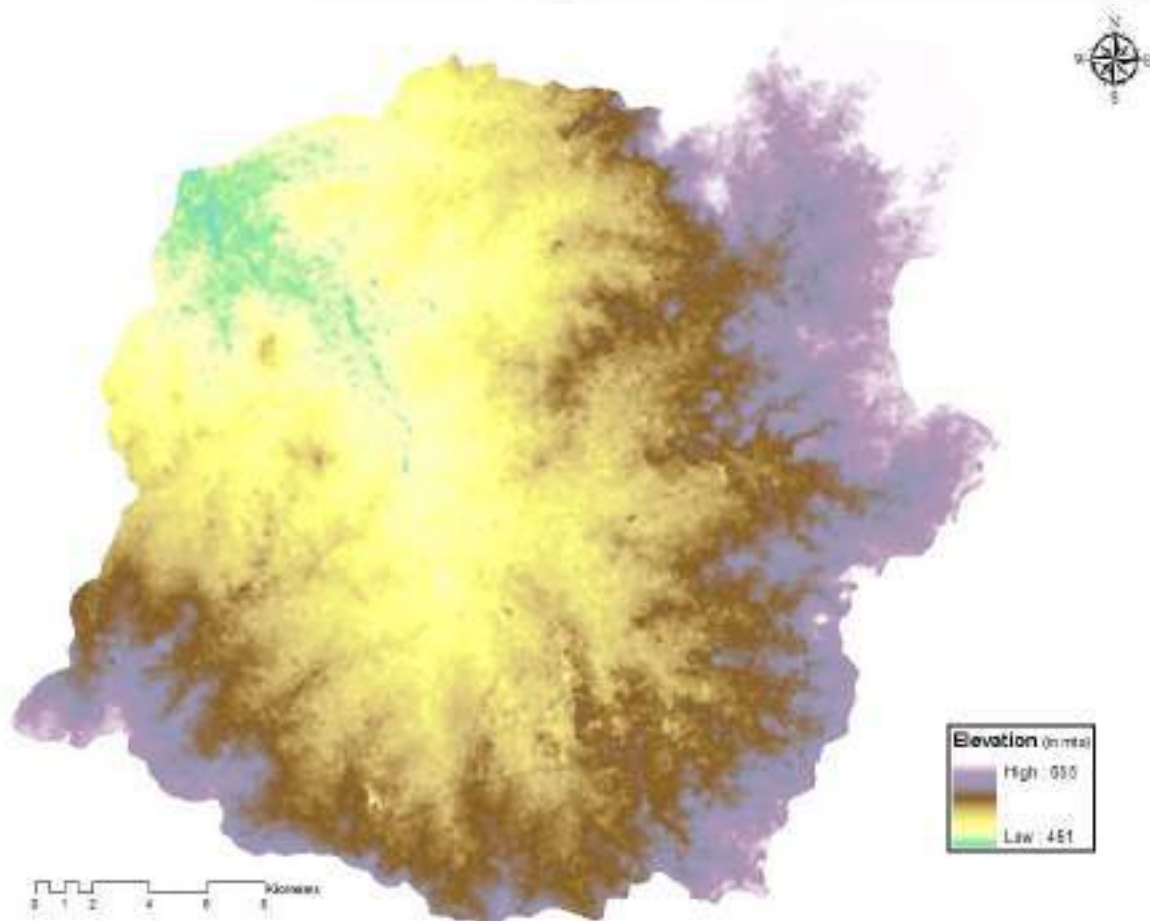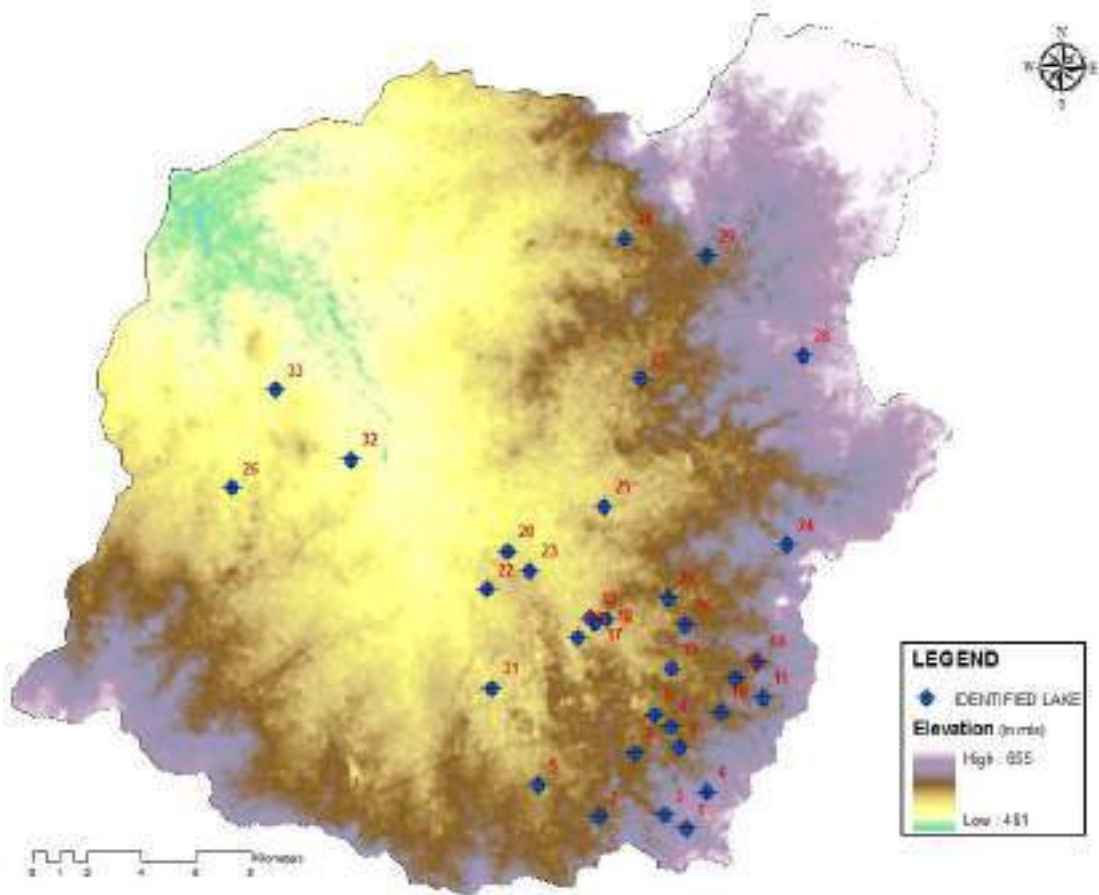

Source: Prepared from the toposheet 1978

Figure 4.4: Thematic Overlaying of Elevation along with Urban, Periurban and Rural zones within Nakka Vagu Watershed
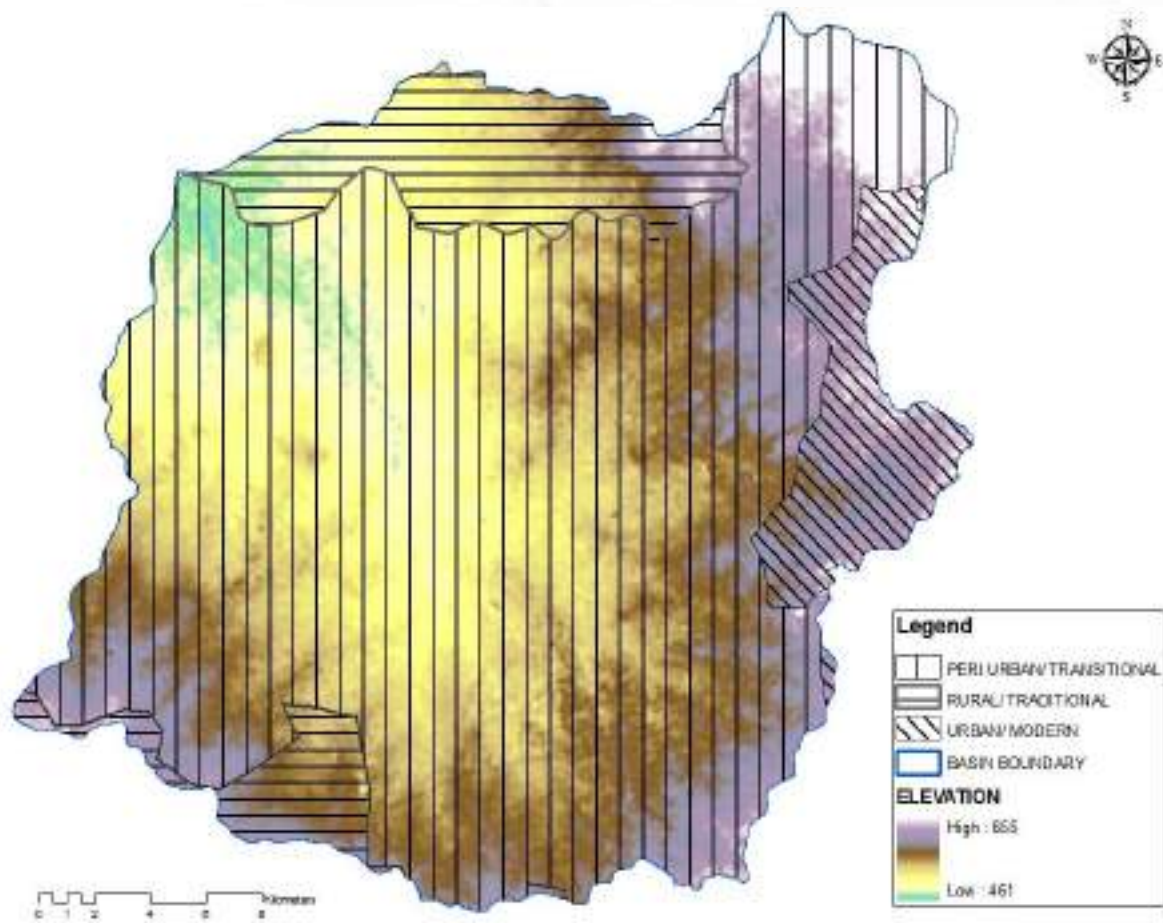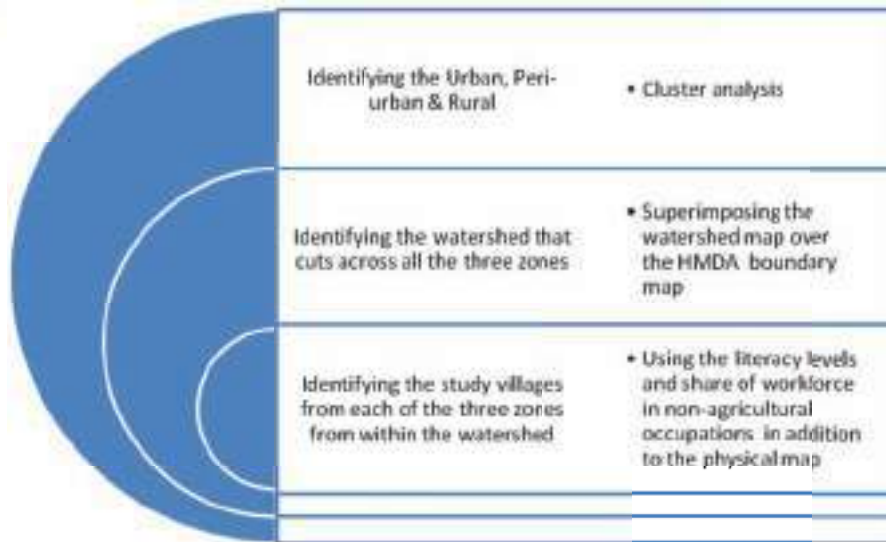
Figure 4.5: Elevation Modelling of Nakka Vagu Watershed

Source: Prepared by the authors

Figure 4.6: Levels in the Selection of Study Area

Literacy rate and share of workforce in the non-agricultural occupation are two indicators that broadly define the position of any entity along the continuum between the urban and the rural. Hence, these two variables have been employed in locating the villages on a scale ranging between rurality and urbanity. The mean literacy level and share of workforce in non-agricultural occupations has been computed for each of the three regions (table 4.3). Then villages that most closely represent the regional mean value with respect to both the literacy rates as well as the share of workforce in non-agricultural pursuits have been selected. For cross validation, the maps indicating each of these two attributes have been superimposed for better understanding, the spatiality of these attributes. From among these, only those three villages from each of the three regions have been selected which have clearly revealed proximity to any water body and location at varying elevations (figure 4.3 & 4.4).

Table 4.3: Showing list of selected villages

| District	Sub-district	Village	% non-agricultural workforce	Class	Literacy rate	Class
Periurban			36.1		51.6	
Medak	Sangareddy	Edthanur	34.2	Medium	50.6	Medium
Medak	Jinnaram	Kazipalle	33.1	Medium	50.2	Medium
Medak	Ramachandrapuram	Osman Nagar	28.3	Medium	51.7	Medium
Urban			58.3		61.1	
Rangareddy	Qutubullapur	Bahadurpalle	62.2	Medium	56.7	Medium
Rangareddy	Qutubullapur	Gagilapur	52.9	Medium	64.6	High
Rangareddy	Qutubullapur	Nizampet	68.0	High	56.8	Medium
Rural			20.9		51.1	
Medak	Hathnoora	Chintalcheru	20.8	Low	43.5	Low
Medak	Hathnoora	Kodapak	18.5	Low	52.3	Medium
Medak	Hathnoora	Palapnoor	21.4	Low	53.8	Medium

Source: Census of India 2001

4.2. Conclusion

These results show that though there is certainly a periurban space within the jurisdiction of the Hyderabad Metropolitan Development Authority. The socio-economic characteristics, as taken in the study constitute a factor that explains the more or less distinct presence of a periurban space that can be distinct from its rural and urban counterparts.

**Figure 4.7:** Digital Elevation Modelling, the Zones, Settlements and Waterbodies within Nakka Vagu Watershed
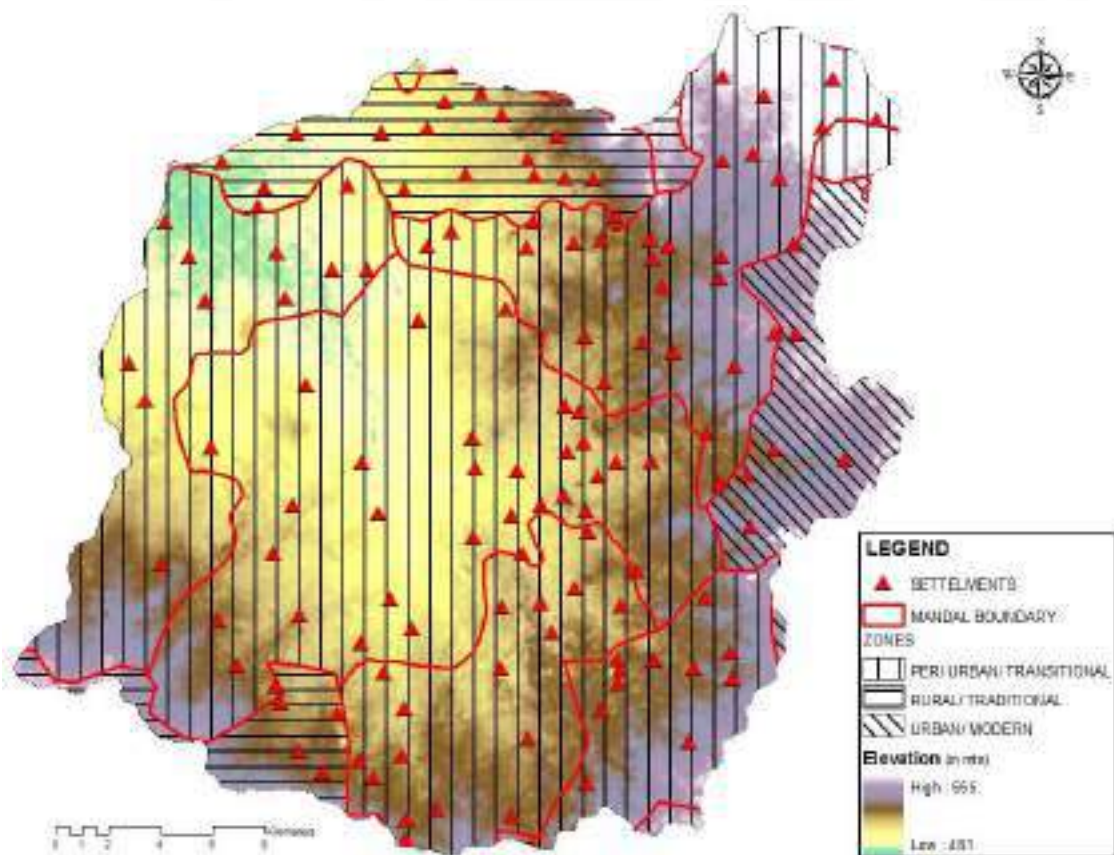
Source: Prepared by the authors

Figure 4.8: Distribution of Literacy Rate across villages/settlements within Nakka Vagu Watershed
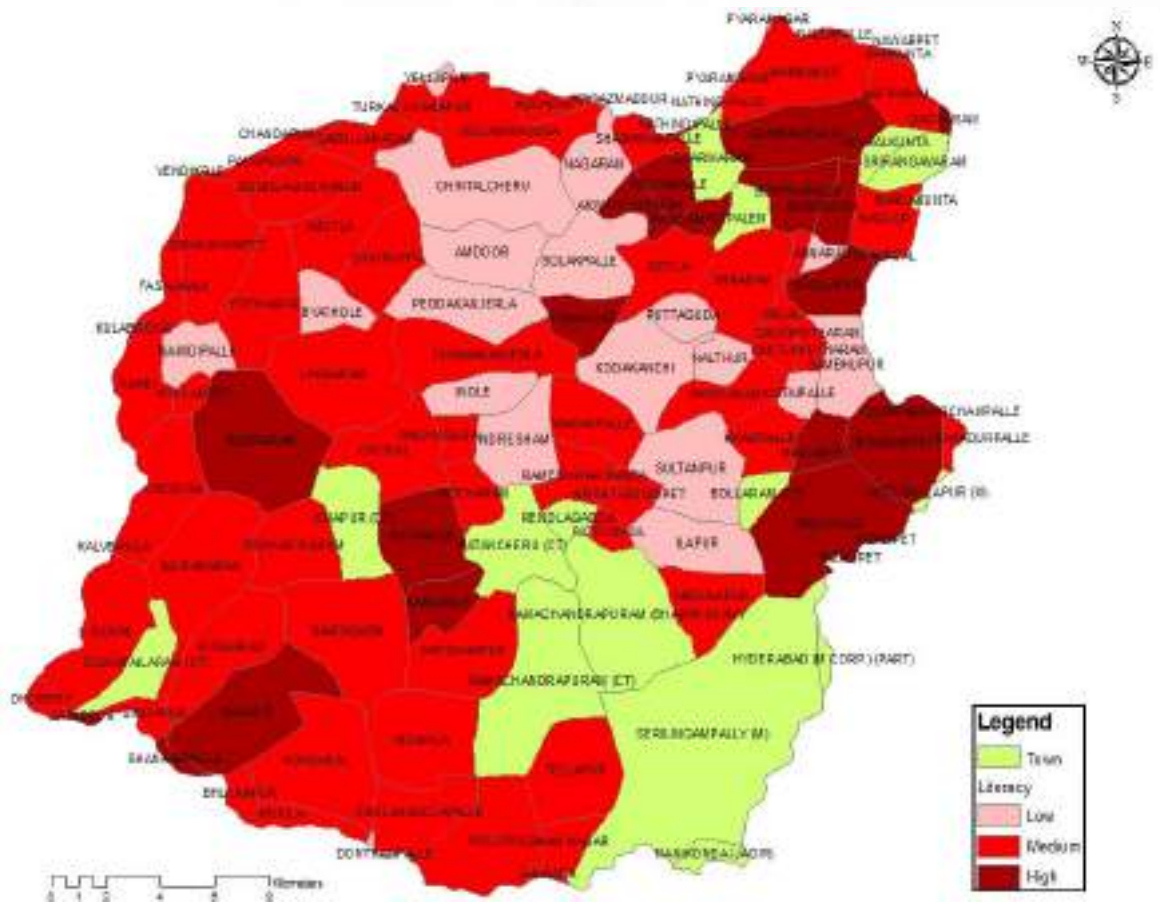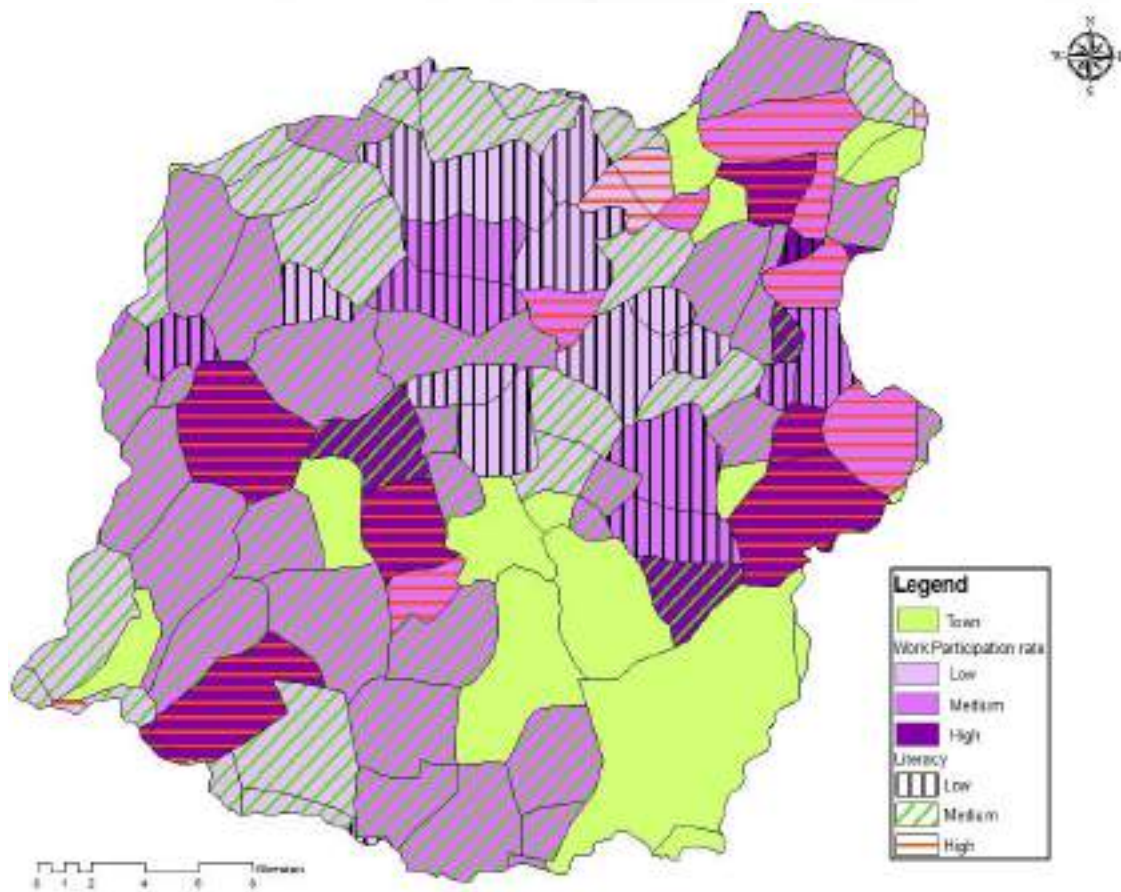

Source: Prepared by the authors

Figure 4.9: Distribution of Work Participation Rate in non agricultural sectors across villages within Nakka Vagu Watershed
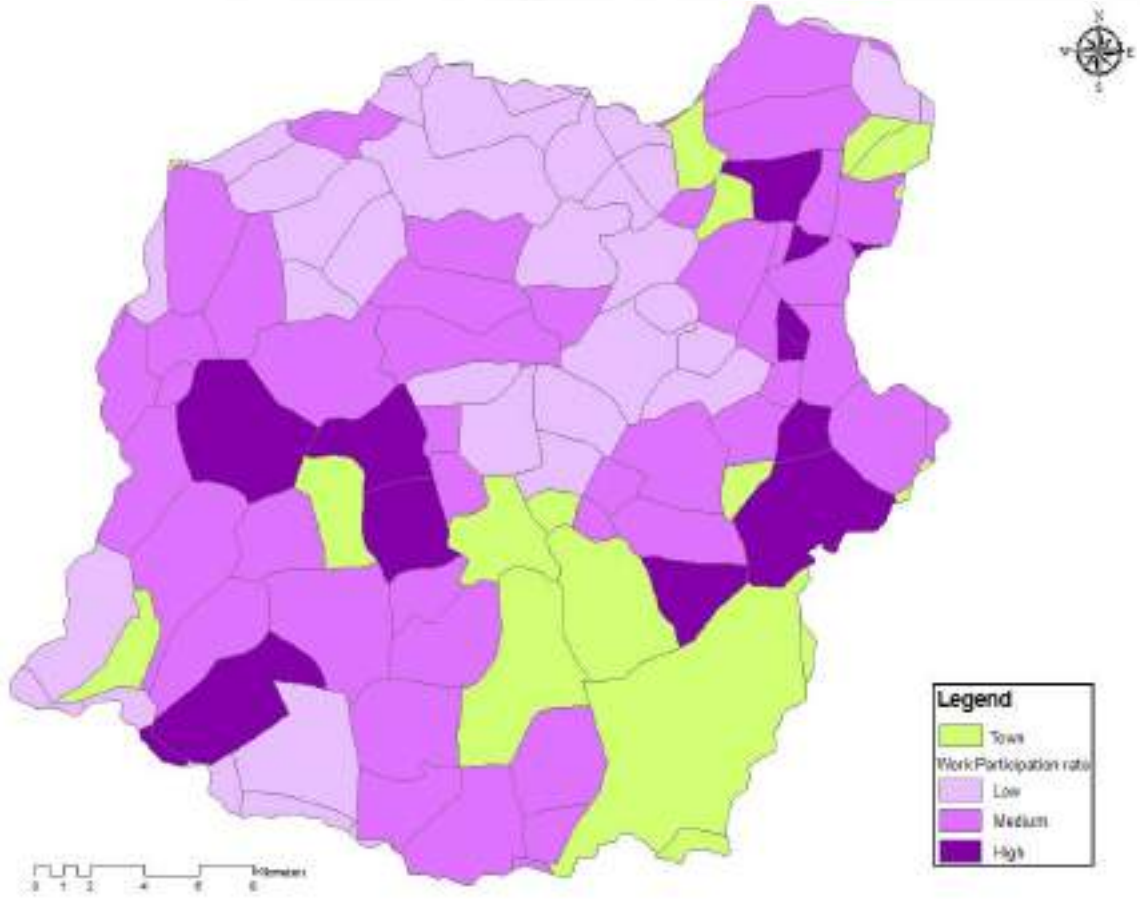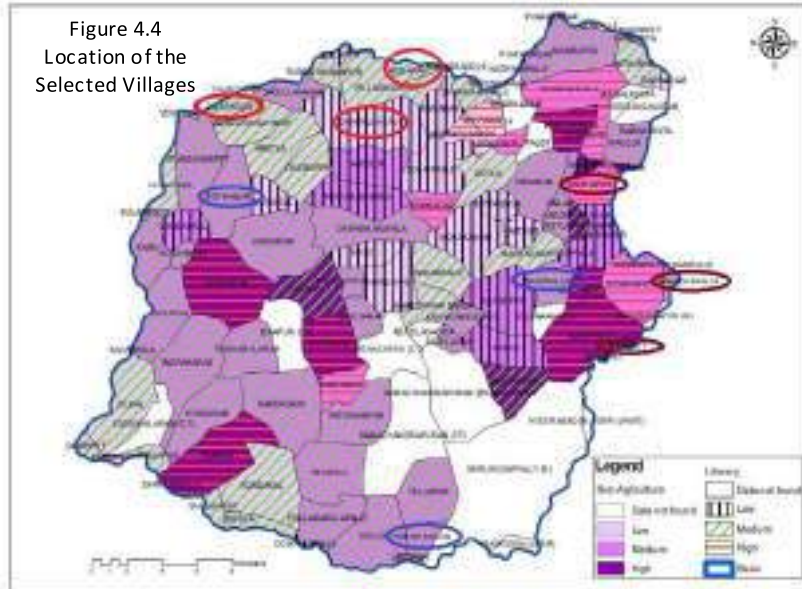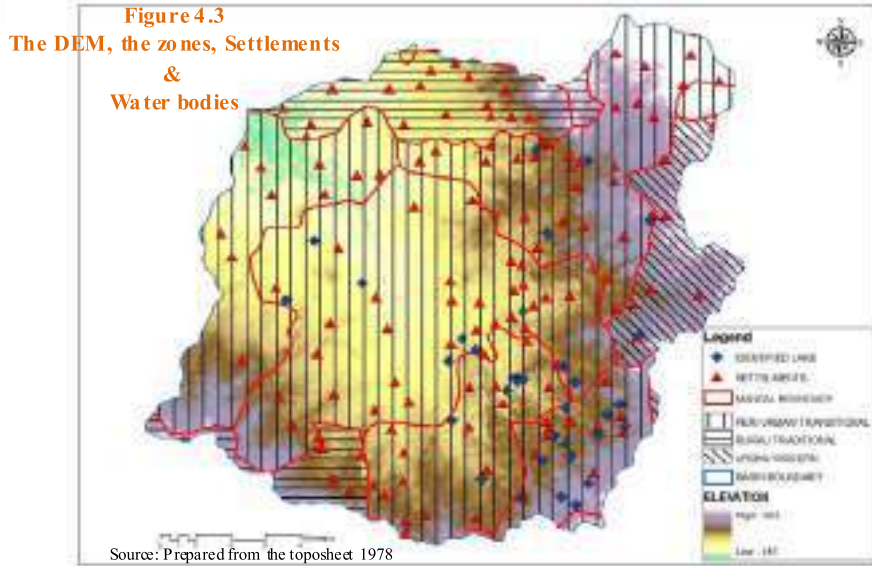

Source: Prepared by the authors

Figure 4.10: Literacy Rate and Percentage Work Participation in non-agricultural sectors across villages within Nakka Vagu Watershed

Source: Prepared by the authors

Figure 4.11: Final selection of villages within Nakka Vagu Watershed

Source: Prepared by the authors

Conclusion and Policy Recommendations

5.1. Conclusion

The study of periurban interface is increasingly becoming an important topic of academic and policy research (Iaquinta and Drescher 2000, Lowry 2010). There is a growing sensitivity towards the fact that rural, periurban and urban environments operate as a system rather than independently and change in one will affect the other. Although significant in the literature and in policy discussions, the concept of periurbanization or interface is filled with ambiguity with several conceptual connotations and different mental images attached to it (Goffette-Nagot, Schmitt, 1998, Adell 1999, Iaquinta and Drescher 2000, Narain 2010). The definitions of periurban are largely situational and case specific (Iaquinta and Drescher 2000). For one group of scholars periurban is a place, a zone of transition between rural and urban (Shindhe (2006, Simon and Mc Gregor et al., 2006). For instance, in the words of Shindhe (2006) there are two main approaches to defining the periurban interface: spatially, as a transitional zone around a city and second as a zone of intense interactions, flows and linkages between urban and rural areas. When used in this sense, 'periurban' refers to rural fringe areas surrounding cities that bear the spillover effect of urban expansion. Conversely, the periurban zone should also be considered as part of the adjacent rural area for purposes of a holistic approach to rural research and development since there are two-way influences and interactions (Simon and Mc Gregor et al., 2006: 9-10)'.

Such place based concept has been contradicted by more process based definition of periurban (Iacquinta and Drescher 2000, Tacoli, 2002 ,Brook and Purushotthoman et al. 2003, Bowyer-Bower 2006 Narain and Nischal 2007) where it is defined as existence of both rural and urban characteristics, rural-urban linkages and the flows of goods and services between them. Iacquinta and Drescher (2000) question the tendency to define periurban in terms of geographical location of a place vis a vis urban centers, but rather underpin the importance of the underlying institutional contexts. This means that proximity to the towns in itself does not define periurban; rather it is the existence of both rural and urban characteristics, rural-urban linkages and the flows of goods and services between them.

Our study has carefully analysed all these different perspectives of periurbanization and concluded that there is certainly a peri urban space around urban spaces, and is clearly different from the rural. The type of town or a village, their socio-economic

characteristics, constitute a factor that explains the more or less distinct presence of a periurban space. Thus zones of low agricultural intensification of urban or rural areas give rise to a zone of intense agriculture essentially catering to the urban markets. That is where we find the most significant periurban area in terms of space, and one which is most different on account of its characteristics from the rest of the typically urban or rural environment. Cluster analysis as depicted in chapter five testifies this fact, wherein distinct PUI can be seen within Hyderabad Urban Agglomeration.

Nevertheless this space is not homogeneous and present uniformly around all towns or cities. This periurban space is itself structured by communication links, which create new inequalities within it. As a matter of fact, the distributional pattern of PUI not necessarily assumes a concentric pattern, rather the periurban reality is more fragmented. So it makes way not only for spaces, whose urban characteristics are highly developed, but also for interstitial spaces. As shown in chapter four, it is the distinctive characteristics of any household, rather than their mere location defines them as being urban, periurban or rural. Thus the study shows that peri urbanization is a combination of both space and processes and it is quite real, visible and measurable. It constitutes today a subject that should be studied at depth with the help of field studies, which will serve to highlight the astonishing diversity of forms it can assume.

5.2 Policy Recommendations

- Literature shows that research on PUI is considerably less compared to what it should have been. Understandably, ambiguity in defining and measuring the concept itself can be one of the reasons, but their measurements are largely restricted due to lack of data. Official statistics, like Census of India does not recognize PUI as a separate entity. What ideally is periurban is actually embedded within either urban or rural denominations of census. Considering the fact that substantial percentages of India households are exposed to these processes of periurbanization, official reorganization and availability of disaggregated data on PUI is therefore crucial.

- Periurban is a volatile space where cultural meaning and social organization that encompasses customary, informal relations, essential institutional features and structural constraints are at constant change. They are often a diffused space of high crime rate and low structural and cognitive social capital Being in the process of such changes, they are the being absorbed whole, marking a jurisdictional change, whether by annexation (actual expansion of the city fringe) or simple reclassification (reflecting de facto urban expansion). More commonly, they are formed from periurban villages by a combination of

these processes. Whichever is the case, because they are being absorbed "whole", such places tend to perpetuate and reinforce the existing power structure and bases of inequality often resulting into conflicts and contestations. In absence of any formal institutional back up, fights, conflicts, complains are often unheard or tackled effectively. Creating a specialized formal institutional mechanism to deal with such changing landscapes are thus critical for effective planning and policy.

Referecences

Kundu, Basanta K Pradhan, A Subramanian (2002): 'Dichotomy or Continuum: Analysis of Impact of Urban Centres on Their Periphery', Economic and Political Weekly December 14.

Adell Germán (1999):'Theories and Models of the Peri Urban Interface: A Changing Conceptual Landscape' Literature review under 'Strategic Environmental Planning and Management for the Peri-urban Interface Research Project'.

Bates, Robert H., 1981, Markets and States in Tropical Africa, Berkeley: University of California Press.

Beauregard, Robert, 1995, "Edge Cities: Peripheralizing the Center", in Urban Geography, Vol. 16, No. 8.

Bowyer- Bower, Tanya A.S. 2006. The inevitable Illusiveness of 'sustainability' in the periurban interface: the case of Harare in D.McGregor, D.Simon and D.Thompson, eds. The periurban interface: approaches to sustainable natural and human resource use. Earthscan VA, USA., pp.151-164.

Dauglas Ian (2006):'Peri urban ecosystems and Societies: Transitional zones and contrasting values' chapter from the edited book 'The peri urban interface: approaches to sustainable natural and human resource use' by Duncan Macgregor, David Simon and Donald Shompson.

Douglas, I. (2006), "Peri-urban ecosystems and societies: transitional zones and contrasting values", in D.McGregor, D.Simon and D.Thompson, e(ds). The periurban interface: approaches to sustainable natural and human resource use. Earthscan VA, USA.

Douglass, Mike, 1998a, "A Regional Network Strategy for Reciprocal Rural-urban Linkages. An Agenda for Policy Research with Reference to Indonesia", in Third World Planning Review, Vol. 20, N°1.

Douglass, Mike, 1998b, Rural-Urban Linkages and Poverty Alleviation: Toward a Policy Framework, International Workshop on Rural-Urban Linkages, Curitiba, Brazil.

Firman, Tommy, 1996, "Urban Development in Bandung Metropolitan Region. A Transformation to a Desa-Kota region", in Third World Planning Review, Vol. 18, N°1.Framework, International

Workshop on Rural-Urban Linkages, Curitiba, Brazil.

Friedmann, John and Mike Douglass, 1975, Agropolitan development: Towards a New Strategy for Regional Planning in Asia, University of California, Los Angeles.

Garreau, Joel, 1991, Edge City: Life in the New Frontier, Doubleday, New York.

Ginsburg, N., 1991, "Preface", in Ginsburg, N., B. Koppel and T. McGee (eds.) The Extended Metropolis: Settlement Transition in Asia, University of Hawai Press, Honolulu.

Iaquinta, D.L. and Drescher, A. W. 2000. 'Defining periurban: understanding rural-urban linkages and their connection to institutional contexts', Paper presented at the Tenth World Congress of the International Rural Sociology Association, Rio de Janeiro, August 1, 2000.

Ingram, Gregory K., 1998, "Patterns of Metropolitan Development: What Have We Learned?, in Urban Studies, Vol. 35, N° 7.

Jean, Yves, Calenge, Christian, (1997), « Espaces périurbains au delà de la ville et de la campagne », Annales de Géographie, no. 596, pp. 389-413.

Karshenas, Massoud, 1997, "Dynamic Economies and the Critique of Urban Bias", in The Journal of Peasant Studies, Vol. 24, N° 1-2.

Lerner, M, Amy and Hallie Eakin(2011), "An obsolete dichotomy? Rethinking the rural–urban interface in terms of food security and production in the global south", The Geographical Journal, Vol. 177, No. 4, December, pages 311–320.

Lipton, Michael, 1977, Why Poor People Stay Poor: Urban Bias in World Development, Maurice, T. Smith, London.

Lofchie, Michael, 1997, "The Rise and Demise of Urban-Biased Development Policies in Africa", in Gugler (ed.), Cities in the Developing World: Issues, Theory, and Policy, Oxford University Press, Oxford.

Losada. H, H. Martínez, J. Vieyra, R. Pealing, R. Zavala and J. Cortés (1998), "Urban agriculture in the metropolitan zone of Mexico City: changes over time in urban, suburban and peri-urban areas", Environment and Urbanization, Vol. 10, No. 2, October, pages 37-54.

McGee, T., 1991, "The Emergence of Desakota Regions in Asia: Expanding a Hypothesis", in N. Ginsburg, B. Koppel and T. McGee (eds.), The Extended Metropolis: Settlement Transition in Asia, University of Hawaii Press, Honolulu.

Narain Vishal (2010): 'Periurban water security in a context of urbanization and climate change: A review of concepts and relationships', discussion paper series of the Peri Urban Project of SaciWATERs.

Narain, V. (2012), "Neglected Frontiers – Peri urban Water Use and Human Health in the National Capital Region" In Prakash. A, Saravanan V.S, Chourney. J(eds), 2012, "Interlacing Water and Human Health - Case studies from South Asia", Water in South Asia, Vol 3, sage publications, New Delhi, pages 360 – 380.

Narain, V. 2009a. Expanding city, shrinking hinterland. Land Acquisition, transition and conflict in periurban Gurgaon. Environment & Urbanization.

Narain, V. 2009b.. 'Gone land, gone water. Crossing Fluid Boundaries in periurban Gurgaon and Faridabad, India.' South Asian Water Sudies 1(2).

Nottingham and Liverpool Universities, 1998, "Literature Review on Peri-Urban Natural Resource Conceptualisation and Management Approaches", Initial Draft, Peri-Urban Production Systems Research, Natural Resources Systems Programme, DFID, London.

Oliveau Sébastien (2005): Periurbanization in Tamil Nadu: A quantitative approach C S H Occasional Paper.

Rakodi, C., 1998, "Review of the Poverty Relevance of the Peri-urban Interface Production System Research", Report for the DFID Natural resorces Systems Research Programme, 2nd Draft.

Rondinelli, Dennis A., 1984, Applied Methods of Regional Analysis: the Spatial Dimensions of Development Policy, Westview Press, Boulder, Colorado.

Rondinelli, Dennis, 1991, "Asian Urban Development Policies in the 1990s: From Growth Control to Urban Diffusion", in World Development, Vol. 19, N° 7.

Schenk, H. (2005) "India's Urban Fringe" In Dupont V(ed), "Peri – Urban Dynamics: Population, Habitat and Environment on the peripheries of large Indian Metropolises A review of concepts and general issues", Publication of the French Research Institutes in India, Vol 14, pages 126 – 149.

Simon, David, Duncan McGregor and Donald Thompson, 2006. 'Contemporary perspectives on the periurban zones of cities in developing areas' in D.McGregor, D Simon and D. Thompson, eds. The periurban interface: approaches to sustainable natural and human resource use. Earthscan VA, USA, pp. 1-17.

Soja, Edward, 1992, "Inside Exopolis: Scenes from Orange County", in Sorkin, M. (ed.), Variations on a Theme Park: the New American City and the End of Public Space, New York, The Noonday Press.

Tacoli, C 2002. Changing rural-urban interactions in sub-Saharan Africa and their impact on livelihoods: a summary. Working Paper 7. International Institute for Environment and Development: London. 40 pp.

Tacoli, C. (1999), "Understanding the Opportunities and Constraints for Low-Income Groups in the Peri-Urban Interface: The Contribution of Livelihood Frameworks," p. 7. Draft for Discussion. London: Peri-urban Interface Project, Development Planning Unit, University College London.

Tacoli, C. (2003), "The links between urban and rural development", Environment and Urbanization, Vol 15, No 1, April, pages 3–12.

Tacoli, C. 2006. 'Editor's introduction' in C. Tacoli e(d). The earthscan reader in rural-urban linkages, London: Earthscan. International Institute for Environment and Development.

Unwin, Tim, 1989, "Urban-rural Interaction in Developing Countries: a Theoretical Perspective", in Potter and Unwin (eds.) The Geography of Urban-rural Interaction in Developing Countries: Essays for Alan B. Mountjoy, Routledge, London.

Saci**WATER**s