CHAPTER 2

REVIEW OF LITERATURE

2.1 GENERAL

Literature on various research works carried out in the field of Systems Dynamics (SD) modeling in Transportation, Transportation and emission sector in India has been collected and reviewed. Several study have been conducted to understand the trend of Peri Urban areas and land use pattern of cities. It is the time to look back at the past to get acquantified with the achievements and the techniques that have been developed so far. Hence, related works in this field of study have been reviewed and are presented below.

2.2 MODEL DEVELOPMENT IN LAND USE DYNAMICS IN PERI URBAN AREAS

Land use dynamics in Peri Urban areas and their implications on the urban growth and form: the case of Dar es Salaam, Tanzaniar. (Wilbard Jackson Kombe/Habitat International-2005) examines the recent trends in the land use transformations taking place in the Peri urban areas of Dares Salaam, Tanzania. It demonstrates that urbanization is the key factor underpinning and catalyzing changes in land use, land transactions, increased rural-urban immigration and the overall transformation of land use in the Peri urban areas. Unregulated Peri Urban land development has given rise to complex organic urban structures which have been expanding horizontally.
The emerging form displays a unique structure of land use which is increasingly breaking away from normative urban land development norms, concepts and standards. The form is also fraught with a number of problems: lack of foresight in land use structures, absence of public surveillance, uneconomical land use distribution, development pattern and increasing public health threats as settlements density.

Observations made in two cases and urban development trends in Tanzania and many cities in sub-Saharan Africa support Watson’s (2002) observation that the future of planning appears gloomy and take a central position in addressing the new development issues. This underlines the need for planners and urban managers to understand and appreciate social and economic factors, including poverty related forces underpinning organic urban growth as well as the factors involved and enhance their roles and capacities.

2.2.1 Studies on Urban Density

The Changes in Urban Density: its implications on the sustainable development of Australian cities’ seeks to develop the phenomenon of urban density and its effects on the sustainability of urban development, functionality and management of Australian cities. The paper (Brian H Roberts 2007) explores different attributes of urban density and presents a conceptual framework to explore the relationship of these to sustainability criteria. This work presented is confined to an exploration of urban density demographic and urban residential development. A simple time series measurement of changes in urban density for select Australian cities drawing upon (Australian Bureau of Statistics (ABS) and satellite imagery data.
It shows the growth of urban areas of Australia’s largest (Sydney) since 1990 at over 2.4% per annum while the population growth rate is around 1.2%. The population densities of Australian cities have been falling at about 0.8 per annum. The paper examines some environmental impacts of urban density on the sustainability of urban systems.

Nicodemus Mandere Mandere et al (2010) has conducted a study with the objective of assessing the impact of the Peri urban development dynamics on household income using the case study of Peri urban Nyahururu, Kenya. The analysis shows a decline in fulltime forming households from 90% in the 1960’s to 49% in the year 2004: an indication of the declining economic significance of agriculture. The decrease in agricultural land area was mainly due to the sale of land for residence, business premises and also land bequests to children.

In return, households have adopted diverse non-farm activities whose earnings proved to be of varying importance to the annual household income. The infrastructural development coupled with emerging business enterprises was found to be the main factor that improved the opportunities for household engagement in high income productive activities. As also rapidly shrinking household agricultural land as low and fluctuating.

Therefore the possibility for peri urban development to accomplish a reduction in poverty for the households does not depend on infrastructural developments alone but also on the socio-economic opportunities that arise from the developments dependent on the developers involved and the government policy.

The concept of growing extension of urban areas requires increased individual and public transport facility leading to an increase in tangential
traffic movement. Suburbanization leads to characteristic environmental loads. From the environmental point of view, the networking of cities causes fragmentation of nature and landscapes, the transformation of habitats into different forms of land use and the loss of natural areas. The concept of sustainable development and of environmentally sustainable development have to be formulated and implemented by a variety of disciplines including spatial and environmental planning at regional, urban, and landscape levels by Ulrike Weiland (2000).

2.2.2 Innovative Approaches in City Planning

Sophie SCHETKE et. al (2010) presents an innovative approach for a multi-criteria assessment (MCA) of specifically for the socio-ecological potentials and limitations of future housing sites in cities in terms of their contribution towards a sustainable and resource-efficient settlement development. Its focus on a sustainable development its application has been exemplified at the strategic level of German preparatory land use planning. looks at the current state of the cities in the world and particularly in Nigeria where the planning has been very inefficient in meeting set objectives and examines the concept of a livable and sustainable city and suggests ways in which the goal of a sustainable city could be accomplished given the interplay of so many complex forces by Kediri Kabir (2006).

This part is divided into two main sections. The first introduces literature about urban-rural connections in the United States and Canada. Urban, Rural land uses in these countries are no longer mutually exclusive but rather exist on community types that are increasingly interconnected migration and settlements patterns are changing new forms of urban, suburban and exurban development alter patterns of community development. The population is increasingly decentralized as sub urbanization is being
replaced by exurban development characterized by low density growth where households with fewer people are living on larger pieces of land further from urban centers.

The second section focuses on developing countries where there is a clear divide between urban and rural areas distorting the realities of urban, rural and the increasingly important peri-urban areas where both urban and rural characteristics are found.

The increasingly complex connections between urban and rural areas are getting recognized but still have relatively limited impacts on development policy and practices (Tacoli 1998). Regional development planning is used for creating a better balance between urban and rural areas migration pressure on urban areas has disproportionately benefitted large firms and wealthy land owners, instead of simulating regional economics. Goods and services required by the new economic activities stimulated by these policies come from businesses located outside the regional boundaries and the new income is not reinvested in the community (Tacoli, 1998). Economic and social conditions in peri-urban areas can be improved only through targeted intervention aimed at the linkages and interactions within regions.

Efforts to improve the urban environment, local governments are especially critical. Local governments are responsible for most aspects of environmental management at the city level, in the provision of urban infrastructure and land use planning to local economic development and pollution control. In the country, local governments have severe stress arising from urban change, population growth, fiscal pressures, growing demand for services spiraling and population.
2.2.3 Critical Study on Urban Planning Standards

Michael Leaf (2002) looks at the evolving situation in two periurban villages undergoing urbanization and integration, one on the other edge of Quanzhou, Fujian, China and the other on the periphery of Hanoi, Vietnam. Generation of local spatial transformations by fundamental economic and social changes is observed and that the influences of globalized processes in these settings are felt primarily through diffuse, opportunistic, and indirect channels.

The globalization in cities is complex, multifaceted and geographically diverse. As a result of national policy changes over the past two decades, the urban impact of increasing global connectivity in China and Vietnam have been sudden and swift in contrast to the more gradually formed transponder linkages of cities elsewhere in Asia. In each country, the shift to market economy, opening up to outside investment, and the subsequent acceleration of economic change have prompted rapid expansion of urban spatial economics.

Lusugga Kironde et al (2005) describe evaluation of planning standards and administrative procedures as applied to a specific scheme at the outskirts of the city of Dares Salaam, Tanzania. The high standard for plot sizes and road reserves have resulted in the production of only as against 15,000 plots over same the area with the adoption of more realistic standards. The unit cost per plot would have been a quarter of what it came to be. Centralized and bureaucratic set-ups and procedures resulted into highly prolonged periods before planning schemes could be implemented; or land, certificates of title or building permits were made available to prospective developers. Many developed land without these permits or titles. Land was
much easier to get in unplanned areas but converting it into under the legal process virtually impossible.

The policy framework supports the revision of planning standards; the incorporation of communities and the private sector in land delivery; and the decentralization and the streamlining of procedures. In practice, official aims were at high standards, centralized and lengthy administrative procedures, and direct public sector involvement in land delivery. Evidence is provided of the deleterious effects of the continued hesitation for addressing the regulatory framework whose revision downwards would result into more legal land being available, under permissible laws faster and at a lower cost; thus reaching more of the low income households, reducing unplanned development and making a positive impact on dealing with urban poverty.

2.3 SD MODELING FOR PERI URBAN PLANNING

In order to regulate the growth of Chennai in an orderly manner for the present and the foreseeable future, this work makes an attempt to emphasize the importance of guided development in fringe areas of Chennai using land use characteristics of Chennai and its Peri Urban areas in the six southern corridor using the Systems Dynamics approach. For Chennai city, future land use scenario for residential purpose is predicted for FSI 1.5, 2, 2.5 based on past data, The residential land area of Chennai city would get saturated by 2017 for 1.5 FSI with a maximum holding capacity of 49.13 lakhs for 2 FSI residential area would get saturated prior to 1.5 FSI by 2013 with a maximum holding capacity of 50.28 lakhs and for 2.5 lakhs FSI it would get saturated well ahead by 2011 with a maximum holding capacity of 52.66 lakhs. In the case of Peri Urban areas, density would be of 275 persons/ha. The residential land area left for 1.5 FSI is 593.33 ha. whereas for 333
persons /ha and 500 persons /ha it would be 1222.80 ha with a growth rate of 55%.

The residential land areas left for 2.5 FSI are 2787.92 and 2434.05 ha with a growth rate 3%. whereas for the density of 275 persons/ha, the land area left for 2.5 FSI would be 1657.62 ha. The result from the scenario analysis gives an outlook of a maximum holding capacity for Chennai city and future trend of residential land use in peri urban areas with respect to current trends and assumed conditions. The land use model explains the trend of development in residential land area due to increase in FSI. The result emphasizes on increasing the FSI in order to increase the holding capacity of the city. The analysis results predict that Chennai city would be saturated by 2017 with maximum holding capacity of 49.13 lakhs and land areas (resources) are available in peri urban areas for future growth. This is now the right time to develop Infrastructure facilities in the Peri Urban areas in order to encourage guided development by Tharini (2012).

India is in the course of an economic transition. The economic growth nurtured the life in the cities has become a major livelihood destination for everyone. This migration of people has contributed to the increased urbanization of Indian cities. The booming economy fostered the well-being and shaped the lifestyle of people in such a way that the dependency on private vehicle has become inevitable. Along with population growth, the increased vehicle ownership has given rise to an overall spurt in travel demand. But the supply side lags behind the demand adding to many of the transport related problems such as accidents, congestion, pollution, inequity etc. The importance of sustainability is understood in the current urban transport scenario leading to the development and promotion of sustainable transport polices.
2.3.1 **Sustainable Urban Transport Planning**

The core agenda of these polices is to target the travel behaviour of people and change travel models by creating a different travel environment. However, the impact of many such policies is either unknown or complex. Hence, before adopting and implementing such policies, it is important for the decision makers to be aware of the impact. The role of travel demand models comes here as they predict the future travel demand under different policy scenarios. This reviews the ability of travel demand models applied in India in analyzing sustainable transport policies. The study found that the conventional model system in India, which is trip based four step aggregate methodologies, is inadequate for analysis of the sustainable transport policies.

A review of an alternative approach, known as activity based travel demand modeling reveals the incapability to handle such policies better than conventional models and are helpful to the decision makers in arriving at the right mix of polices specific to the situations. Since there is no operational activity based travel demand model system developed in India, the study at the end envisages a conceptual framework of an integrated activity based travel demand model based on the requirements identified from the review. This can potentially replace the existing travel demand models and can be used for planning applications once the modification and validation have been done according to the existing activity-travel behaviour of individuals.

Worldwide, population is getting increasingly centralized in metropolitan areas. This has an impact on water systems and complex metropolitan watersheds emerge. Flows of varying water quality are generated and distributed among different users who develop new opportunities and coping mechanisms for dealing with marginal quality water. In developing countries waste water management often fails to cope up with
increasing numbers and volumes of flows. Financial and institutional limitations force waste water managers to discharge substantial amounts of untreated or partially treated waste water into surface waters. Consequently, use of polluted water is becoming increasingly common in the downstream peri-urban agricultural areas. This, albeit productive, may lead to negative impacts on human health and environment, for the absence of the right water management.

Mitigation of the problems requires rethinking of conventional ‘top-down’ waste water system design and management in combination with expected down-stream use. In this chapter the applicability of water governance principles in design and operation of waste water systems with an effluent use component is investigated. Acknowledgment of the treatment potential of subsequent uses and the significance of use-based practices as opposed to zero pollution design will certainly change design and treatment procedures. Inclusion of agriculture and nature as a treatment step and participation of users in decision-making are expected to optimize the use of finance, infrastructure and personnel by B. van Vliet et al.

2.3.2 Sustainable Peri-Urban Planning

Flexible transport systems (FTS) can offer an alternative to fixed route fixed schedule bus services in situations of low and dispersed demand. Although it is widely recognised that these on-demand services provide a better level of service to passengers at a lower operating cost than the infrequent fixed route services which they often replace, they still require significant financial support to cover their costs. As local authority budgets to support public transport continue to be reduced the sustainability of these services is being brought into sharper focus. In this, comparison and contrast of the development of FTS in UK, Japan and India is made. In particular the
extent to which new technologies are being used to contribute to a reduction in operating costs in the UK and Japan is examined and whether these developments point to a future model for sustainable flexible service provision in developing countries, using India as an example by Steve Wright et al (2014).

The article looks at contestations over space in Peri urban India. It studies the acrimonious responses in defence of a local marketplace that occupied public land against the sovereign project of highway expansion in Peri urban West Bengal. It posits an opposition between two aspects of state governance—rational–legal and magical—that shape the contentions. In the rational–legal mode, the expansion of the highways represents the official development goals for progress. The magical aspects of the State engender the circulation of officially approved illegal chits that give occupying migrant villagers’ claim to the space around the highway.

Ethnography looks at the economy of illegal chits that political parties and local bureaucracies use to bring migrating villagers within their ambit. It explores illegal chits the manner of embodiment of the state’s legible presence in the villagers’ everyday lives, their kinnet works, and on communities and transform individual affective orientations toward space. In these new modes of simultaneous “space” and “place” making, public land is understood less as commons, but more as a stretch that could be divided among individuals and households aspiring to be “developed” or upwardly mobile by excluding others. The essay contends that emergence of the “right to the city” as a collective right requires a double-edged critique. A simple celebration of the subversive potential of the magical aspect of the state vis-à-vis its rational–legal mode may not be helpful for a politics of values that seeks to challenge the idea of value (or what makes life worth living)
embedded in the wider neoliberal development discourse by Sarasij Majumder (2014).

Indian cities face a transport crisis characterized by high levels of congestion, noise, pollution, traffic fatalities and injuries, and inequity far exceeding those in most European and North American cities. India’s transport crisis has been exacerbated by the extremely rapid growth of largest cities in the context of low incomes, limited and outdated transport infrastructure, rampant suburban sprawl, sharply rising motor vehicle ownership and use, deteriorating bus services, a wide range of motorized and non-motorized transport modes sharing roadways, and inadequate as well as uncoordinated land use and transport planning. This article summarizes key trends in India’s transport system and travel behaviour, analyzes the extent and causes of the most severe problems, and recommends nine policy improvements that would help mitigate India’s urban transport problems by John Puchera et al (2005).

2.3.3 Settlement Planning in Metro Cities

Several studies of relationship between urban land use and travel have shown correlations between daily-life travel behaviour and the location of the dwelling. However, in order to substantiate that residential location is a (contributory) cause of such differences, the basic mechanisms by which the location of dwellings influences travel behaviour should be shown. Examples showing the rationales on which people base their frequency of participation in out-of-home activities, the location of these activities, the modes of travel used for reaching these locations, and the routes followed make up important elements in this endeavour. Based on qualitative interviews carried out as part of a comprehensive study of residential location and travel in Hangzhou Metropolitan Area, China, this article seeks to show how various types of
rationale for activity participation, location of activities, travel modes and route choice tend to strengthen or weaken aggregate-level relationships between residential location and travel. In particular, the influences of such rationale on the relative importance of residential location close to the main city centre and local centres, respectively, will be demonstrated.

The tendency of inhabitants in modern cities to emphasise on the possibility of choosing among facilities rather than proximity means that the volume of travel is influenced to a higher extent by the location of the residence in relation to concentrations of facilities, rather than the distance to the closest single facility within a category. Travelling distances daily therefore tends to be more influenced by the distance from the dwelling to the city’s main concentration of facilities (usually the inner-city) than by its distance to local centres. The same applies to the travel modes chosen, where rationale concerning physical efforts, time-saving and flexibility motivate inner-city dwellers for more frequent use of non-motorised modes and fewer trips by car than among suburbanites by Petter Næss (2013).

2.3.4 Growth Pattern of Metro Cities

This study examines the process of restructuring taking place in metropolitan cities in India. The opening up of the Indian economy since 1991 has brought palpable change in large cities. Both local and global agencies have played a significant role but with considerable variation in different states of the country. Taking the case of Bangalure (Karnataka) and Kolkata (West Bengal), the objective is to examine these agencies and their impacts on the cities’ growth policies. As an early leader of the reform process, Karnataka state and Bangalore, its capital, provide a contrast to West Bengal and its capital, Kolkata. The sub-national comparative study
undertaken here could have wider applicability to other large developing countries by Shaw (2007).

The emergence of the satellite cities as feeder cities to major metropolises is a phenomenon of increasing urbanization. Employees and students travel to major cities, returning on mediocre public transport or congested highways. Problems in some satellite cities range from deficient local employment opportunities, to social and cultural activities, and economic development. Concurrent local unemployment and higher crime rates suggest that citizen’s experience stresses. These factors affect the citizens' brand experience and identity. Conversely, self-sustaining cities associate with strong economic and social roots.

The developing city branding research domain has yet to address stressed satellite cities' branding. The purpose of this study is to develop the nature of a stressed satellite city brand profile. This quantitative study examines two stressed satellite cities, developing a common stressed satellite cities brand profile. The findings develop a common stressed satellite city brand profile, facilitating policies addressing stressed satellite cities' problems by Bill Merrilees et al (2013).

After a discussion of the meaning of ‘sustainable public transport’, this Workshop discusses issues of need, system design, institutional arrangements, environmental improvements and social aspects of service. Land use/transport integration was seen as critical for long term strategic direction setting for public transport, backed by sustainable financing/funding arrangements. These need to encompass such revenue sources as externality pricing, user pays, beneficiary pays, wider value capture, asset sales and other opportunities. Such matters are just some of the important examples of governance/institutional design considerations that underpin sustainable
public transport, an area the workshop recognised as needing much greater future focus. Ways to improve use in growth of public transport, and service delivery efficiency and performance, in both trunk and local markets were discussed, with specific focus on flexible transport systems. Whether these services should target specific niche markets or pursue a wider customer base was an area of some disagreement requiring further research, in a low density developed country setting. The different roles played by flexible transport systems between developed and emerging countries were palpable. The workshop developed a set of general principles intended to further promote sustainable public transport John Stanley and Karen Lucas (2014).

2.4 MICRO LEVEL STUDIES IN PERI URBAN SETTLEMENTS

The main objective of this study is to develop GIS based database for Peri Urban areas and developing a system model for reasonable density value. The study area selected in the southern part of Chennai Metropolitan Area. This has been divided into five zones on the basis of population and growth. This geo data base consists of land use and population data collected from CMDA. The methodology for the study comprises review of literature, data collection, geo data base creation, model building, model analysis, results and recommendations.

System dynamics model has been developed for the study and tested for various scenarios of density values in order to find the sufficiency level of Peri urban development. Under do minimum condition of taking 275 persons per ha. as density value zone 4 namely Perumbakkam, the excess of floor area (maximum value) observed in the horizon year 334.96 ha. In s desirable conditions, taking density value as 333 persons per ha. in zone 2 namely Okkiyam Thuraipakkam, the excess of floor area (maximum value) was observed in the horizon year as 795.77 ha. Whereas in extreme
conditions, taking density value as 500 persons per ha. in zone 2 namely Okkiyam Thuraipakkam, the excess of floor area (maximum value) observed in the horizon year as 1754.07 ha. From this study, the geo data base has been created for all five zones with vital attribute data and system model has been developed for density value of 275 / ha. with growth rate of 6 percentage for every year which shows good result in land area availability in all five zones. Hence, it is recommended that peri urban areas development in southern part of Chennai Metropolitan Area (CMA), this density value may be considered by Sundarraj (2012).

2.5 INFERENCES FROM LITERATURE REVIEW

Several observations are made from the literature review. Peri Urban areas are rapidly growing and this growth must be regulated by following provisions:

- Innovative concepts such as Accommodation Reservation and Minimum lot zoning restricting higher density developments would orient the development towards optimum density.
- Detailed planning and regulations should be devised for peri urban areas.
- Increase in FSI is generally good for places like Mumbai where there is scarcity of land and the prices are very high.
- Transferable Development Rights can be proposed in the case of road widening to attract development.
- The State has to take proactive measures and put in place and institutional framework for regulating land use development.
- Transit way should be encouraged to guide growth in suburbs in order to avoid development tin a haphazard manner.

- City growth is enormous and it can be accommodated by promoting development in Peri Urban.

- GIS is the one of important tools for analysis and evaluation of the available land use at macro level for sustainable development in Peri Urban area.

- Urban area development should be channelled under the control of local authorities, using GIS and Remote Sensing techniques especially in planning stages and monitoring urban areas.

- Effective utilization of scarce land to avoid the underutilization of land in developing countries like India.

- Study of transport, land use and emission interaction is warranted with advanced modeling methods.

- Tools in ArcGIS software such as Model Builder allow alternative scenarios to be generated easily, tested and regenerated, and presented to improve the decision making process.