SUSTAINABLE MOBILITY SERVICES FOR PASSENGERS IN KOLKATA

A THESIS

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DESIGN

By

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CANDIDATE'S DECLARATION

I hereby certify that the work which is being presented in the thesis entitled **SUSTAINABLE MOBILITY SERVICES FOR PASSENGERS IN KOLKATA** in partial fulfilment of the requirements for the award of the degree of Doctor of Philosophy submitted in the Department of Architecture & Planning, Indian Institute of Technology Roorkee, Roorkee is an authentic record of my own work carried out during the period from January 2004 to September 2007 under the supervision of Mr. P. K. Patel, Associate Professor and Dr. Ila Gupta, Assistant Professor of the Department of Architecture & Planning, Indian Institute of Technology Roorkee, Roorkee.

The matter presented in this thesis has not been submitted by me for the award of any other degree of this Institute or any other Institute.

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27/09/07

This is to certify that the above statement made by the candidate is correct to the best of our knowledge.

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Abstract

Every human being on this planet has the rights to survive and live well. But having rights is not the only solution; it should be implemented in a proper way so that every body gets benefited. The whole world is an ecological system and sustainability of this system is very much dependent on three pillars like environmental, economic and social aspects.
It is true that the non-renewable resource materials are limited and the whole future human generations will have to survive with the help of this limited resource materials. The distribution of materials and the distribution process and system to distribute were not efficient enough to support every strata of human civilization because of various socio-political reasons. Also increasing difference between the rich and poor segments of the society is also increasing day by day because of unsustainable two hundred years of industrial economy.

The growing population mainly in the developing countries indicates the requirement to necessitate the change in strategies in socio-economic policies of these governments for their economic activities to afford this increasing population. The over consumption by the particular segments and under consumption by some other segments of the society already generates many kinds of socio-political problems those the human society is facing through out the world in every country.
Fossil fuel is one of the burning issues now-a-days; the whole world is facing with, and already faced many such regional wars in the recent past. One of the major areas of consumption of fossil fuel is mobility activities in the city, where fossil fuel is extensively used by every vehicle. Also one of the main reasons of pollution in the city is the mobility activities and the emission generated by this particular activity.
But cities as the growing economic centers of world activities, attracts people to move from one point to another point for their participation in various kinds of economic activities within the city. In this situation, these time poor passengers in the city have to use various kinds of mobility activities to solve their purposes.

As already explained that because of various kinds of socio-political and economic reasons the distribution of resource material was not proper and equal through out the history. Also many people use to use them in different ways according to their various purposes and according to their capabilities. These capabilities may vary from passenger to passenger according to their preference to act for solving their purposes.
So to achieve the sustainable consumption and production scenario in a city, one has to define the pattern of mobility activities in a systemic way. But as every passenger has the freedom to achieve their goals, the system should

have the efficiency to provide enough number of solutions to choose that they are having reasons to value. This value system is very much generated by culture.
So a change in culture of consumption is very much required for those passengers who like to use their personal vehicles for movement purposes within the city. Also there should be an efficient system of mobility activities for mass passengers who can not afford to have a personal vehicle and also should not opt for according to research findings and literatures.

A networked system of various kinds of mobility activities is very much required within a city for various kinds of passengers and their various kinds of preferences within the market economy. The freedom of transparent transaction is very much required to promote sustainable mobility activities for every segments of the society.
The phenomenological system perception of networked mobility activities by every passenger validates the human capability to adopt the situation to generate sustainable consumption and production pattern with social harmony. The participation of the passengers to generate concept of commercially sustainable mobility activities can be found in Kokata.

Special Note: Many references of different writers from their old publications were coated from some different latest publications. So in the Bibliography, the researcher tried to refer both the old and new publications simultaneously.
In many cases the researcher tried to refer the internet sources for collecting study material for reference purposes.

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Introduction

1.1 Introduction

The report "Our Common Future", submitted by the World Commission on Environment and Development (WCED) to United Nations, defined sustainable development as "Development that meets the needs of the present generation without compromising the needs of the future generation". Also argued that economic development and environmental protection in fact could be made compatible, but this would require radical changes in economic practices throughout the world.

The sustainable development concept, presented by WCED, stressed the role of industry and new production patterns in reaching a stable status of sustainable development; and also further developed to include the need of new consumption patterns and to discuss the role of consumers. Agenda 21, the final document of the Rio Earth Summit 1992 stated, "The major cause of continued degradation of the global environment is the unsustainable pattern of consumption and production, ..." In order to reach the triple bottom line of sustainability (environmental, economic and social), production and consumption systems should give more attention to values, elementary human needs, resource property, product and service functions, and local conditions, in both developed and developing countries.

Dematerialisation is the concept, which aims to reduce the environmental impact per unit of economic activity. The baseline is that we need to produce more (to feed the growing population) with fewer natural resources (50% reduction) i.e., a technological shift from the enormous use of resource material and less amount of waste generation, both from economics and environmental point of view, obtainable from a Product-Service-Systems (UNEP PSS Business model, 2002). Service activity or more technically, Product-Service-Systems (PSS) can be defined as the result of an innovation strategy, shifting the business focus from designing and selling physical products only, to selling the functions of a system of products and services, which are jointly capable of

fulfilling specific client demands. So the economy is based on providing functions rather than products.

Mobility consumption is one of the challenging areas in sustainable consumption research because of growth in economic activity in urban areas. Environmental pollution per capita is increasing simultaneously by decreasing the amount of resource materials because of increasing number of personalization of vehicles for growing buying power of the time poor consumers.

1.2 Literature Review

Many Researchers and Thinkers (e.g. Manzini, 1990, 1992, 1993, 1994, 1997, 2003, 2004, 2006; Schmidheiny, 1992; Cramer, 1993, 1994, 1995, 1996, 1997, 1999; Fussler, 1996, Evans 2004, Vezzoli 2005 etc.) discussed the idea to intervene in current consumption practice by developing and introducing innovative products and services. This is often seen as a challenge to industry because it requires completely new solutions for fulfilling customer needs. Solutions, those not only have to be more environmentally efficient but also have to be competitive in the consumer market.

This approach differs from the approaches followed in the past (e.g. Vlek and Michon, 1992; Midden and Bartels, 1994; Tertoolen, 1994 etc.), where it was assumed that the consumer behaviour was mainly influenced by Govt. policy. But Design researchers (Manzini, 2003; Brezet, 1997; Evans 2004; Vezzoli, 2005; Mont, 2002; etc.) have shown that a bottom-up solution can provide the

sustainable consumption and production pattern by adapting the local value system.

The 1994 Oslo Symposium, hosted by Norwegian Ministry of the Environment, produced this working definition of sustainable consumption: "the use of services and related products which respond to basic needs and bring a better life while minimising the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardise the needs of future generations" (MD, 1994).

The concept of "Eco-efficient Services" entails a specific analysis of the interaction between the economy and the ecology, especially with respect to flows of material. This is particularly important since, through technological development, companies design the transformation process of resources – or what has been defined as "consumption practices" – into socially useful and desired results.

Rens G. Meijkamp (2000) has shown about changing consumer behaviour through Eco-efficient car services in Netherlands in his empirical studies. Eco-efficiency addresses the challenge of making production more efficient, but it does not include consumption patterns from the consumer behaviour point of view. As was shown before, there is a possibility that the environmental benefits of efficient production may be negated if consumption levels continue to rise. Therefore, eco-efficiency answers just half of the sustainability challenges. It

must be accompanied by concepts and approaches dealing with fundamental changes in consumption patterns before sustainability can be achieved.

Sustainability considers three basic pillars; those are environmental, social, economical issues. Every aspect has to be satisfied simultaneously with rest other two aspects. So at the time of considering the sustainability issue, all the three aspects must be considered together.

1.3 Hypotheses

Every passenger in Kolkata can choose a set of various kinds of urban mobility services to reach his/her destinations for daily life purposes. Passengers differ in valuing these various mobility services and activities (i.e. various kinds of Product-Service Systems concepts, walking, bicycling) according to their 'life strategies' to achieve their well-beings.

The freedom to lead different types of mobility services consumption strategy is reflected in the passenger's capability set. The capability of a passenger depends on a variety of factors, including personal characteristics and social arrangements. If individual passenger can reach her destination through consumption of mobility services and activities, those are available in Kolkata with the help of full exploration of her capability as expression of freedom, then the agency goal of the passenger community is to create a sustainable

production and consumption pattern of mobility services activities of Kolkata, can be achieved.

Potentially this kind of production & consumption pattern can be an alternative path to human socio-economic development against the present unsustainable Industrial economy.

1.4 Objectives

The following objectives are framed in this investigation in the area of Mobility Services and activities of Kolkata. They are:

1) To study the consumption pattern of mobility of passengers in Kolkata

2) To study the economic, environmental and social dimensions of Sustainability of mobility service consumption for full journey of passenger

3) To access the Sustainable Product-Service-Systems concept of passengers-mobility services in Kolkata

4) To study the socio-economic development in Kolkata due to Sustainable mobility services

5) To study the relation between local context & Sustainable mobility service pattern

6) To study the role of designer in design of sustainable mobility services in different parts of city.

1.5 Scope of the study

In India, out of the total population of 1027 million (Census 2001), about 285 million (27.8 per cent) live in urban areas. The net addition to the population over 1991- 2001 was 68 million in urban areas with Greater Mumbai the highest at 16.4 million, followed by Kolkata (13.2 million), Delhi (12.7 million), Chennai, Bangalore, Hyderabad, Ahmedabad, Pune, Surat etc.

The key to a more 'sustainable mobility', for instance, lies in town planning and systems optimization, not in vehicle technology according to French architect Tony Garnier. "Sustainable mobility" can be defined as any method of mobility which enables a person to move with less energy input including by walking, bicycles etc also.

In adoption of a PSS business model implies new types of stakeholder relationships and/or partnerships, new convergence of economic interests, and a concomitant systemic resources optimization. Further, if we broaden this notion of whole system optimization beyond a single product life cycle to an interconnected series of product and service life cycles, then the potential for eco-efficiency gains becomes even greater.

For need of study the Researcher has taken Mobility consumption of passengers in Kolkata as case study research. Kolkata is one of the mega-city in eastern part of India with population of 13.2 million (approx. population density of 24,760/km², Census 2001). The researcher tried to understand the concept of

sustainable mobility consumption and production system model, so that it can be applied in similar condition of urban contexts in other cities to achieve the sustainable scenario in mobility sector.

1.6 Methodology

Both primary and secondary survey methods have been adopted for this present research. The detail of the research methodology is presented in Figure 1.6.

1.7 Survey methods and Data collection

This present research consists of practice based primary survey methods. Consideration has been given to construct validity and reliability. Remote observation of the consumption patterns of the passengers were very much required to be noted before taking any decision about Data collection.

In the next phase Data collection and Verification of the consumption of resource material & energy per capita were calculated for mobility consumption. Low resource material and energy consumption per capita oriented mobility services were selected for the consideration of sustainable scenarios.

The patterns of the consumption of passengers were observed and Informal Interviews were taken to know their experiences about their daily life strategy of consumption of mobility services for fulfilling their daily life needs. The informal Interviews of passengers were very much focused asking the specific questions informally, like the researcher was also a passenger and trying to communicate with his co-passengers on the way of journey. More emphasis was given on

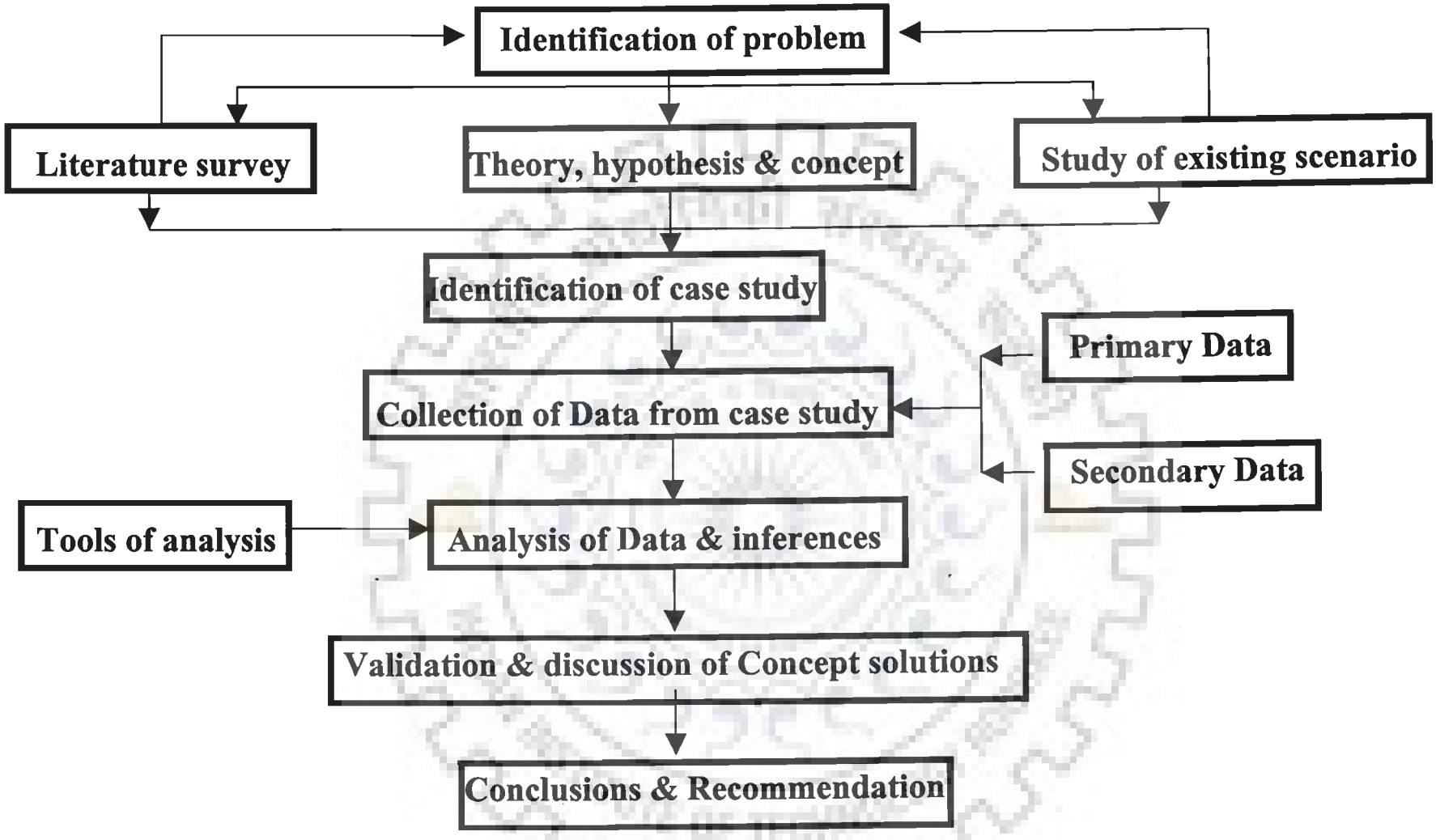

Figure 1.6 Research Methodology

"How do they consume" and "Why do they consume" aspects simultaneously with 'Which mobility service' aspect of the mobility consumption of the passengers. The passengers were asked to take a note of their consumption activities of mobility services for various daily life purposes, considering that they would provide the right information.

For validation purposes, Photography technique was adapted to document the consumption patterns as a capability to reach the destinations of daily passengers in Kolkata. The researcher observed but did not interact with the research subjects (i.e. passengers) to verify with what they said at the time of Interview. Indeed, the subjects did not know that they were being observed via the use of a camera in the case of mobility service consumption behaviour in a journey. This ensures that the subjects were not affected by being observed. Once the researcher gets the idea of the consumption pattern of a full journey of passengers through observation; calculations were being done for the economic, environmental and social aspects of sustainability for per capita consumption of mobility services.

The researcher himself also experienced the consumption pattern of mobility services of Kolkata as participant observer for various kinds of situations in the city life, considering and observing various types of space of activities for himself and others, which are situated through out the city to influence the decision making process of passengers in choosing a set of available mobility

services for consumption purposes. The researcher belongs to the city of Kolkata, and a permanent resident for more than thirty years, so it was easier for the researcher to move from one point to another point of the city easily like any other regular passenger as he was familiar with the culture of the city very much.

1.8 Analytical methods

Tabulation and calculation techniques for those general few questions; ethno-methodological and conversation analysis, photography documentation in the social sciences were adapted to analyse the passenger consumption strategy oriented informal interviews and their bodily actions in creating local rationality. Also informal interviews were taken of other stakeholders about their business strategy and strategic convergence with others for sustainability of mobility services. The existing service pattern of Kolkata was studied and documented.

1.9 Limitations

There were few limitations for this research. Those were as follows:

- Time limit: within the limited period of time the research had to be completed. And that also, doing interview for 458 passengers & questionnaire survey for validation purposes for almost 1478 passengers (including the previous 458) from the case study area was a hard job for the researcher, because every interview was a time taking process.

- Limited availability of manpower for conducting the survey (the researcher himself conducted the investigation, at the grass root level, which yields more advantages).

But there was an advantage, as the researcher himself belongs to the city of Kolkata and a permanent citizen for more than thirty years, so he was familiar with the culture of the city and its geography.

1.10 Concluding remarks

1) Systemic approach is adapted by all the stakeholders (including passenger consumers) to create valuable sustainable Product-Service Systems (PSS) business in Urban Mobility Service. Creative capabilities of passenger consumers as an expression of freedom can help to develop the viability of sustainable consumption and production of mobility services and to lead a desired life-style that they have reason to value.

2) The consumption pattern of mobility services in Kolkata has become a matured consumption pattern, so passengers have become habituated with the systems. Even those passengers who used to use their personal vehicle, many times they like to use the fastest possible combination of mobility services to reach their destination rather than taking extra burden of personal vehicle, to avoid a chance of theft at parking places.

3) Reliability and cost-effectiveness are the vital issues for sustainable mobility service business in case of market transparency for urban passengers. In that case the local Govt. and the other stakeholders as an agency takes the

responsibility of a valuable and secured journey for passenger. Density of demand is the driving force for sustainable mobility service business. Densely neighbourhood urban pattern promote more sustainable mobility services through out the city and secure social safety for passengers. Most of the passengers feel safe to use the public mobility services through out the day, evening, and till mid night. Even this is applied for female passengers also. Ultimately it creates trust on the society and a belief system on the urban mobility service systems also.

4) The Designer must consider the local culture in promoting new PSS concept in mobility service sector using scenario based methodologies. Designer must work for strategic convergence of local stakeholders in promoting local level PSS to promote local economy so that jobs can be created at local level. The approach should be, in fact is a bottom-up approach by those local stakeholders in Kolkata at present can be promoted through Design.

5) Individual Capabilities can be enhanced by public policy and the direction of public policy can be influenced by the effective use of participatory capabilities by the public in mobility services. For e.g. 33% seats are reserved for female passengers in Public Bus, Metro rail, Train etc. Even security protection is provided as a norm in long route trains in female compartments by Railway Dept. Ultimately the participation of females in job sectors can enhance their personal family life standard.

6) Govt. must promote public mobility services for passengers through public policy. Environmental consciousness must be promoted among the

passenger-consumers to use more of these alternatives to reduce the pollution problem.

1.11 Organization of work

The ***first chapter*** of this thesis provide an overall frame work of the research work that has been done by the researcher to create this research report. It can give an over all view of the step by step systematic work to achieve the results. It says about research work s those have been done still, the hypotheses, the methodology, scope of work, data collection, limitations, conclusions etc.

The ***second chapter*** explains the overall systemic view of the problematic situations of the cities, the mobility oriented problems of Kolkata as a mega city, the example of sustainable consumption and production and the sustainable system concept of city activities.

The ***third chapter*** explains about the detailed economic and social behaviour of over consumption in mobility sector and how to motivate those individuals who consume more than sufficient, which ultimately increase production. To change their consumption pattern towards sustainability, one need to motivate them, so there is a need to change their economic behaviour and consumption culture.

The ***fourth chapter*** explains about the process of acting in a sustainable mobility system, and explains the theoretical background to validate the process of sustainable mobility activity in a city as a networked system. It also explains the characters of open system of city and the human capability to achieve over all goal of sustained growth of economic activities of mobility activity.

The ***fifth chapter*** explains about the methods of collection of data, as this research belongs to 'field-theoretical'. It explains the experiences that the researcher had experienced at the time of collecting data.

The ***sixth chapter*** explains the understanding the abstract of the consumption and production activities of mobility services and the system concept of the urban pattern. It also explains the human strategic phenomenal perception activity to create the networked system of mobility activities to reach from one place to another before even acting in reality. It also explains the continuous process of this activity in a critical system situation.

The ***last or seventh chapter*** explains about the findings of this research and the recommendations for the development of sustainable mobility activity consumption for the passenger. It also explains the further scope of work.

2

Sustainability and city: a systemic view

2.1Introduction

Researchers already realized that sustainability is a holistic vision of daily life consumption and production activities of a society. Changing the unsustainable consumption and production activities in a small part of the society, will not be able to survive by its own, because the society is an interconnected network system of socio-economic activities. City is such kind of networked socio-economic activity system. As already mentioned by many UN reports, that almost 66 percent people will be living in congested cities in near future, so achieving sustainability is a common challenge for the city municipal

authorities. Urban mobility activity is also such kind of economic activity system, which is a good example of networked system. Also achieving sustainability within the limitations of such congested city will be easier following a systemic approach, as maximum population will be in city in near future. So if one can achieve that success, then it will be a great help for the human society.

2.2 Sustainability: a complex issue

Sustainability is a socio-political activity of ecological economics. It means that, in an ecological system, the sustainable economic activity always happens within a socio-political framework. The economic growth and human well-being depend on natural resources that sustain all living systems (Formentini, 2005)[9-10]. Much work has been done on sustainability since the issue has been raised by world bodies. Environmental sustainability and social inequality are mostly discussed problems those are affecting our present time.

The two hundred years of unsustainable industrial economy has not only created a lot of increasing inequality among the society, but also created harm to the ecological system. The optimization of the production process to reduce unit cost overcome the scarcity of goods of all kinds to emphasise more on efficient process of technologies and a better quality of goods at point-of-sale (Stahel, 2003)[264-265]. Still the focus is on technological progress of production and not on utilisation. It is already well understood of a need to reorient the present unsustainable economic system to achieve the targets of sustainability.

It is common to refer to our present society as being 'materialistic', and this widely accepted mere idea hides a deeper truth. If material goods really mattered to human society, every person would spend more time preserving them and any other aspect of the material world that one could affect. Instead, the consumer-oriented approach leads to our swift acceptance of the next, newest, latest product and service. In reality, it is not materials that fascinate human society, but the abstract values that one can invest in them. And that value is created by the functions of products and services those are consumed by consumers for their daily life purposes.

Sustainability is a long-term societal vision, which insists on the strategic spending and to take care of natural resources in order to safeguard the opportunities and choices of future generations. The linear structure of short-term optimisation of industrial economy is directly coupled to resource flows of both materials and energy. In order to be sustainable, the economy must therefore operate at a much higher level of resource productivity. That means it must be able to produce the same utilisation value out of a greatly reduced resources for the same amount of work that is done. Changing course towards a more sustainable society means decoupling economic success from resource effectively.

As economic activity systems became global in scale, social institutions too have begun to show strain induced by increased population, inequalities in development and more ecological interdependencies and environmental impacts

that refuse to respect the boundaries of nation states. The impacts of globalisation and the popular conception of this trend that was started in business and has extended its effects to all aspects of living, is going beyond the normal boundaries of politics, economics and even geography and very much accepted as sociology to examine factors like fundamental process of social inequalities between the 'haves' and the 'have nots'.

The continued existence of poverty is one of the most often cited indicators of failure when assessing the efficacy of our current economic and political systems. The focus of business strategy still tends to be on the survival and prosperity of the company itself, causing damage to longer term social or environmental aims. There is a worldwide pattern of de-capitalization. Capital, whether it is natural capital in the form of resources, or human capital, in the form of low-wage workers, or local capital in the form of functional and healthy local economies, is being extracted and converted to financial capital at an increasingly accelerated rate. The financial capital is being concentrated by corporations, institutional investors, and even our pension funds, and being reinvested in companies those repeat this process because it provides the highest return on that financial capital. If one can create better strategic techniques and skills in long range planning, then the ability to integrate business survival with wider goals in a truly sustainable linkage becomes a possibility.

The 'Bruntland Report' by World Commission on Environment and Development, (WECD, 1987) approaches the environmental and development issues which were (and still are) facing the world as one common challenge, to be solved by collective multilateral action rather than through the pursuit of national self-interest. It examines population and human resources, ecosystems, energy, industry, and 'the urban challenge' of humans in their built environment. Importantly, it approaches these common concerns with a holistic perspective. Meadows et al. (1992) showed that, if 'Brundtland Report' (1987) was still influenced by the necessity of an exponential growth of 5-6% in developing and 3-4% in industrialized countries, it has become evident that nature may not be able to sustain such a growth. Schmidt-Bleek's (1994) main argument is that currently, one-fifth of the world population in the rich countries consume four-fifths of world resources. If developing countries were to attain the same lifestyles of developed countries, material flows would grow five-fold. Taking into account expected growth in population, this would translate into eight times the current global material flows by the year 2040 (Heiskanen and Jalas, 2000)[7]. Since the earth is a closed ecosystem, it will not be possible to support such an exponentially increasing population within the actual growth-oriented economic systems. The goal here should be to achieve a comparable quality of life for the whole population on this earth.

2.2.1 World cities: problems and challenges

According to a published report of the United Nations (2006), in 2008, more than half its human population, 3.3 billion people, will be living in urban

areas. By 2030, this is expected to swell to almost 5 billion. Many of the new urbanites will be poor. By 2030, the towns and cities of the developing world will make up 81 percent of urban humanity. Though the environment of the cities is very much damaged by the modern activities of civilization; yet experts and policymakers increasingly recognize the potential value of cities to long-term sustainability, as the concentration of the density of population and the provision of services and amenities are very high within an artificially controlled less amount of area.

UN-Habitat's Third World Urban Forum (2006), as well as its *State of the World's Cities 2006/7*, successfully focused world interest on the deteriorating social and environmental conditions of urban localities. The process of globalization has also drawn attention to the productive potential of cities and to the human cost. Yet the enormous scale and impact of future urbanization has not penetrated the public's mind. So far, attention had centred mostly on immediate concerns, problems such as how to accommodate the poor and improve living conditions; how to generate employment; how to reduce cities' ecological footprint; how to improve governance; and how to administer increasingly complex urban systems.

These are all obviously important questions, but they shrink in comparison with the problems raised by the obvious future growth of the urban population. Up to now, policymakers and civil society organizations have reacted to challenges as they arise. This is no longer enough. An advanced well prepared approach is

needed if urbanization in developing countries is to help solve social and environmental problems, rather than make them catastrophically worse.

One of the Report's key observations is that poor people will make up a large part of future urban growth. This simple fact has generally been overlooked, at great cost. Most urban growth now stems from natural increase (more births than deaths) rather than migration. But wherever it comes from, the growth of urban areas includes huge numbers of poor people. Ignoring this basic reality will make it impossible either to plan for inevitable and massive city growth or to use urban dynamics to help relieve poverty.

According to the UN report (2006), three policy initiatives stand out in this connection. First, preparing for an urban future requires, at a minimum, respecting the rights of the poor to the city. Secondly, cities need a longer-term and broader vision of the use of urban space to reduce poverty and promote sustainability. Thirdly, population institutions and specialists can and should play a key role in supporting community organizations, social movements, governments and the international community in improving the nature and form of future urban expansion, and thus enhancing its power to reduce poverty and promote environmental sustainability.

2.2.2 City life and mobility activities in developing countries: many people, many problems

"The growth of cities will be the single largest influence on development in the 21st century." These were the opening words of UNFPA's (1996) *State of World Population* Report. This statement is proving more accurate by the day. Most of this growth will be in developing countries. The urban population of Africa and Asia is expected to double between 2000 and 2030. The International Conference on Population and Development (ICPD) clearly recommended that: "Governments should strengthen their capacities to respond to the pressures caused by rapid urbanization by revising and reorienting the agencies and mechanisms for urban management as necessary and ensuring the wide participation of all population groups in planning and decision-making on local development" (UN, 1995).

In India, a recent assessment of the components of urban growth 1961-2001 found that the share of growth attributable to urban natural increase ranged from 51 per cent to about 65 per cent over the period (UN, 2006)[Ch.1].

Since the 1950s, rapid urbanization has been a catalyst of cultural change. As globalization proceeds, the urban transition is having an enormous impact on culture. Such transformations have not been as uniform or seamless according to social prediction. The widening gaps between social groups made inequality more visible. Many people in developing countries also associate the processes of modernization and globalization with the imposition of Western values on their own cultures and resent them accordingly (UN, 2006)[Ch.2].

The extensive growth in cities as dynamic locals of global economy, facilitate the intensive concentration of economic activities today in India. The economic participation of the city dwellers makes them to move from one corner to another for their own survival. Any human social communication system like urban mobility systems depicts as an expression of human socio-cultural integrity.

On the other hand, increase in population in cities due to increase in scope of economic activities demands more mobility consumption in its volume, ultimately increases pressure on the existing public infrastructure of any city. Also because, lack of proper planning and investment in public mobility sector and due to wrong monopolistic policy of government, the existing public mobility system in a city fails to show its efficiency to fulfil individual needs of various kinds of passengers. As a result in particular, information rich and time-poor(!) passengers with increasing buying capability try to cope with the situations by some personalized mobility solutions of their own, which ultimately result in rebound effects (Manzini and Jegou, 2003)[45-47].

The deprivation from the just facilities or services for mobility activities in a city can restrict the freedom to reach from one place to another place for the passengers. The socially exclusive growth of the government policies is also creating differences of inequality bigger everyday. Unfortunately, our social imaginary, a "constructed landscape of collective aspirations," is dominated by the idea of the crisis; a crisis of uncertainty. It is becoming a challenge day by

day to influence this social imaginary towards sustainable values to break out of the expressive space of art, myth and ritual to enter logic of ordinary life of passengers and to initiate a social action among the ordinary lives of ordinary passengers in the practice of their everyday lives (Formentini, 2005)[10].

Suburbanization appears to be more complex in developing countries. Given their pervasive poverty and inequality, the culture of the automobile and its far-reaching impact on urban civilization arrived later and continue to be restricted to a minority. At the same time, the relative uncertain and unsecured public transportation and infrastructure has prevented wealthier people from moving to the suburbs in large numbers and commuting easily from there—a pattern already established in innumerable North American cities.

Urban concentration need not aggravate environmental problems. These are due primarily to unsustainable patterns of production and consumption and to inadequate urban management. Urban localities actually offer better chances for long-term sustainability, starting with the fact that they concentrate half the Earth's population on less than 3 per cent of its land area. The dispersion of population and economic activities would likely make the problems worse rather than better. Adopting the right approaches in anticipation of urban growth can also prevent many of the environmental problems linked to urbanization.

The increasing Inter-personal violence and insecurity, particularly in urban areas of poorer countries exacts an enormous toll on individuals, communities and even nations, and is fast becoming a major public security and health issue. Violence tends to be greater in faster-growing and larger cities. The daily living

conditions of the urban poor have been strongly correlated with social exclusion and inequality, which tend to be more blatant and resented in cities (UN, 2006)[Ch.2]. They can heighten the potential for the emergence of conflict, crime or violence. The poor and women are the principal victims of violence in these cities. Violence triggers a wide array of direct and indirect impacts on economic, political and social organization and has a huge impact on development. The organization of urban space is also affected by crime and violence. The affluent middle and upper classes wall themselves in and pay for private security. But the privatization of security itself can be a source of increased violence and disrespect for human rights (UN, 2006)[Ch.2].

People are already doing a great deal at the local level to make urban locations more habitable and environmentally friendly for the purposes of mobility activities. Cities can learn from each other and use positive experiences for their own benefit. However, finding local solutions to current problems is not enough, given the rapid doubling of the urban population of developing countries in an era of economic globalization. Local strategies will have to be integrated into a more inclusive temporal and spatial framework to address broader problems and ensure longer-term sustainability.

The UN Report (2006)[Ch.6] has repeatedly made the point that effective responses to the urban challenge must also add a spatial dimension to this longer-term outlook. Therefore, integrating social and environmental concerns for urban growth within a broader vision of time and space is critical for

sustainability. Closer attention to human rights and the rise of civil society, along with movements towards democratization and political pluralism, have also given local-level institutions more responsibility in many countries. This trend toward democratization helps to strengthen urban governance by increasing popular participation and making local administration more accountable. Finally, these trends towards localization and decentralization become more important because half of all urban demographic growth is occurring in smaller localities. These have the advantage of flexibility in making decisions on critical issues, such as land use, mobility, infrastructure and services, and are more amenable to popular participation and political oversight. On the other hand, they tend to be under-resourced and under-financed. They also lack critical information and the technical capability to use it.

Overall the mobility activity in a city is an outdoor activity and the sustained growth of it is very much dependent on many factors. It is very much affected by the govt. policies as well as passengers' behaviour starting from violence, conspicuous consumption to social disharmony and many others issues. It calls for a systemic approach to the solutions of existing situations.

2.2.3 Mobility activity in Kolkata: a mega-city oriented problem

Kolkata is a mega-city in the eastern part of India. It is more than 300 years old city established by the British colonial system. Now it is the State Capital of West Bengal. In the British period, it was named as Calcutta. In 2001, Calcutta was officially renamed as Kolkata. It is one of the most populated mega-

city (population 13,216,546, Census 2001) with the population density of 24,760/km². Following is the map of Kolkata and India in Figure 2.2.3.1.

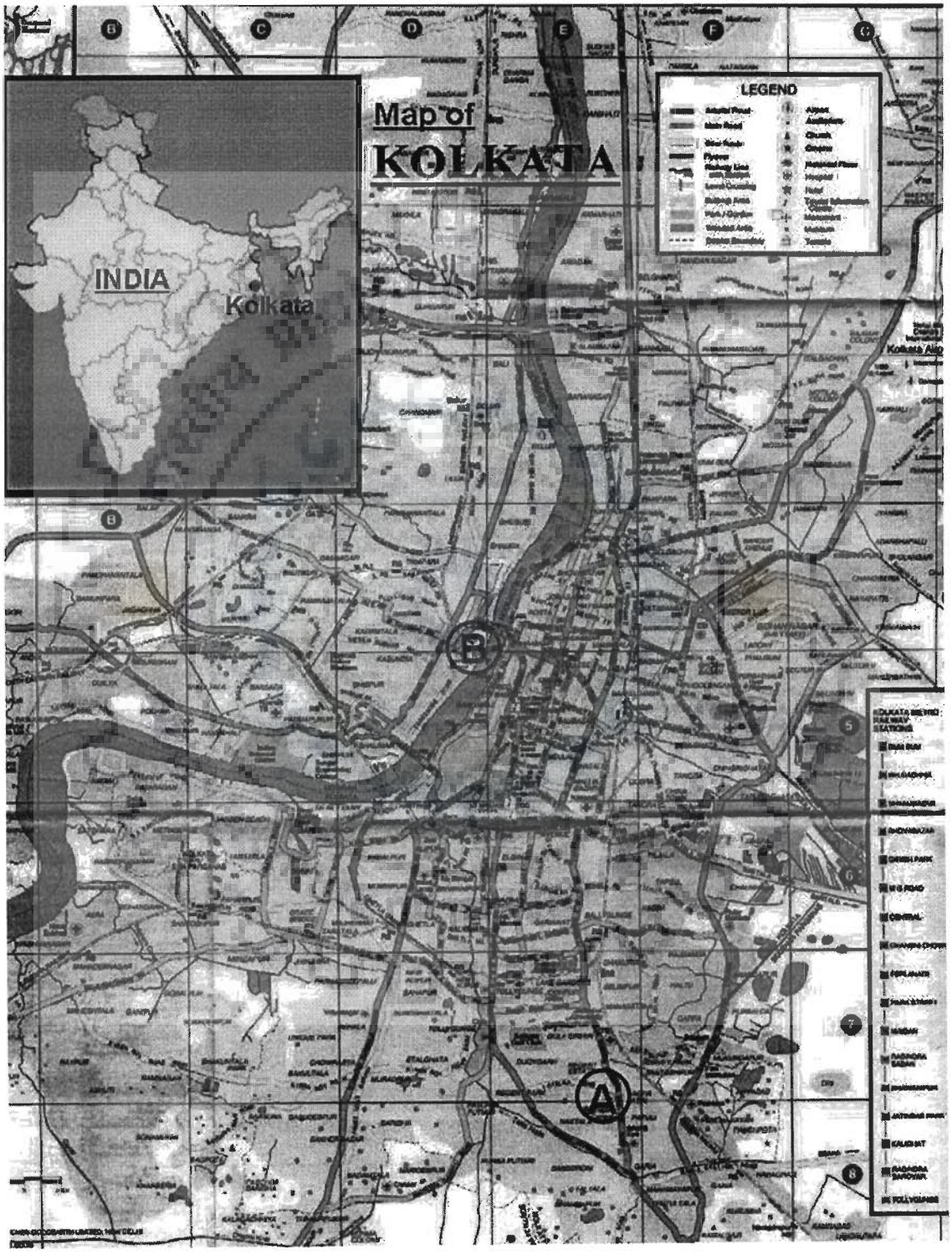

Figure 2.2.3.1 Map of Kolkata and India

Presently it is the capital of the state of West Bengal, situated on the eastern bank of river Hooghly. Many times it is referred to as the "Cultural Capital of India", a vibrant city with a distinct socio-political background. Kolkata's literacy rate is 80.86% (Census 2001). Kolkata witnessed economic stagnation in the years following India's independence in 1947. Since the year 2000 however, an economic rejuvenation has arrested the morbid decline, leading to a spurt in the city's growth.

The densely patterned settlement of Kolkata is largely developed as unplanned with no future vision in the British colonial period in the pre-auto era, resulting in proportions of urban road space relatively low compared to those planned cities. The road space of Kolkata is 6.4 percent (%) of total area in comparison to planned city like Paris (25%), Tokyo (24%) etc. Consequently, Kolkata registers comparatively higher emission level for a given vehicular mile travelled (VMT), given the link between congestion and pollution.

The recent economic development in the state of West Bengal results in increase of number of personal motorized vehicles, because of the increase in buying power for some particular market segments in Kolkata. Personal modes of mobility like personal vehicle like car, scooter, motorcycle, etc. are not eco-friendly or sustainable in terms of resource material and fuel consumption per capita. As the buying power is growing of the customers in the market economy in India, there is a growing tendency in showing social status through more

resource material consumption and that also through buying more number of products. There are almost 347880 numbers of personal vehicles in Kolkata, of which, 123389 numbers of personal two wheelers, and 224491 numbers of personal car (all Data collected from office of the Govt. of West Bengal, Transport Dept. as on January, 2006). Data shows, almost 12 – 13 percent (%) of the total population can travel by their own motorized vehicles in this city. These small vehicles create congestion and obstacle at the peak time for office goers Figure 2.2.3.

A study, 'Environment and Social Sustainability of Transport – Comparative Study of Rail and Road', done by Asian institute of Transport Development in 2002, reveals that passenger cars with carbon dioxide emission level ranging between 21.04 – 28.07 grams per passenger kilometre made it the least friendly of transport modes.

Within hours of the budget announcement of 2006-07 of Govt. of India, small car makers came out price cuts; the duty cut on small cars to 16% from 24% to attract more customers. But this duty cut is not really as citizen-friendly as it seems at the first glance. If more people can enjoy 'good life' now, more cars will only add to their woes. The government will now have to spend more on providing for the infrastructure for the running of these cars – be that in the form of roads and flyovers or parking lots. This will only stifle the limited resources for

the more pressing needs such as water supply, sanitation, healthcare and education, even the public mobility service sector itself.

Predictably, such auto friendly policies induce further traffic growth, congestion, and pollution, defeating such policies in short orders. The widespread auto friendly bias lowers the level of resources available and thus works against the development of strong urban public transit systems which are crucial to the mobility of the majority of the low and moderate income residents in the city. In some cases, public transportation systems may be weakened further by policies instituting such low fares which prevent the recovery of operating and capital costs of transit service. This in turn leads to a vicious cycle of deteriorating vehicles, worsening service, dropping transit usage, and further downward spiralling service.

This auto friendly bias lowers the level of resources available and thus works against the development of strong urban public transit systems. The public systems are crucial to the mobility of the majority residents in this city who have low and moderate incomes. Given the per capita income levels and the costs to own and use cars, motorcycles in this city, clearly cars are within reach of only a minority of residents of Kolkata.

Note: Cars are also the most energy intensive: 0.28 – 0.38 mega-joules per passenger kilometre (PKM). The Rocky Mountain Institute, quoted by Scientific American in a survey of energy in 2005, states that only 13% of fuel energy used in a car reaches the wheels, the rest dissipating as heat and noise in the engine, the drive train, air conditioning, and idling. Moreover, 95% of the accelerated mass is the car itself and only 1% of fuel is utilized to move the driver.

Figure 2.2.3 Traffic and parking problems created by Personal vehicles

So the question is how the other 87 % to 88% of the total population is surviving in Kolkata for their mobility purposes. It is a positive point of Kolkata that, maximum numbers of passengers do not have personal motorised vehicles; otherwise it would have become a mess in such a congested city, where the road space is such a low in volume in comparison to other major world cities. It is a question of social responsibility towards the sustainable consumer behaviour for every citizen in Kolkata. If the public arrangements can create such a healthy social environment to serve the society in a productive manner, then what is the need of a huge amount of investment by an individual for same personal achievement?

That is the challenge for the sustainable developmental policy and for the maximum population, who are doing their mobility activities in this city without any personal motorized vehicle; the story of the alternative in Kolkata.

2.3 Sustainable consumption and production: a system concept

The sustainable development concept, presented in the report by World Commission on Environment and Development (WCED) in 1987, stressed the role of industry and new production patterns in reaching a stable status of sustainable development; and also further developed to include the need of new consumption patterns and to discuss the role of consumers. Agenda 21, the final document of the Rio Earth Summit 1992 stressed upon the unsustainable pattern of consumption and production for the major cause of continued degradation of the global environment. In order to reach the triple bottom line of sustainability,

production and consumption systems should give more attention to values, elementary human needs, resource property, product and service functions, and local conditions, in both developed and developing countries (United Nations General Assembly, 1992).

Eco-efficiency addresses the challenge of making production more efficient, but it does not include consumption patterns from the total sustainability point of view. As was explained before, there is the possibility that the environmental benefits of efficient production may be negated if consumption levels continue to rise. Therefore, eco-efficiency answers just half of the sustainability challenges. It must be accompanied by concepts and approaches dealing with fundamental changes in consumption patterns before sustainability can be achieved. As Michael Braungart put it, "If you make the wrong system efficient, it's even more deadly" (Mont, 2002)[7-52].

Innovation in service delivery can lead to process improvements, decreased environment burdens and improved profits. It will increase the productivity of our natural capital – the resource systems upon which we depend to live – instead of our human capital.

With a new awareness of the complexity of living and social systems, an investigation of the assumptions that underpinned our common understanding of economic, social and environmental system is required, not because, from our partial view, the stakes are high; but because there has simply never been the

opportunity to rethink all our ways of engaging with the world around us in such a fundamental way.

2.3.1 Sustainable consumption

There are many efforts from time to time to develop new approaches to reach sustainability, and mostly in the manufacturing side. End-of-pipe measures, increases in mechanical efficiency, reducing the amount of materials in product, eco-efficiency, recycling and claiming the product material back etc. are the many ways to reduce the resource intensity of products. Also an eco efficient product can increase the number of sale in the market because of growing buying power by particular segments in the present market economy and present concept of globalisation. Following the metaphor of the two-faced coin that the UN uses to address production and consumption, the second side of the coin – the consumption side – has to increase in importance as well (United Nations General Assembly, 1992).

Consumption and lifestyle are synonymous to each other for many long years among the socio-economic classes. In fact 'more resource consumption means higher lifestyle' of modern society already became the established phenomena in the capitalist economy. The social class structure is defined through such kind of phenomena. Even if one tries to distinguish among the basic needs, wants and desires; consumption is considered as not only fulfilling needs, but also desires. The concept of 'conspicuous consumption' or

'competitive display' to show the power of an individual or a distinguished class already have symbolised the unsustainable industrial economy.

Baudrillard (1970) described the consumption system as a system of symbols used by consumers as a sign of their status, class, and occupation. Douglas and Isherwood (1979) explained their position around consumption, which is not only a way to satisfy basic needs but, and in particular in the industrial society, it expresses and reflects an entire system of values, cultural differences and social categories (Formentini, 2005)[16-27].

Eberle and Brohmann defined sustainable consumption as a more ecological but also socially premised way of buying and using goods and services. According to Shove, Warde and Empacher, individuals and societal consumptive behaviour is immersed in daily routines and is influenced by a variety of context factors such as specific lifestyles, neighbourhood, favoured peer groups, etc. The dominant institutional consensus tended to be oriented towards a position that asked for 'consuming differently' rather than 'consuming less' (Brohmann, 2006)[27-37].

Mahatma Gandhi said, "Be the change you want to see in the world".

Creative consumers are the invention of the social actions of sustainable values of consumption patterns. They use their 'Creativity' to make sustainable strategies for their daily life activities. But unless they organize their social

arrangements of which they are also a part and do practice, it is not possible for them to reach to a mature, lasting state where they take the form of a social enterprise reaching into the everyday life of a large number of people and organize themselves to achieve the results that interest them producing sociality (Manzini & Jegou, 2006)[5-16].

When those creative behaviour becomes permanent habit, then it becomes a tradition, as Weber (1946) said, 'traditionalism....shall refer to the psychic attitude – set for the habitual workday and to the belief in the everyday routine as an inviolable norm of conduct'. In the second part of Weber's sentence one can find that a systematized kind of special action is a behavioural norm.

In fact learning from such kinds of existing examples of sustainable mobility services can be a good idea to understand the socio-economic and environmental issues of sustainable consumption and production system in emerging contexts. There are many such examples of sustainable consumption and production (participation of all stakeholders) scenarios of mobility activities available in Indian cities. Kolkata is not an exceptional case in this regard and in fact it is one of the best examples that have been observed from urban networked mobility activity system point of view in India according to the researcher.

Understanding of sustainability is very much a local issue rather than global from culture perspective. One can stay connected with global, being local. Because the change of consumption pattern of those particular city dwellers

towards sustainability within the city geography is a question of their motivation to change in habit and life strategy for daily activities. And it can create an inspiration for other cities also (Manzini & Jegou, 2003)[35-60].

It has been always observed, that in case of taking a strategic decision for any issue of a city, the consumers always try to behave as a responsible citizen than a selfish individual; because the decision over an issue related to a problem of the city is more long-term in nature than a short term consumption activity (Formentini, 2005).

So it is a challenge in this research, to make a radical turn for those personal motorised vehicle users towards a responsible citizen passenger of sustainable mobility services in the city of Kolkata.

2.3.2 Sustainable mobility activity: a Product-Service Systems concept

"Sustainable mobility" can be defined as any method of mobility which enables a person to move faster and with less non-renewable resource and energy input. The chances that improvements to the motorcar will ever reach the human yardstick are low. Innovative strategies for new solutions are thus needed for increases in resource productivity well beyond a factor 4, or even factor 10. This means attacking problems on a systems level instead of a product level,

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Note: for Factor 4 see www.wupperinst.org/FactorFour/

for Factor 10 see www.factor10-institute.org

departing from a new understanding of the underlying need, or using revolutionary new technology.

Systems thinking promote gaining insights into the whole by understanding the linkages and interactions between the elements that comprise the whole "system". System thinking recognizes that all human activity systems are open systems; therefore, they are affected by the environment in which they exist. The key to a more 'sustainable mobility', for instance, lies in town planning and systems optimization, not in vehicle technology. Tony Garnier was a French architect who had the right kind of thinking 100 years ago (Stahel, 2003)[279-281].

System innovation requires certain changes that are needed in the first place to overcome the traditional inertia of all stakeholders in accepting, adopting and using new products and services. Of course it is much easier to change a product than a system; therefore, we often see inefficient products just because our present system does not have the necessary infrastructure or awareness to accept a better one. Thus instead of improving the system, products are produced those suit a very inefficient current system. The opposite is true as well; present society creates the entire system around one product. For example, the car has become the dominant mode of transport, and the entire societal infrastructure was created to suit this only product (Mont, 2002)[19].

In the traditional business model Figure 2.3.2.1 the stakeholders try to optimize their own 'segment' of production process. They are only responsible for their particular face of production and consumption cycle. Typical stakeholders will operate as discrete entities as shown inside the ring in Figure 2.3.2.1 the raw materials and energy suppliers, the producers, the retailers, the customers/consumers and the end-of-life managers, all make up part of the life cycle framework. Even the design function which is situated in the centre to emphasize that it can influence the resource optimization in other phases does not of necessity have to consider the links to all other parts of the value chain.
In this case there is no necessary coincidence between economic value for individual stakeholders and overall systemic resource optimization.

Dematerialisation is the concept, which aims to reduce the environmental impact per unit of economic activity. In contrast, the Product-Service Systems (PSS) approach Figure 2.3.2.2, which takes as its starting point the goal of achieving an integrated functional solution to meet client demands, moves away from phase based servicing and discrete resource optimization, to system resource optimization which is utility based. The resulting PSS can produce synergies in profit, competitiveness and environmental benefits, because of the opportunities which arise from broadening the system to be optimized. In other words, the potential eco-efficiency of a PSS relies on system optimization because of the stakeholders' convergence of interests.

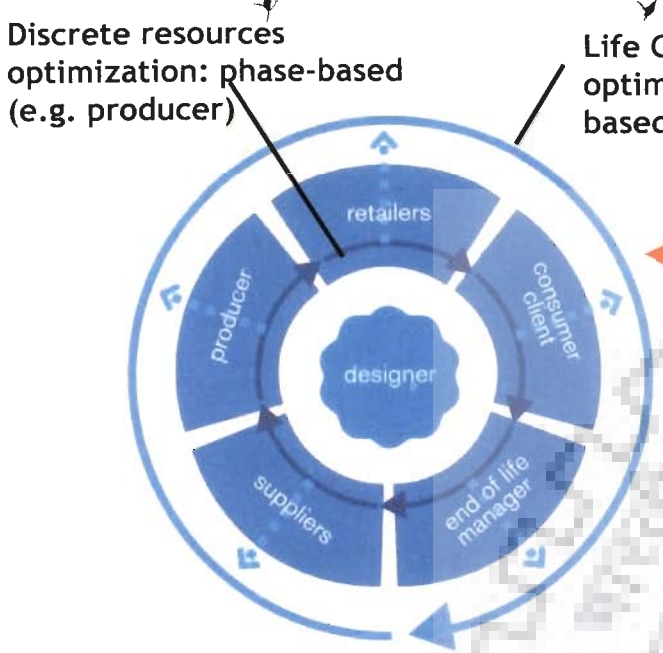


Figure 2.3.2.1 Stakeholders in a product life cycle: discrete vs. system resources optimization

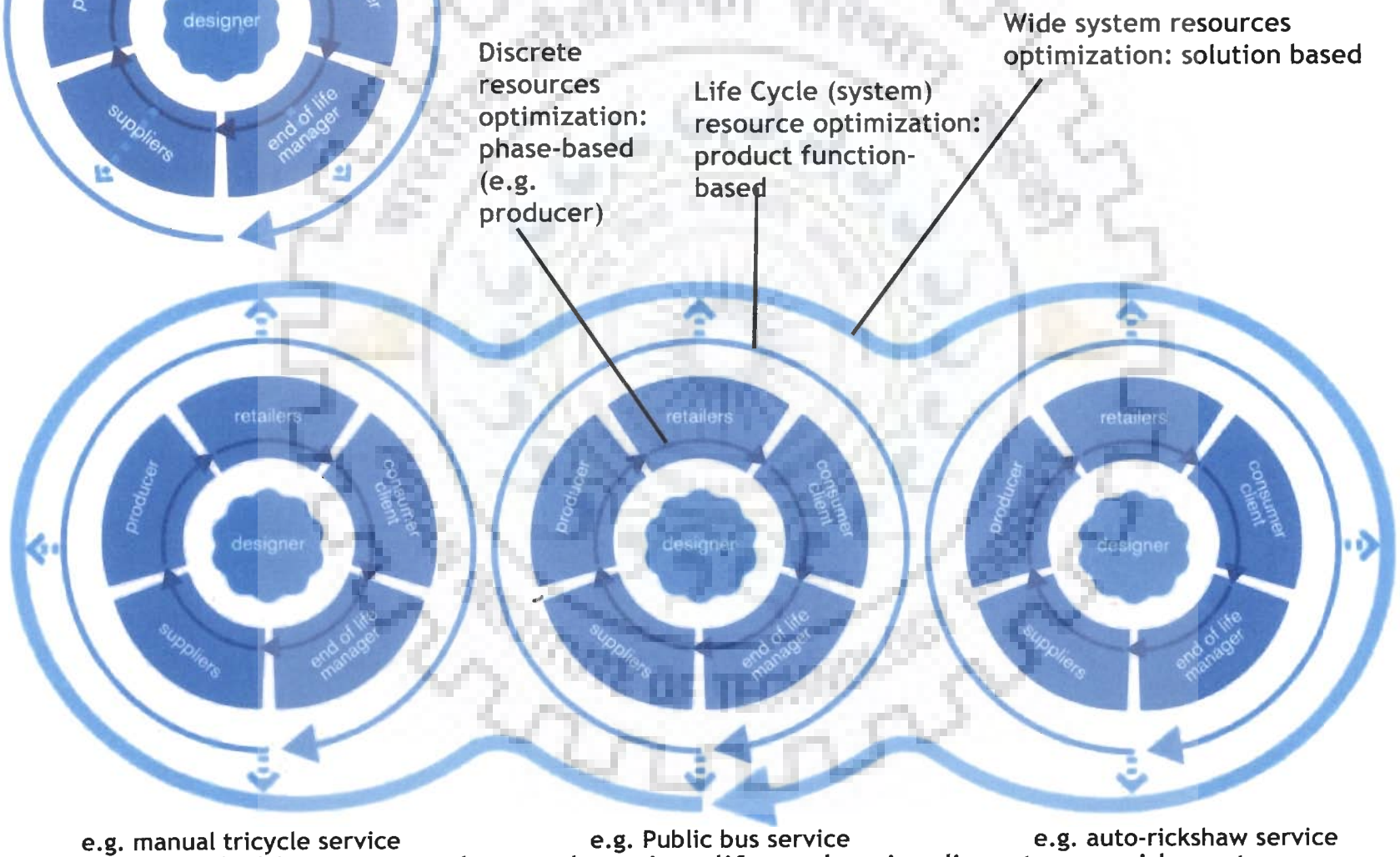


Figure 2.3.2.2 Stakeholders in a product and services life-cycle mix: discrete vs. wide system resources optimization (source: UNEP SPSS model, 2002)

The baseline is that we need to produce more (to feed the growing population) with fewer natural resources i.e., a technological shift from the enormous use of resource material and less amount of waste generation, both from economics and environmental point of view, obtainable from a Product-Service-Systems. Service activity or more technically, Product-Service Systems can be defined as the result of an innovation strategy, shifting the business focus from designing and selling physical products only, to selling the functions of a system of products and services, which are jointly capable of fulfilling specific client demands. So the economy is based on providing functions rather than products (Manzini & Vezzoli, 2002)[3-17].

The role of services in providing value is ever more important. The development of technology makes it possible to substitute products with innovative services, which are often referred to as functional economy. The functional economy is Product-Service Systems consisting of products that are substituted by services. The main difference between functional economy and the service economy is that in the former an entire product-service system is designed, rather than only a product, as is the case in a service economy.

In the functional economy, material products are treated as capital assets rather than as consumables. This shift in the perception might stimulate the appreciation of material products not for their price per unit, but rather for the units of function, they might deliver over their lifetime. Thus, an incentive may be created for products to improve the efficiency of this value generating system.

This also leads to that the distinction between manufacturing/production equipment and products disappears, as both become capital assets and ownership of equipment and product stays in the hands of producers/providers. The dematerialization concept was accepted by many companies of economic benefits (less resources used → less resources bought → less money spent → less waste generated → less paid for pollution and for final disposal) (Mont, 2000)[7-52].

In adoption of a PSS business model implies new types of stakeholder relationships and/or partnerships, new convergence of economic interests, and a concomitant systemic resources optimization. Further, if we broaden this notion of whole system optimization beyond a single product life cycle to an interconnected series of product and service life cycles, then the potential for eco-efficiency gains becomes even greater. In this case Figure 2.3.2.2 the stakeholders' panorama is more complex, but offers greater potential for eco-efficient system innovations.

2.3.3 Sustainability and systems

A mobility activity system (PSS) is a man-mind-resource structure. It imposes a certain kind of constraint or necessity upon human beings to the extent that there is sufficient rationale for them to conform their behaviour to the practices which comprise the mobility activity system (PSS). All this happens in such a subtle psychological frame that people are quite unaware of the process of interaction.

A mobility activity system (PSS) has to be treated as a part of the whole of a system of the city. It owes its character to more complementary with the wishes of the individuals or the designs of stakeholders. In every society there are mechanisms in operation which shift and sort out the consumption and production activity processes which are possible in a given geography or culture. This natural selection is a constant and continuous system having given properties which are recognizable for any stakeholder that would seek to change its people's consumption patterns.

The environmental, the social, and the economic approaches to study about sustainability in a mobility activity system (PSS) of a city, involves itself in a distinct frame of reference for explaining resource utilization. The first takes the physical habitat as its point of departure; the second starts with the culture of the passengers; the third begins with the attribute of scarcity which shapes and controls mobility activities.

The idea that human beings have to be motivated in order to make their behaviour comply with a mobility activity system of optimum resource consumption practice depends upon many sociological and psychological factors. The major supposition is that such mobility activity system can be remade after the image of an ideal and the passengers have to be considered as system users. The passengers as agents conditioned by customs and traditions, function on the basis of psychological resistances.

In every culture there are a limited number of themes or patterns. These themes and patterns are related with the norms and activities of the culture. The culture of the passengers consists of a set of movement activities. The role of culture is so pervasive in defining passenger's perception and manipulation of mobility oriented phenomena that different social groups though occupying the same networked system may have made use of different set of mobility activity system (PSS). The Mobility activity sets are not what they are; they are what cultures make them to be according to the functional theory of resources as expressed by Erich Zimmermann (1933 [3, 216] & 1951[814-815]). And the basic resources are very much a part of mobility activity systems (PSS).

In the social approach there is an argument which can be stated in the form of a syllogism.

(1) Any mobility consumption and production process to be adopted must be valued by the people in terms of their system of activities.

(2) There are some mobility consumption and production systems which are not valued by the people in terms of their system of activities.

(3) There fore, there are some mobility consumption and production systems which will not be adopted by certain people, i.e. where the mobility consumption and production processes involve beliefs and techniques those are not in conformity with the passengers' system of activities, it will not be adopted by those passengers.

The assumption is that there is a limited supply for mobility purposes in a city, in which productive factors are available. That means the resources are fixed in

amount, and it is a close system of resources. Now because of the limited supply, resource users (i.e. passengers) are confronted with a necessity for choice and therefore with the problem of economizing their use of productive factors. In order to maximise their want satisfaction, the productive factors have to be combined in certain proportions rather than others, so that certain scales of output are adopted. For example, in this research, the target is to minimise the use of personal motorised vehicles by some particular passengers and to maximise the allotment of mobility services for all the passengers to reduce the production of resource materials and generation of environmental pollution per capita within a limited amount of resources. The use of resources, mainly in the case of those set of mobility service activity systems, must be the revealed preferences of those passengers according to their culture and for the purposes of maximization of productivity of the processes of mobility activity systems (i.e. PSS). So the service activities to use those resource systems are very much dependent on those revealed preferences of passengers, and these service systems are open systems, as there are variations of consumption of various combinations of services for various types of passengers. Any resource utilization process which minimises production costs and maximizes profits will be maximally efficient resource process, and mobility service activities are one of those resource processes.

Here in this research, the researcher tried to deal with those consumption activities in open system like mobility service system, with an assumption that the allotment of resources is fixed within a closed system. So understanding of the

passengers' consumption activities from environmental, social and economic point of view in an open system like mobility activity system will help to create a more efficient policy for resource planning and utilisation.

In case of an approximation to economic analysis it should be possible to divide adoptable resource utilization processes into two corresponding dichotomies:

(1) a division into those processes which are gainful to individual resource users in a psychological way and those which are not gainful in this way,

(2) a division into those processes which have at least a formally stated degree of productive efficiency, and those which have less than that degree of productive efficiency.

Economic theory defines a sub-set of optimum resource utilization processes within the more inclusive set of gainful resource utilization processes. A resource utilization system made up entirely of such processes would be an appropriate goal for resource planning and policy framing. If, in addition, such a goal was confirmed with the goals implied in ecological and the social approaches, it would offer an even more certain criterion for resource conservation and resource growth.

Three important propositions that for any given people and given habitat there are certain resource utilization systems which are not possible, there are certain resource utilization systems which are not gainful so not adoptable. For

example, personal motorised vehicles are not gainful and possible from sustainability point of view, so not acceptable within a big city.

If resource plans and policies are to succeed, they must have some theoretical rationale. Mostly resource policies are determined with little or no regard for their logical derivation. They are largely the outcome of practical policies. Once such a resource policy is advanced or implemented, it becomes difficult to introduce any change in it on the basis of realism. So the assumptions made by the ecologist, the sociologist, or the economist are largely ignored or discounted. It has been pointed out that resource policies must conform to the social order.

Two propositions may be advanced: first, that a mobility service system can be manipulated to answer the purposes of an ideal; and second, that the mobility service system used must be gainful in order to be viable.

At this point the problem becomes empirical. A resource utilization system, like mobility service system, is constituted by the willing conformity of resource users (passengers) with respect to a set of adoptable resource utilization processes (i.e. use of mobility service systems). There are incentives, on the one hand, for every user to employ processes that are gainful to him. On the other hand, there are other incentives which lead him to accept bounds to his preference for gainful processes. In other words, every passenger is both attracted to and deterred from gainful processes. This psychological ambivalence is always at work. By and large, a passenger finds himself committed to some gainful consumption

practices and to some non-gainful consumption practices. These considerations demand empirical demonstration.

The stakeholders' desire to change people's resource practices are attributable to a moral necessity which is expressed in the willing conformity of their human agents. The attitude of willing conformity has a dual aspect. It manifests ambivalence in the human being as a resource user, whereby he finds himself drawn toward two kinds of practices. One leads him to experiment and to invent and thereby brings about radical social change; the other leads him to preserve and to acquiesce and thereby to work out conservation through social contact.

This dual aspect to willing conformity endows every resource system with an inherent potential for change or growth and also an inherent resistance to change or growth. The new gainful resource utilization processes have to undergo a process of selection that is imposed by the social order. If the new processes are confronted with the felt needs and vested interests of the passengers, they will be readily incorporated into existing resource utilization systems. If, however, they go against the passengers' felt needs and vested interests, they will be resisted. If the resistance succeeds, the new processes will not be accepted, if the resistance does not succeed, the existing resource utilization system will be changed into another or different system i.e. there should be a need to redesign of the mobility service system for those passengers itself to change the

consumption pattern towards sustainability ultimately will help to influence the planning of the overall resource system of the city.

The resource planner needs a theory which tells him under what conditions one or another resource use is good or bad. Here the assumption has been that a resource process must be a necessary one, possessing the attributes of gainfulness and taking into account economic efficiency within the larger framework of the social order.

2.4 Conclusion

Mobility activity is a connecting consumption and production activity of many other spaces of activities in daily life scenario in a city. It can create of a system network of many daily life activities. These mobility activities within a system network must be sustainable for long term to sustain the socio-economic growth of human society. City is the growing attraction and interaction point of many growth oriented economic activities. People migrate and settled in cities to participate and survive in their social life. Within such a congested city, the density of population settlement and their various kinds of activities are higher in comparison to other part of the world. Obviously mobility activity also has to show the higher growth within the constraints.

The higher density of production of individual vehicles for their mobility consumption purposes indicates the red signal of environmental pollution, scarcity of resource material and other socio-disharmony. Also the 200 hundred years of industrial economy still could not be able to achieve the targeted well-

being for every human being. Not only that, this industrial economy has created many kinds of socio-economic and political differences and gaps among the society.

There is a need to look at the overview of the problems of society like a city, where various kinds of people from different strata of the world migrate and settle in the city. To create a social harmony of consumption among those various kinds of people is the big challenge for any city authority. And it can be achieved not only through some Government oriented top-down approaches, but also through the people's participation in bottom-up approaches. Unless there is a common platform is created to look at the problems from a systemic point of view, the detailed problems will not be perceived and solved by both the government-public participation.

3

Motivating individual to sustainable consumption

3.1 Introduction

In most of the cases, the non-renewable materials are very much wasted by many manufacturing companies as data shows. Simultaneously the unsustainable irresponsible behaviour of some people in the society can create many unsustainable consumption patterns to fulfil their many wishes and hidden desires. The great economist Adam Smith criticised about the behaviour of these 'prodigals' who unnecessarily waste natural non-renewable materials. Veblen also explained the unsustainable consumption behaviour of the particular segment of people in the society more than hundred years back.

All the people can not afford to do such kinds of unsustainable activities for their economic constraints and even if one assumes those kinds of unsustainable activities for all, the question comes of how to afford such huge amount activities by limited amount of non-renewable materials.

It is a challenge for the society and economic thinkers to change that unsustainable consumption behaviour of those prodigals, for whom the industrial economy is always trying their best to satisfy their wants and desires and creating so much pollution for the purpose of feeding resource material only for 15 to 20 percent of people of this world.

3.2 Changing attitude from an individual to a responsible passenger

The role of consumer citizen (i.e. passenger) is vital in civilizing the market economy and contribution to sustainability (Formentini, 2005)[16-27]. It is necessary for the passengers to interpret relevant information and corporate message and reorient the demand for corporate social and environmental responsibility by empowering herself.

Within the limits of feasibility and reasonable returns, there are substantial choices to be made, and in these choices one's visions and identities could matter (Sen, 2005)[334-356]. Unquestionably the both roles (i.e. citizen & consumer) are present in each individual passenger, influencing each of us according to the role we play at a certain moment.

Further, they are intrinsically different and somehow contradictory: "the consumer has a selfish and short-term orientation aimed at healthy and safe products with a low price, at products that lend status to the buyer, that give communicative significance, or provide direct enjoyment. On the other side, the citizen is more long-term oriented and more interested in social values. In most cases, citizens don't operate in their own" (Formentini, 2005)[16-27].

The two roles come in conflict if, for instance, an individual passenger finds herself deciding between an environmentally friendly one. Casimir and Dutilh state that, in most cases, the consumer wins the battle as citizen's values can only influence consumer behaviour and not control it. What they propose is to reach the citizen aspect of individuals, by putting emphasis on cooperation, group-consciousness and collective action.

This means a "radical turn away from the individual – oriented society we currently live on" (Formentini, 2005)[16-27].

3.2.1 The individual user of personal motorised vehicle: utility vs. distribution of resources

It is true that no such user will like to opt for mobility services rather than affording their own vehicle because of utility factors. In an effort through a collective contract the group of individuals, who use personal vehicles can reserve their options than what they will do under individualistic action. So a general will of social contract can be accepted and enforced for that purpose (Sen, 1982)[60-65]. But what if no such contract can be arrived at? Are the

personal vehicle users doomed to suffer a heavy penalty constrained by their own rational choice calculus?

Even if all such users are determined not to let their other comrades down at least irrespective of the consequences of themselves. Then everybody will use their personal motorised vehicle and they will get off lightly. There is, of course, an element of uncertainty in the exercise of choice that the users face, for neither of them knows what the others are up to. In this situation, every user prefers at least one of the possible outcomes resulting from her commitment to what would have happened had she betrayed, given other things. That is, either she prefers the consequence of her committing given the other users' non-commitment, or the consequences of her committing given the other users' commitment. But in fact neither happens to be true. Neither user prefers to use the public mobility services. And nor anybody will sacrifice for others. Everybody is assumed to be self-centred and interested basically only in her own benefit and leisure, and the choice of making commitment follows not from calculations based on this welfare function, but from following a moral code of behaviour suspending the rational calculus. The preference is no different in any case, but behaviour is. The behaviour pattern that will make each better off in terms of their real preferences is not at all the behaviour pattern that will reveal those real preferences. Choices that reveal individual preferences may be quite inefficient for achieving welfare of the group (Sen, 1982)[60-65].

People use incomes and commodities as the material basis of their well-being. But the way of using a given bundle of commodities, or more generally of a given level of income, depends crucially on a number of contingent circumstances, both personal and social. The use of vehicle requirements of established patterns of behaviour may vary between communities, depending on conventions and customs. Even the same parametric variability may apply to the personal vehicle needed for the fulfilment of self-respect in an inter-societal variation rather than an inter-individual variation within a given society (Sen, 1982)[60-65]. In the case of income distribution, the incomes earned by one or more members of a family are shared by all – non-earners as well as earners. The well-being or freedom of individuals in a family depends on how the family income is used in furtherance of the interests and objectives of different members of the family (Sen, 2000)[71]. Even physical characteristics influence the need of more resources in some cases. These kinds of different sources of variation in the relation between income and well-being make a limited guide to welfare and the quality of life.

Though in many cases Gross National Product (GNP) per capita is crude and widely used measurement process of quality of life for public policy making, and utility is considered as the merit of measurement for quality of human life (whether understood as happiness or satisfaction of desire or preference); but it is mainly rejected by many economists and philosophers because of many different kinds of activities those actually make up a 'thriving' human life. Rawls replaced aggregative and welfare characters of utilitarianism by equality and primary goods accordingly to his '*A Theory of Justice*' (1971). Also Sen raised

question against the fundamental metric of measurement for distributive equality in an egalitarian society (Sen, 1982)[353-369].

The modern use of "utility" in contemporary choice theory, its identification with pleasure or desire-fulfilment has been largely abandoned in favour of seeing utility simply as the numerical representation of a person's choice. Robbins (1938) and other methodological positivists criticized that interpersonal comparisons of different people's minds were "meaningless" from the scientific point of view. He argued that there are "no means whereby such comparisons can be accomplished." Even Jevons (1911) argued that, *"There is no unit of .....suffering, or enjoyment .....we can hardly form the conception of a unit of pleasure or pain, so that the numerical expression of quantities of feeling seems to be out of the question. I confess that it seems to me difficult even to imagine how such estimates and summations can be made with any approach to accuracy. .....I see no means by which (comparison of) the amount of feeling in one's mind with that in another.....can be accomplished. The susceptibility of one mind may, for what we know, be a thousand times greater than that of another.....Every mind is thus inscrutable to every other mind, and no common denominator of feeling seems possible".*

If different persons have different preferences, there is *obviously* no way of getting interpersonal comparisons from these diverse preferences. But if those persons share the same preference and make the same choices in similar circumstances, then it will be interesting to ask whether interpersonal comparisons can be made under this very special assumption. But unfortunately,

the answer is in the negative. There would be many other assumptions. Indeed Horace noted as "there are as many preferences as there are people". Even the numerical representation of choice behaviour is not unique; each choice-behaviour can be represented by a wide set of possible utility functions (Sen, 1982)[74-83]. The coincidence of choice behaviour need not entail any congruence of utilities.

The pleasure of mobility activity from a personal motorised vehicle one takes in discriminating against or in subjecting others to a lesser liberty should not count equally with other satisfactions from the point of view of justice. And also the expensive preference satisfaction of buying personal vehicle must bear the cost of 'their lack of foresight or self-discipline'. From the point of view of justice, such pleasures deserve condemnation, and the corresponding preferences have no claim to be satisfied, even if they would have to be satisfied for welfare equality to prevail.....this objection defeats welfarism, and hence equality of welfare (Nussbaum and Sen, 1993)[10-16].

From 1990, under the pioneering leadership of economist Mahbub ul Haq, the United Nations Development Programme (UNDP) has been publishing annual reports on "human development" that have thrown systematic light on the actual lives by people, especially by the relatively deprived. The actual living and its constituent elements that people manage to achieve (the freedom to achieve actual livings that one can have reason to value) have become the focal point in many attempts in contemporary economics (Sen, 2000).

3.2.2 Morality for shifting to urban mobility services

Sen (1982) argued for moral rules of behaviour in different social situations in response to different types of problems. Particular rules of behaviour have been proposed, which have in common the analytical property of trying to generate the results of a social contract without there being any such formal contract. The fact that man is a social animal and her choices are not rigidly bound to her own preferences only, the act of choice for this social animal is fundamentally a social act. There is a chance that this kind of act may change the traditional simpler way of analysis of rigid correspondence between choice, preference and welfare assumed in economic theory and open important avenues of social and economic change.

Environmental issue is an important part of ecological economics. To promote sustainable consumption behaviour, Government may offer financial incentives to the public mobility service users. But that may not be adequate if the personal vehicle users neither worry about the environment nor are thrilled by receiving back small change. They may think that their single use of personal motorised vehicle may affect the environment very less, so not to worry about much. On the other hand they may think why only they will take the responsibility for that act of over consumption of personal vehicles and its after effects. To tackle this problem moral behaviour is the ultimate way.

There can be various options of behaviour for a user of personal motorised vehicle towards the change in the case of strong environmental reasons:

(1) The person simply prefers using urban mobility services rather than personal vehicle from a purely self-regarding point of view, because she likes public mobility services, or she believes the impact on environment of her using personal motorised vehicle will hurt significantly.

(2) The person is worried about the welfare of other personal vehicle users as well and her own welfare function includes concern for people's welfare (Sen, 1982)[69], and she refuses public mobility services because she takes the hurt on others as hurt on herself.

(3) The person's concern for the other people's welfare reflected in her notion of her own welfare would not be sufficient to prevent her from using personal vehicle if she could do it on the sly, but she is afraid of the social stigma of being seen to do the 'wrong' thing, or afraid of others emulating her in doing the 'wrong' thing and thereby her getting hit indirectly.

(4) The person can do the 'wrong' thing on the sly without being noticed and she feels that if she did that she personally would be better off (even after taking note of whether weight she might wish to put on the welfare of the others), but she feels that she would be acting socially irresponsibly if she did proceed to do it, and therefore dose not do so.

In case of (3), since preferences are not usually defined on the space of stigmas and such things; and identical vehicle choices will involve quite different welfare

levels depending on the reaction of others. So case (3) can be, in principle, taken care of through a suitable redefinition of the domain of choice.

In case of (4), taking an action based on the social responsibility in opposed to one's personal welfare is the 'ultimate' preference. Now the question is whether this ultimate preference can be maintained always. Because the question arises from the dual link between choices and preferences at the one side and preferences and welfare on the other side, so the issue is to maintain both through some definition of preference.

First of all, it is an issue of moral responsibility in daily life story to make a decision based on social judgement. Second, in the empirical work, behaviour is the major source of information on person's preferences. So based on the context the person may act, which reveals his preference in the practical life. Third, human being is the social animal and superior to others. The decision she takes as preferences is not only made under a straightforward pursuit of her welfare only, but it is a decision making process comprising of many other issues also. Fourth, she may not have the connected preference pattern and there fore it is difficult to distinguish such incompleteness from indifference. Fifth, every person tries to achieve her best according to her preference and that is possible when there is a social contract, but this kind of social contract is not possible in most of the time, still the parties involved will be better off following rules of social code of behaviour to act as if they have different preferences from what they really have. Finally, it is not possible to guarantee both the choices and welfare

simultaneously. Preference can be maintained with the relation of either with choice or welfare; something has to give at one place or the other.

3.2.3 Motivation to choose according to commitment

The human being is a 'self-interested man' in economic principle, as asserted by Edgeworth (1881) himself knew that it is not at all a realistic one. On the other hand, according to Spencer (1879), 'general happiness is to be achieved mainly through the adequate pursuit of their own happiness by individuals; while, reciprocally, the happiness of individuals are to be achieved in part by their pursuit of the general happiness'.

Even if a personal vehicle owner starts using public mobility services available in the city, showing her egoistic nature, because of her concern over environmental aspects, still she may like to claim or maximize her personal utility level in that consumption activity. According to Sen, there are claims of variety of groups between the claims of oneself and claims of all. And also that no one could be made better of without making somebody else worse off (called 'Pareto optimum'), and that no one is worse of than she would be without trade, and that no coalition of individuals, by altering the trade among themselves, could on their own improve their own lot. So in what sense and to what extent would egoistic behaviour achieve general good?

It is true that what ever she does, the passenger's interests in such a way can be seen to be furthering her own interest in every isolated act of choice. The passenger's choices are considered 'rational' only if these choices can all be

explained in terms of some preference relation consistent with the revealed preference definition, that is, if all her choices can be explained as the choosing of 'most preferred' alternatives with respect to a postulated preference relation. Also choice may reflect a compromise among a variety of considerations of which personal welfare may be just one (Sen, 1982)[89]. Also according to Samuelson, behaviour is to be 'explained in terms of preferences, which are in turn defined only by behaviour' (Sen, 1982)[90]. Still the question remains as the accommodation of behavioural characteristics within the formal limits of consistent choice on which the welfare-maximization approach depends (Sen, 1982)[90]. Even if we agree upon the required consistency, it still leaves the question of egoism unresolved.

It is true that every person has direct control in her acts of choice over her or her family's own bundle of commodities. Following Edgeworth's words, behaviour based on sympathy is in an important sense egoistic. Here well-being of one person is psychologically dependent on someone else's welfare. Where as action based on commitment rather than sympathy which would be non-egoistic in this sense. While sympathy relates similar things to each other – namely, welfares of different persons – commitment relates choice to anticipated levels of welfare. One way of defining commitment is in terms of a passenger choosing a mobility service activity that she believes will yield a lower level of personal welfare to her than an alternative that is also available to her.

But it is also a true fact that the definition of commitment excludes mobility service activities that go against self-interest resulting purely from a failure to foresee consequences. Now if the passenger's choice happens to coincide with the maximization of her anticipated personal welfare, which is not the reason for her choice, then we can expand the definition of commitment to include those mobility service activities in which the passenger's choice to maximize anticipated personal welfare. This broader sense has particular relevance when one acts on the basis of a concern for duty, which is really chosen out of the sense of duty rather than just to avoid the ill-fare resulting from the remorse that would occur if one were to act otherwise.

In the case of uncertainty concerning anticipated welfare, the personal welfare of the passenger is replaced expected personal welfare; commitment then involves choosing an action that yields a lower expected welfare than an alternative available action. For example, the consumer as passenger decides to travel by a particular mobility service, but it is not available at that moment; so obviously she will try to use an alternative which may not be able to provide that expected level of welfare, but somehow fulfils the purpose. That means commitment does involve in counter preferential choice, destroying the crucial assumption that a chosen alternative must be better than the others for the passenger choosing it. So the characteristic of commitment drives a wedge between the identity of personal choice and personal welfare as commitment is closely connected with one's morals. The basic link between choice behaviour

and welfare achievements in the traditional economic models is served as soon as commitment is admitted as an important ingredient of choice (Sen, 1982)[91-94].

3.2.4 Commitment and moral preference of public mobility activities and services

In the real world there can be only one or more choices for a passenger. If the passenger is having only and only one preference and tries to describe it as her actual choices, welfare and behaviour, then may be it can be described as 'rational' in the limited sense of revealing no inconsistency in his choice behaviour. In fact more choices are the better options in a sustainable scenario as the researcher will discuss about the freedom of choice aspects later. But what will be the preference ranking considering both the 'ethical' and 'subjective' aspects of a passenger, is the issue at this moment.

According to Harsanyi (1955) both 'ethical' preferences and 'subjective' preferences can be described as 'the expression of individual preferences (or, rather would prefer), on the basis of impersonal social considerations alone,' and the latter as 'the expression of what she actually prefers on the basis of her personal interests or on any other basis,' accordingly (Sen, 1982)[99]. But the connectivity of sympathy and commitment with these two kinds of preferences create ambiguity about the actual preference expressed by the passenger. According to Harsanyi, 'ethical' preferences are by contrast given the role of

expressing 'what she prefers only in those possibly rare moments when she forces a special impartial and impersonal attitude on herself' (Sen, 1982)[100]. But what if she departs from her personal welfare maximization (including any sympathy), not through an impartial concern for all, but through a sense of commitment to some particular group. That means the preference ranking (Sen, 1982)[100] varies according to the context as the researcher earlier mentioned that in between the claims of oneself and the claims of all in the society, there are claims of variety of groups – families, friends, economic and social classes. The concepts of family responsibility, business ethics, class consciousness, and so on, relate to these intermediate areas of concern and the dismissal of utilitarianism as a descriptive theory of behaviour does not leave us with egoism as an expression of commitment as the only alternative. The relevance of some of these considerations to the economics of negotiations and contracts would be difficult to deny (Sen, 1982)[100].

In fact the actual ranking of moral rankings based on ethical reasons of various choices available is not based on 'most moral' aspects. Because a particular morality can be viewed, not just in terms of the 'most moral' ranking of the set of alternative actions, but as a moral ranking of the rankings of actions. According to Sen, a particular ranking of the action-set is not articulate enough to express much about a given morality, and a more robust format is provided by choosing a meta-ranking of actions. Such meta-ranking may include inter alia the specification of a particular action-ranking as the 'most moral', but in so far as

actual behaviour may be based on a compromise between claims of morality and the pursuit of various other objectives (including self-interest), one has to look also at the relative moral standings of those action-rankings that are not 'most moral'.

There can be various types of rankings of action-set:

1) One representing personal welfare ordering which represents personal interests,

2) Another one is 'isolated' personal interests ignoring sympathy, where such separation is not always so,

3) And the third one is of actual choices made by the passenger are represent-able by a ranking, which again is not always so.

4) The 'most moral' can be any of those above or something quite different from all the above.

Even if we assume that the moral system requires sacrifice of some self-interest and also of 'isolated' self-interest. Still a clear distinction of ordering is very much required. It so happens that the pursuit of self-interest, including pleasure and pain from sympathy, is put morally above the pursuit of 'isolated' self-interest, there by leading to a partial coincidence of self-interest with morality, and the actual choices reflect a morally superior position to the pursuit of self-interest due to a compromise in the moral direction, then the morality in question precipitates the meta-ranking 4, 3, 1, 2 in descending order. This, of course, goes well beyond specifying that '4' is 'morally best' (Sen, 1982)[100-101].

Each passenger is better off personally by playing the selfish strategy, but in complex circumstances, much depends on the concept of rationality and many characterizations. In the sense of consistency of choice, there is no reason to think that admitting commitment must imply any departure from rationality. Commitment does not presuppose reasoning, but it does not exclude it. Admitting commitment as a part of behaviour implies no denial of reasoned assessment as a basis for action. In fact, in so far as consequences on others have to be more clearly understood and assessed in terms of one's values and instincts, the scope for reasoning may well expand. Rational behaviour lies in the fact that in actual situation people often do not follow the selfish strategy.

3.3 Majority rule

Arrow's "impossibility Theorem" (1963) establishes, in effect, not the impossibility of rational social choice, but the impossibility that arises when it is tried to base social choice on a limited class of information. In taking a social decision on economic matters, it would be natural for someone to consider other types of information also. Indeed, a majority rule – whether or not consistent – would be a non-starter as a mechanism for resolving economic disputes. Acceptable social rules would tend to take notice of a variety of other relevant facts in judging who is poorer than whom, who gains how much in terms of welfare or of the basic ingredients of living. In fact Arrow provides a general approach to thinking about social decisions based on individual conditions - what is possible and what is not may turn crucially on what information is taken into

effective account in making social decisions. Through informational broadening, it is possible to have coherent and consistent criteria for social and economic assessment. The "social choice" literature, which has resulted from Arrow's pioneering move, is as much a world of possibility as of conditional impossibilities (Sen, 2000)[250-252].

The politics of social consensus calls not only for acting on the basis of given individual preferences, but also for sensitivity of social decisions to the development of individual preferences and norms. In this context, particular importance has to be attached to the role of public discussion and interactions in the emergence of shared values and commitments (Sen, 2000)[253]. It is also true that tremendous fine-tuning precision of agreed social arrangements and adequate public policies is not required for judgements of "social justice". Partial agreements still separate out acceptable options from unacceptable ones. Indeed, the overuse of the concept of justice reduces the force of the idea when applied to the terrible deprivations and inequities that characterize the world in which we live.

Sen argued against Smith's "the theory of unintended consequences", where according to Smith, the selfish and the rapacious are led "by an invisible hand," to advance the interest of the society," to achieve "without intending it, without knowing it" (Sen, 2000)[254-256]. In that case, the promotion of urban mobility public services, by both Government and Private participation, are not unintended consequences. In fact the intended, planned and committed

promotion of this kind of services may provide benefit to a large volume of passengers in the urban area. The long term investment and long tern relations between service providers and urban passengers may produce a long term profit with comparatively low investment per capita. On the other hand, the shift of those personal vehicle users to mobility service consumption and production process may also support the other passengers as well as the service providers in their benefit.

Self-interest is an extremely important rational motive. And the daily life actions reflect values which have clear social components beyond the narrow confines of purely selfish behaviour. The emergence of social norms can be facilitated both by communicative reasoning and by evolutionary selection of behavioural modes. The use of socially responsible reasoning and of ideas of justice relates closely to the centrality of individual freedom. People can invoke their ideas of justice or utilize their powers of socially sensitive reasoning, in deciding on how to exercise their freedom. Social values play an important part in the success if various forms of social organizations, including market mechanism, democratic political systems and rights, provision of basic public goods like urban public mobility services, etc.

Trust in one another's words and promises can be a very important ingredient of successful market, which not only survives on the basis of exchanges, but also on the solid foundation of institutions and behavioural ethics. Despite its effectiveness, capitalist ethics is, in fact, deeply limited in some respects, dealing

particularly with issues of economic inequality, environmental protection and the need for cooperation of different kinds that operate outside the market. But within its domain, capitalism works effectively through a system of ethics that provides the vision and the trust needed for successful use of the market mechanism and related institutions. Capitalism's need for motivational structures that are more complex than pure profit maximization has been acknowledged in various forms by leading social scientists like Marx (1946 & 1947), Weber (1930), Tawney (1926) and others. The success of capitalism in transforming the general level of economic prosperity in the world has drawn on morals and codes of behaviour that have made market transactions economical and effective (Sen, 2000)[261-265].

According to Sen, the big challenges that capitalism now faces in the contemporary world include issues of inequality and of "public goods or services" like mobility service systems. The solution to these problems will almost certainly call for institutions that take us beyond the capitalist market economy. But the reach of the capitalist market economy itself is, in many ways, extendable by an appropriate development of ethics sensitive to these concerns. The compatibility of the market mechanism with a wide range of values is an important question, and it has to be faced along with exploring the extension of institutional arrangements beyond the limits of the pure market economy.

The environmental challenge is part of a more general problem related to resource allocation involving "public goods or services," where the community life is enjoyed in common rather than separately by one consumer only. For efficient

provision of public goods or services, it is not only the state action and social provisioning, those are considered, but also one has to examine the part that can be played by the development of social values and of a sense of responsibility that may reduce the need for forceful state action(Sen, 2000)[269].

Smith's conception of the rational person places this person firmly in the company of others – right in the middle of a society to which he belongs. The person's evaluations as well as actions invoke the presence of others, and the individual is not dissociated from "the public."

According to Stigler (1975), "self-interest dominates the majority of men." The motivation for mutually beneficial exchange certainly does not need anything more than what Smith called "self love," and this is decidedly important to note, since exchange is so central to economic analysis. But in dealing with issues of distribution, equity etc. - Smith emphasized broader motivations. John Rawls (1993) defined "moral powers" shared by persons as "a capacity for a sense of justice and for a conception of the good." These shared powers as central to "the tradition of democratic thought," along with "powers of reason". In fact, the role of values is extensive in human behaviour, and to deny this would amount not only to a departure from the tradition of democratic thought, but also to the limiting rationality (Sen, 2000)[270-272].

Sen proposed some ways to influence the motivational behaviour by values, like firstly, the value may come from reflection and analysis, where

reflections may relate directly with our concerns and responsibilities (as Kant and Smith both emphasized), or indirectly with the effects of good behaviour. Second, they may arise from the willingness to follow convention, and to think and act in ways that the established mores suggest they do. This type of "concordant behaviour" can extend the reach of reasoning beyond the limits of the individual's own critical assessment, since one can emulate what others have found reasons to do. Third, public discussion can have a strong influence on value formation. According to Knight, values "are established or validated and recognized through discussion, an activity which is at once social, intellectual, and creative". Fourth, behaviour patterns can survive and flourish because of their consequential role through evolutionary selection of activities (Sen, 2000)[272-274].

Public policies are dependent on how individuals and groups in the society behave. These behaviours are influenced by the understanding and interpretation of the demands of social ethics. According to Sen, for the making of public policy it is important not only to assess the demands of justice and the reach of values in choosing the objective and priorities of public policy, but also to understand the values of the public at large, including their sense of justice.

3.4 Culture and social development

Any consumption activity is the reflection of revealed preference. Activities are part of behaviour and psychology. Activities are done in an environment according to constraints. It is the cultural resistance of behaviour that helps to survive in an environment full of constraints. The culture is developed through the

socio-political actions of human being according to the environment through out the life time; so the knowledge of ethics, value system, story of past happenings etc. influence human being throughout her acts of living.

3.4.1 Behaviour and culture

According to Sen, behaviour is a major source of information on a person's preferences. Motivation has something to do with ethics, though that lies outside the economics of rewards and punishment (Sen, 1982)[97-99]. Moral reasoning influences one's actions, and in a broader sense these are matters of culture, of which morality is one part.

The Aristotelian account of the human good is explicitly linked with the necessity to 'first ascertain the function of man' and it then proceeds to explore 'life in the sense of activity' (Nussbaum and Sen, 1993)[46]. According to Lewontin (1982), human activity is a complex evolutionary achievement. Even this type of activity is not just passive adaptation - "species do not adapt to environments; they construct them."

Also according to the principle of Lewin (1935), behaviour evolves as a function of the interplay between person and environment, symbolically presented as B=f (PE), where psychology is defined as the science of behaviour (B), to give substantial if not equal emphasis to both elements on the independent side of the equation, to investigate the person (P) and the environment (E). Special attention is given to the interaction between the two. In practice it provides information about highly differentiated profiles of abilities, predominant behaviour

tendencies of the individual and about the settings from which the persons come. Also it talks about the environment for the evolving processes of interaction through which the behaviour of participants in the system is instigated, sustained, and developed.

Bronfenbrenner (2004) defined development as a lasting change in the way in which a person perceives and deals with his environment.

The biologist Haeckel understood ecology to mean,

'..the study of the economy, of the household, of animal organisms. This includes the relationships of animals with both the inorganic and organic environments, above all the beneficial and inimical relations that Darwin referred to as the conditions of the struggle for existence' (Bates, 1953)[700-713].

This means, human being deals with economic activities in an environment to survive in their life and with the process that link human being and place, and this process goes on throughout the life of human being. According to the situation of the environment the human being changes her strategy to act and change her behaviour pattern, which ultimately change the characteristics of that human being. So in the same way, if a personal vehicle user starts acting in the mobility service system of a city, there is a chance of changes in her habit and characters accordingly.

Lowie quoted, "environment cannot explain culture because the identical environment is consistent with distinct cultures; because cultural traits persist

from inertia in an unfavourable environment; because they do not develop where they would be distinct advantage to a people; and because they may even disappear where one would least expect it on geographical principles" (Netting, 1986)[3]. But this does not mean that the influence of climate, topography, and natural vegetation on the group of people should be ignored. Indeed, Wissler (1926) and Kroeber (1939) carefully documented the correspondence between cultural and natural areas in their research.

"Between the physical environment and human activity there is always a middle term, a collection of specific objectives and values, a body of knowledge and belief: in other words, a cultural pattern" (Forde, 1963)[463]. The first priority of modern anthropology is to explore culture as embodied by specific societies at particular points in time – to look at it from the inside out in terms of its own patterns and rules to establish a true science of culture.

Customs, beliefs, and values that form a patterned common ideological reality are shared in large part by the members of a society. Instead of looking at the cultural tradition from the individual cultural trait, one must consider the systematic interaction among members of the group. In any social body, as in an organism, the parts must work together as an overall system. Social structure is not an aspect of culture but the entire culture of a given people handled in a special frame of theory (Fortes, 1957)[17-41]. Steward defined cultural ecology as the study of "the adaptive processes by which the nature of society and an unpredictable number of features of culture are affected by the basic adjustment

through which man utilizes a given environment" (Tax, 1953)[243]. Steward also added, a "cultural core" of features most closely related to subsistence activities and economic arrangements are to be specified (Steward, 1955)[37].

Functionalism is extended beyond the social sphere; structural arrangements are seen to have adaptive value in organization for defence and production, cultural attitudes showed selective advantages in promoting subsistence success.

It is well understood that the social arrangements always can not explain the culture of that area, but to some extent it can contribute to culture. For example, if the social arrangements like sustainable mobility service facilities are totally absent, then the citizens are forced to adopt their personal mode for mobility activities. It can be walking, bicycling, or motorized vehicles. But for those people who have to go long distance and do not have their personal vehicles, they will have to face major problems, also those who have buying capability, always try to use their personal vehicles. Ultimately it may create social disharmony. The inequality gap will be prominent and may proceed for further for social tension. It can reflect on their culture even as time goes by.

3.4.2 Socio-cultural development

Hawley (1950) states that, man reacts to the web of life as a cultural animal rather than as a biological species. He states: "The weight of evidence forces the conclusion that the physical environment exerts but a permissive and limiting effect", but he also says that "each habitat not only permits but to a certain extent necessitates a distinctive mode of life". The first statement closely

confirms with the widely accepted anthropological position that historical factors are more important than environmental factors, which may be permissive or prohibitive of culture change but are never causative. The second indicates that, cultural ecological adaptations constitute creative processes of consumers (passengers) (Steward, 1955)[34].

Owing in part to reaction against the "environmental determinists," and in part to cumulative evidence that any culture increases in complexity to a large extent because of diffused practices, the orthodox view now holds that history, rather than adaptive processes, explains culture. Since historical "explanations" of culture employ the culture area concept, there is an apparent contradiction. The culture area is a construct of behavioural uniformities which occur within an area of environmental uniformities. It is assumed that cultural and natural areas are generally coterminous because the culture represents an adjustment to the particular environment. Since cultural differences are not directly attributable to environmental differences and most certainly not to organic or racial differences, they are merely said to represent divergences in cultural history, to reflect tendencies of societies to develop in unlike ways.

Environment is relegated to a purely secondary and passive role. It is considered prohibitive or permissive, but not creative. It allows man to carry on some kinds of activities and it prevents others. The origins of these activities are pushed back to a remote point in time or space, but they are not explained. This view has been best expressed by Forde, who writes:

"Neither the world distributions of the various economies, nor their development and relative importance among the particular peoples, can be regarded as simple functions of physical conditions and natural resources. Between the physical environment and human activity there is always ...a cultural pattern. That culture itself is not static, it is adaptable and modifiable in relation to physical conditions, must not be allowed to obscure the fact that adaptation proceeds by discoveries and inventions which are themselves in no sense inevitable and which are, in any individual community, nearly all of them acquisitions or impositions from without...Equally important are the restrictions placed by social patterns and religious concepts on the utilization of certain resources or on adaptations to physical conditions". (Forde, 1949)[463]

"The habitat at one and the same time circumscribes and affords scope for cultural development in relation to the pre-existing equipment and tendency of a particular society, and to any new concepts and equipment that may reach it from without". (Forde, 1949)[464]

"But if geographical determinism fails to account for the existence and distribution of economies, economic determinism is equally inadequate in accounting for the social and political organizations, the religious beliefs and the psychological attitudes which may be found in the cultures based on those economies. Indeed, the economy may owe as much to the social and ritual pattern as does the character of society to the economy...As physical conditions may limit the possibilities of the economy, so the economy may in turn be a limiting or stimulating factor in relation to the size, density and stability of human settlement,

and to the scale of the social and political unit. But it is only one such factor, and advantage may not be taken of the opportunities it affords. The tenure and transmission of land and other property, the development and relations of social classes, the nature of government, the religious and ceremonial life – all these are parts of a social superstructure, the development of which is conditioned not only by the foundations of habitat and economy, but by complex interactions within its own fabric and by external contacts, often largely indifferent to both the physical background and to the basic economy alike". (Forde, 1949)[465]

The adjustments of human societies to their environments require particular modes of behaviour and they permit latitude for a certain range of possible behaviour patterns. The normative concept, which views culture as a system of mutually reinforcing practices backed by a set of attitudes and values, seems to regard all human behaviour as so completely determined by culture that environmental adaptations have no effect. It considers that the entire pattern of technology, land use, land tenure, and social features derive entirely from culture. Cultures do, of course, tend to perpetuate themselves, and change may be slow for such reasons as those cited. But over the millennia cultures in different environments have changed tremendously, and these changes are basically traceable to new adaptations required by changing technology and productive arrangements. In advanced societies, the nature of the culture core will be determined by a complex technology and by productive arrangements, which themselves have a long cultural history. In the case of the adaptive

processes, attention is directed not simply to the human community as part of the total web of life but to such cultural features as are affected by the adaptations. This in turn requires that primary attention be paid only to relevant environmental features rather than to the web of life for its own sake. Only those features to which the local culture ascribes importance need be considered.

According to Steward (1955)[39-42], three fundamental procedures of cultural ecology are as follows:

First, the interrelationship of exploitative or productive technology and environment must be analyzed. This technology includes a considerable part of what is often called "material culture," but all features may not be of equal importance. In an industrial world, capital and credit arrangements, trade systems and the like are crucial.

Second, the behaviour patterns involved in the exploitation of a particular area by means of a particular technology must be analyzed. Some subsistence patterns impose very narrow limits on the general mode of life of the people, while others allow considerable latitude. The exploitative patterns not only depend upon the habits concerned in the direct production of goods but upon facilities for transporting the people to the source of supply or the goods to the people.

The third procedure is to ascertain to extent to which the behaviour patterns entailed in exploiting the environment affect other aspects of culture. Although technology and environment prescribe that certain things must be done in certain ways if they are to be done at all, the extent to which these activities are

functionally tied to other aspects of culture is a purely empirical problem. If it can be established that the productive arrangements permit great latitude in the socio-cultural type, then historical influences may explain the particular type found.

It requires a genuinely holistic approach, for if such factors as demography, settlement pattern, kinship structures, land tenure, land use, and other key cultural features are considered separately, their interrelationships to one another and to the environment cannot be grasped. Land use by means of a given technology permits a certain population density. The clustering of this population will depend partly upon where resources occur and upon transportational devices. The composition of these clusters will be a function of their size, of the nature of subsistence activities, and of cultural-historical factors. The ownership of land or resources will reflect subsistence activities on the one hand and the composition of the group on the other.

3.5 Conclusion

It has become true that a good culture can support sustainable behaviour to people, of which they are also a part. And body of knowledge, ethics, values take a big role in creating a sustainable culture, rather than the only economic or geographic or climatic factors. Because there are so many example are there of similar geo-climatic and economic situation in the world, but because of the

different historical background of these localities, one can observe the variation of culture among those geographical localities.

These cultures are nothing but some unwritten rules and regulations which determine or control the socio-economic activities in many ways. It inherits in the people's mind through various kinds of story telling, practicing from the childhood itself. It creates the ethical sense among the people of the society to integrate their social thinking as a responsible citizen, rather than a selfish individual. This sense of responsibility takes a big role to participate in sustainable consumption and production activities like mobility services and activities in a city. This moral responsibility helps the person to commit a decision for a particular preference, which can influence the well-being of the whole society.

4

Acting in sustainable mobility activity or service systems

4.1 Introduction

Good culture can enhance the human capability to some extent, but the social infrastructure is also required to be created in such a way so that every human being can make use of those materials in an effective way. The systemic approach in decision making process of human physical and psychological world creates those consumption and production scenario through daily life practice and makes the person habitual in those existing sustainable system of society to survive.

The creative capability of every human helps her to act in a sustainable way in a sustainable system of economic activities. Every human can express her full capability if she has the freedom to express it in a democratic system of consumption and production in a society. The city as a social system must ensure this sustainable pattern through the participation of its social organizations on a common platform. Every passenger must participate as an agent to ensure this sustainable social infrastructure of mobility set up through responsible consumption by her as well as helping others to achieve the same.

4.2 Passenger's capability and human development

Edgeworth tried to establish the acceptability of 'egoism' as the fundamental behavioural assumption against the acceptability of 'utilitarianism' as a description of actual behaviour. But utilitarianism is far from being the only non-egoistic approach. Between the claims of oneself and the claims of all lie the claims of a variety of groups. Through a collective contract the group of individuals can do better than what they will do under individualistic action. The distinction has something to do with a necessity of a 'social contract' to achieve what Rousseau's 'general will' wills. It can be argued that some of the difficulties in the general theory of social choice arise from a desire to fit essentially different classes of group aggregation problems into one uniform framework and from seeking excessive generality. It is important to distinguish between different types of aggregation exercises covered by social choice theory since they involve quite different problems.

From the previous chapter, one point is clear, that modern human being always tries to construct her own environment for her purposes, and adopt it according to the culture and economic activities. This process goes on through out the life time. Even the same environment creates different kinds of situation at different point of time within the same day. One of the best examples is the situations of mobility activities in city of how to survive in different situations is the issue of capability for human and her development.

4.2.1 Functioning, capability and freedom to choose

It is not possible to construct an adequate theory of equality on the combined grounds of Rawlsian equality and equality under the two welfarist conceptions – utilitarian equality and total utility equality. While equality of opportunity for welfare survives Rawls's criticisms of equality of welfare, Sen advanced something like opportunity, but it was not welfare. Sen proposed two large changes of view: from actual state to opportunity, and from goods (and welfare) to what he sometimes called 'functionings'.

Sen's argument was that differently constructed and situated people require different amounts of primary goods to satisfy the same needs, so that 'judging advantage in terms of primary goods leads to a partially blind morality'. According to Sen, 'what people get out of goods depends on a variety of factors, and judging personal advantage just by the size of personal ownership of goods and services can be very misleading...It seems reasonable to move away from a

focus on goods as such to what goods do to human beings' (Basu et al., 1995)[17-19].

Goods (a bus) → characteristics (transport) → functioning (moving) → utility (pleasure)

Sen also criticized both the hedonic and preference-satisfaction welfarists for their too-narrow view of what people get from goods, for focusing 'not on the person's capabilities but on his mental reaction'. Sen also argued that utility is an unsuitable guide to policy, if only because a person may adjust his expectations to his condition (Nussbaum and Sen, 1993)[16-17].

Functionings represent parts of the state of a person – in particular the various things that he or she manages to do or to be in leading a life. The capability of a person reflects the alternative combinations of functionings the person can achieve, and from which she can choose one collection (Nussbaum and Sen, 1993)[31].

Commodities (a bus) → Functionings (mobility) → Capabilities (to use mobility service) → Utility (pleasure)

The weight to different functionings may vary from person to person though they all may be valuable and the assessment of individual and social advantages must be alive to these variations. Some functionings are very elementary and strongly valued by all, where as some are complex and widely valued. Mobility activity can be a necessary function in urban daily life.

Capabilities are defined derivatively from functionings. In the space of functionings any point, representing an n-tuple of functionings, reflects a combination of the person's doings and beings, relevant to the exercise. The capability is a set of such functioning n-tuples, representing the various alternative combinations of beings and doings any one (combination) of which the person can choose (Sen, 1985b). This set contains information about the actual functioning n-tuple chosen, since it too is obviously among the feasible n-tuples. The evaluation of a capability set may be based on the assessment of the particular n-tuple chosen from that set. Evaluation according to the achieved functioning combination is thus a 'special case' of evaluation on the basis of the capability set as a whole.

For example, a passenger can make various kinds of combination of available public mobility services to reach from one place to another according to her capabilities. These capabilities can be of various forms, may it be a financial, or physical, social, or political. Suppose if the passenger observes that on her way to her destination, there is some political tension, but still she needs to reach her destination; so in that case she tries to reach through different route and in that case she have to spend little more money for the extra fare for extra journey through different route. Otherwise she will have to face the political tension of that particular area and somehow reach her destination by her own risk. The risk may be of physical clash between two political groups. Again it is her different kind of capability she uses for her purposes.

The conceptualization of functioning and capability is based on evaluative objects of values for any choice. The evaluative space consists of the individual utilities. The capability approach is concerned primarily with the identification of value-objects, and sees the evaluative space in terms of functionings and capabilities to function. A complete evaluative approach entails a class of 'informational constraints' in the form of ruling out directly evaluative use of various types of information, those do not belong to the evaluative space (Nussbaum and Sen, 1993)[32].

Because of the nature of the evaluative space, the capability approach differs from utilitarian evaluation in making room for a variety of human acts and states as important in themselves (not just because they may produce utility, nor just to the extent that they yield utility). It also makes room for valuing various freedoms – in the form of capabilities. The approach does not attach direct importance to the means of living or means of freedom (e.g. real income, wealth or resources), as some other approaches do. These variables are not part of the evaluative space; though they can indirectly influence the evaluation through their effects on variables included in that space.

The capability of a person depends on a variety of factors, including personal characteristics and social arrangements. A full accounting of individual freedom must go beyond the capabilities of personal living and pay attention to the person's other objectives (e.g. social goals not directly related to one's own life), but human capabilities constitute an important part of individual freedom.

Sen discarded the momentous relation between evaluation of achievements and that of freedom, since it concerns the 'range' of choice a person has – not how she values the elements in that range or what she chooses from it (Sen, 1985b). Also the number-counting procedure leads to a rather peculiar accounting of freedom. The freedom of a person is no less when she has to choose between three alternatives which she sees respectively as 'bad', 'awful', and 'gruesome' than when she has the choice between three alternatives which she assesses as 'good', 'excellent', and 'superb' (Nussbaum and Sen, 1993)[33-35].. The evaluation of the freedom to lead a life and the assessment of the life led (including choosing freely) have to be done simultaneously, in a desegregated way.

4.2.2 Agency goal and agency freedom

According to Sen, assessing well-being and judging achievement in terms of the person's overall goals are two different directional activities, since a person can have objectives other than the pursuit of her own well-being. Judging achievement of either kind may also differ from the evaluation of the freedom to achieve, since a person can be advantaged in having more freedom and still end up achieving less (Nussbaum and Sen, 1993)[35-38]..

The two distinctions between (1.1) the promotion of the person's well-being, and (1.2) the pursuit of the person's overall agency goals; and between (2.1) achievement, and (2.2) the freedom to achieve, can be applied both to the perspective of well-being and to that of agency to yield four different concepts of

advantage, related to a person: (1) 'well-being achievement', (2) 'agency achievement', (3) 'well-being freedom', and (4) 'agency freedom'.

	Person's Well-being	**Person's agency goal**
Achievement	*Well-being Achievement* (e.g. Participation in Urban mobility activity to reach destination)	*Agency Achievement* (e.g. Sustainable Urban mobility activity systems for passengers)
Freedom to achieve	*Well-being Freedom* (e.g. Capability as freedom to choose a set of combination of Urban mobility activity to reach the destination)	*Agency Freedom* (e.g. Socio-economic-political and physical freedom to achieve sustainable consumption & production)

(1.2) encompasses the goals that a person has reasons to adopt, which can *inter alia* include goals other than the advancement of her own well-being to generate orderings different from that of well-being. The contrast between (2.1) & (2.2) can be applied both to the perspective of well-being and to that of agency. For daily passengers, all values are very much interconnected. If the passenger can have the well-being freedom, then she can achieve well-being. And in this way all the passengers will achieve agency goal, i.e. a sustainable mobility activity system in the city. And this is only possible when they will have agency freedom; a freedom to move anywhere and anytime according to their needs within the city by using

those sustainable mobility functionings. That means the effect of 'other regarding' concerns on one's well-being has to operate through some feature of the person's own being.

If the value-purpose is changed from checking the 'well-ness' of the person's being to assessing the person's success in the pursuit of all the objectives that she has reason to promote, then the exercise becomes one of evaluation of 'agency achievement', rather than of well-being achievement. The space of functionings may be rather restrictive for this exercise, since the person's goals may well include other types of objective. Also, the difference between agency achievement and well-being achievement is not only a matter of space, but also one of differential weighting of the shared elements. The assessment of agency success is a broader exercise than the evaluation of well-being. A particularly important one is that of evaluating a person's standard of living. The inability to consume mobility activity, which will be widely recognized as a failure of an important functioning, may arise either from sources within one's own life, or from sources outside it. While both types of factor affect one's well-being, the case for excluding the latter from the assessment, specifically, of one's living standards would seem fairly reasonable, since the latter relates primarily to the lives of others, rather than one's own (Nussbaum and Sen, 1993)[36-38].

Well-being achievement can be assessed on the basis of the capability set, even when no freedom-type notion influences that achievement. On the other hand,

the informational base of capability is at least as adequate as that of achieved functionings. Because examining 'well-being achievement' is not only of interest but also 'well-being freedom'. A passenger's actual freedom to reach her destination with the help of some mobility activities is of some interest in social as well as personal evaluation. Even if one is to take the view, which will be disputed presently, that well-being achievement depends only on the achieved functionings, the 'well-being freedom' of a person will represent the freedom to enjoy the various possible well-beings associated with the different functioning n-tuples in the capability set (Nussbaum and Sen, 1993)[36-38].

4.2.3 Freedom as process and opportunity

The view of freedom that is being taken here involves both the processes that allow freedom of actions and decisions, and the actual opportunities that people have, given their personal and social circumstances. Both "process" and "opportunity", the two aspects of freedom are very much important in these regards. Because the domain of interest cannot be confined only to the outcomes in the form of the promotion of high output or income, or the generation of high consumption, but also a process of participation in political decisions and social choice as the means to development (Sen, 2000)[17].

Also freedom may have intrinsic importance for the person's well-being achievement. Acting freely and being able to choose some mobility activities may be directly conducive to well-being, not just because more freedom may make

better alternatives available, but also the passenger is having reasons to value those choices. This view is contrary to the one typically assumed in standard consumer theory, in which the contribution of a set of feasible choices is judged exclusively by the value of the best element available (Nussbaum and Sen, 1993)[38-40]. Even the removal of all the elements of a feasible set (e.g. of a budget set) other than the chosen best element is seen, in that theory, as no real loss, since the freedom to choose does not, in this view, matter in itself. The levels of real income that people enjoy are important in giving them corresponding opportunities to purchase goods and services and to enjoy living standards that go with those purchases.

In contrast, if choosing is seen as a part of living and 'doing it' is distinguished from 'choosing to do it and doing it', then even 'well-being achievement' need not be independent of the freedom reflected in the capability set (Sen, 1985b). In that case, both 'well-being achievement' and 'well-being freedom' will have to be assessed in terms of capability sets. Both must then involve 'set evaluation' in a non-elementary way, i.e. without limiting the usable informational content of capability sets through elementary evaluation.

For example, a passenger is going home at night after a party. She chooses to have the last trip of a particular public bus route to reach her home. Because of some reasons she becomes late by few moments only and she watches from a far distance that the scheduled bus about to start. She could not be able to run faster, she is an aged lady. Ultimately she misses the bus, and now she has to reach by a taxi service. Now this taxi service is an individual service, so in this

case the per capita consumption of fuel is higher in comparison to public bus, which can produce less amount of environmental pollution per capita. So a lack of capability of a passenger may add an extra amount of environmental pollution which is harmful to the health of human being.

Being free to live the way one would like; may be enormously helped by the choice of others, and it would be a mistake to think of achievements only in terms of active choice by oneself. A person's ability to achieve various valuable functionings may be greatly enhanced by public action and policy (Nussbaum and Sen, 1993)[41] and these expansions of capability are not unimportant for freedom for that reason. Thus, both the process aspect and the opportunity aspect of freedom require one to go well beyond the traditional view of development in terms of "the growth of output per head."

4.2.4 Income and capability

Mobility activity is one of the basic consumption and production activity for mass passengers in the urban daily life. 'Basic capabilities' can be defined as the ability to satisfy certain crucially important functionings up to certain minimally adequate level. Equality in the fulfilment of certain 'basic capabilities' provides a plausible approach to egalitarianism in the presence of elementary deprivation. The conversion of income into basic capabilities may vary greatly between individuals and also between different societies, so that the ability to reach

minimally acceptable levels of basic capabilities can go with varying levels of minimally adequate incomes (Nussbaum and Sen, 1993)[40-42].

It is also true that the income-centred view of poverty, based on specifying an interpersonally invariant 'poverty line' income, may be very misleading in the identification and evaluation of poverty. Since income is not desired for its own sake, any income-based notion of poverty must refer – directly or indirectly – to those basic ends which are promoted by income as means. The relation between income and capabilities varies between communities and between people in the same community, the minimally adequate income level for reaching the same minimally acceptable capability levels will be seen as variable – depending on personal and social characteristics. Once this correspondence is established, it would not really matter whether poverty is defined in terms of a failure of basic capability or as a failure to have the corresponding minimally adequate income. What is really important is to take note of the interpersonal and inter-social variations in the relation between incomes and capabilities. That is where the distinctive contribution of the capability approach to poverty analysis lies.

Martha Nussbaum (1988, 1990) has discussed illuminatingly the Aristotelian analysis of 'political distribution', and its relation to the capability approach. The basis of a fair distribution of capability to function is given a central place in the Aristotelian theory of political distribution. The capability approach has indeed been used to argue that while the commodity requirements of such capabilities as 'being able to take part in the life of the community' or 'being able to appear in

public without shame' vary greatly from one community to another (thereby giving the 'poverty line' a relativist character in the space of commodities), there is much less variation in the capabilities that are aimed at through the use of these commodities. This argument, suggesting less variability at a more intrinsic level, has clear links with Aristotle's identification of 'non-relative virtues', but the Aristotelian claims of uniqueness go much further (Nussbaum and Sen, 1993)[46-48].

Aristotle's rejection of opulence as a criterion of achievement (rejecting wealth and income as the standards), his analysis of *eudaimonia* in terms of valued activities (rather than relying on readings of mental states, as in some utilitarian procedures), and his assertion of the need to examine the processes through which human activities are chosen, thereby pointing towards the importance of freedom as a part of living.

4.3 Activity theory in urban mobility service system

In his Theses on Feuerback, Marx (1845) pointedly characterized the two pitfalls of social theory: "The chief defect of all previous materialism ... is that the thing, reality, sensuousness, is conceived only in the form of the object or of contemplation, but not as sensuous human activity, practice, not subjectively." And on the other hand: "Hence in opposition to materialism the active side was developed abstractly by idealism, which of course does not know real sensuous activity as such."

In the case of sustainable urban mobility services (one kind of PSS), the service process is defined based on Activity Theory, which is actually based on Marxist philosophy.

According to Leontiev (1981), people engage in "actions" that do not in themselves satisfy a need, but contribute towards the eventual satisfaction of a need. These actions only make sense in a social context of a shared work activity i.e. actions that constitute the activities lead to satisfy need. Leontiev also argued that the activity in which a person is involved is reflected in their mental activity; that is, material reality is "presented" to consciousness, but only in its vital meaning or significance.

Human as an individual never reacts directly to environment. The relationship between human agent and objects of environment is mediated by cultural means, tools and signs (Vygotsky, 1978). Luria (1976) explains that, the simplest form of [human conscious] behaviour can be found in tool- or sign-using, where a tool (or sign) can be used to reach a certain goal. Instead of the elementary scheme $S \rightarrow R$ ('*S*' for stimulus, '*R*' for reflex), he proposed a new scheme $S \rightarrow {}_{x} \rightarrow R$ {where *S* stands for stimulus, *x* for means (tool or sign), *R* for reflex} (**Figure 4.3.1**). Luria also argues that human activity "is supposed to lie not in its reduction to single elements but in its inclusion in a rich net of essential relations."

In the early work of the cultural-historical school, mediation by other human beings and social relations was not theoretically integrated into the triangular

model action (Figure 4.3.1). Such integration required a breakthrough into the concept of activity by distinguishing between collective activity and individual action. This step was achieved by Leontiev by means of reconstructing the emergence of division of labour as a fundamental process behind the evolution of mental functions.

Engestrom (1987) proposed a scheme of activity different from that by Leontiev; it contains three interacting entities – the individual, the object and the community – instead of the two components – the individual and the object – in Leontiev's original scheme. Engestrom added rules to mediate between subject and community, and the division of labour to mediate between object and community.

In Figure 4.3.2, the uppermost side of 'Individual survival' is ruptured by the emerging utilization of tool, most clearly demonstrated by the anthropoid apes. The left hand side of 'social life' is ruptured by collective traditions, rituals and rules, originating at the crossing of adaptation and mating. The right hand side of 'collective survival' is ruptured by division of labour, influenced by the practices of breeding, upbringing and mating, and appearing first as the evolving division of labour between the sexes Figure 4.3.3.

Marx's concept of labour, or production of use of values, was the paradigmatic model of human object-oriented activity for Leontiev. Mediated by tools, work is also "performed in conditions of joint, collective activity…Only

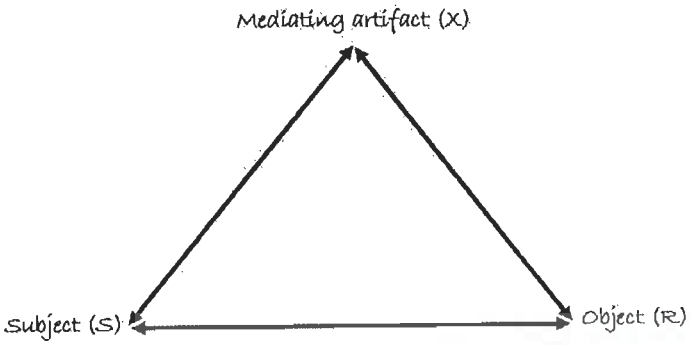


Figure 4.3.1 Vygotsky's model of mediated action and its common reformation

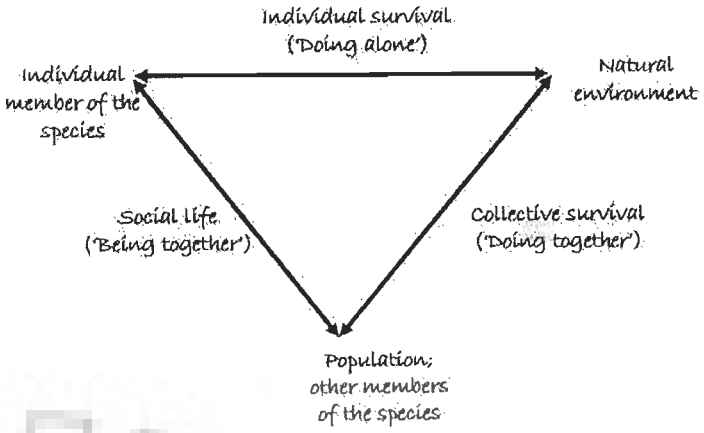


Figure 4.3.2 General structure of animal form of activity (Engestorm, 1987, p. 74)

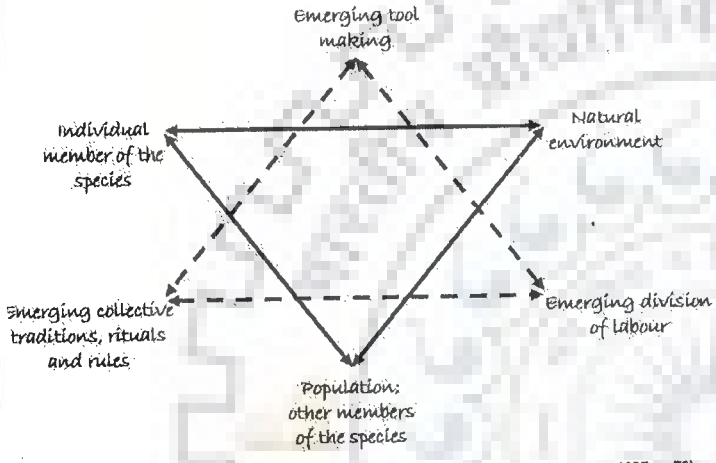


Figure 4.3.3 Structure of activity in transition from animal to human (Engestrom, 1987, p. 79)

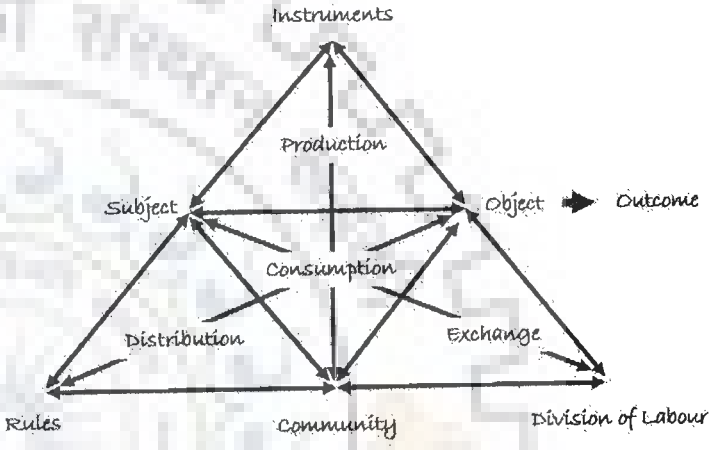


Figure 4.3.4 The structure of human activity (Engestrom, 1987, p.78)

LEVEL		ORIENTED TOWARDS		CARRIED OUT BY
Activity	--	Object / Motive	--	Community
Action	--	Goal	--	Individual or Group
Operation	--	Conditions	--	Routinized Human or Machine

Figure 4.3.5 The hierarchical structure of activity

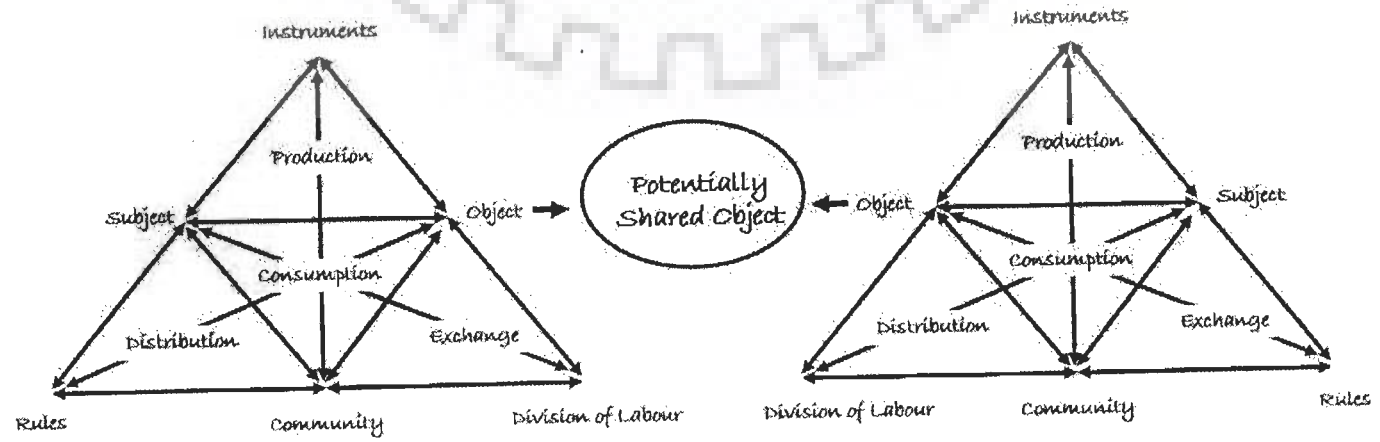


Figure 4.3.6 Two interacting activity systems as minimal model for the third generation of activity theory

through a relation with other people does man relate to nature itself, which means that labour appears from the very beginning as a process mediated by tools (in the broad sense) and at the same time mediated socially." (Leontiev, 1981)

The breakthrough into human cultural evolution – into a specifically human form of activity – requires that what used to be separate ruptures or emerging mediators become unified determining factors. At the same time, what used to be ecological and natural becomes economic and historical. What used to be adaptive activity is transformed into consumption and subordinated to the three dominant aspects of human activity – production, distribution, and exchange (or communication). The model suggests the possibility of analyzing a multitude of relations within the triangular structure of activity. However, the essential task is always to grasp to systemic whole, not just separate connections Figure 4.3.4.

In the model, the subject refers to the individual or sub-group whose agency is chosen as the point of view in the analysis. The object refers to the 'raw material' or 'problem space' at which the activity is directed and which is moulded and transformed into outcomes with the help of physical and symbolic, external and internal mediating instruments, including both tools and signs. The community comprises multiple individuals as distinct from other communities. The division of labour refers to both the horizontal division of tasks between the members of the community and to the vertical division of power and status. Finally the rules refer to the explicit and implicit regulations, norms and conventions that constrain actions and interactions within the activity system.

The distinction between activity, action and operation became the basis of Leontiev's three-level model of activity (1981) Figure 4.3.5. The uppermost level of collective activity is driven by an object-related motive; the middle level of individual (or group) action is driven by a conscious goal; and the bottom level of automatic operations is driven by the conditions and tools of the action at hand. For example, one can consider the urban mobility service provided by a public bus service provider in an urban area. He may own the bus or hire from other owner. The owner of the public bus, either actively participate or can appoint a driver and conductor to provide the mobility service to the passengers as the object in this activity. In that case the driver will drive the bus and the conductor will collect money in exchange of tickets from the passengers. The outcomes include reaching every stop in time, so that the passengers can reach their destination. And the instrument in this case is the public bus, road and other on road facilities. The community consists of the public bus owner, the driver, the conductor, other staff, passengers etc. The division of labour determines the tasks and decision-making powers of the public bus service provider, the conductor or driver etc. Finally, the rules regulate the use of daily schedule of starting every trip, the prices of tickets etc.

Nardi (1996) argued activity theory as a powerful and clarifying descriptive tool rather than a strongly predictive theory. The object of activity theory is to understand the unity of consciousness and activity. Activity theorists argue that

consciousness is not a set of discrete disembodied cognitive acts (decision making, classification, remembering), and certainly it is not the brain; rather, consciousness is located in everyday practice: you are what you do. Vygotsky described consciousness as a phenomenon that unifies attention, intention, memory, reasoning, and speech....and "Activity theory, with its emphasis on the importance of motive and consciousness – which belongs only to humans – sees people and things as fundamentally different. People are not reduced to 'nodes' or 'agents' in a system; 'information processing' is not seen as something to be modelled in the same way for people and machine."

Nardi *et al* in comparing activity theory with cognitive science, argue that, activity theory is above all a social theory of consciousness and therefore activity theory wants to define consciousness, that is, all the mental functioning including remembering, deciding, classifying, generalising, abstracting and so forth, as a product of our social interactions with other people and of our use of tools. Activity theory begins with the notion of activity. An activity is seen as a system of human "doing" whereby a subject works on an object in order to obtain a desired outcome. In order to do this, the subject employs tools that may be external or internal.

Activity theory provides a number of useful concepts that can be used to address the lack of expression for 'soft' factors which are inadequately represented by most process modelling frameworks. One such concept is the internal plane of action. Activity theory recognises that each activity takes place in two planes: the external plane and the internal plane. The external plane represents the objective

components of the action while the internal plane of actions as "The human ability to perform manipulations on an internal representation of external objects before starting actions with these objects in reality" (Verenikina, 1998; Lewin, 1931, 1935).

According to Tikhomirov, human creativity plays an important role in activity theory, that "human beings ... are essentially creative beings" in "the creative, non-predictable character". Tikhomirov also analyses the importance of creative activity, contrasting it to routine activity.

Activity theory further argues that subjects are grouped into communities, with rules mediating between subject and community and a division of labour mediating between object and community. A subject may be part of several communities and a community, itself, may be of other communities. Activity is a collective, systemic formation that has a complex mediational structure. An activity system produces actions and is realized by means of actions. However, activity is not reducible to actions. Actions are relatively short-lived and have a temporally clear-cut beginning and end. Activity systems evolve over lengthy periods of socio-historical time, often taking the form of institutions and organizations.

An activity system interacts with a network of other activity systems. In this mode, the basic model is expanded to include minimally two (or more) interacting activity systems Figure 4.3.6. It receives rules and instruments from certain activity systems and produces outcomes for certain other activity systems. Thus,

influences from outside 'intrude' into the activity systems. However, such external forces are not a sufficient explanation for surprising events and changes in the activity. The outside influences are first appropriated by the activity system, turned and modified into internal factors. It may even create an imbalance. In this sense, an activity system is a virtual disturbance- and innovation-producing machine.

The primary contradiction of all activities in capitalist socio-economic formations is that between the exchange value and the use value within each element of the activity system. In the case of sustainability and mobility service systems, the passengers will try to use minimum number of use of mobility service activity for their daily life activities, where as the service providers will try to seek more number of passengers for earning their profit (Leontiev, 1981). A contradiction appears when a culturally more advanced object and motive is introduced into the activity. Such new object may be formally implemented, but they are internally resisted by the vestiges of the old activity. Another type of contradictions may emerge between the changing central activity and its neighbouring activities in their interaction.

The above theoretical input of activity theory and the capability to act within the system of mobility activities will be explained with an example of the urban mobility service activities in detail later.

4.4 Systemic process of passenger's mobility activity and service consumption

According to Sen, a passenger can make use of a set of a combination of various kinds of available mobility activities and reach from one point to another point within the city, but the question is how the passenger perceives that combination of mobility activity choices in a day to day life, so that she can comfortably fulfil her journey. The passenger makes the strategy of that set of combination of various kinds of mobility activities being in one geographical space, where as her destination is situated in a different space within the city, and also what will happen on the decided path of journey is unknown to the passenger, but still she can make strategically viable program of journey within the city and proceeds.

All these are the phenomenological activities that a regular passenger can do in her daily life activities of journey in a city.

4.4.1 Field-theoretical vs. class theoretical in human activity system

In contrast to analytic models that assume only additive effects of person and environmental interaction operating independently of each other in most developmental investigations, it has been revealed and envisioned by Lewin in his original formulation that a particular environmental conditions have been shown to produce different developmental consequences depending on the personal characteristics of individuals living in that environment.

In a human activity system, the process of activity between person and context is not additive but interactive. The person is both the product and partial producer in the process of her own development. Both the environment and human being require a process of mutual accommodation because of their two directional character of permissive and restrictive interaction between them (Hawley, 1950; Bronfenbrenner, 1979). The human development takes place through processes of progressively more complex reciprocal interaction between an active, evolving bio-psychological human organism and the persons, objects, and symbols in its immediate external environment over the life course. To be effective, the interaction must occur on a fairly regular basis over extended periods of time. And the environment defined as relevant to development processes is not limited to a single, immediate setting but is extended to incorporate interconnections between such settings, as well as to external influences emanating from the larger surroundings.

Bronfenbrenner's new Ecological System model which is called as the Process-Person-Context-Time model (PPCT) (Bronfenbrenner, 2004)[106-173], where the design permits analysis of variations in developmental processes and outcomes as a joint function of the characteristics of the environment and of the person, defines the phenomenon under investigation. And also focuses on the development of the scientific tools – the theoretical models and corresponding research designs required for assessing the continuity and change. These two tasks are the joint product of emerging and converging ideas, based on both

theoretical and empirical grounds – a process called "developmental science in the discovery mode" (Bronfenbrenner & Evans, 2000)[115-125]. In the more familiar "verification mode," the aim is to replicate previous findings in other settings to make sure that the findings still apply. By contrast, in the discovery mode, the aim is to fulfil two broader but interrelated objectives (Bronfenbrenner & Evans, 2000)[999-1000]:

1. Devising new alternative hypotheses and corresponding research designs that not only call existing results into question but also stand a chance of yielding new, more differentiated, more precise, replicable research findings and thereby producing more scientific knowledge.
2. Providing scientific bases for the design of effective social policies and programs that can counteract newly emerging development disruptive influences.

In fact Lewin's argument for "field-theoretical" or "Galilean" paradigms that specify the particular processes through which the observed phenomenon is brought about, gradually replaced "Aristotelian' or "class-theoretical" (Lewin, 1931 [141-177], 1935, 1951). Earlier phenomena were "explained" by the categories to which they are assigned called as "Aristotelian' or "class-theoretical". In this, "one looks only at the social address" – that is, the environmental label – with no attention to what the environment is like, what people are living there, what they are doing, or how the activities taking place could affect them (Bronfenbrenner, 2004)[60-66]. "Galilean" or "field-theoretical" reveals the mechanisms that account for observed relationship between person

and environmental characteristics, which is a conceptualization of a particular process (or set of processes) expected to produce a special effect either in enhancing constructive development or in undermining the process.

To show that development has actually occurred, the research design must demonstrate that the elements in the design, and their dynamic relationships to each other, have influenced the bio-psychological characteristics of the developing person over an extended period of time. In his view, Lewin (1931) argued that in psychology as in physics, present events can be influenced only by forces operative in the present situation. But the real fact is the process of human development cannot be defined except in relation to time, since the central concern of development study is the nature of continuity and change in the biological and psychological structures of individual human beings throughout their life course.

Even the developmental psychology has not come easily to the thought that the processes it was observing under controlled conditions might operate differently for people in different situations. It was both obvious and understandable that individuals and groups differed in levels of psychological functioning. But the mechanisms through which these varying levels were attained were presumed to be the same and to operate with equal effectiveness, wherever applied.

Tulkin's (1970, 1977) implicit paradigm not only specifies some proximal processes through which developmental change is brought about but also makes

it possible to investigate whether and how these processes vary as a function of the broader context in which the process takes place. Tulkin's conceptions of process include not only objective behaviours but also subjective psychological states and, what turns out to be even more critical, the relationship between these two process domains. Such simultaneous consideration of subjective and objective factors, in both developmental processes and outcomes, constitutes a dual component for designing more effective research models. (Bronfenbrenner, 2004)[74-77].

4.4.2 Phenomenological behaviour

Lewin discussed behaviour always in context – situational, interpersonal, sociological, cultural, historical and theoretical. According to him, space is not physical but psychological – consisting of the environment not as it exists in the so-called objective world (where, for us, practical matters are usually thought to reside) but in the mind of the person, in her phenomenological field – including, as especially significant, the world of imagination, fantasy, and unreality. Lewin treated motivational forces as emanating not from within the organism but from the environment. Objects, activities, and especially, other people sent out lines of forces, valences and vectors that attracted and repelled, thus steering the behaviour of the person. He argued, human as 'self' consists of 'psychical systems," which appear to be somehow isomorphic with the structure of the environment (Lewin, 1935).

According to Lewin, this is a theory that presumably provides us our surest guide for dealing with practical problems – a theory, in which the perceived is viewed as more important than the actual, the unreal as more valid than the real, where the motivation that stress the person's behaviour inheres in external objects, activities, persons, and groups, and, to the utter confounding of the practical doer, where the content of all these complicated structures remains unspecified.

Lewin's definition of "mental" conception indicated towards psychology as the science of mind rather than 'American behaviourism'. But still it leaves behaviour in the model. The emphasis is not on the traditional psychological processes of perception, motivation, thinking, and learning but on their contents – what is perceived, desired, feared, thought about, or acquired as belief and how the nature of this psychological material changes as a function of a person's exposure to and interaction with the environment. The motivational properties inhered in perceived objects, activities, persons, and events, including those in the domains of uncertainty creates a complex of differentiated regions, some embedded in others, some interconnected, others isolated, but all interacting to steer the behaviour and development of the person. Development is defined as the person's evolving conception of the ecological environment, and her relation to it, as well as the person's growing capacity to discover, sustain, or alter its properties. The construction of reality cannot be observed directly; it can only be inferred from patterns of activity as these are expressed in both verbal and non-

verbal behaviour, particularly in the activities, roles, and relations in which the person engages.

In this topological thinking of the ecological environment, the innermost space of interaction referred to as *micro-system*, which is interconnected with other such series of nested systems, is the immediate space of activity for every person. For example, in this research the activity is the consumption of urban mobility activity. This is an ongoing process characterized by intention and possessing a momentum of its own, so that the person is captured by a demand for closure. Consistent with this element of intention, a dominant feature of an activity is the perception of a goal and movement toward the goal. Also the existence of connections between people in the setting are formulated in terms not so much of interpersonal feelings as of the relations of the various parties toward each other as members of a group engaged in common, complementary, or relatively independent tasks.

The increasing order of these interconnected ecological system of interaction are *micro-system, meso-system, exo-system* and *macro-system.* According to Bronfenbrenner, the most basic possible interaction between two micro-systems of a meso-system is called the *ecological transition*. Such transition has developmental consequences that involve the person in new activities and types of social structure. Every transition is in effect a ready-made experiment of nature with a built-in, before-after design. Exo-systems are important in two ways. First, while not containing the developing person, they

may involve "significant others" in that person's life. And second, any social institution that makes decisions that ultimately affect conditions of family life can function as an exo-system. Finally, macro-system encompasses the overarching patterns of stability, at the level of the subculture or the culture as a whole, in forms of social organization and associated belief systems and lifestyles. Such patterns result in similarities among the lower-order systems to which particular groups of persons are exposed. These subcultures are characteristics patterns of ideology and lifestyles that are reflected in goals and practices of socialization. In this process the study will be focusing on the direct influences of structured aspects of environment that function to enhance the development of the person's consumption of mobility activity irrespective of the various social class, ethnicity and religion as attributes of the passenger. Because according to Lewin, "There is nothing like the practical to build a good theory." (Lewin, 1931 & 1935)

4.4.3 Micro-, meso-, exo- & macro-system of PPCT model

According to Bronfenbrenner (1979), here the approach departs in yet another respect from that of conventional research models: environments are not distinguished by reference to linear variables but are analyzed in systems terms. Beginning at the innermost level of the ecological schema, one of the basic units of analysis is the dyad or two-person system (in this case, the passenger and mobility service provides). He argued, if one member of the pair undergoes a process of development, the other does also. Ecological environment is conceived as extending far beyond the immediate situation directly affecting the

developing person – the objects to which he responds or the people with whom he interacts on a face-to-face basis. Regarded as of equal importance are connections between other persons present in the setting, the nature of these links, and their indirect influence on the developing person through their effect on those who deal with him at first hand. This complex of interrelations within the immediate setting is referred to as the micro-system.

The principle of interconnectedness is seen as applying not only within settings but with equal force and consequence to linkages between settings, both those in which the developing person actually participates and those that he may never enter but in which events occur that affect that happens in the person's immediate environment. The former constitute what is called meso-systems, and the latter exo-systems.

Finally, the complex of nested, interconnected systems is viewed as a manifestation of overarching patterns of ideology and organization of the social institutions common to a particular culture or subculture. Such generalized patterns are referred to as macro-systems. Thus within a given society or social group, the structure and substance of micro-, meso-, and exo-systems tend to be similar, as if they were constructed from the same master model, and the systems function in similar ways. Hence by analysing and comparing the micro-, meso-, and exo-systems characterizing different social classes, it is possible to describe systematically and to distinguish the ecological properties of these larger social contexts as environments for human development.

Also according to Thomas and Thomas, "If men define situations as real, they are real in their consequences" (Thomas & Thomas, 1928). For Lewin, the environment is of greatest relevance for the scientific understanding of behaviour and development is reality not as it exists in the so-called objective world but as it appears in the mind pf the person; in other words the way in which the environment is perceived by the human beings who interact within and with it. The primacy of the phenomenological over the real environmental is in steering behaviour, the impossibility of understanding that behaviour solely from the objective properties of an environment without reference to its meaning for the people in the setting; the palpable motivational character of environmental objects and events; and, especially, the importance of the unreal, the imagined.

To understand empirically how situations are perceived by the people who participate in them, there are two aspects of every situation, distinguished by Lewin, those are likely to capture the person's attention. The first is "ongoing activity", which refers to the task or operations in which a person sees herself or others as engaging. The second salient feature involves the perceived interconnections between the people in the setting, in terms not so much of interpersonal feelings as of the relations of the various parties with each other as members of a group engaged in common, complementary, or relatively independent undertakings.

4.5 Sustainable social market system for mobility activity

In the interests of advancing fundamental research on human development, basic science needs public policy even more than public policy needs basic science. What is required is not merely a complementary relation between these two domains but their functional integration. Knowledge and analysis of social policy are essential for progress in developmental research because they alert the investigator to those aspects of the environment, both immediate and more remote, that are most critical for the cognitive, emotional, and social development of the person. In examining the impact of public policy issues for basic research in human development, it is all the more essential to distinguish between interpretations founded on empirical evidence and those rooted in ideological preference.

According to Bronfenbrenner (2004), there are two kinds of systems – the bio-psychological system that a human being is and the socioeconomic-political system that an environment is. And there must be a complementarity between these two systems for purpose of human development to flourish, because social development applies not only to the individual but to the social organization of which he is a part (Bronfenbrenner, 1943)[363].

4.5.1 Freedom and social market mechanism

Public policy is a part of the macro-system determining the specific properties of exo-, meso-, and micro-systems that occur at the level of everyday life and steer the course of behaviour and development. Development can be

seen as a process of expanding the real freedoms that people enjoy in their daily life activities for consumption and production purposes with the help of their capability; which depends on a variety of factors, including personal characteristics and socio-infrastructural arrangements. And behaviour is nothing but the capability to act within the social system combining of products and services according to human needs and desires. Attention is paid particularly to the expansion of the "capabilities" of persons to lead the kind of lives they value – and have reasons to value. These capabilities can be enhanced by public policy, and also, the direction of public policy can be influenced by the effective use of participatory capabilities by the public.

The usefulness of wealth lies in the things that it allows one to do – the substantive freedoms it helps one to achieve. According to Sen (2000), economic growth cannot sensibly be treated as an end in itself. Development has to be more concerned with enhancing the lives one leads and the freedoms one enjoys. Expanding the freedoms that one has reason to value not only makes one's life richer and more unfettered, but also allows one to be fuller social person, exercising one's own volitions and interacting with – and influencing – the world in which one lives.

Individual freedom is quintessentially a social product, and there is a two-way relation between (1) social arrangements to expand individual freedoms and (2) the use of individual freedoms not only to improve the respective lives but also to make the social arrangements more appropriate and effective. The

freedom-oriented perspective of liberty of all to participate in deciding what traditions to observe cannot be ruled out by the national or local "guardians" or by any other political, cultural or religious "experts".

According to Sen (2000)[38-40], there are five types of instrumental freedom: (1) political freedoms, (2) economic facilities, (3) social opportunities, (4) transparency guarantees and (5) protective security. The effectiveness of freedom as an instrument lies in the fact that different kinds of freedom interrelate with one another, and freedom of one type may greatly help in advancing freedom of other type.

To demand for the supply of frequent mobility services for various kinds of passengers, both male and female, according to the market needs from morning to night can show the inter-relation of all kinds of instrumental freedoms in a democratic system. The achievements of democracy depend not only on the rules and procedures that are adopted and safeguarded, but also on the way the opportunities are used by the citizens. According to Fidel Valdez Ramos (1998), the former president of the Philippines, "...The political challenge for people around the world today is not just to replace authoritarian regimes by democratic ones. Beyond this, it is to make democracy work for ordinary people" (Sen, 2000)[155].

It is true that the need for critical scrutiny of standard preconceptions and political-economic attitudes has never been stronger (Sen, 1987, 1993, 1994 & 1997). The development of free markets in general and of free seeking of

employment in particular is very much appreciated fact throughout the history as well as in present also. Even Karl Marx saw the emergence of freedom of employment as momentous progress (Sen, 2000)[113]. The freedom of market transaction lies in the basic importance of that freedom itself. People have good reasons to buy and sell, to exchange, and to seek lives that can flourish on the basis if transactions, even the freedom of women to seek employment outside the family (eg. Jobs in mobility service sector also) can have a better 'deal" in intra-household distribution. Free market can create small entrepreneurs which can produce competitive quality of services in mobility service sector, can satisfy needs at micro levels even.

A competitive market can have many kinds of information available for various kinds of stakeholders. Generally in an efficient market, the market efficiency is defined by the classical model of "Pareto optimality": a situation in which the utility (or welfare) of no one can be raised without reducing the utility (or welfare) of someone else. According to Arrow-Debreu results, given some preconditions – the results of the market mechanism are not improvable in ways that would enhance everyone's utility (or enhance utility of some without reducing the utility of anyone else). Sen questioned about the utility factor of the efficiency of market, and argued in favour of individual freedom. Sen demonstrated in terms of some plausible characterizations of substantive individual freedoms, an important part of the Arrow-Debreu efficiency result translates from the "space" of utilities to that of individual freedoms, both in terms of freedom to choose

commodity baskets and in terms of capabilities to function (Nussbaum and Sen, 1993)[32-46]. Similar assumptions are employed as are needed for the original Arrow-Debreu results (such as the absence of non-marketability), and with these presumptions, it turns out that for a cogent characterization of individual freedoms, a competitive market equilibrium guarantees that no one's freedom can be increased any further while maintaining the freedom of everybody else (Sen, 2000)[116-117].

It can be noticed that given canny choice by individuals, efficiency in terms of individual utilities has to be, to a great extent, parasitic on offering the individuals adequate opportunities from which they can choose. These opportunities are not only relevant for what people choose (and the utility they achieve), but also for what useful options they have (and the substantive freedoms they enjoy). The restriction of having to assume self-interested behaviour can be removed if our primary concern is with substantive freedoms that people enjoy (no matter for what purpose they use these freedoms), not the extent to which their self-interests are fulfilled (through their own self-interested behaviour). No assumption need be made, in this case, about what motives the individuals' choices, since the point at issue is no longer the achievement of interest fulfilment, but the availability of freedom (no matter whether the freedom is aimed at self-interest or at some other objective). The basic analytical results of the Arrow-Debreu theorem are thus quite independent of the motivations that lie behind the individual preferences, and can be left unaddressed if the object is to

show efficiency in preference fulfilment, or efficiency in substantive individual freedoms (irrespective of motivation) (Nussbaum and Sen, 1993)[42-46].

The problem of inequality gets magnified as the attention is shifted from income inequality to the inequality in the distribution of substantive freedoms and capabilities because of some "coupling" of income inequality, on the one hand, with unequal advantages in converting incomes into capabilities, on the other (Sen, 1993; Atkinson, 1970 & Wedderburn, 1979). In this context social intervention including governmental support may have an important role.

Adam Smith, Karl Marx, David Ricardo etc. argued strongly against a monopolistic market. Atkinson (1995) argued, if a service is supplied by the monopolist, or by monopolistically competitive suppliers, then the necessary income depends on the degree of monopoly mark-up. A profit-maximizing supplier determines this mark-up taking account of the effect on all sales. As a result, a change in the distribution of income may affect the mark-up, and hence the ability of a person with a specified money income to purchase the service necessary to ensure the capability to function. It is sufficient that there be a strictly minimum essential quantity. Lewis and Ulph (1988) have examined the implications of there being a strictly positive quantity of certain goods or services required to avoid poverty. Variations of quality are similarly important: a passenger may not be able to purchase the preferred combination of price and quality. The achievement of a specified capacity may depend on the range of goods supplied in the market. In this case Smith (1976) wrote that,

The interest of the dealers, however, in any particular branch of trade or manufacturer, is always in some respects different from, and even opposite to that of the publick. To widen the market and to narrow the competition is always the interest of the dealers. To widen the market may frequently be agreeable enough to the interest of the publick; but to narrow the competition must always be against it, and can serve only to enable the dealers, by raising their profits above what they naturally would be, to levy their own benefit, an absurd tax upon the rest of their fellow-citizens (Sen, 2000)[122-123].

Even as Pareto's famous argument illustrates, there may be a thousand people whose interests are a little hurt by the policy that heavily feeds the interest of one businessman, and once the picture is seized with clarity, there may be no dearth of a majority in opposition to such special pleading. This is an ideal field for more public discussion of the claims and counter-claims on the different sides, and in the test of open democracy. So freedom of one kind (political freedom) can be seen as helping the realization of freedom of other kinds (economic openness) (Sen, 2000)[123].

Regarding "prodigals," Smith saw in them a great potential for social waste, driven as they are "with the passion for present enjoyment." Also regarding "projectors," Smith's worries related again to social waste (Smith, 1976). The lesson to draw from Smith's analysis of the market mechanism is not any massive strategy of jumping to policy conclusions from some general "pro" or "anti" attitude to markets. But a broad and multi-sided approach to

"comprehensive development framework" is very much required, as discussed by James Wolfensohn, the president of the World Bank (Wolfensohn, 1999; Stiglitz, 1998). According to Sen, the success could have been even greater if the reforms were combined with a commitment to expand the development of social opportunities; as special attention must be paid to the requirements it has to possess in order to enact public cultures and practices in everyday social life (Leonardis, 2000). Combining extensive use of markets with the development of social opportunities must be seen as a part of a still broader comprehensive approach that also emphasizes freedoms of other kinds (democratic rights, security guarantees, opportunities of cooperation and so on) (Sen, 2000). The expansion and the effective reach of these social opportunities and services may require cooperative activities and provisioning by the state or the local authorities. Leonardis put stress on the crucial requirements concern the organizational set up of welfare operational agencies and their relationship with citizens also.

4.5.2 Agency freedom and responsibility for sustainable mobility activities & services

Questions are raised regarding the issues like, the fiscal burden of public expenditure, which can be quite large, depending on how much is planned to be done, and the incentives, and the effects that a system of public support may have in discouraging initiative and distorting individual efforts. Because the extent of the need for these services by recipients and the extent to which one could

have afforded to pay for these services oneself, must be seen as an inalienable right of citizens in a contemporary "society".

Sen (2000) argued that capability deprivation is more important as a criterion of disadvantage than is the lowness of income, since income is only instrumentally important and its derivative value is contingent on many social and economic circumstances. That argument can now be supplemented by the suggestion that focusing on capability deprivation has some advantage in preventing incentive distortions compared with working with lowness of income as a criterion of transfer and subsidy. The rationale of this approach lies in the fact that the potential recipients' choices are governed by considerations that are broader than maximization of income earned. Since the individuals involved focus more on overall opportunities, public policy making can make intelligent use of this broader concern.

In fact, the issue of charging for the public services according to the ability to pay which would bring back the need for ascertaining the income of the potential recipient. It reduces the fiscal burden, and the same amount of public funds can be stretched much further in covering the economically needy if the relatively affluent can be made to pay for the benefits they receive. In this case, if the intention is to provide free service for the poor but not for those who can afford to pay, there is the further issue of checking the person's economic circumstances. This can be particularly problematic especially in those areas where information on income and wealth is hard to elicit.

According to Sen (2000), both men and women passengers must take responsibility for their doing things or not doing them. It makes a difference, and one has to take note of that difference. Understanding the agency role is thus central to recognizing passengers as responsible persons. The rights to the well-being or utility are not only the thing to look after, but also rights that are aimed mainly at the free agency of passengers must be considered. Passengers can act or refuse to act, and can choose to act one way rather than another is a matter of their motivation towards consumption of sustainable mobility services. This elementary acknowledgement, though simple enough in principle, can be exacting in its implications, both for social analysis and for practical reason and action.

The active agency of passengers cannot ignore the urgency of rectifying many inequalities that blight the well-being of both male and female passengers and subject them to unequal treatment; thus the agency role must be much concerned with passengers' well-being also. Similarly, any practical attempt at enhancing the well-being of passengers cannot but draw on the agency of passengers themselves in bringing about such a change. So the well-being aspect and the agency aspect of passengers' movement inevitably have a substantial intersection. And yet they cannot but be different at a foundational level, since the role of a passenger as an "agent" is fundamentally distinct from the role of the same passenger as a "patient". The fact that the agent may have to see himself or herself as a patient as well does not alter the additional

modalities and responsibilities that are inescapably associated with the agency of a passenger.

It is the rights of the passengers to have the mobility services in city for their daily movement activities. And there should be some agency to look after it, so that the rights are not gotten violated. The rights must be realizable in the sense of what Immanuel Kant called a "perfect obligation" – a specific duty of a particular agent for the realization of that right (Kant, 1788). The ethical assertion of a right goes beyond the value of the corresponding freedom only to the extent that some demands are placed on others that they should try to help. While one may be able to manage well enough with the language of freedom rather than of rights, there may sometimes be a good case for suggesting – or demanding – that others help the person to achieve the freedom in question. The language of rights can supplement that of freedom (Sen, 2000). This issue can be well understood in the case of a female passenger, when she uses the public mobility services in the late evening or night in the city.

A division of responsibility that places the burden of looking after a person's interest on another person can lead to the loss of many important things in the form of motivation, involvement and self-knowledge that the person herself may be in a unique position to have. Any affirmation of social responsibility that replaces individual responsibility cannot but be, to varying extents, counterproductive. There is no substitute for individual responsibility. The sense of responsibility need not relate only to the afflictions that one's own behaviour

may have caused, but can also relate more generally to the miseries that one sees around oneself and that lie within one's power to help remedy. It is not so much a matter of having exact rules about how precisely one ought to behave, as of recognizing the relevance of one's shared humanity in making the choices one faces (Sen, 1982, 1984 & 1990). According to Sen, responsibility requires freedom. Without the substantive freedom and capability to do something, a person cannot be responsible for doing it. Having the freedom and capability to do something does impose on the person the duty to consider whether to do it or not, and this does involve individual responsibility. In this sense, freedom is both necessary and sufficient for responsibility.

There is a difference between "nanying" an individual's choices and creating more opportunity for choice and for substantive decisions for individuals who can then act responsibly on that basis. The social commitment to individual freedom need not, of course, operate only through the state, but must also involve other institutions. The capabilities that a person does actually have depend on the nature of social arrangements, which can be crucial for individual freedoms. And there the state and the society cannot escape responsibility. The emergence and consolidation of democracy, basic political and civil rights can be seen as being constitutive of the process of development.

The creation of social opportunities makes a direct contribution to the expansion of human capabilities and the quality of life. The highly labour-intensive nature of

sustainable mobility activities and services make it comparatively cheap in the early stages of economic development, when labour costs are low. Equity in cultural as well as economic opportunities can be profoundly important in a globalizing world. This is a shared challenged for the economic and the cultural world. When an economic adjustment takes place, there may be some nostalgia for specialized and elegant objects. The demise of old ways of living can cause anguish, and a deep sense of loss. For smoothing the process of transition, there also have to be opportunities for retraining and acquiring of new skill, in addition to providing social safety nets for those whose interests should be taken care off.

4.6 Conclusion

Acting in a sustainable way is an art of consuming for any passenger in a sustainable system of mobility activities. Bronfenbrenner already talked about the child development in a sustainable context, where the roles of other human beings and the environment are very much crucial. So for a child, if she gets the kind of sustainable environment for her movement activities and becomes habituated with the culture of the system, then she can show sustainable behaviour of mobility consumption as a responsible citizen-passenger.

The passenger can use her creative capabilities to perceive the reality in her mind to make a sustainable strategy before even start consuming the available mobility activities and services in a critical situation also. The participation of all the passengers with good culture can help each other to achieve their capability as freedom to reach their destination by using those mobility activities and

services. It can create a social harmony in the system concept and maintain the agency goal of sustainable system.

5

Communicating sustainable cases

5.1 Introduction

There are many sustainable consumption and production patterns are available in the society. These examples can change the social imaginary world of passengers to achieve and participate in constructing sustainable system of mobility activities. Unless the passengers come to know about the alternative world, they can not think about its possibility. So documenting those available sustainable scenarios and presenting them through a valid way is the job for this present research.

Every passenger as an individual has her own different lifestyle and needs. So it is impossible to measure their every need with one single questionnaire, as every passenger is having her own reasons to value her own preference. And the way

of handling of daily life problems varies from person to person according to her capability and available social infrastructure.

Talking to these passengers to know about their consumption situation and their preference is the way to know how and why they choose to perform those particular mobility activities. And these happen every day every moment to every passenger. Observing the whole activities can give an idea of working of a system network within the constraints of the city.

5.2 Communicating sustainability: cases, tools, and knowledge

There are many good quality examples of sustainable mobility activities or services, available in Kolkata. Communicating those sustainable examples as references is the key action for creating new story board for future consumption and production purposes. Sustainability is very much a local issue (Manzini & Jegou, 2003). So the consumption and production model is also very much local according to local demands and local set-up of urban mobility services. These local references or examples can act as 'case study', 'best practice', 'success story', etc. for creating new design of mobility activity.

Even these kinds of 'case' or 'story' can inspire the consumers or passengers to follow and act in their own situations. The commonality in socio-economic and urban systems of two different urban areas can influence in developing one's sustainable mobility activity with reference to the other's existing examples of sustainable mobility activities. So "we need more examples to show that we have the means to apply the cleaner production concept, to let consumers make

informed choices and to demand and provide environmental information" (Worldwatch Institute, State of World 2004) and as currently considered one of the most utilised strategies.

So it is necessary to highlight the more or less structured databases of cases, to distribute and disseminate it in order to create impact and give concreteness to the case study illustrated.

5.2.1 Best practices and Bench marking

'Best practice' and 'Bench marking' are considered the most effective way to create knowledge tools to inspire, encourage and replicate the other passengers for practicing sustainable consumption pattern and helping the service producers in production of those sustainable mobility services. It is said, that "Practice makes a man perfect"; and best practices can create good culture, which can become "a driver towards continuous improvement" (Hall & Landry, 1997). In fact, an ecological orientation emphasizing the passenger's definition of the situation accords far more importance to the knowledge and initiative of the passengers under study. Experimental instructions and manipulations are by no means ruled out but are directed toward clarifying or determining the objective features of the environment rather than specifying the particular ways in which the subject is to behave (Bronfenbrenner, 1979).

'Best practice' can create an understanding about the culture of the passengers and their pattern of consumption, product and service details to the service providers also. So the 'Best practice' can become a kind of 'Bench mark' with lots

of knowledge and tools to create popular sustainable services in the mobility sector of an urban area in this competitive world.

For Research Organizations, 'Best practice' can become the scope to learn about the nuts and bolts of those best cases. They all exemplify the recent trend of communicating projects, initiatives, activities, campaigns and many other performances related to sustainability and that need to be circulated and shown to a wider public.

In fact particularly in the case of urban mobility services, the urban pattern which influence in creating the density of demand can attract the attention of urban planner and other professionals to create the urban pattern is such a way, so that from the first day itself the consumption pattern can become sustainable. So it is the job to study the relation between the mobility service pattern and the urban pattern also for the researchers.

5.2.2 Cataloguing cases and success stories: databases and case histories

There are many kinds of researchers in the form of academic research, journalism, market research etc. They present their databases in the form of printed materials or on-line formats about various kinds of studies on the urban mobility activities of Kolkata and other Indian cities. Various kinds of promotional, administrative, economic or other problems oriented data are produced by these kinds of professionals and published in public media. News about the effort of the Govt. to create and promote public mobility services and related issues are also a source of information to know about the attitude of the local Govt. towards

public policy. Ultimately all these kinds of information from various sources can help to create a catalogue of sustainable mobility service cases.

5.3 Experiencing daily life mobility activities and services in Kolkata

Within the academic environment, and in many different disciplines, cases have been widely used as methodological research tools and, although the case study methodology has encountered difficult moments for acceptance, they have recently gained consensus about their legitimacy as a research process and their validity as a communication tool.

Sustainability is a new issue in planning activity also. And creating a sustainable urban pattern is a new activity. There are already many existing major cities are there through out the world, where these cities face many problems at system level, because of lack of vision of sustainability issue at the time of creation of these cities. But still, in many 'already' developed and settled urban patterns, one may find some good quality existing urban solutions of sustainable mobility activities.

The mobility activity of Kolkata starts from the dawn and ends at the late night. In this present research, the researcher took a note of the mobility activities of passengers of Kolkata as case study for the purpose of analysis of sustainability issues. There are various kinds of mobility activities or services, available in Kolkata. The following are the details of those activities Figure 5.3.1.

EMU suburban train service: The electrified suburban rail network is extensive and stretches far into the neighbouring districts also. Huge numbers of daily passengers from adjacent districts enter Kolkata mainly for their jobs and other purposes, use this network everyday. This rail network is stretched from north to south at the eastern part of Kolkata and it also helps the daily passengers to do journey from north to south or from south to north without even entering into this congested city.

Another Circular Rail encircles the entire city of Kolkata, and is at present being extended. A new railway line connects the airport to the main stations of city.

There are a large number of people who work in Kolkata but keep their families elsewhere for extended family responsibility or economic reasons. Due to improvement in the transportation network, many of these people now stay with their families outside the city and commute to work in Kolkata everyday from outside. Passengers as far as from Burdhaman in the north (150 Km away from Kolkata), commutes daily to Kolkata for their jobs.

The number of daily commuters to Kolkata is estimated to be 1.5 million or more (Govt. of West Bengal, 1996). This phenomenon saves the KMA (Kolkata Municipal Area) from additional pressure of housing, but puts pressure on the transportation sector, and requires the city to provide additional inner-city transport infrastructure. The improvement in the transportation system (a city-out growth strategy) by the Govt., especially in the railway system to and from Kolkata, equally helped in keeping the people outside the KMA.

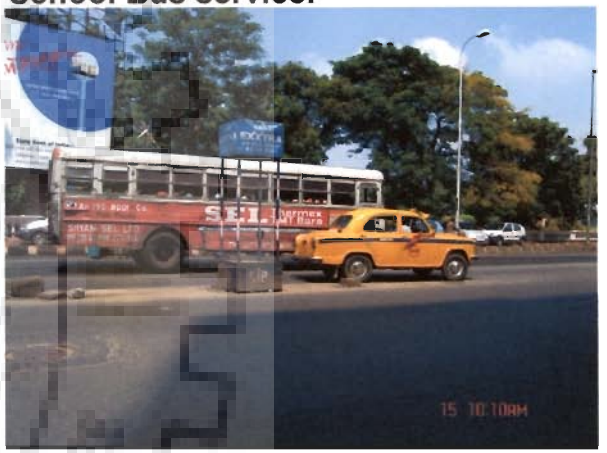
Suburban EMU Train service.

Metro Rail service.

School Bus service.

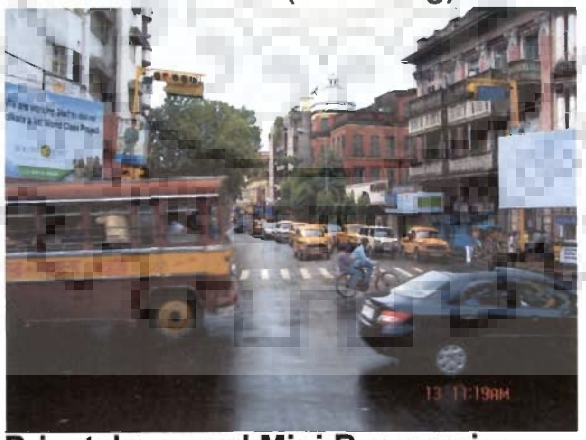
Chartered Bus service for office goers.

CSTC Bus service (Govt. Org).



CTC Bus service (Govt. org).

Privately owned Public Bus service.



Privately owned Mini Bus service.

Figure 5.3.1Various types of sustainable mobility activities in Kolkata

Tram service (Govt. Org).

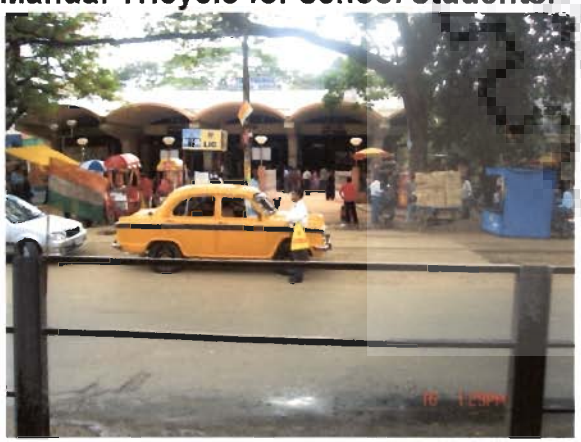
Ferry Steamer service (water way).

Auto rickshaw service.

Manual Tricycle for school students.

Manual Tricycle service.

Bicycling.



Taxi service.

School students walking back home.

People Walking.

Figure 5.3.1 Various types of sustainable-mobility activities in Kolkata.

Metro Rail service: The Metro Railway in Kolkata is the first of its kind in the country and the fifth in Asia, has since it commenced commercial services in 1984, been a source of great pride for the people of the city. It was set up with the sole purpose of addressing the traffic problems that plagued the city. To some extent it has succeeded in doing so.

Although the Metro Rail system has proved useful for a sizable section of the people of Kolkata and its performance in the past 20 years has been good, a nagging feeling persists that its objective is yet to be realised fully, as addressed by one of the Managers of Kolkata Metro Railway, told to one news magazine (Frontline, 2005).

According to the manager, the Metro's main problem is that the 16.45-km stretch, on which it plies, just does not attract enough passengers even to meet the maintenance cost. It has 17 stations, each station about a kilometer apart and is a boon for its users. Of the approximately three lakh passengers who use the service daily, only 25 per cent are regular commuters, that is, season-ticket holders; the remaining 75 per cent are those who make random trips. There has been growth in the volume of passengers in the past 10 years, but not significant enough. Where the gross annual income of the Metro is roughly Rs.48 crores, its maintenance cost is a whopping Rs.125 crores. The target is to increase passenger strength by at least eight to nine lakh a day as described by the manager to that magazine.

When the Metro rail in Kolkata was conceptualised, it was done with a grand scheme. It was envisaged that other than the north-south line in existence today, there would also be an east-west line. It was also envisaged that the Metro's passenger capacity would be around 22 lakh. In fact, according to a study made in 1971, 15 lakh people were expected to use it regularly by 1991. "The projections made earlier have not materialised, as the east-west corridor yet to come into existence. The Govt. of West Bengal, however, is contemplating an underground railway network, which would link Rajarhat in the east of Kolkata to Ramrajatala in Howrah, the west. Even during peak periods, the capacity utilisation of the trains has been around 70 per cent, and only 40 per cent in the early mornings".

The tube traffic has been growing steadily since 1999 – as a proof of the convenience to the commuting public. In 1999-2000, the passenger count was around 557.83 lakhs; in 2000-2001 it was 706.05 lakhs; in the following two years it was 766.05 lakhs and 773.52 lakhs respectively. Following are the details of number of passengers as provided by Metro railway authority.

Month	2003-04	2004-05	2005-06
Apr	6923153	7280473	8089007
May	6794708	7038508	8416103
Jun	7006879	7598130	8447279
July	8008696	8283949	9056338
Aug	7494394	8207179	9170043

Sept	8343864	8499269	9228485
Oct	7494301	8443003	8959328
Nov	7546569	8002190	8875665
Dec	8194081	8694031	9697467
Jan	8012323	8743743	9958998
Feb	7280916	8521153	8703838
Mar	7453137	8250580	9170574
Total	9,05,53,021	9,75,62,208	10,77,73,125

Table 5.2.1 *Metro Railway Kolkata, Passenger Statistics.*

Although the National Urban Transport Policy has envisaged the public transport system in an overcrowded metropolis to wean away the middle-class commuters from using motorised personal transport (personal cars, hired taxis and so on). Further more, experts point to the absence of composite ticketing, which is prevalent in many European countries; where the same ticket can be valid for the underground as well as for buses, trams and even suburban trains.

One must however admit, that the Kolkata Metro has performed most admirably within these constraints, and elicited approbation from visitors from all over the world. Paramount importance is given to ensuring the safety of passengers. The service is impeccable and the trains and the stations are kept spotlessly clean. In fact, an article in *The Independent* stated: "Calcutta's (now

Kolkata) Metro is cleaner than the underground in London or Paris. It runs better too."

The present Kolkata metro has a huge coach repair and maintenance depot spread over 140 acres virtually in the heart of the north part of city, in Dum Dum. The facility is grossly under-utilised. The proposed east-west system, by way of the process of integration, can take control of the facility, without incurring any extra cost. After all, creating a coach maintenance and repair facility constitutes a sizeable portion of the total cost of any underground rapid transport project.

Many passengers prefer to use the Metro Railway rather than driving their own car. The reason behind is the unlimited traffic problems on narrow roads which make these passengers fail to reach their destinations (mostly places of work) on time, even if they ride their own car. "But if the Metro functions smoothly, one can forget about the red marks in the office attendance register," these passengers say. School kids also favour the Metro for the same reason. In fact, in the early morning, one usually finds them rubbing shoulders with executives in the crowded Metro rail.

Kolkata residents' pride in the city's Metro is legendary, and they ensure its maintenance and cleanliness with almost a religious fervour. The surprising thing is that the same Kolkatan, who spits to his heart's content anywhere and

everywhere in the city, suddenly becomes the model civic citizen when he boards the Metro, as said by one passenger.

Various types of Public Bus services: Kolkata also has an extensive network of government run and privately owned buses. The private-owned buses are quite typical of Kolkata and are usually very crowded. The private-owned buses are of two types: the regular bigger size buses and the mini-buses. The regular buses are coloured light-blue and yellow. The mini-buses contain less number of seats and all are of brown and yellow colour. The mini-buses were started in the late seventies as a relief for the office commuters from the overloaded buses by being a sitting-only service. But, this has given way to severely overloaded and crowded mini buses. The government-run buses are run by several authorities like Calcutta State Transport Corporation (CSTC), South Bengal State Transport Corporation (SBSTC), West Bengal Surface Transport Corporation (WBSTC) and the Calcutta Tramways Company (CTC). Recently Aircon buses have been introduced by the WB Surface transport Corp. These buses are white coloured and connect places like the Airport, main railway station and main metro rail station, etc. Even one can find buses in the night filled up with passengers, mostly working people, returning home after completing job (evening shift 2PM to 10PM). Again it is an example of commitment to the customers from the service providers.

PARTICULAR / YEAR	2001-02	2002-03	2003-04	2004-05	2005-06
Rider ship (every month) i.e. average number of passengers carried per month **(in million)**	19.392	18.422	18.371	16.999	16.309

Table 5.2.2 *Calcutta State Transport Corporation (CSTC) Passenger Data.*

Other kind of mobility services like chartered bus service for long distance school going students or office goers, who use to hire the chartered buses for monthly or permanent basis with an advance payment. So that the service will be available for that passenger from his/her home to his/her destinations to and fro.

Tram service: Kolkata is the only city in India to have a tram network. Trams are under the administration of the Calcutta Tramways Company, popularly called CTC. However, the trams are often claimed to cause slowness of traffic. So there are groups of people who voice abolishing the tram. On the other hand, the environment-friendliness (electrified tracks) and the old charm of the trams attract many people. At present, the tram lines in some major roads are being renovated so as to maintain the tram lines at the same plane as the rest of the road, thereby smoothening the road and increase the speed to make it more popular.

Ferry steamer service (water way): Ferry steamer services are provided to communicate both Kolkata and the adjacent district of Howrah. Both of them are commercial districts, so the economic activities are the main reasons for passengers to cross the river of Hooghly in between these two districts always.

Auto Rickshaw service: Auto-rickshaws have become a very common mode of transport for short distances journey to reach nearby food market, school, bank etc. These services are usually not metered, but a fixed rate is decided by the service providers and it is common throughout Kolkata. There are several short routes in Kolkata and the auto-rickshaws of a particular route ply between two distinct places of that route only. Auto-rickshaws can accommodate 3 people in the backseat, however, 3 passengers on the back and 2 more on two sides of the driver at the front is a common trend but potentially risky behaviour.

They are very much competitive in terms of low cost and their availability at the local level or short route journey. Local Government don't give permission to run this type of auto-rickshaw in the Administrative office areas because those area are already congested by other mobility services. Rest areas of Kolkata (mainly residential area, market places etc.) are permitted for auto-rickshaw to run. Auto-rickshaw works as a feeder system for the long route public vehicle service systems (Public bus, Metro rail, Tram etc.) in the city also.

Every passenger gets a comfortable seat for journey. This again adds a value to the lower cost of journey. If one compares the advantage of an auto-rickshaw to

a public bus for a short route in Kolkata, the tendency of the public bus service is to wait for a longer time period to get more passengers so that it can earn profit according to economy of scale at a short route, where as auto-rickshaws have a stand at every distinct junction mostly in residential or market areas and once they get at least 4 –5 passengers at a time they start moving for their next distinct destination. Also the auto-rickshaw service is provided on the first cum first chance basis. In fact in those area, where demand is more for auto-rickshaws, time-poor passenger still use to make a queue to maintain the first cum first service offer. Which is again shows an indication of sustainable behaviour.

Manual Rickshaw service: Both Paddle driven and Hand pulled rickshaws are available in Kolkata from a long past. Though Hand pulled rickshaw is on the list of probable abolishment on humanitarian grounds. These rickshaws are popular and used at the local level mobility services.

Sometimes there is a competition between Auto-rickshaw and manual Rickshaw for the possession of market at the local residential areas. Manual Rickshaw has to loose the ground in front of Auto-rickshaw because of lack of speed and comparative cost (economy of scale). But many times manual Rickshaw gains over Auto-rickshaw, when the customer's destination is out of the route of Auto-rickshaw at the local level.

Bi-cycling: People in Kolkata are very much habituated to use bicycle. Even many poor passengers like to take their bicycle to their work places as it is cost free and comfortable to journey, provided they can manage to ride in those congested narrow width roads.

Walking: At the local level many times manual three wheeler rickshaws are used for the transport of school children from home to school, to and fro. Or many times the mothers or the elder persons use to take their kids to schools by walking. And it is a general practice of the residents of the city to walk instead of using any vehicle for their destinations. As most of the citizens of this city belong from middle or lower class, they try to accommodate or plan their daily life activities according their economic capability. Or a bicycle can be a best way to travel at the local level. Poor workers most of the times like to take their bicycle to their work place.

Taxi service: The metered-cabs are mostly of the brand "Ambassador" manufactured by Hindustan Motors. The all-yellow ones have a West Bengal permit & Kolkata permit and can run from any point to any point. Generally individual or family can use it for hiring purposes and not shared by many different individual passengers at a time. It charges heavily per kilometre in comparison to normal public service vehicle (e.g. Public bus, Metro rail) in long run.

Other types of hired car services: These types of services are generally provided for special occasions to public or many commercial organizations for their personal purposes.

5.4 The educational value of stories and cases

Informal communication in form of conversations is one of the commonly chosen tool that influence human thinking and decision making process and change the everyday lifestyle of individual and community, is getting importance in making strategy of sustainable change. The importance of story telling and informal conversations is getting recognition in the field of educational value creating activity.

The value that a story teller or an aged person tries to convey through this kind of activities, has been happening naturally since ages among the communities and more formally within academic learning context. Though story telling is an informal and scientifically non-documenting activity in the domain of formal methodology, but it is very much influential in the cultural domain in a community. Stories are a "culture's coin and currency" (Burner, 2002).

A story telling of a consumption activity, particularly of mobility activity in an urban area, looks like an on-paper strategy making: where and in which situation, how to deal with the available mobility activities or services to solve the problems. This strategy making activity is also done through practice of story telling, as Lewin showed in his research. The determination that is shown by the

"hero as a human" of the story inspires the listeners, to think or to feel that same kind of capability among them to solve their daily life problems.

So the intent of story telling clearly expresses the need to promote a change in values in our society following the same educational principles of the ancient information and communication tool (UNESCO, 2002). As A. Gersie states in Earthtales: Storytelling in Times of Change, "storytelling has led many educators to think about the ways in which storytelling can be used to explore important shared themes and visions", especially related to the current environmental issues.

A storytelling deals with many variables in a complex systems like the present society, where a scientific solution may not be arrived at, but the capability of human with honest motivation can solve many issues those we see in the present context of the world. These stories can become real case study with the concept of possible real world, which has been recently gaining success and more interest in many disciplinary fields like educational, legal, administrative etc.

Two streams of analysis on case study research are being developed: one is characterized by a more quantitative approach (e.g. Yin and Reige), which aims at using quite rigorous methods to ensure validity and reliability.

The other group (e.g. Stake and Smith) supports the idea that case study research also needs to have a qualitative approach especially when representing complex systems such as stories and practices of human in daily life.

What is important is their potential to catalyse the understanding of a radical possible world and to facilitate that change.

Finally, the case study report has to take the consideration of various kinds of readers as everybody has his own intention to read the report, so that it can provide various kind of information those can fulfil different needs and interests of those readers.

Like frictionless motion, ecological validity is a goal to be pursued, approached, but never achieved. The more closely the case study report is approximated, the clearer will be the scientific understanding of the complex interplay between the developing human organism and the functionally relevant aspects of its physical and social environment.

5.5 Characterization of mobility functioning

Understanding the nature of system level ecological perspective of mobility activity in any urban context and validating its sustainability in terms of its production and consumption pattern, is an important issue for this kind of research. The capability to use those mobility functionings or services through a networked system level concept is primary criteria for ecological validity in an urban context.

5.5.1 Characteristics of mobility activity and services

Mobility as action (or service activity) is a "Verb" according to English Grammar (Oxford Advanced Learner's Dictionary, 2000), i.e. somebody (e.g. passenger) does this movement activity. The character of mobility service as well as mobility activity is intangible. The way of documentation of mobility services or mobility activities can be different from documentation of product, as product is measured in terms of space, where as mobility activity can be measured in terms time and space. The service cannot be resold nor does exist before purchase. The production and consumption of mobility services generally coincide and cannot be transported. The buyer/passenger and service provider directly take part in production and it is necessary to come in direct contact to each other (Norman, 2000).

Walking on the road, bicycling or consuming some public mobility services in the city are the examples of mobility activity. This kind of mobility services are social events, where the social interactions are going on between service providers and passengers.

5.5.2 Characterization of capability for mobility activity

Capability of a person varies according to the nature of work activity. According to Sen (1997 & 2000), capability of consuming mobility activity or service is very much a direct approach, which takes the form of directly examining and comparing vectors of functionings. There are various kinds of direct approaches are there, which include

i) "total comparison," involving the ranking of all such vectors vis-à-vis each other in terms of poverty or inequality;

ii) "partial ranking," involving the ranking of some vectors vis-à-vis others, but not demanding completeness of the evaluative ranking;

iii) "distinguished capability comparison," involving the comparison of some particular capability chosen as the focus, without looking for completeness of coverage.

Doing or using mobility activity in an urban area can be seen as "distinguished capability" of passengers. Here the researcher concentrated only on "distinguished capability".

5.6 Rational behaviour as the reflection of common daily life culture

In a conditioned social system, the rational behaviours of passengers and the various rational properties of conduct are more or less similar. Any urban system is mostly designed by the combination of human activities and material systems. So the rational behaviour of the urban dwellers are almost logically predicted and controlled by the design of material systems. Rationality frequently means a high degree of dependence of one upon the other. The scientific rationalities, in fact, occur as stable properties of actions and as sanctionable ideals only in the case of actions governed by the attitude of scientific theorizing (Garfinkel, 1967).

In fact the passengers may "rehearse in imagination" along various kinds of alternative mobility activities and situations, before even actually acting on that line in reality (Lewin, 1951). The actions may involve the exercise of choice between two or more means for the same ends or of a choice between ends. Such decisions act as a player's strategy (Neumann & Morgenstern, 1947).

Also there can be tolerable error in those similarities of mobility behaviours. And these actions are governed by the "attitude of daily life." Where actions and social structures that are governed by the presuppositions of everyday life are concerned, any attempts to stabilize these features or to compel adherence through socially systematic administration of rewards and punishments are the operations required to multiply the anomic features of interaction. Here the actions are governed by the attitude of daily life are marked by the specific absence of these rationalities either as stable properties or as sanctionable ideals (Garfinkel, 1967).

The reconstruction of the "problem of rationality" depends upon a viable distinction between the "attitude of daily life" and the "attitude of scientific theorizing." It is necessary, therefore, that the different presuppositions that make up each attitude be briefly compared.

According to Schutz (1943, 1944, 1945, 1951 & 1953), in everyday situations the "practical theorist" achieves an ordering of events while seeking to retain and sanction the presupposition that the objects of the world are as they appear and expects that just as he expects the relationship to hold for the other person the other person expects it to hold for him. It provides that interpretation be

conducted while holding a position of "official neutrality" towards the belief that the objects of the world are as they appear. The activities of everyday life, of course, permit the actor's doubt that the objects are as they appear; but this doubt is in principle a doubt that is limited by the theorist's "practical considerations." Doubt for the practical theorist is limited by his respect for certain valued, more or less routine features of the social order as "seen from within," that he specifically does not and will not call into question. By contrast, the activities of scientific theorizing are governed by the strange ideal of doubt that is in principle unlimited and that specifically does not recognize the normative social structures as constraining conditions. And also the interpretive rules of the attitude of scientific theorizing provide that the sense and accuracy of a model is to be tested and decided while suspending judgement on the relevance of what the theorizer knows by virtue of his social and bodily positions in the real world.

Schutz describes, the man in daily life is informed as to the sense of events by using a presupposed background of the "natural facts of life" that from his point of view "Any of Us" is obligated to know and give credence to. The use of such natural facts of life is a condition of continued bona fide membership in the group. He assumes that such a background is used by herself and others in the manner of morally enforceable "coding rules". In his everyday activities, he uses the scheme of standard time as a means of scheduling and coordinating his actions with those of others, of gearing his interests to those of others and of pacing his actions to theirs. He assumes that the scheme of standard time is

entirely a public enterprise, a kind of "one big clock identical for all." In this, of course the theorizer is interested in matters of fact.

Even according to Schutz (1943), rational choice would be present if the actor had sufficient knowledge of the end to be realized as well as the different means apt to succeed, in case,

i) knowledge of the place of the end to be realized within the framework of the plans of the actor (which must be known by him too).

ii) knowledge of its interrelations with other ends and its compatibility with them.

iii) knowledge of the desirable and undesirable consequences which may arise as by-products of the realization of the main end.

iv) knowledge of the different chains of means which technically or even ontologically are suitable for the accomplishment of this end regardless of whether the actor has control of all or several of these elements.

v) knowledge of the interference of such means with other ends of other chains of means including all their secondary effects and incidental consequences.

vi) knowledge of the accessibility of these means for the actor, picking out the means which are within his reach and which he can and may set going.

The ideal characteristics that scientific observers subscribe to as the ideal standards of their investigative and theorizing conduct are used to construct the model of a person who acts in a manner governed by these ideals. Von Neumann's game player, for example, is such a construction.

Schutz concludes that, the concept of rationality has its native place not at the level of everyday conceptions of the social world but at the theoretical level of the

scientific observation of it. It is found in the logical status, the elements, and the uses of the model which the scientist decides on and uses as a scheme for interpreting the events of conduct. It is to emphasize that the ideal of rationality is not and cannot be a peculiar feature of everyday thought nor can it therefore be a methodological principle of the interpretation of human sets in daily life (Garfinkel, 262-283).

5.7 The case study methodology: cases as a research strategy

A case study allows an investigation to retain the holistic and meaningful characteristics of real-life events. Case studies can be based on any mix of quantitative and qualitative evidence. But it should not be confused with "qualitative research" (Schwartz & Jacobs, 1979; Strauss & Corbin, 1990; Van Maanen, 1988; Van Maanen, Dabbs & Faulkner, 1982); as qualitative research follows ethnographic methods and seeks to satisfy two conditions: (i) the use of close-up, detailed observation of the natural world by the investigator and (ii) the attempt to avoid prior commitment to any theoretical model (Jacob, 1987, 1989; Lincoln & Guba, 1986; Stake, 1983; Van Maanen et al., 1982).

According to Yin (1981a, 1981b), a case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. The contextual conditions those a case study method tries to cover is distinguished from other research strategies like, experiment, documentation of historical events and survey. Because an experiment deliberately divorces a

phenomenon from its context; so the attention can be focused on only a few variables. A history does deal with the entangled situation between phenomenon and context, but normally non-contemporary events. And surveys can deal with phenomenon and context but the context is extremely limited; and tries to limit the number of variables to be analyzed to fall safely within the number of respondents that can be surveyed. So a questionnaire survey for the data collection of passengers can not be adopted, as the passengers are having their particular reasons to value their revealed preference (Sen, 1982 & 2000) in this present research.

Also the case study inquiry copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result benefits from the prior development of theoretical propositions to guide data collection and analysis. Case study begins with "a logic of design...a strategy to be preferred when circumstances and research problems are appropriate rather than an ideological commitment to be followed whatever the circumstances" (Platt, 1992a).

According to Yin (1994), case study can be "explanatory", where the research focuses on "how" and "why" oriented question; it also can be "exploratory", where the research focuses on "what" kind of question; and finally it can be "descriptive" where the research is focused on "who" and "where" kinds of questions. Even though each strategy has its distinctive characteristics, there are large areas of overlap among them (Sieber, 1973). In fact these different

strategies are a pluralistic one. The type of research questions posed, the extent of control an investigator has over actual behavioural events, and the degree of focus on contemporary as opposed to historical events, are the kinds of conditions those distinguish the strategies.

Case study research is applied to explain the causal links in real-life interventions that are too complex for the survey or experimental strategies. It is also to describe an intervention and the real-life context in which it occurred. Even the intervention being evaluated where it has no clear, single set of outcomes; case study strategy may be used to explore those situations. For illustrating certain topics within an evaluation, case study is required. Also certain journalistic efforts can qualify as case studies (Yin, 1993; Cronbach et al., 1980; Guba & Lincoln, 1981; Patton, 1980; U.S. General Accounting Office, 1990).

Based on these reasons, which legitimize the choice of case study research as a methodology, the case design and realisation had been studied accordingly:

1. There is no fixed way or method of doing case studies, since it can be specific to any research. Yin (1994) proposed a precise pre-structured protocol by providing an insightful approach to case study. Though Stake (1995) is not in favour strictly defined pre-structured theoretical perspective in order to create opportunities for understanding researcher reflexivity and case representation. According to Yin, a given theoretical framework determines the boundaries of the case study research.

But sometimes an alteration and revision of the design may change the method of research and the format of the pre-constructed cases to fit to the original theoretical concerns and objectives.

2. Both single or multiple case(s) can be handled according to the requirement of case study research. Single case can be handled to get an insightful and detailed description through exploratory, explanatory or descriptive studies. It represents the critical case in testing a well-formulated theory. The theory has specified a clear set of propositions as well as the circumstances within which the propositions are believed to be true. A single case can represent a significant contribution to knowledge and theory-building. Multiple cases are required to validate phenomena in different realities and with different facets.

This research is based on a single case inquiry with many subunits in order to explain all the conditions and phenomena for testing a well-formulated theory in a more detailed and rigorous way.

3. Even the same case study may involve more than one unit of analysis. It happens within a single case, where attention is also given to a subunit or subunits, is called embedded single-case design. Though one or more cases can be used as subunits in this research, but that choice of using one or more subunit cases are selected through sampling techniques. The embedded units might be "process" units. Mostly these cases are used as exemplar.

In this case studies more subunits are included as representatives in testing of one rationale for a single case. So it is an embedded approach of a single-case with an insight, incorporated with many subunits of analyses.

4. Given that, all research processes, "very few case studies will end up exactly as planned" (Yin) changes and manipulation will be brought by the researcher during the case preparation. The research questions and the theoretical framework orient data collection should be a relatively open process of investigation and observation. According to Yin, evidence for case studies may come from six sources: documents, archival records, interviews, direct observation, participant observation and physical artefacts.

In this research at each level of analysis, different data collection techniques were used, ranging from documents, interviews, direct observation, and participant observation.

5. As the last step of the case study inquiry, the case study report is considered one of the most important within the whole process, as it has to effectively communicate the work and the results of it. The case study report doesn't need to follow and stereotypical form and it need not be in written form only (Yin), even if "the written product also has the advantage of familiarity, both for the writer and the reader" (Yin).

In this research case study reports will include significant non-written parts. The conviction that a picture is worth "a thousand words" here finds expression in this strategic use of photos that the case studies report make use of them.

6

Understanding the bottom-up sustainable mobility activities & services of Kolkata

6.1 Introduction

Kolkata is the only city in India, which is having various kinds of mobility services for various kinds of people and their various purposes of movement activities. So the consumption activity of movement occurs on a stage like situation. Here it is very much required to understand the relation between the context and types of passengers and their socio-cultural as well as economic situation to proceed further for the sustainable process of movement activities of passengers through out the day and night.

Understanding the 'what', 'why' and 'how' are the main issue of analysis of this sustainable mobility activity research. The abstract of the consumption pattern and the supporting production of those mobility services and activities are main issue of this explanation of analysis. It can highlight every individual element that can constitute an overall sustainable system network of mobility activities.

So understanding the relations among elements is the primary work at the first moment. Once that is over, then understanding the overall relations among all the elements becomes easier.

Also understanding the role of design of this kind of social system is crucial, so that designer can guide the participants to achieve their goal in new situations.

6.2 Understanding individual element of sustainable urban mobility services and activities

6.2.1 Various types of available mobility activities and services

A graph Fig 6.2.1 has been created to place all the passenger related urban mobility activities in the city of Kolkata according to their **model of service (enabling-relieving)** and **organizational model (centralised-networked)**.

The format is according to **enabling–relieving** and **centralised–networked** axis. Also the researcher tried to take a note on pattern of use of those vehicles.

Before explaining about every quadrant one should be clear about the types of stakeholders' participation in this economic activity of urban mobility in Kolkata.

Local Govt. also takes part in providing infrastructure for mobility activity. It has to provide service-infrastructure through construction of road network according to the city development schemes and promote other facilities on road (for example, road lighting facilities in night, pedestrian, etc.) to make it accessible and comfortable for various kinds of stakeholders at the time of their mobility activity.

Mainly these services are divided into **enabling-centralised services**, **relieving-centralised services**, **relieving-networked services** and **enabling-networked services**.

Models of Service:

Enabling Service: This kind of service enables the passenger to perform her own mobility activity by her own personal resources.

Relieving Service: In this kind of service, the service provider does all kind of mobility activities with the help of its own setup to provide mobility services to the passenger. So that, the passenger has not to do any activity by her own.

Types of Organization:

Centralised Organization: This kind of service organization provides mobility services to the passengers by its own setup without taking help from other organization or without making any collaboration with other organizations. The services will be centralised under one management, creating more hierarchical relationships.

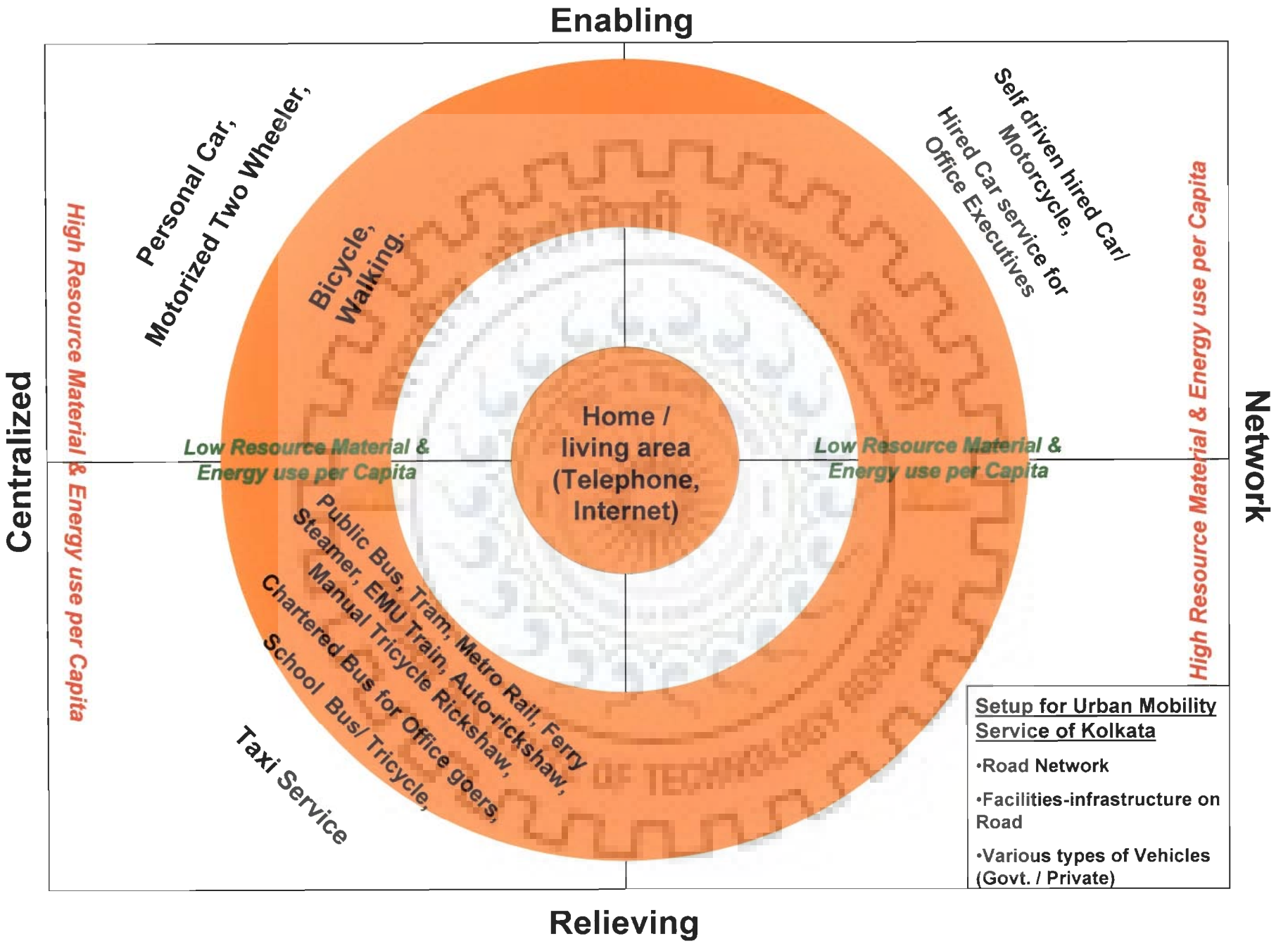


Figure 6.2.1 Various type of organizational and mobility activities in Kolkata

Networked Organization: This kind of organization is actually a collaboration of more than one organization to provide networked mobility services to the passengers. But still those organizations may remain independent and equal in relationship.

Also these mobility activities or services are placed on the graph with respect to intensity of resource material consumption and production of polluting gases per capita. For example, when one vehicle is used by more number of passengers, obviously the intensity of resource material consumption and volume of production of polluting gases per capita will be less in comparison to the use of a vehicle by one person. And if the vehicle is used by many passengers again and again, then obviously the intensity of resource material consumption per capita will be reduced more than the earlier one.

Following are the detailed explanations of characteristics of various types of mobility activity consumption and production patterns according to every quadrant of the graph.

Enabling-centralised services:

According to this quadrant, the passengers use to use their own personal vehicles like car, motorcycle, scooter, bicycle etc. Even sometimes passengers use to walk on the road or pedestrian as an alternative to reach their destination. Local Govt., as a stakeholder, constructs and promotes infrastructural setup (e.g. road network) for mobility activity of the passengers, which is also another kind of

service. These kinds of activities are very much flexible in nature. Here walking and bicycling are the low resource material & energy consumption activities per capita, but use of personal car, motorcycle or scooter are the indication of high resource material & energy consumption activities per capita and also are costly in comparison to other mobility activities in this city, as indicated in the graph.

***Relieving-centralised services*:**

According to this quadrant, various kind of service providers offer mobility services to the passengers with the help of their own setup like, Public Bus, Metro Rail, Tram, Ferry Steamer, EMU Train, Auto Rickshaw, Manual Tricycle Rickshaw etc. Also there is no fixed passenger in these cases. But these mobility services have their fixed route numbers, so they have to run their services on those fixed routes and get their usual passengers. This is very much profitable, as the density of demand for these kind of services are very much high in this city.

Other kind of services are offered as contract basis service for permanent passengers, who use to get the centralised service from the starting of their journey to the end of their journey by one fixed mobility service provider everyday. Generally advanced payment is done to these service providers, and it is renewable every month. Chartered bus for office goers, School bus or manual Tricycle for school children are the examples of this kind of service.

Mostly more number passengers are accommodated to earn the profit according to the rule of economy of scale. And the cost of expenditure of availing these

services becomes less in comparison to previous kind of service (i.e. enabling-centralised service). The per capita consumption of resource material and energy is less in these cases.

On the other hand, Taxi service in the city from any point to any other point, shows the example of medium type of resource material and energy consumption per capita. And cost of the service is also high according to economy of scale, as it is generally used by individual passenger or a family or a group of passengers or friends at a time. In these cases the passenger does not have the responsibility to drive the vehicle and more comfortable & preferable journey can be achieved by the particular passenger. One advantage of this Taxi service is, when the city public mobility services are not available in the late night, these service providers use to take interest to provide service to the passengers, but at a higher cost.

***Relieving-networked services*:**

According to this quadrant, the kinds of services are very few in number. Some service providers in a network provide services to the passengers with the combination of bus, ferry steamer & bus etc. Daily passengers who use to come from outside of Kolkata for their daily jobs, they like to use these kinds of facilities. Again these kinds of facilities are the indication of use of low resource material and fuel energy per capita.

***Enabling-networked services*:**

In this quadrant, the kinds of mobility services are slowly mushrooming in Kolkata because of growing complex needs and demands according to economic growth. Various corporate firms hire cars from transport agencies and provide services to their office executives. Even sometimes families like to hire cars from small transport agencies and use by their own for various mobility purposes to participate in some particular cultural occasions (for example, for marriage or other ceremonies etc.). Overall these kinds of services are the examples of high/low consumption of resource material and energy per capita depends upon the context of use.

6.2.2 Urban local context and local culture in Kolkata

Kolkata is one of the most populated mega-city (population 13,216,546, Census 2001) with the population density of 24,760/km^2. Presently it is the capital of the state of West Bengal, situated on the bank of river Hooghly in the eastern part of India. Always referred to as the "Cultural Capital of India", a vibrant city with a distinct socio-political background; Kolkata is noted for its revolutionary history and commercially, industrially and intellectually the most important. Kolkata witnessed economic stagnation in the years following India's independence in 1947. Since 2000 however, an economic rejuvenation has arrested the morbid decline, leading to a spurt in the city's growth.

Kolkata's literacy rate of 80.86% exceeds the all-India average of 59.8% (Census 2001). As the former capital of India, Kolkata was the birthplace of modern Indian

literary and artistic thought. Kolkatans tend to have a special appreciation for art and literature; its tradition of welcoming new talent has made it a "city of furious creative energy".

Kolkata is a three hundred years old city, which was slowly developed and spread over its surrounding areas according to its necessity. So it is not as a pre-planned city at the initial stage. It was mainly set by the British colonials as a business centre with many official and administrative areas, slowly mushroomed by other commercial and residential areas at the surrounding places. Kolkata faced a huge number of migration because of two world wars and a partition (1947), as well as migration from the neighbour states in search of jobs. Poverty still haunts Kolkata. But a positive view of the present State Govt. of West Bengal is creating some scope of hope among the people through recent industrialisation process. Growing mobility activity is also an indication of this development.

If one can look at the map of Kolkata Figure 6.2.2.1, one will see the expansion of Kolkata towards the south and north directions, as the western side is very much bounded by the river Hooghly, which is flowing from north to south direction and the eastern part is very much engaged in farming land (mostly vegetables), which feeds the population of Kolkata in their day to day life. So it is the policy of West Bengal Govt. not to develop any civil construction on those farming land as a part of food security strategy for the population of Kolkata.

The city is having a grid pattern combining of four major roads, one local EMU train line and one under ground Metro rail line running from north to south

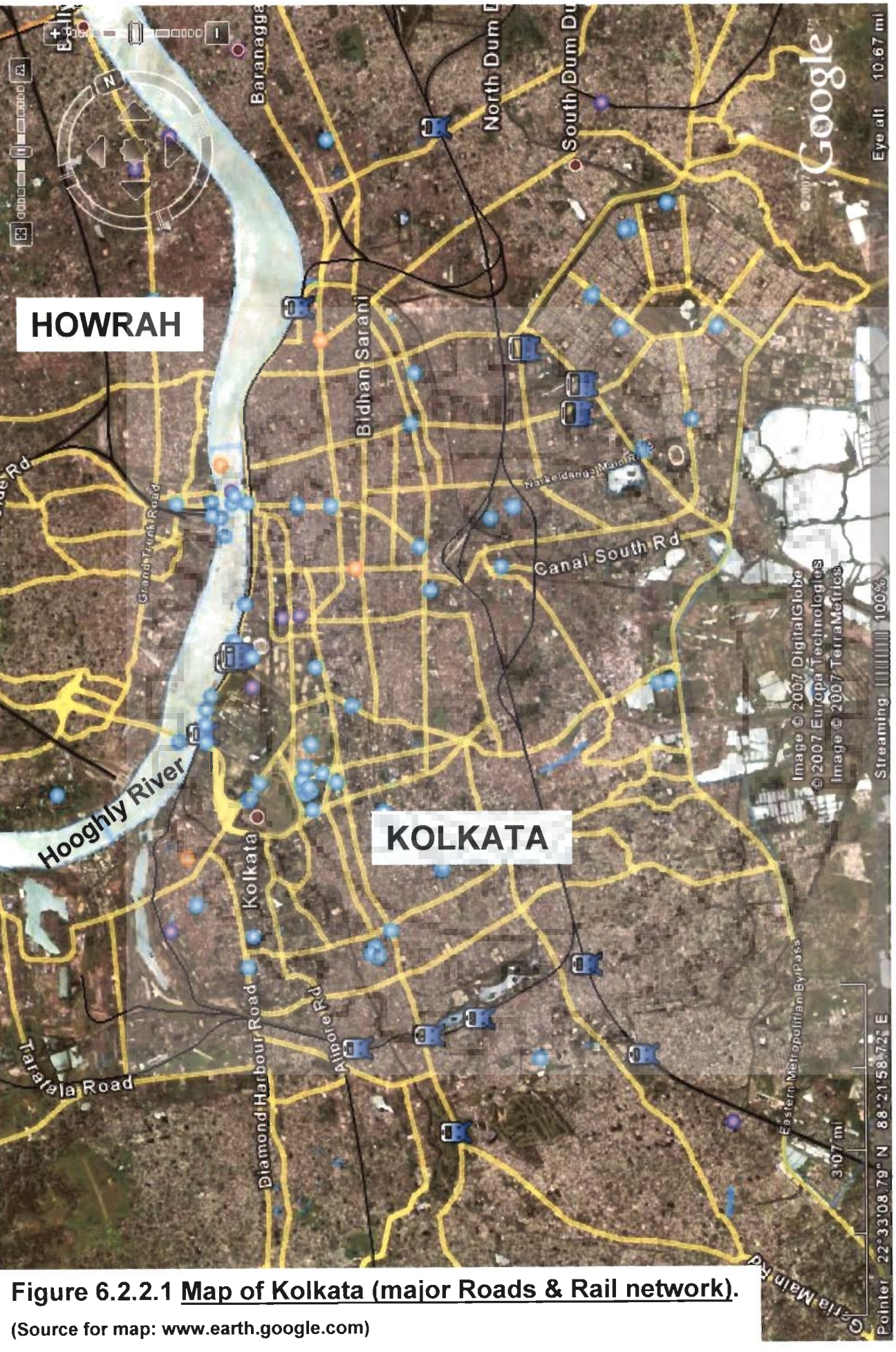


Figure 6.2.2.1 Map of Kolkata (major Roads & Rail network).

(Source for map: www.earth.google.com)

connecting the city with other adjacent districts, and small roads running from west to east connecting these major roads and rail lines. Many small size streets spread over the residential settlements connecting to the big size roads. So the congestion of the passengers are very much divided and distributed according to density of demand for transportation purposes Figure 6.2.2.2. Generally big size public transport vehicles do not like to enter in these small congested area and small size public transport vehicles use to run their mobility services within the limit of these congested areas. So it is more or less a kind of rectangular shaped mobility activity of the passengers of Kolkata. One can see the densely populated urban settlement for residential and other activities through out the city. The city was expanded according to the growing demands and other migration settlements from time to time, through out its history. Mostly a mixed and neighbourhood pattern of settlement Figure 6.2.2.3 can be observed through out Kolkata. These components lead the conditioned urban population to behave in accordance with the dictates of a divide-and-control authority pattern.

As the time goes by, the rise in demand for more housing is being forced to opt for the vertical increase of settlement in the city. Because of this reason, even few years beck, where there was a one storey building on a small plot, one can see a multi storied apartment building on that same plot now because of the booming construction industry. Average people in Kolkata belong to middle class family. Even though they do not have the ability to construct a well furnished house, by their own, on their piece of land, they invite the local building contractor to construct a multi storied apartment on that same plot, and instead

they get one or two flats for their own through some legal agreement and the remaining number of flats are sold by the contractor and earn his profit. In this way the density of population in these residential areas also increases.

Even in many cases one can have the ability to construct his own house on a piece of land, but people don't try to take the risk because of security problem. It happens mostly to the nuclear families. They opt for group housing of multi storied apartment, where the social security is in many ways depends on the community of that group housing. So in this way, the density of population is increased in this congested city in many cases.

Also the mixed use of land and neighbourhood pattern by all ages and economic-class mix create a secure urban community through out the local area. Most of the people in Kolkata are not rich; maximum of them are belong to middle class of the society. Their participations are in the predomination of the age-old local culture driven local consumption oriented trade activity. So local businessmen get enough opportunities in the market than those centralised business centres, where the trade activities are mainly controlled by business giants. The local Govt. policies, which also in many ways try to safeguard these local trade activities; so a market is not only a market of trading activities, but it is more of a centre of interaction, which attracts local people and the roads full of local activities etc.

The local movement of the local people for their daily life activities (e.g. going to vegetable market, post office and bank, school, to meet friends or neighbours etc.) mostly by walking, or bicycling etc. within a certain reach of the society,

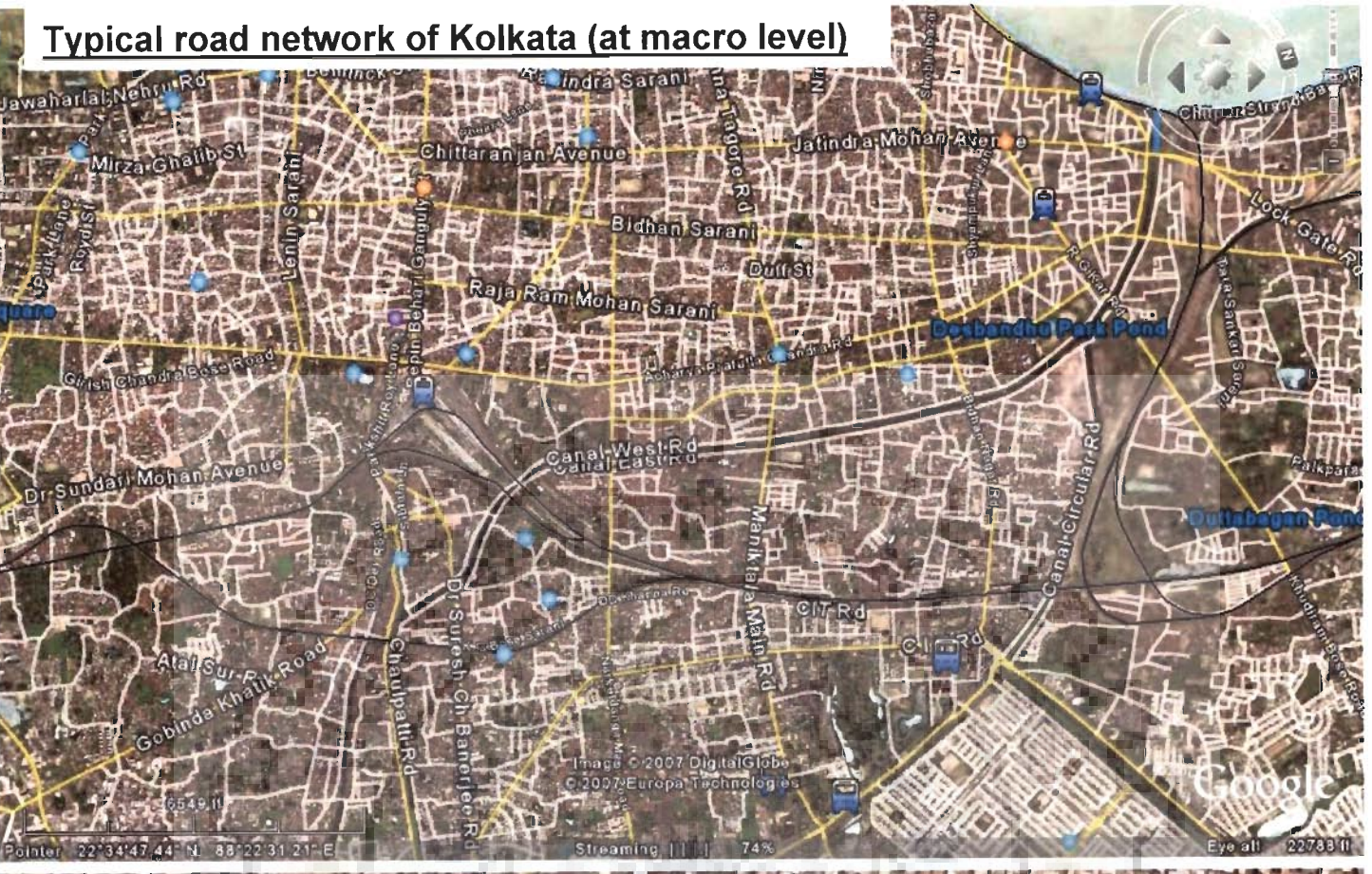


Figure 6.2.2.2 Rail and Road (big & small size) network in Kolkata
(Source for map: www.earth.google.com)

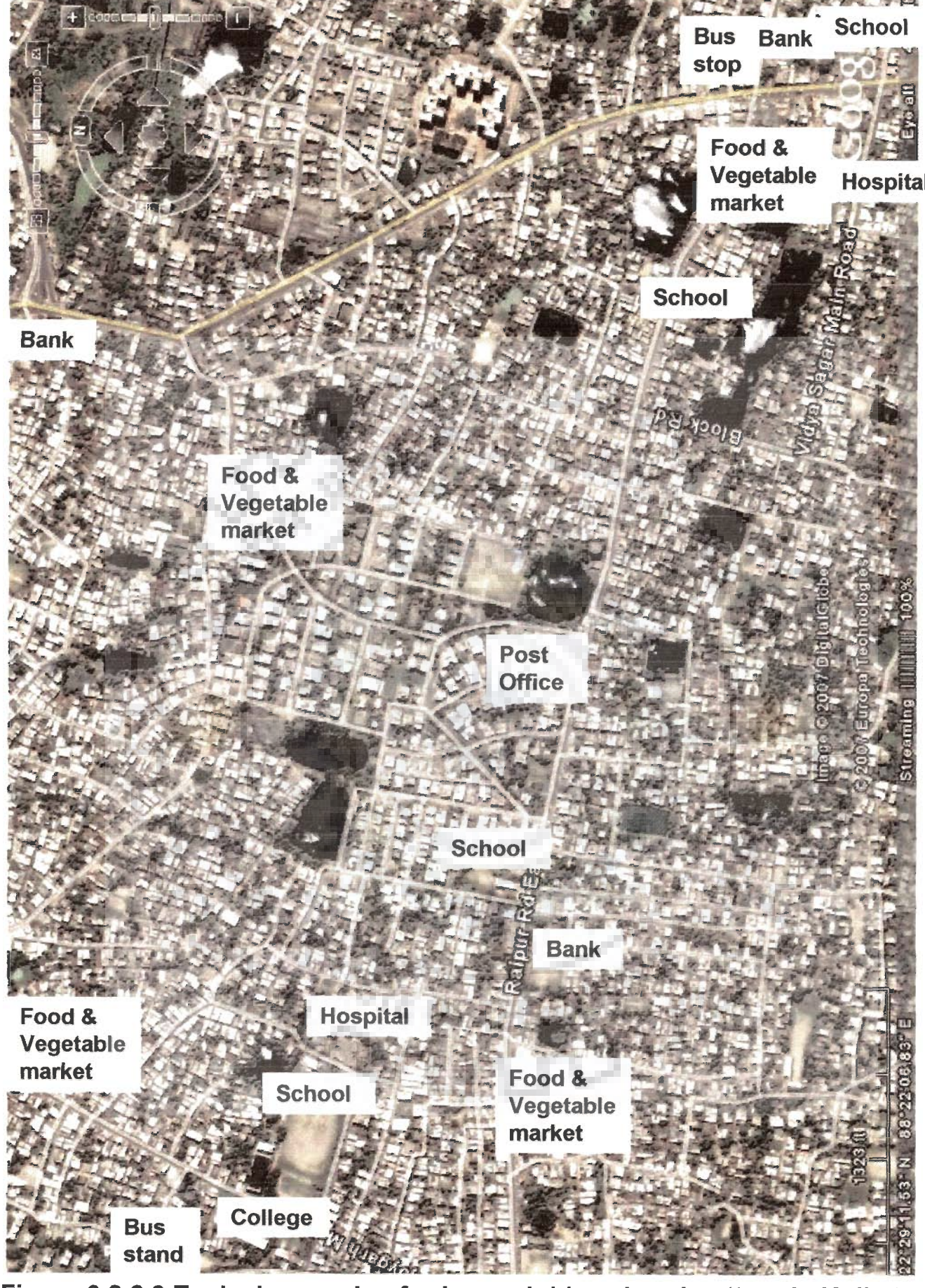


Figure 6.2.2.3 Typical example of urban neighbourhood pattern in Kolkata

(source of map: ww.earth.google.com)

makes the locality very much lively. The continuous interaction among the known people on the way of movement for their daily activities creates a continuous watch and exchange of information about the locality. These kinds of local activities become a part of the local culture Figure 6.2.2.4.

Most of the spaces of activities (e.g. residential, administrative, commercial, educational, entertainment etc.) are spreaded throughout Kolkata as combination of many pockets. These pockets are not planned always. But these spaces of activities were developed according to growing requirements with combination of all daily life activities. Mostly the residential spaces of activities spread through out Kolkata, except some specific pockets of administrative areas, so most of the places are very much lively by people even after the evening. In fact the increasing outdoor activities of the people, and more by the young generations now-a-days, make the city more charming and secured. Even females also like to stay and enjoy their life and do movement activities till night without any accompany. People have due respect to females very much in this city. When a female passenger is walking on the road after getting down from public bus on the way to home in the late evening, the community activity in market or local shopping place, or club etc can create feeling of social security in her mind. And it is not a new phenomenon in Kolkata. For as many as more than two hundred years Kolkata has gone through many transitions of social reform. Many writers, social thinkers, philosophers, freedom fighters influenced the people of Bengal through their activities and thinking. And many times Kolkata was the centre of those activities. People here habitually indulge in "*adda*" or leisurely chat, and

these 'adda' sessions are often a form of freestyle intellectual conversation, which influences many people in many ways in formation of a good habit and culture.

One can find many such kinds pockets of repetitive activities through out the city of Kolkata. In local language, these kinds of pockets are called '*pada*', which can be defined as the cultural and social neighbourhood boundary of these pockets within the city. One of the good examples of the proof of this 'pada' culture is the time when the 'Goddess Durga' is worshipped in a particular time of the year. The local young generation use to arrange this activity within the local community. So one can generally find at least one such worship activity in every local pocket ('pada') at that particular time in every year.

6.2.3 Various types of passengers and their mobility activities

Broadly one can segregate the passenger community into three segments:

i) New passenger

ii) Regular passenger

iii) Irregular or occasional passenger

i) New passengers are generally the new entrants in Kolkata. Who are migrant people either want to settle in Kolkata or enter into city for some specific kind of purposes.

Figure 6.2.2.4 Neighbourhood and mix-used urban local context in Kolkata (road-side activities).

a) For those, who enter into the city first time just for the day or two to complete their specific assignments and goes back to their native place from Kolkata, are not so specific to know the routes to their destination as a specific intention. But for them to complete the assignments in time, those, they are here for is the main intention. So they concentrate their attention more on those assignments. Those assignments can be an appointment for medical treatment, an official or administrative purpose, shopping or visiting places in Kolkata etc. Many of the time they use to have an advanced huge budget for the transportation purposes. So they don't mind to book a permanent taxi service for the whole day, just to avoid the burden of public mobility service for a single day in the city.
Otherwise if they do not have enough to spend for transportation, they try to seek help from the traffic police, mobility service providers or even from co-passengers to guide them to get the accurate available mobility services to reach their destination. In this case one important point is, the co-passengers take a big role in helping them. Many times these co-passengers, who are also going to the same direction or nearby to that destination, accompany them till they reach to their destination with a smile. These kinds of passengers try to keep remember the routes they travelled for the next time also.

b) Another type of new passengers who migrate to the city to settle there permanently have different story. It is like the first step to become a regular passenger in the city. They generally try to do experiments for combination of

services for first few days and also consult with others like neighbours or friends for proper advice. Once they find the appropriate one for their particular regular destination, they fix on that. So in this case budget, time, quality of particular mobility service, safety are the important issues. It is like a new learning process for them. But budget is the primary issue for every new passenger. They try to have experiment exactly which combination of services is convenient for them within that budget.

Ultimately the traffic police, service providers, co-passengers are the sources of information. And it is the speciality of Kolkata that one can rely on them. The broad mind and a helping hand is always very much welcome for the new passengers in this 'city of joy'. Many visitors have mentioned it many times in their writings that though many people are poor in this city, but still they always try to laugh, a symbol of welcome for the new visitors in Kolkata. It can be a part of the culture. The freedoms people enjoy in a democratic system (Sen, 2000) is the reflection of the culture of this city. It is one of the good sustainable behaviour.

ii) Regular passengers represent the mass public in Kolkata. If one look at the data collected from the Govt. of West Bengal, Transport Department office, one can understand that in the year the number of Motorised Registered Personal Vehicle in Kolkata were 347880. Even one takes it as granted, that a family comprises of five persons and all of one Motorised Personal Vehicle is use by all

the five members of a family, then the number of population of Motorised Personal Vehicle can be 1739400. According to the UN Report on world population in 2006, the agglomeration of Kolkata population was 14521000, so almost 12 percent (%) of the total population agglomeration of Kolkata population use their Personal Motorised Vehicles. So it is the challenge for the urban mobility systems of Kolkata to deliver quality services to this rest 88 percent (%) population.

One can divide the regular passengers into two different segments. The first one is the passengers who use chartered vehicles services. And the second one is the passengers who use any combinations of mobility activities or services for their daily routine.

a) Those office goers and school children, who use chartered vehicle services, have their fixed schedules every day. From the morning they prepare themselves so that they can reach the pick up points from where they get their mobility services. These pick up points are the nearby points where the mobility services can be accessible easily. These are pre-determined points after the discussions with the service providers. The service providers pre-fix these points in such a way that it can match the pre-designed routes of the service vehicles and the desired pick-up points of the customers (fixed passengers). The same repetition happens at the time of returning home also.

These kinds of services are very much safe and secured for regular passengers with an assurance of sitting facility. It makes a sense of discipline in their daily

life. And also it makes a sense of small travelling community for those particular moments. School van (manually driven), chartered bus, small vans and hired cars etc. are the examples, which are used for these kinds of services. As the service providers get enough number of such customers, so it becomes easier for them to provide confirmed quality services to the customer, which is very much profitable according to economy scale also.

b) The second kind of services is used by most of the regular passengers. Kolkata is the only city in India, where maximum varieties of mobility services are available. The variety of these services gives the passengers enough freedom to choose according to their requirements, as they are having reasons to value their preferences (Sen, 2000).

One can find many competitors with various kinds of mobility services in this city. Starting from Public big size bus, Mini bus, Midi bus, EMU local train, Metro rail, Tram, Auto Rickshaw, Manual Tricycle etc., this variety of services varies according to the scale and nature of demands and situations. The scale of demands, the type of delivery of services and the distribution of road network in the city are very much compatible to each other.

If one follows the urban pattern of Kolkata and available mobility services, she can observe that passengers come out from their houses to start their journey. Every passenger is not lucky enough to construct her house just near by medium sized road, so maximum number of passengers or residents have to construct their residents little far from the near by medium sized road. Small size roads are

used to connect these residential plots and the near by main road. Passengers generally like to walk or use manual tricycle rickshaw services to reach the near by medium sized road in those residential areas. These manual tricycle rickshaws can carry one or two passengers at a time. So it is purely a micro level service provided at personal level (de Leonardis, 2000).

After reaching the near by medium sized road they can avail the existing auto rickshaw service, which can carry 4 to 5 passengers at a time. These auto rickshaws run their shuttle services between to major popular junctions, where they can get enough number of passengers to start with. These types of services work as feeder services to the bigger size mobility services which run on the major big size roads (de Leonardis, 2000).

As already stated earlier that major big size roads are running from north to south and in some cases from east to west also, maximum number of passengers are carried by public buses, metro rail or EMU local trains, tram connecting residential areas and other spaces of activities through these roads. So maximum of the distance is covered by these particular services as the economy of scale. When the passengers come close to their destinations, again they need more micro level or at the personal level services after getting down from public bus or other big services; they use auto rickshaw, tricycle rickshaw, walking etc to reach their destination in every pocket of the urban pattern.

It is a chain of services that passengers choose to consume according to their requirements, they have reasons to value. They make a pre-decided strategy according to some permutation-combination. This combination of services may

not be the same everyday and may vary according to the situations. The combination may vary from passenger to passenger according to their positions of spaces of activities within the urban area.

iii) Irregular or occasional passengers are those residents of Kolkata, who go to their destinations occasionally according to their needs. It can be a part of leisure activity or serious activity for them. In the case of a leisure activity the passenger can be very much relaxed in mood with enough time and enjoy the journey. The passenger may adopt any combination of services in that case. It can be a combination of public bus, auto rickshaw, or it can be a taxi service (de Leonardis, 2000), and they use to have an adequate budget for that.
But for a serious occasional passenger, who concentrates more on his or her job, behaves like any regular passenger.

6.2.4 Concept of community in mobility strategy & consumption pattern as part of daily life activities

Kolkata is a multi-cultural and multi-lingual city. It is like a mini-India. People have migrated for various reasons and settled here. This city has always welcomed every migration. They have become one entity that is they are called 'Kolkatan'. Even though there are so many pockets as parts of urban composition, but those pockets are always very much similar in terms of daily life activities and reflect the multi-cultural harmony, which any citizen can be proud of, in this "Cultural Capital" of India.

The social organization among every concentration of individuals in a community provides enough opportunities of individual space for thinking and actions of purposes as well as maintenance of value systems in this city, which ultimately creates the vibration of communal harmony and social integrity. Whatever one wants, the next question is generally raised regarding the conditions of possibility of those desires. So there is a continuous tension between individual interest and the common interest. The Platonic Republic, in which passengers as citizens are socialized and related to one another so that one wants what she gets and gets what she wants. In such an order that which is good to individual is right to the group. Self-interest and public interest are different aspects of the same morality (Minar & Greer, 1970).

In definition, the proper relation of every passenger, as individual citizen and collectively, emphasize his freedom to do what he wish within very broad limits, ignoring the interests of others in the faith that the "individual hand" of the market place would allocate values, reward virtue, and punish vices. Individual aggrandizement results in the greatest good of the collective. This "solution" to the problem of community is resulted in encouraging the entrepreneur and the innovator, at considerable cost to the traditional social values and particularly, the weaker social classes. It produces a world valuing change, individuality, heterogeneity, and individual liberty (Minar & Greer, 1970).

Sustainable mobility is one type of socio-technical communication strategy and process for social interaction and also part of it. This social interaction begins with mutual modification of behaviour. It happens in every space of activity

among citizens as well as passengers. Such interaction, in turn, becomes patterned by the nature of the activity which calls it into being; it is structured. In Kolkata certain structures are partly defined by the spatial scene they occur in; through interaction emerge shared perspectives and commitments to the place and its group – that is, the community. So the citizen as passenger learns to interact with her environment at all levels starting from micro-, meso-, exo- or macro-level, and decide her strategy of interaction with various spaces of activities and mobility to reach those spaces within the city. Slowly it makes sense to begin a consideration of community by looking at the relationship between interaction and commitment to a given place and its group, a commitment to the structured activities Figure 6.2.4.

Thus every activity and movement turns to an action, interaction, and sentiment (Homans, 1992). Thus the strength of a group, a spatial community, to unite and direct its members' actions will be a result of the degree of interdependence and sentiment generated between members and for the group as a whole.

A series of activities at one particular place and time a person does in physical surroundings with certain other persons together begin with a process, a flux of things, and the passing scene. For example when a passenger plans her daily life outdoor activities, she does it according to existing situations, she is familiar with. So the existing urban pattern or the existing mobility service or activity pattern influences her to make such decision of process of activities. Now in an urban scenario, if one creates the settlement in such a way, so that the passenger need not to go far distance to fulfil her outdoor needs, and also if

Mixed used local context

Shared Auto-rickshaw service

Disciplined passengers in a queue waiting for Auto-rickshaw

Group of school students going back home

Mothers can accompany their kids to school

Mother can accompany her kid back to home after school

Disciplined passengers waiting for the public bus service in a queue

Passengers have patience to enter the bus in a queue

Passengers waiting for mobility services at the bus stop

Inside the Public bus

Passengers entering into the sub-urban train

Passengers walking to their work places

Figure 6.2.4 Sustainable community behaviour of passengers

growth of those production and consumption patterns of those scenarios are very much sustained, then the holistic approach of creating those scenarios will be very much sustainable. And to create those sustainable scenarios, only material design or material planning is not sufficient, but the design of human behaviour is also another required part. The behaviour of the person as a citizen and passenger should be in such a way so that the interaction with other people and the environment can produce the sustained growth. As Bronfenbrenner has already said, the development of child should be in such an environment, so that the child can become a good citizen with all the responsibility to support the total system of consumption and production for future development. So it is a cyclic process transfer from one generation to another generation. And it happens in a community. And these pockets of communities must have a social interaction to create a bigger community as a city like Kolkata.

One of the preconditions for citizen involvement, which is fundamental to iterative participatory goal formulation as well as to interactive strategy development, is the commitment of individuals to contribute to a given community. This commitment is again shaped by people's perception of and attitude towards this community. Community identity is shaped by both territorial and socio-cultural relations. To determine the commitment of a person towards its community, not only her own perception and evaluation is important, but also what a person thinks of the perception and evaluation of others. If one thinks, for example the community should develop in a more sustainable direction, but others do not

agree with this, this person will probably not be motivated to act (Puddifoot, 1995 & 1996).

Most of the daily life basic activities can be accommodated within a pocket (e.g. bank, post office, vegetable market, school etc.). For example, if the local school provides good quality education, then there will not be any need to send the kids to a famous school for good quality education for parents. That means it is a local competition among the local schools to provide good quality education for local students. So it is the responsibility for the teachers to teach good quality lesson to school children. In this way the school will be able to survive as well as there will not be any need to send the children to a school at a far distance by public bus or other vehicles, which is little bit risky both for the children and parents. Ultimately it becomes a bottom-up solution. And if the Govt. policy supports this kind of bottom-up solution, then it can produce local economy. For example, one can see manually driven three wheeled van, which carry school children from home to school to and fro as a personalized mobility service (de Leonardis, 2000). The local people can run these kinds of mobility services to produce their local economy. Also on the other hand, school children can walk in a group to reach their school in time, which can create time sense among them and also walking is a good physical exercise for their physical development. And the local neighbourhood and mix used concept of the urban locality create these kinds of situation. In a mix used pattern of urban locality, one can see the local shopping and local activities just at the side of the road happening, which keeps a continuous communication about what is happening on the road. Suppose the

school children are going school, and at that time there is an attempt of kidnapping of a school child, so in that situation other children who are the friend of the victim and walking together can shout and the local shopkeeper or other local people can get alerted and may rescue the victim (school child). So the physical protective security is very much required for those school children at the time of going to school or coming from (Sen, 2000). So it is a holistic approach in combination of the participation of all kind of stakeholders in a sustainable city development as well as community development for daily life production and consumption purposes; mobility activity or services is a part of this holistic approach (Checkland & Scholes, 1990; Banathy, 1996). So this community culture can make the parents assured of sending their kids to local school.

Even in the case of a daily passenger who use to go for her work, follows a particular daily life schedule, which is almost similar with any other regular passenger in Kolkata. All of them try to maintain the same timing. It is like a community time followed by the entire regular passengers in their daily life works. Every body does this with the use of a scheme of temporal relationships that she assumes she and other passengers as citizens employ in an equivalent and standardized fashion. She cannot plan for the future without relying on the massive regularities of expected behaviour. These recurrences in social behaviour recognized as customs, which is very much defensive in nature, because every custom is related to other custom and a systems of custom can survive in this way. It s not something outside of, and apart from, social organization but is implicit in organization.

From the morning she prepares for her breakfast, and then be ready for journey to office. And all she does according to time, so that she can reach office in time. It is a similar process to everybody. She comes out from the home, and either starts walking to reach the nearest possible bus stop to travel by public bus or may start her journey even by local shared auto rickshaw or manual tricycle rickshaw service to reach the nearest possible public bus stop or to reach nearest possible metro rail station. All these activities happen like a scheme of standard time as a means of scheduling and coordinating her actions with those of others, of gearing her interest to those of others and of pacing her actions to theirs. Her interest in standard time is directed to the problems such specifications solve in scheduling and coordinating interaction. She assumes too that the scheme of standard time is entirely a public enterprise, a kind of "one big clock identical for all."

On the journey, many times those privately owned public bus service providers make their journey late by running slow or stop anywhere in between two scheduled bus stops to take passengers. These kinds of activities make the office goers late to attain their offices. Ultimately these passengers start shouting whenever the bus drivers make such kind of late on the journey. And the protest comes from every passenger. The kind of unity they show at that time reflects the community unity of those passengers for those temporary moments (Puddifoot, 1995 & 1996). The agency goal of the passengers in this case, is to have a profitable sustained quality service considering both the sides of stakeholders. In

that case the density of demand indicates the economy of scale to earn this profit.

6.2.5 Financial aspects

Kolkata is the only city in India, which provides maximum types of mobility services. There is a combination of both Government as well as private players in the market. Obviously there is no monopoly of any player in the market of Kolkata, like any other city in India. There are almost 35000 auto rickshaws running their services on Kolkata. At least 5 types of public bus services are provided by many Government as well as private players. In fact both those sky blue and maroon coloured privately owned public bus services are provided by many private players. And every service provider has its particular route in the city. Including these, there are tram, metro rail, local EMU train, manual cycle rickshaw. So there is a competition among these players.

The cost of the ticket is decided in such a way that both the customer as well as service provider can get benefited. And this decision is made with a discussion among the various kinds of stakeholders including the Government and passengers. One can find the seriousness of these organizations both from passengers and service providers in deciding the market price of tickets for those mobility services, in those local news papers. Kolkata is always called the "city of middle class". Middle class is a kind of economic segment which is in between poor and rich economic class, but there is no defined boundary for these classes by the Govt. But it is assumed those people who can earn their life and live

comparatively well in comparison to poor people are called 'middle class'. So any increase in the mobility service price may cause a problem in that middle class monthly budget. As earlier mentioned that almost more than 85 percent (%) people do not have any motorized vehicle (data collected as on Jan, 2006), so they depend more on public mobility services. So such a vast market can produce enough economy for those service providers according to the economy of scale.

In fact there are advantages of having such a variety services in the city. A monopolistic service can provide the market cost of service according to its own wish to earn profit, which will decide the minimum buying power of the passengers in the city. This kind of decision may create problem for those poor passengers who can not afford such a high cost of service in the market and also the quality will be decided by the service provider. In that case it may degrade the quality of service. But a promotion of various kinds of competitors may increase the quality of services as well as those services will be provided at a reasonable cost. As also described by Sen (1979), about the capability of consuming a combination of product and services, the huge population avail various combination of services those are running on various routes, to travel from one corner to another corner of the city without using their personal vehicle. This combination of services can be any type of combination according to their situations, that they are having reasons to value. In fact if one tries to look at the Table 6.2.5, one can understands that these combinations are very much situation specific, customer specific, as well as their cost of services. For those

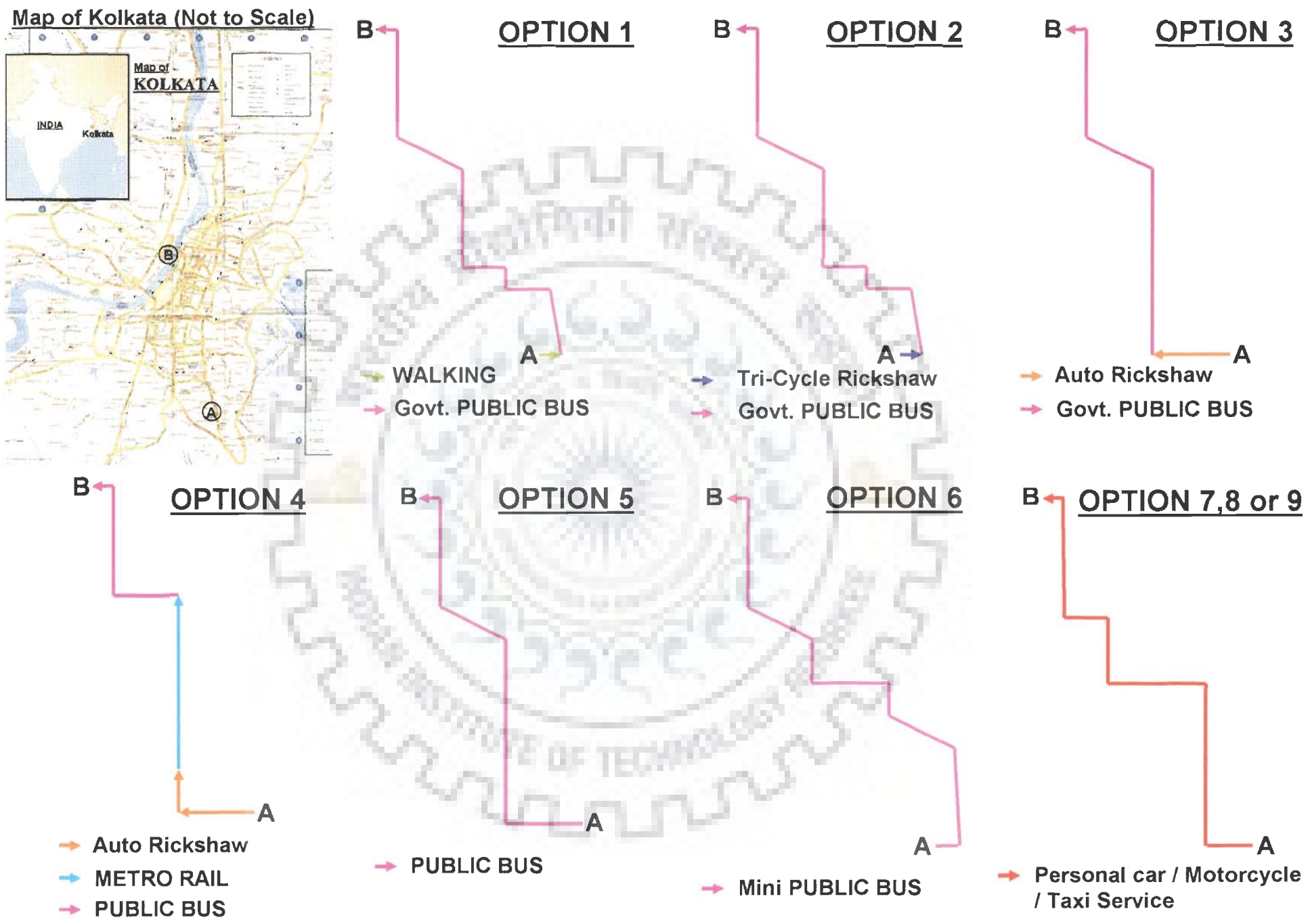


Figure 6.2.5 Various combinations of mobility activities to reach from "A" to "B".

daily passengers, who use to go office everyday and has to travel from point 'A' to point 'B' Figure 6.2.5, have a fixed budget with the accurate combination of services; because they have fixed schedules with fixed services. They have made it with lots of permutation combinations, and they have reasons to value (Sen, 2000). For example, one passenger likes to accommodate the option no. 1 (i.e. walking + Govt. public bus service) from the Table 6.2.5. So according to that option that she has decided after many experiments, fits according his schedule or she has made her daily life schedule in such a way that she can avail that particular combination everyday. Suppose she fails to avail that combination one fine morning, because of some personal reasons. But she has to reach her office in time, so she decides to avail the option no. 4 (i.e. Auto rickshaw + Auto rickshaw + Metro rail + Public bus services) to reach her office in time. Obviously the total cost of services of the option no. 4 is more than option no. 1. But for that day she has to adopt that particular option no. 4 instead of option no. 1, because if she uses the option no. 4, then she can travel faster than option no. 1 in that existing situation and reach her office in time. So in this case, she thinks to avoid an absent mark on the register in office, so that she can stop spending one day casual leave or loosing salary of one day, which more in amount than the total monetary amount of option no. 4 comparatively (Sen, 2000).

Option. No.	Combination of Services	Total cost	Total avg. no of passengers	Total no of Km travelled	Emission** * (gms/km)
1	Walking + Govt. Public bus (GPB)	Rs 6	52 Seats (GPB)	(W) 0.5 Km + (GPB)17.5km	0 + 0.7773
2	Tricycle rickshaw (TR) + Govt. Public bus (GPB)	Rs 5 + Rs 6	2 Seats (TR) + 52 Seats (GPB)	(TR) 0.5Km + (GPB)17.5Km	0 + 0.7773
3	Auto rickshaw (AR) + Govt. Public bus (GPB)	Rs 4 + Rs 5.50	5 Seats (AR) + 52 Seats (GPB)	(AR)2.5Km + (GPB)14Km	4.6383+ 0.7773
4	Auto rickshaw (AR) + Auto rickshaw (AR) + Metro rail (MR) + Public bus (PB)	Rs 4 + Rs 4 + Rs 6 + Rs 4	5 Seats (AR) + 5 Seats (AR) + 2500pasgs(MR) + 37 Seats (PB)	(AR)2.5Km + (AR) 2Km + (MR)7.5Km + (PB) 4.5Km	4.6383+ 4.6383+ 0 + 3.9674
5	Public bus (PB)	Rs 6.50	37 Seats (PB)	(PB) 16.5 Km	3.9674
6	Mini Public bus (MPB)	Rs 8.75	27Seats (MPB)	(MPB) 17 Km	2.5057

7	Personal car	Rs 57	Individual	16.5 Km	0.8953
8	Personal two wheeler	Rs 18.5	Individual	16.5 Km	5.8284
9	Taxi service	Rs 150	Individual	16.5 Km	2.1626

Note: 1$=Rs 41 (Indian currency). Cost of 1lit Diesel= Rs 34. Cost of 1lit Petrol= Rs 45.

Mobility type Notation: Public bus= PB, Govt. public bus= GPB, Auto rickshaw=AR, Metro rail= MR, Tricycle rickshaw= TR, Walking= W.

Avg. dist. Travelled per litre of fossil fuel of various vehicles and fuel type:

AR= Avg. 20 Km/ Lit (Petrol)

PB= Avg. 4 Km/ Lit (Diesel)

GPB= Avg. 4.25 Km/Lit (Diesel)

MPB= Avg. 4.5 Km/Lit (Diesel)

Taxi= Avg. 13 Km/Lit (Diesel)

Maruti 800 (Std.)= 13 Km/Lit (Petrol)

Two Wheeler= 40 Km/Lit (Petrol)

MR= Avg. 55 Kmph (Electricity consumed), emission free

W= Emission free

TR= Manual (human energy), emission free

Unit emission*= emission per unit energy x fuel consumption x fuel density x total distance

= unit emission / MJ x L / Km x MJ / L x Km

*Due to limitation of data of different types of vehicles for calculation of full LCA study, the assessments cover only the greenhouse gas emission (GHG).

** All data are from Primary & Secondary survey of Kolkata.

***Emissions of (PM + SO_2 + NO_X + CO + HC) (Ref: Dutta, M. et al. 2005)

Table 6.2.5 Economic & Environmental calculation of various options from point 'A' to point 'B' for a passenger in Kolkata

So what ever the situations those daily passengers face, they ultimately try to solve their problems with the help of those existing combinations of mobility services rather than trying any personal vehicle. The reason behind is most of the people do not have personal motorised vehicles as data shows. That is why they like to share those public mobility services. Even one tries to hire those public taxi service in that emergency case, that kind of option is still justified, because those hired taxi services are shared by any passengers through out the day (de Leonardis, 2000). And also many passengers who used to use their personal motorised vehicles earlier, now shifted to public mobility services to avoid time wastage, because of lots of traffic problems created by those personal vehicles at those rush hours. Also the cost of these kinds of public mobility services is less in comparison to the expenditure of journey by personal vehicles (see Table 6.2.5). It is a good signal, but unless until all such personal vehicle users turn to the public mobility services, the question of sustainability issue

remains a challenging issue. The creation of such kinds of mobility services to meet the micro level needs of many such kinds of passengers are the challenge to a designer and other stake holders in this case.

6.3 Understanding the freedom of passenger to participate in a democratic social system of urban mobility services and Service network

6.3.1 Freedom in mobility activity of a passenger

In the following, one full example can be explained of a journey for a young female passenger, who is coming home to enjoy her winter vacation, reaching the main rail station in Kolkata (For example, Howrah Station) after long route journey by train from outside at 10 PM night. The journey to her home at that situation can explain all the five freedoms, those explained by Sen (2000) as to define the sustainable mobility consumption and production scenario in Kolkata.

After reaching Howrah rail station just after 10 PM, which is one of the busiest rail stations and a big junction in India adjacent to Kolkata, the female passenger decided to travel by public bus instead of taking a hired taxi service, because the cost of the journey by public bus was much lesser than the hired taxi service. Also she would be travelling alone if she could hire taxi service at night. So travelling by public bus would be much safer, as there would be more passengers at least in comparison to a hired taxi service. And she was not in a

hurry, and the journey would be convenient for her. She got into the particular public bus, which could drop her at a far distance from her house; because there was no such service which can drop her near by her house from this Howrah rail station. The bus was congested as many passengers were going home after completing their evening shift duty (i.e. evening shift duty is from 2 PM to 10 PM). But she got a chance to sit, as there were some seats reserved for female passengers (33 percent of the total numbers of seats are reserved for female passengers in every bus in Kolkata). And she noticed later that all the ladies seats become full. That means female passengers were habituated to travel by that public bus, because they were assured by the confirmed quality service of the service provider. Ultimately she reached to an auto rickshaw stand which is near by her house and got down from the public bus accordingly and from there she got a shared auto rickshaw to reach her home. All these detailed step by step strategies of mobility activities can be explained as a systemic process by a system map Figure 6.3.1.

It is hardly a difference of few minutes between those by a public bus service and hired taxi service. But there was a huge difference in cost of those journeys. And also hiring a taxi service at night is little bit risky for female passenger like her. But she enjoyed a lively assured service by public bus. So she chose the opportunity which achieved the highest level of secured journey for her.

Even it may fulfil the agency goal for a female passenger, who goes out for earning to support her family (Nussbaum & Sen, 1993). For example, a nurse who lives in the southern part of Kolkata and does her nursing job in a hospital in

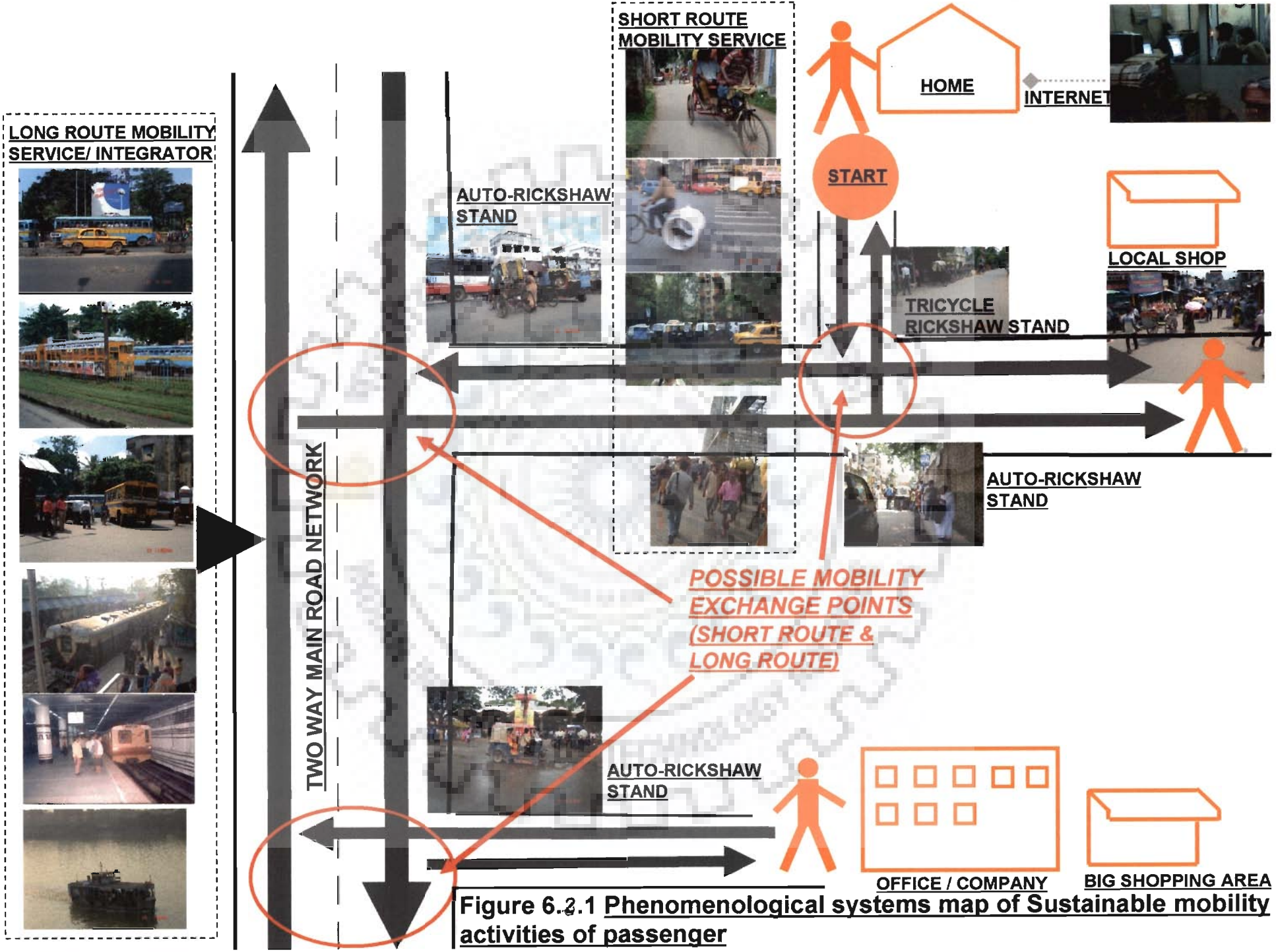


Figure 6.2.1 Phenomenological systems map of Sustainable mobility activities of passenger

north of Kolkata, obviously has to reach her work place in time, whether it is day or night. It is a noble and emergency job; and even in any political crisis in the city, nobody can stop her to go for her work place. Through out her life, she has to follow the routine. She has to do her journey to and fro alone. It is not only a question of right to a passenger, but also a need. The social attitude towards a female may decide not only the safety of the female passengers, but there are many related issues are there for sustainability issue of urban mobility services. If the female passengers don't get chance to travel by public mobility systems to go to their work place or even cannot walk on the street in the evening, then how can they support their family. And it is not possible to buy personal vehicle for that purposes by every female passenger just to avoid some kind of unfair mishap. Also if the number of passengers is reduced because of those social issues, then the public mobility service companies will loose their customers as well as their profit., as a consequence the frequency of services will be reduced and public will have wait for long time to avail those services. In that situation many passengers, who are financially capable, will like to buy their personal vehicles to avoid those long wait. Ultimately it will again create an unsustainable situation of the total urban mobility systems, because of increasing of pollution, scarcity of materials, and fuel, traffic problem etc. And also the government or other player will not able to run their services as well as there will be a creation of void in budget allocation in the supply and demand ration of public mobility services for the city.

So the agency goal of the passengers must be fulfilled by those service providers, and the agency goal of those service providers must be fulfilled by those passengers; it is a vis-à-vis.

All these facts are very much reflecting all kinds of freedom that she enjoys in the city of Kolkata (Sen, 2000). And it is only possible through a proper culture and seriousness to sustainable mobility activities. And this culture is not only developed by the socio-technical setup, but through the age-old history of that area (Steward, 1955). It is a trust and support that people create through their age-old daily life practices. Kolkata is the city where females are very much respected and well secured in this culture. And the crime rate against humanity is very low. Even Sen described it in one of his lecture last March, 2007 on "The Urbanity of Calcutta," given in New York in the name of the late city planner and architect Lewis Mumford, and in another lecture last April, 2007 on "Poverty, War and Peace" in Johannesburg and Cape Town. According to him,

"my humble Kolkata, notorious for its grinding poverty, has the lowest incidence of most kinds of violent crimes among all the sizable cities in the world for which I could get data, and particularly the lowest rate of murder and homicide. I had not seen this fact discussed anywhere,...It also emerged that while Kolkata was by a long margin the city with the lowest homicide rate in India, the Indian cities in general, almost without exception, are strikingly low in the incidence of violent crime by world standards, ..."

The average incidence of homicide in the principal Indian cities (including all the 35 cities that are counted in that category) is 2.7 per 1000,000 people. The figure

for Delhi is 2.9, for Chennai 1.9, and for Mumbai 1.3 per 100,000. The corresponding rate for homicide is as low as 0.3 in Kolkata. If one compares this with other principal cities in world, one can find, Paris has a homicide rate of 2.3, London 2.4, Dhaka 3.6, New York 5.0, Buenos Aires 6.4, Los Angeles 8.8, Mexico City 17.0, Johannesburg 21.5, Sao Paulo 24.0, and Rio de Janeiro an astonishing 34.9. Only Patna is in the big league with a figure of 14.0 as the homicide rate – no other Indian city gets even to half that number, and the average of Indian cities is, as mentioned earlier, only 2.7. Even the famously low-crime Japanese cities have more than three times the number rate of Kolkata, with 1.0 per 100,000 for Tokyo and 1.8 for Osaka, and only Hong Kong and Singapore come close to Kolkata (though still more than 60 percent higher), at 0.5 per 100,000, compared to Kolkata's 0.3 (Data till 2005).

As already described that Kolkata is having the maximum number of mobility services in India, that also available till night, which gives any passenger enough freedom to choose according to her budget and convenience. Even securely walking on the road in the night in any locality of Kolkata is easily done by any passer-by. Sen also included in his lecture that,

"...the influence of different parameters in keeping the homicide rates and violent crimes low in India in general and in Kolkata in particular, such as mixed neighbourhoods, the hold of family life, the role of cultural lives, and in the case particularly of Kolkata, perhaps the mainstreaming of economic discontent in regular politics rather than leaving it to find violent outlets in irregular crime. But

these are all highly speculative conjectures, and we badly need probing empirical investigation of this momentous but neglected issue."

"It will be a big mistake to blame violence on economic inequality and poverty," according to Sen. He referred to "Kolkata, where Muslim, Sikh, and Christian minorities had a sense of security." It's often remarked, and according to him with some justice, that "it's the only major city in India where women can walk around in the evening, unaccompanied...

...the world may get something from India's experience even when we do little to help others in an active way. While some lessons are in well-known fields, including democracy, freedom, secularism, the media, and others, there are further areas that may be worth bringing into comparative analysis. The incidence of violent crimes and of homicide may well prove to be an area of great importance for global comparisons and for learning from experience."

Social quality does not refer to products or services only but to social processes: relationships, discourses and practices, instead of consumption of services or goods. So from this perspective, the quality must be considered as a "societal" requirement, not only generically social. It concerns the inter-subjective level of social life – neither just objective nor just subjective. In this perspective social quality is defined as a political quality, just in that it concerns public life. And at the same time it redefines what "politics" is, transferring it in daily life (Showstack Sassoon, 1997).

6.3.2 System behaviour in critical moment of urban mobility activities or services

Walter Fenno Dearborn once told (Bronfenbrenner, 1979), "...if you want to understand something, try to change it....If you wish to understand the relation between the developing person and some aspect of his environment, try to budge the one, and see what happens to the other." There is a relation between the person and the environment where one lives. And this environment has properties of a system with momentum of its own; the only way to discover the nature of this inertia is to try to disturb the existing equilibrium. So from this perspective one can say that the primary purpose of the experiment of sustainable ecological system of an urban mobility services is to discover its structure; identification of those system properties and processes those affect and are affected by the behaviour and development of the passengers.

For example, in this Figure 6.3.2.1, it presents a scenario of a massive jam on Howrah bridge (also called Rabindra Setu), that was created due to road blockade by the State opposition political party of West Bengal, in protest against the acquisition of agricultural land in Singur (it is one suburban area nearby Kolkata) by the State Government of West Bengal for an automobile factory. If one looks at the map of Kolkata, one can understand that there are two adjacent districts are there; those are Howrah and Kolkata. Both were developed at the time of British colonial era. Both the districts are centres for industries, commerce and administrative activities. Both the districts are very much connected by bridges and steamer ferry services by water ways, because of the river Hooghly

flowing from north to south in between these two districts. Howrah rail way station and adjacent bus stand are the two big junctions for connecting many places of Kolkata, Howrah and many other long distance places in the country. So obviously this junction is one of the busiest accessibility nodal exchange point in this region. In fact Howrah railway station and bus stand are the entry point to Kolkata also.

So if somehow one can block the mobility services those are started from Howrah Bus Stand towards Kolkata, it can create a massive blockade to the adjacent region and can create lots of troubles to daily passengers. Unless the blockade is removed from that place with the help of local administration, those vehicles wait in a long queue resulting massive jam on the Howrah Bridge.

But those passengers, who are in a hurry, may start walking on the pedestrian to cross bridge to avoid this blockade (Option 1) Figure 6.3.2.2. Because once they cross that region, they can get enough number options of other mobility services, which come from some different directions and go towards the desired destinations of those passengers. Those passengers can travel by those mobility services and reach their destinations in time.

Even many of them can choose to take a totally different route. For example, they can use a ferry steamer service to cross the river Hooghly and reach the bank of Kolkata (Option 2) Figure 6.3.2.2. Then they can get different public bus routes to reach their destinations.

There can be another route, where one can cross the river Hooghly by another newly constructed nearby bridge (Vidyasagar Setu) and reach the bank of

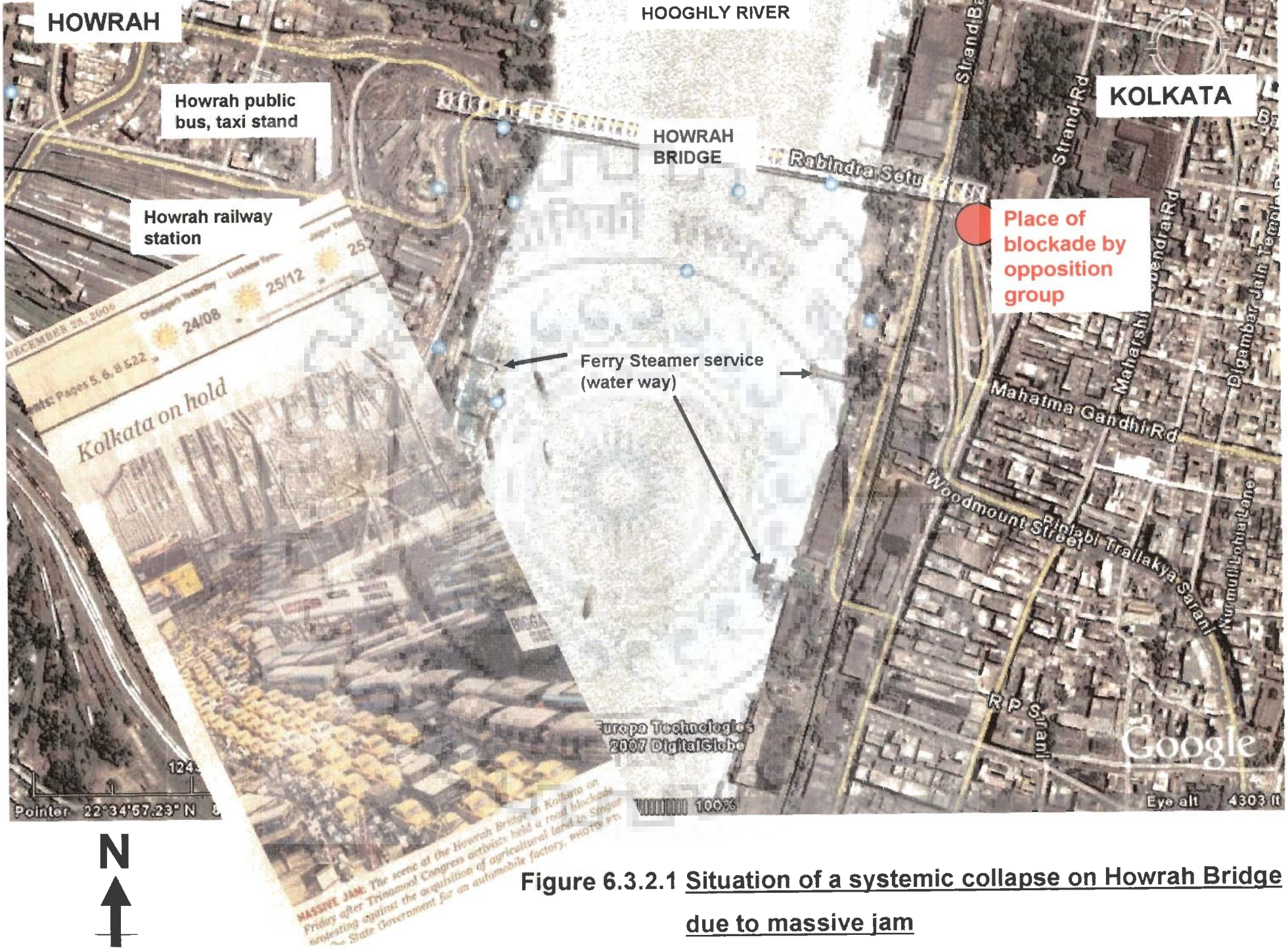


Figure 6.3.2.1 Situation of a systemic collapse on Howrah Bridge due to massive jam

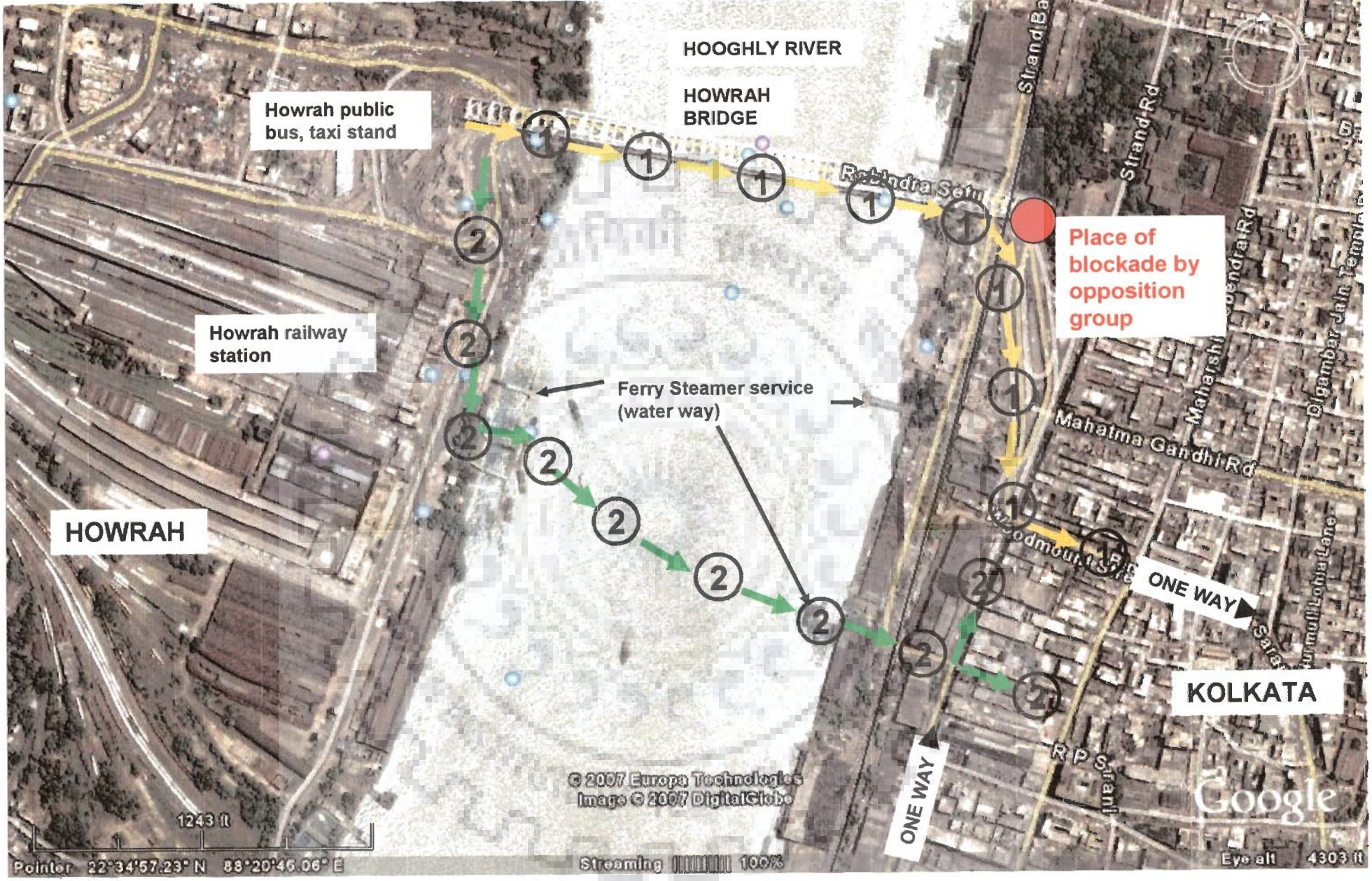


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Figure 6.3.2.2 Option 1 & 2, to solve journey problems.

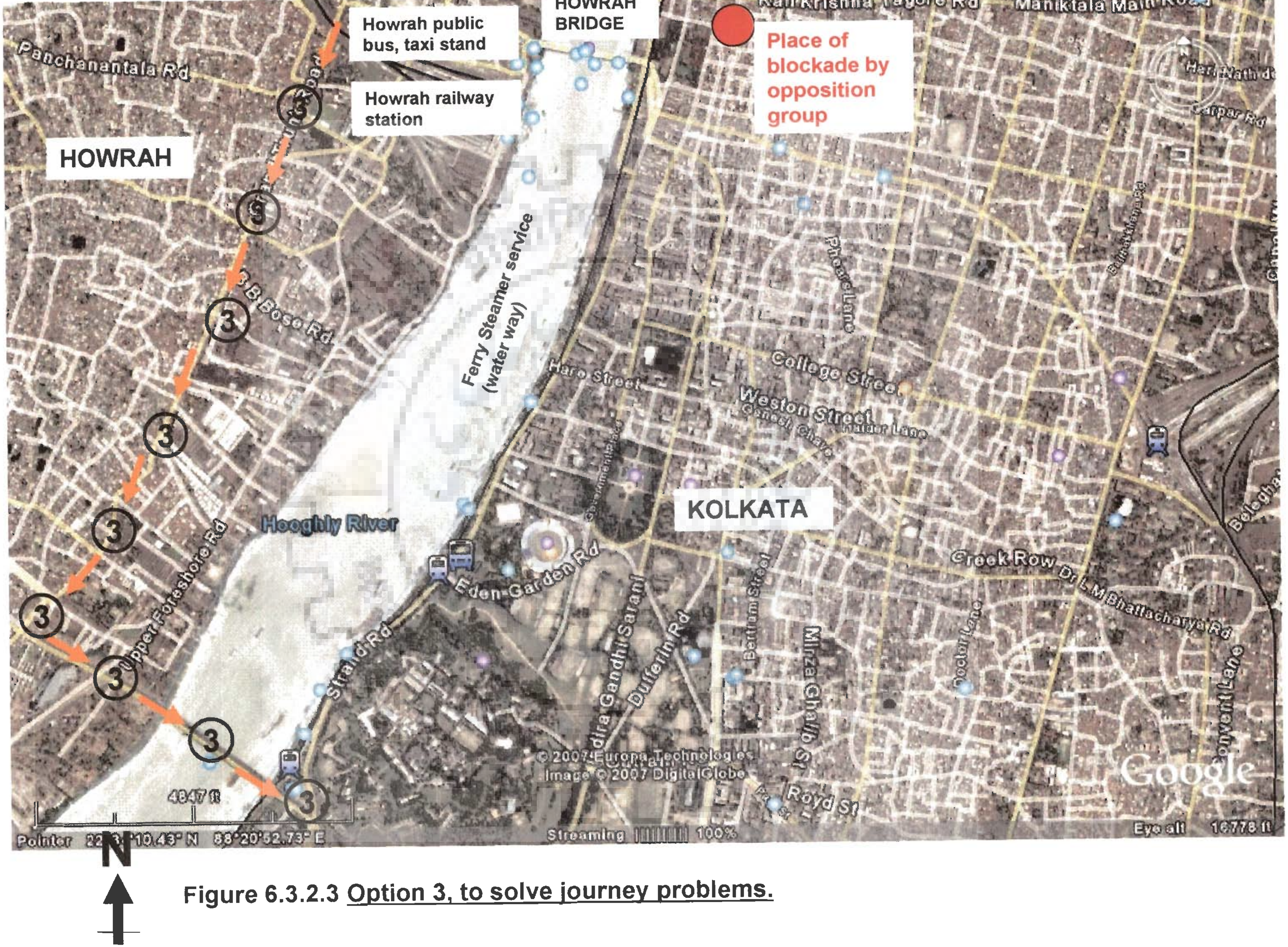

Figure 6.3.2.3 Option 3, to solve journey problems.

Kolkata (option 3) Figure 6.3.2.3 and then to their destination by another combination of public mobility services. May be, in this case, it will take comparatively little more time, but they will reach securely. All these options they can opt according to their capabilities and they are having reasons to value these revealed preferences (Sen, 1982 & 2000).

The effect of the blockade creates many consequential molar activities for many passengers; those affect this particular region of the mobility activity system like those concentric circular waves, which are created when one stone is thrown into the pond. It is a consequential process of effects of all these activities. The whole Kolkata is networked by many kinds of mobility services, and these services are provided within their fixed routes, so it is a perception activity of these habitual passengers to create a journey map, a combination of services, with the help of these already known existing services to them in their minds.

This imagination activity or creation of 'mental meso-system' is done very much in phenomenological field and the treatment of motivational forces those emanate not from those passengers themselves but from the environment, the problem situation. It is a continuing process that entails more than a beginning or an end. The geographical position of the blockade on the road, the immediate political tension created by that blockade in that area, the existing network of roads, and the available alternative mobility services at that situation, passengers' own capability to make their own strategy of their preferences - all these lines of forces, valences and vectors those attracted and repelled, thus steering the behaviour of the passengers. In fact the design of these strategies

with the permutation and combination of those available alternatives seems real at that situation and the motivated passengers start acting according to those planned strategies of perceived reality.

But those perceived reality may fail in actual reality also. For example, when the passengers opt to use the available ferry steamer service on water way to cross the river Hooghly to reach the other bank of Kolkata and start their journey from the Howrah Station side, on the way the ferry steamer may get drowned into the river because of some accident, so in that case the passengers may get drowned even. But those passengers did not expect or imagined that case in their perceived reality. Still what was earlier perceived by those passengers is viewed as more important and usual than the actual, the unreal as more valid than the real. The motivation that steers the passengers' behaviour inheres in external objects, activities, persons, and groups, and, to the utter confounding of the practical doer.

It is true that psychology is defined as science of mind, but American behaviourism tries to explain human activity as an alternative to science of mind. Lewin's arguments keep a space for behaviour as the explanation of activity, but that activity actually happens in passengers' mind according to him. So there is a relation between the perception as scientific psychological phenomena that perceives those realistic activities, first in the passengers' minds as phenomenological and consequential activities and decides a preference upon many other perceived choices and then act in the real human world according to their revealed preference (Lewin, 1917, 1931& 1935; Bronfenbrenner, 2004; Sen

1982, 2000). And these choices are perceived by those passengers mostly from their memories, past incidences and experiences. They learn from their past incidences, from others experiences, and they use those references at those critical system situations.

Even in case, those passengers walk a distance to avoid the political tension which is created by the blockade, and after crossing that area they may find a different situation, that is not similar with what they perceived earlier as the suppose to be the future reality, what is called as 'mental meso-system'. So in that situation they make their different strategy for their next journey, and again they repeat the same earlier process of perception and motivational forces for their next activities.

Also if the blockade turns to a violent situation or runs for a long time, then these vehicles may not be able to start their journey and those passengers, who are waiting for these particular route services on many different junctions or stoppages on the way, will be affected by this problem as a consequential effect of exo-system near Howrah Bridge. In that situation these passengers may start making different strategy, to travel by different combinations of mobility services to reach their destinations. These new combinations may be defined and delimited by the possibilities available in a given culture at a given point in its history (Vygotsky, 1978; Vygotsky & Lauria, 1956 [English version in Lloyd & Fernyhough, 1999]). So it may affect their budget, time, convenience, other programs etc, which they have reasons to value for that particular situation (Sen, 2000).

There is another part of these molar systems, and it is the existence of connections between people in the setting, as already discussed earlier in community concept in section 6.2.4. These interconnections are formulated in terms of not so much of interpersonal feelings as of the relations of the various parties toward each other as members of a group engaged in common, complementary, relatively independent tasks.

In this way, the particular part of the total mobility system of Kolkata may go for a regional change. Its system activities will be changed partly by the passengers and service providers and city administration with available alternatives and try to create a balanced situation towards normality. That is why this kind of open system of mobility consumption and production activities are very much turbulent in nature and at any time any factor can influence the elements to unbalance the situation of this open system. And it is the nature of this open system to rearrange its elements to create the balanced harmony towards a different direction. So unless the influencing factor is eliminated from this turbulent system, the system will not come back to its original position.

Sustainability is a holistic approach in a turbulent system concept. And the nature of the problematic situation can not be solved by any step by step systematic way; it must be solved in a systemic way. Because in a systematic solution, once the problem is defined by some boundaries, no other influencing factors can be included and the problem is solved by some fixed steps like, problem definition, literature survey, concept generation towards solution, finalization of concept,

making functional prototype, run the prototype, implementation of the final prototype. It is very much linear in nature.

Whereas in the case of systemic solution, every time a new influencing factor can unbalance the situation, and also human mind and behaviour are very much mysterious in nature, at any moment it may change its behaviour pattern according to the situations; so no boundary can be defined for this open system and fixed accordingly. It is a problematic situation rather than problem situation and very much complex and multidirectional in nature rather than linear. The relation between every two elements in the system is not in a balanced position. They may influence each other and change the balanced situation in this open system.

This system is consisting for many more such kind of molar mobility activities, which are very much connected with each other. And there is every connection between a molar activity system and the whole mobility system of the city. And the property of the whole system is very much different from one molar activity system. So it is not possible to take the individual molar activity out of the whole system and solve the problem, because the whole system is very much interconnected psychologically by every passenger and service provider, and these activities are very much phenomenological in nature.

It creates a 'rich picture' perspective of the whole story within which to consider how people can develop their own ways of thinking, doing, and being without having to submit to the hegemony of technology transferred from some other culture or some other era. Also one can see that the self-determination of a

people and their ability to engage in sustainable development practices are matters of collective learning and freedom to use the available social systems. Also the development and advancement of life-enhancing bottom-up solutions of mobility services that foster the competencies necessary to address contemporary socio-ecological problems are matters of individual empowerment, both the passengers and service providers. Each focus provides depth and background to the other, one concentrating on social development and the other on personal development. It provides complementary perspective on the issue of learning how to foster our individual and collective evolutionary potentials. The phenomenological and consequential events include all aspects of change in complex dynamic systems with an inclusion of many kinds of information and energy. More simply it is a general way of conceptualizing the self-organization in the dynamic relations between living systems and their environment.

6.3.3 Sustainable mobility service network of Kolkata

In a human activity system, the flexible participation of various stakeholders should be very much required for their empowerment of passengers in developmental process and consumption scenario for sustainability. The monopoly or license-raj of a particular organization may hamper this empowerment. It is true that the creative imagination of the service providers to build a mobility service business can support the social development program, where the creative consumption capability of the passengers can help their personal development. So it is a collective approach which can be initiated from

the bottom-up solutions and the participation of many stakeholders and other organizations. Because even if people fully develop their potential, they cannot give direction to their lives, they cannot forge their density, they cannot take charge of their future – unless they also develop competence to take part directly and authentically in the design of the social systems in which they live and work, and reclaim their right to do so (Banathy, 1996).

So the design process should be to design with others (passengers) rather than design for others (passengers). Since in societal systems human beings are the critical factor, design must incorporate them in this participatory democracy. The way every human express his freedom to choose her preference will enhance this democratic process (Sen, 1982, 2000).

Two complementary modes of dialogue comprise design conversation: generative dialogue and strategic dialogue (Banathy, 1996). One provides a process through which individuals become friends and partner in learning/designing and a community generates common meaning. The other focuses on particular tasks in the creation of solutions for a specific social circumstance. This complementary dynamic between generative and strategic dialogue spells M. Scott Peck's (1987) exhortation: "community-building first, problem-solving second."

In Kolkata, though there is no such kind of conventional designer to act for all these processes, but the combined participations of passengers, service providers, the government and other related organization generated this sustainable people's friendly mobility service systems for maximum number of

people in Kolkata. The harmonious community culture of Kolkata was developed not only in a single day, but it is a continuous social reform that went on by many thinkers, social reformers of that region for many years both before the independence, i.e. in British era as well as after the independence in the democratic system. It is the history that influences the people's minds to shape their phenomenological world of consumption to think in a direction of sustainability. Also the democratic socio-economic policy of the democratic government after independence, that influenced to shape the urban pattern of mixed-economic classes in forming social equality at least in the people's phenomenological world and their attitude to each other in Kolkata, which is a good example to social harmony. It helped a lot in shaping a social system like urban mobility services of Kolkata. It is a conscious evolution of the mobility service systems of this city by the evolution of consciousness of the passengers and other stake holders for long time, as evolution becomes history, it becomes conscious.

There was a time when in many parts of Kolkata, the mobility services were not available, mostly at those peripheral areas or the totally personalized mobility services at every pocket were not available. It may be because of very low buying power in those pockets at those early periods, or the density of demand was very low, or the view of policy of the local government was not so much business friendly i.e. there was license-raj (monopoly) system. But it is also true that the local government can not invest for various segments of mobility services for all categories of people in the city. So a government-private partnership or

only government or only private investments are also very much required for the success of sustainability of the mobility service system in this city. On the other hand, the increase of number of players may increase the number of options of services and competition and quality of services also, so the cost of services will not be increased by those service providers much. In this way even the poor passenger also will be able to avail those mobility services options, which they are having reasons to value.

Also the most distributive and redistributive choices, as a matter of fact, concern how many resources are to be allocated and to what social categories, because social quality is to be measured against aspects and questions of social policy that are relatively left out by current economic analyses and theories. These tend to focus their attention on "who" benefits, and "how much". All these depend upon which service providers and institutions implement social policy, how services are organized and in what way they operate in the society, which cultures and practices they enact, etc. These service providers create potential services for the structure of social life, by constituting a strategic factor for the quality and density of public life.

Now because of the growing economy, growing market demand or buying power and diversification of consumer culture and more importantly the expansion of Kolkata, the success rate of mobility services are increasing. Even the recent UN Report (June' 07) shows that residents of Kolkata are going outward, i.e. a reverse directional migration is going on from the city; that means,

there will be more demand of personalised mobility services for these growing and spreading population at those outskirt pockets of the city; other wise these peripheral residents will try to create unsustainable consumption pattern by using personal vehicles, in case of lacking of urban mobility services at those outskirts for their daily life movements.

As already stated in early sections, that the passengers are using a combination of mobility activities according to their creative capabilities and according to the availability of demand for particular mobility services or activities; one can draw the typical design of mobility activities according to the urban pattern, density of demand etc. Figure 6.3.3.1 & Figure 6.3.3.2. According to the discussion in those previous sections generally small size regular vehicles like manual tricycle rickshaw, auto-rickshaw and walking, bicycling are the preferred types of mobility activities for inner side of spaces of human activities (like, residential, market, etc.) because these types of activities are very much comfortable for passengers in those situations. For any long route, big size vehicle like public bus, chartered bus, tram, metro rail, suburban train are mostly preferred by passengers. Also these preferences support the urban pattern and types of road network systems.

Taxi service or other types of hired car services are very much acceptable for various kinds of leisure type of activities or urgent activities of passengers. Though comparatively they are costly and consumption of resource material and fuel are higher, but for some special occasion passengers like to use them (de Leonardis, 2000).

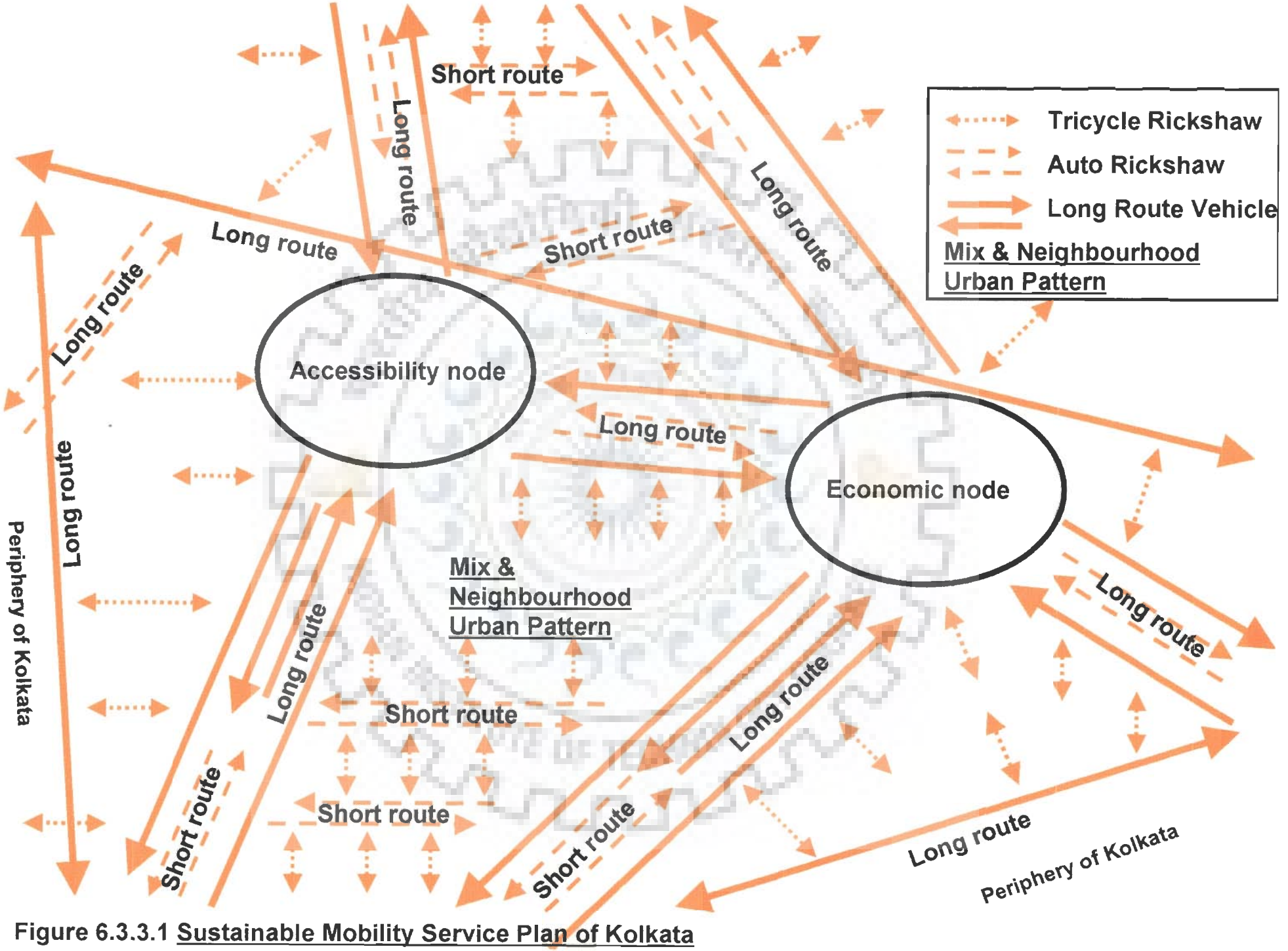

Figure 6.3.3.1 Sustainable Mobility Service Plan of Kolkata

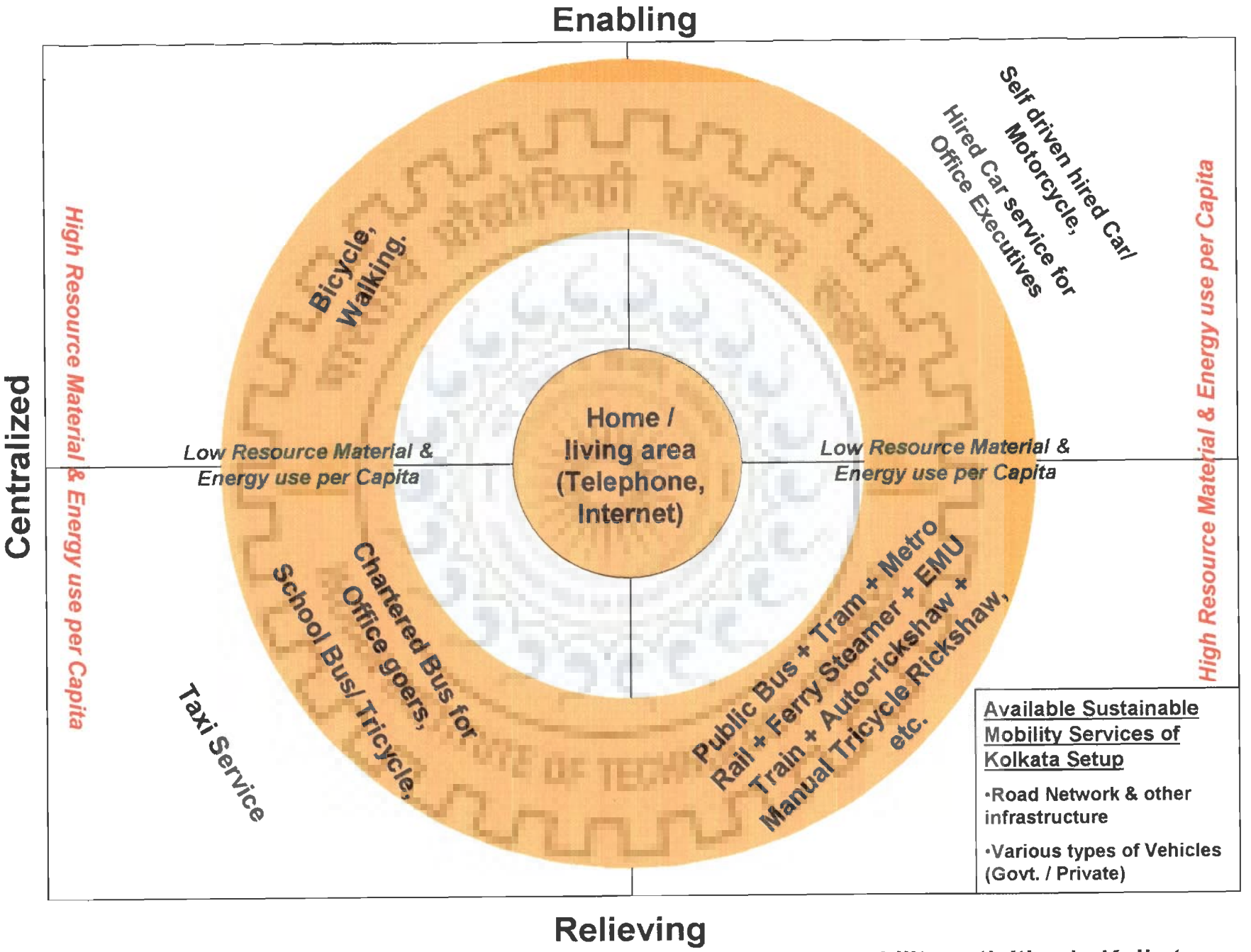

Figure 6.3.3.2 Various types of Sustainable organizational and mobility activities in Kolkata

7

Conclusions

7.1 Conclusions

1) The research was done within the disciplinary field of *strategic design* and *product-service systems design*, and more precisely in *design for sustainability*. Design can create the social networked system of consumption and production activities to support the traditional economic and technological system towards sustainability, to redefine the service oriented industrial economy.

Design can confirm the sustainable human behaviour in local culture through their participation in the production of socio-economic activities. It can create the knowledge and tools those can be used at the time of creating another such kind of socio-economic activities somewhere in the world.

Design can adopt a systemic approach for urban mobility activities to achieve all the three pillars (environmental, economic, and social) to accommodate all kinds of passengers from various segments of the society for their mobility activity purposes. The participation of various segments of passengers within a system can create social harmony.

2) It is the basic human capability to use the existing social infrastructure in the best possible way according to their revealed preference and complete the required consumption and production activities for daily life purposes. Every regular passenger is habituated with her preferred system of networked mobility activities and services to reach her destination. Generally passengers like to use single mobility service, if available, for their journey purposes to accommodate their daily journey within their target budget.

3) The geographical position of every place of activity confers her perception of making the system network in her phenomenological world of imagination of reality, which looks more real than the actual reality. Because the normal daily functioning of the preferred system of networked mobility activities creates the belief that she can trust upon. She knows, if she adopts or uses the

preferred network, she can easily reach her destination within the set time period. And she is so habitual with that existing preference that she can't even imagine any kind of collapse of that system even for a single day. Every kind of force of action, she is familiar with, helps to create such kind of belief system on that particular preferred system of network of mobility activities. The other passengers, the setup of mobility activities, the civil structures at every geographical position within the city create that perceived situation before even consuming the mobility activities for the passenger.

The other passengers, who create a community feeling for those particular moments as they get familiar with each other in that same preferred journey create the force of action, those are helpful at any crucial moment on the journey. The freedom to achieve the comfort of journey is even confirmed by these passengers through helping to each other. This research shows how the passengers themselves create the network of mobility activities and services for their journey in their phenomenological world in a critical system situation in the reality. Sustainable mobility activity is a process of consumption for journey purposes.

4) The methodology of this research is very much related to the theoretical background and the operational phases of work simultaneously, because validation of every aspect of theoretical backup is done at every step of data collection activities. As the existing mobility activities of Kolkata is an age-old activity, so the validation of the culture of consumption was easily confirmed on

the spot. The researcher himself belongs to this place and using the system for more than thirty years.

Even validation of the network of system imagination process was done by the researcher through asking question about any journey to any destination from any regular passenger. For example, when the researcher asked to any regular passenger, how to reach to a particular destination and the way the regular passenger thought and created the system of network of mobility services and activities through conversation, was very much validated by the researcher, as he himself knew the answer already being a permanent citizen of this city and familiar with many places of this city.

5) There is 33 percent (%) reservation of seats for women passengers in every public bus and metro rail. It helps the women passenger to achieve their journey comfortably. Also whenever there is a need of increasing the cost of services, the passenger community, mobility service providers, the local government use to have a discussion together to decide for a reasonable cost of services.

6) The urban pattern is very much important in this research topic, as the urban pattern itself generates the density of demand for various kinds of mobility services and activities. The researcher has visited many other Indian cities also; for example, Delhi does not have such kind of consumption pattern as such. That is because of many types of reasons. The local government never tried to do the

experiment that Kolkata did in promoting maximum variety of mobility services within the city. Also the government policy is not so general people's friendly always. The kind of urban pattern which can support sustainable mobility activities are not always available every where in Delhi, so ultimately it creates a gap, the link is cut due to lack of vision at the urban planning itself. There was an attitude of segmenting the urban pattern according to socio-economic classes in that case. The mixed pattern of socio-economic class pattern was never adopted. So easily one can observe that there are pockets where rich people are living and also there are pockets where poor people are living. And there is no communication between them, the pattern of mobility activities are totally different from each other. Also the economic distribution is totally unequal in that society and it is increasing day by day. So there is a total lacking of social harmony.

One can see the big garden with firm-house type bungalows in a row, where the bungalow is at a far distance from the main road. In the evening suppose one female passenger is walking on the silent road and she is mishandled by some people suddenly; at that moment nobody will be able to rescue her as the road is totally a silent place. Nobody will be able to know about such kind of occurrence. But some places are there in Delhi where one can feel safe because the road is totally populated and it creates a sense of social security to every passer-by.

All this kind of urban developments are very much time consuming, but there should be a proper vision at the initial level of planning itself.

7) Kolkata is the city where maximum numbers of various types of mobility services are there in India. Even the poor passengers also get benefited to choose their preferred choice of consumption and participation of social system like mobility activity in the city. It is the city where women are very much respected. This is the city where women passenger can easily walk on the road after evening alone. People can very much enjoy their freedom of expression and social issues are very much discussed through social media.

7.2 Recommendations

1) The planning of urban locality is very much important and in that case the mixed and neighbourhood urban pattern with mixed economic classes is very much effective to create such kind of sustainable situations for passenger, so it can be promoted more at the time of designing urban locals by planners.

2) The spaces of activities should be very much interconnected, and maximum number of outdoor activities must be incorporated at the local level, so that the passengers will have to spend minimum energy to complete their outdoor activities within their reach to reduce the mobility service consumption, and more activities done by walking, bicycling, tricycle rickshaw etc.

3) There should be more bottom-up concepts of mobility services to maximise the benefit of the urban passengers as well as poor passenger also. Most of the services should be networked. The governing agency of city mobility

services must take care of such design of networked routes and demands of passengers at the time of promoting such services.

4) Maximum number of players and maximum duration of time of services should be there to provide services for passengers for their outdoor activities. It can create competition among the service providers and the service can be provided at a competitive cost.

5) If it is required there can be a reservation of seats for women passengers and other handicapped people in the public vehicles, because it can help them to achieve their journey comfortably.

6) The local culture must be promoted by the local participation of decision making process for providing the required mobility services and the design of it.

7.3 Further scope of work

1) Urban mobility service is a complex social system activity from sustainability point of view. And also participation of all the stakeholders is very much important to achieve the success.

Design can take a lead role in constructing a sustainable mobility service system and other mobility activities considering the local culture with the help of many other professions.

2) The design method of this kind of complex social system like mobility activity system should be explored, so that it can be applied to other cities also. In fact the application of 'field theoretical' or 'Galilean' can be applied more in these kind of sustainability research to understand the daily life culture and activities of human development. The participation of the researcher in those targeted daily life practices can make the researcher understand the abstract of consumption culture in field theoretical. It can make the researcher realise the possibility of those sustainable happenings in those particular local contexts.

3) Collection of these kinds of sustainable cases can create a rich story board to design many practical commercial solutions to achieve sustainability commercially. The documentation process of such cases may go beyond such conventional research methods to establish its validity in 'field theoretical'.

4) As already it has been established that, the available non-renewable resource materials are not sufficient enough to achieve the life style of developed countries by the developing countries, and also the population increment is mostly going on in the cities of developing countries mostly, so the documentation of cases of sustainable scenarios mostly required from these developing countries to understand their consumption culture. Also the government of these countries must make the policies to enable all the people to achieve their well-being. On the other hand the developed countries also must make policies to check their over consumption through top-down approach like

tax reforms etc. and also change their attitude and motivate their behaviour towards sustainability. Both the government and other social organizations can take part in creating the social awareness and social platform to achieve those target sustainability.

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Appendix I

Sustainable Mobility Services for Passengers in Kolkata

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Schedule: Public mobility service user research in Kolkata

1. Do you use the particular vehicle service for your daily journey? Which one?
2. Do you need to do break journey to reach your destination? Yes or no.
3. Do you feel safe in public vehicle? Yes or no.
4. Do you use public mobility services always? Yes, no or anything different sometimes
5. Why don't you use other route of public mobility services?
6. Do you feel using public mobility services means more freedom than taking more responsibility of using personal vehicle? If you have one.
7. How do you program the whole break journey?
8. If there is any problem of unavailability of your choice of service, what do you do?
9. Do you think that there is any need to increase of number of frequency of services?
10. Any particular experience you faced in past on your journey. Please explain.