

Dimensions of Urban Landuse Change- A Case Study On Kazhakuttom- World Market Bypass Corridor, Trivandrum

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Abstract

The study of spatial and temporal characteristics and the relationship of the earth's surface is known as geography, which has traditionally been concerned with the relationship between man and the environment. Land is essential for human survival, providing living space, food, and raw materials, but human activity plays an important role in conditioning and transforming the physical environment. Land use refers to the surface utilization of all land at a specific point in time and space, with changes driven by society's variable demands.

This case study focuses on the environmental and economic impacts of the National Highway 66 (NH66) bypass road on the land and people along the 12km stretch of the Kazhakuttom-Chackai bypass in Trivandrum. The area, once a vast uninhabited land, has developed significantly and is now the city's major IT hub. The research aims to analyse the dimensions of urban land use change along the bypass up to the World Market Junction and examine the implications of the bypass on the local economy and environment, including people's perceptions of the new developments.

The methodology involved analysing both primary and secondary data, including the use of an old cadastral map from 1965 to study the land utilization before the bypass construction and field surveys, transect surveys, and Google images for the present land use. Traffic flow and functional analysis surveys were also conducted, along with a questionnaire survey among local people.

Before the bypass, the region was primarily agricultural and marshy, with minimal secondary, tertiary, or quaternary activities. Following the completion of the bypass (around 2010) and the establishment of IT hubs like Technopark, the area transformed from agrarian and marshy lands to a developed spot with commercial and residential buildings. The economic activity has largely shifted from agriculture to the quaternary sector, with nearly 80% of local revenue coming from tertiary jobs. The present land use in the 100-meter buffer zone shows a high percentage of Commercial Buildings (29.1%), Barren land (20.6%), Residential Buildings (15.0%), and IT Hubs (14.5%). The development has brought both positive and negative impacts. Positive effects include job opportunities for skilled workers in the IT sector. Negative impacts involve environmental pollution, leading to barren land, polluted natural streams and wells, and an increase in airborne diseases.

The study concludes that the bypass and IT hubs have driven significant urbanization, economic growth, and cultural change in the region, shifting it from a marshy agricultural area to a highly developed technocentric zone.

Keywords- Geography, Man and environment relationship, Land use, Urbanization, Land use change, Kazhakuttom- Chackai bypass, Economic impact, Environmental impact

1. Introduction

The study of spatial and temporal characteristics and relationship of the earth surface is known as geography. It has traditionally been concerned with man and environment relationship. Geography has been concerned with the changing pattern of agricultural regions since a very long time and has there for, been involved with the methodology of regionalization, and since any region does not exhibit a single set of factors but is a complex of multi-factors in a divers environment many facts come into its scope. Land is necessary for human survival, because it provides mean with living space, with food and with number of raw materials which are used in the satisfaction of his wants. But as necessary as the land factor may be, man plays and important role in conditioning and transforming his physical environment (Barlowe, R.1963). Land is a delineable area of the earth's terrestrial surface, encompassing all attributes of the biosphere immediately above or below this surface including those of the near-surface, climate, the soil and terrain forms, the surface hydrology (including shallow lakes, rivers, marshes, and swamps), the near surface sedimentary layers and associated groundwater reserve, the plant and animal populations, the human settlement pattern and physical results of past and present human activity (terracing, water storage or drainage structures, roads, buildings, etc.). Land use is the surface utilization of all developed and vacant land on a specific point, at a given time and space. "This leads one back to the village farm and the farmer, to the fields, gardens, pastures, fallow land, forests and an isolated farmstead" (freeman, 1968) as geography deals with the spatial relationship between these aspects and planning. This is because land use changes to meet the variable demands of the land by the society in its new ways and conditions of life. The demand for new uses of land may be inspired by a technological change, or by a change in the size, composition and requirements of a community. Some changes are short-lived, whereas other represent a more constant demand (Jackson, 1963). A clear understanding of these dynamic qualities in land use will emerge from a historical survey designed to reveal the successive development of inherent characteristics of land. In this way, land utilization is the use made of the land by man, as surveyed and mapped in a series of recognized categories. The primary uses of land are for crops, forest, pasture, mining, transportation, gardening, residential, recreational, industrial, commercial and uncultivable waste, barren and fallow land, etc. it is not normally possible to use land for two or more purposes simultaneously though sometimes even this is possible i.e., the pastured woodland. In most cases the proportion of waste land is quite large. The concept of land use planning has been recently introduced in land utilization studies which means the formulation and administration of land policies aimed at the employment of land resources and the uses for which they are socially, politically and economically best suited.

STATEMENT OF THE RESEARCH PROBLEM

The NATIONAL HIGHWAY 66, also known as NH66 runs north-south along the western coast of India. It connects Panvel to Kanyakumari. The highway passes through Trivandrum. Our case study focuses on the 12km stretch of Kazhakuttom- Chackai bypass which comes under the NH66 or the National Highway Authority of India. The case study follows the environmental and economic impacts of the bypass road on land and people of this 12km stretch of Kazhakuttom-Chackai road. Our land has undergone many

physical changes in the name of development. Every day the area is undergoing some changes. From a vast uninhabited land to a settled developed area is this Kazhakuttom in our Trivandrum city. The area is the city's major IT hub and the epitome of a western culture. Even the land has changed quite remarkably. Therefore, it was initiated to take up this area as our case study to know the land use changes and its effects on the economy and environment. Present study is intended to analyse the dimensions of urban land use change along the Kazhakoottam Bypass up to World Market Junction.

LITERATURE REVIEW

Brandt and Townsend (2006) examined land use–land cover conversion, regeneration, and degradation in the high-elevation regions of the Bolivian Andes, emphasizing the effects of land use change on biodiversity. Their study employed remotely sensed land cover data, topographic data, and supervised classification techniques. Bajocco (2012) analyzed land cover changes and land degradation dynamics in the Mediterranean region using GIS-based surveys. Liu Yansui (2004) focused on the causes and environmental impacts of land use conversion during agricultural restructuring in Northeast China, primarily using Landsat TM imagery for mapping land use impacts.

Symeonalis (2007) investigated land use change and land degradation in southeastern Mediterranean Spain using aerial photographs and Landsat data. Ichikawa (2007) studied forest land degradation and land use changes in eastern Malaysia through literature surveys and aerial photograph analysis. In the Indian context, Pandey (2018) examined changing land use patterns and the expansion of fallow lands using secondary data from published sources.

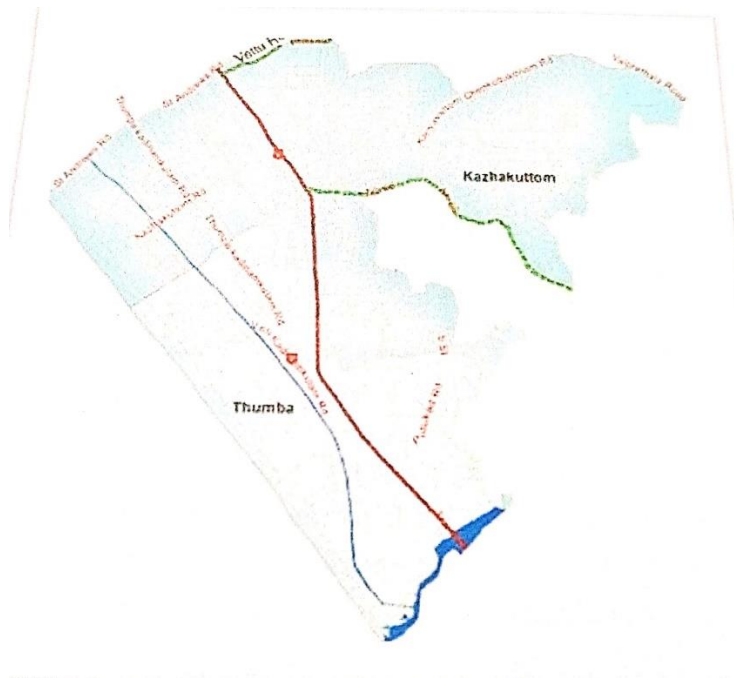
Urbanization-related land use changes have also been widely studied. Mohan (2016) analyzed the dynamics of urbanization and its impact on land use and land cover in Delhi using remote sensing and GIS techniques. Mangagowri (2016) focused on land use impacts on agriculture in Mysore district through GIS surveys and questionnaire-based methods. Sreedhar (2016) studied land use changes in the Cuddapah region using remote sensing and GIS tools.

Wetland and regional land use transformations have been highlighted by Roopa and Vijayan (2016), who conducted a spatio-temporal analysis of land use changes in the wetlands of the Kuttanad region, Kerala. Asok (2016) assessed temporal land use changes along the Kinfra–Vizhinjam stretch in Thiruvananthapuram using satellite data to map metropolitan expansion. Premakumar (2016) carried out a spatio-temporal land use analysis of Palakkad district using statistical and GIS techniques, while Manick studied land use changes in Devikulam taluk of Idukki district through GIS-based analysis

STUDY AREA

Kazhakuttom is an IT hub and residential area of Trivandrum city which is the capital and largest metropolitan of the Indian state of Kerala. Kazhakuttom is located at the coordinates 8°33'56' at north and 76°52'29' on East. Having time zone UTC+5:30, Kazhakuttom is a ward under the Thiruvananthapuram corporation which is 15km from the Trivandrum central.

PHYSICAL SETTING



The study area is characterised with tropical monsoon climate. The annual variation of mean air temperature at Trivandrum is from 21degrees to 34degrees. The humidity is high and rise about 90percent during the monsoon season. This is the first area along the path of southwest monsoon and gets its showers by the end of May and beginning of June. The average annual rainfall of the district is 2035mm. This area also gets rain from the retreating monsoon which hits by October. It is significant that the district gets benefits of both the south west and north east monsoon. The area is characterized by very high precipitation which is spread over very few wet days and a long dry season during December to May and a marked gradient from the easterly hilly region to the sea rapidly re-converging the rainfall back to the sea through short, fast, west flowing rivers. The landform of the area is carved out by a combination of marine, fluvial and denudational processes. The landforms can be categorized into a lowland region. Marine and fluvial activities are represented in the lowland part. The region was a slopy one but currently it has become a plain one. The major types of soil here is the laterite soil, brown hydrographic loam and forest loam.

DEMOGRAPHIC CHARACTERISTICS

Development of a society is reflected in the level of literacy and attainment of education. The trends in literacy are considered as an index of pace at which socio-economic transformation of a society is taking place. Total about sixteen thousand people in the ward are literate, among them are 7923 are male and 6340 are female literacy rate of the ward. 97percentage of male and 94 percentage of female are literate here. Kazhakuttom ward has 36 percent of population engaged in either main or marginal workers. 54 percent of male and 20 percent of female comprise the working population. Kazhakuttom is the only ward in Trivandrum and its population is 19000. Based on 2011 census, the total population of male is 9048 and that of female is 9801. 88 percent of from the general caste and 11 percent are from the scheduled caste. Child population of this ward is 10.1 percent. As of 2011 census, the sex ratio is 1064 females per 1000

males in the ward. The sex ratio in general caste is 1089, in scheduled caste and tribe is 1039. The child sex ratio is found to be 1001 girls under six years of age per 1000 boys of the same age in this ward.

ECONOMIC STRUCTURE

A tremendous change has occurred in the area of Kazhakuttom in last few years. This also resulted in the economic lifestyle of people. The economic structure of this area can be divided into agriculture, household industry, and to tertiary and quaternary sectors. The primary activity of this region is agriculture. Both male and female engage in the agricultural activities. Lots of private cultivators occupy the region. Household industry workers form the secondary activity of the region. 20 to 30 percent of people engage in household industry. Since the area is an urban one, the people majorly are engaged in tertiary activities. Lots of IT hubs have played a role for this. Infosys, Technopark etc have completely shaped the economic structure of this region. In fact, nearly 80 percent of revenue for the people here get from these types of tertiary jobs. Quaternary activities like tourism also shape the economy. The construction of NH66 bypass road is a must- visit tourist site. The transportation of the tourists has been made easier through the construction of bypass. Avast change from an agrarian land to IT hubs can be seen here.

URBANISATION IN KAZHAKUTTOM

The word urbanization refers to the population shift from rural areas to urban areas, the gradient increase in the proportion of people living in urban areas and the ways in which each society adapts to this change. Kazhakuttom is an IT hub and residential area and contributes 85 percent of IT exports from Kerala. Kazhakuttom was a low populated marshy land area before the establishment of Technopark. Technopark is a technology park in Trivandrum established on 18 November 1990. As of 2005, Technopark is home to 400 companies employing more than 56000 professionals and is still expanding. As a result of this expansion the marshy and field areas are converted into commercial and settlement regions. So kazhakuttom is now highly exposed to urbanization due to rapid increase in population and development of this area.

RELEVANCE AND SCOPE OF THE STUDY

Land use is the actual human activity for which the land is used, which may differ from the promoted use of the land. Land use is based on the functional dimension of the land for different human needs. Main types or categories of land are industrial use, dwellings, transport, recreational use or natural, protection areas. Physiography is major factor for controlling the land use of any region. The development of any region depends upon the physical aspects of that particular region. The 12km stretch of Kazhakuttom-Chackai bypass region is a very developed region of the Trivandrum city. Major land use changes have happened during a span of hundred years. The land use study will be able to understand that region's changes in its physical conditions and how it affects the people living in that region. Land use study helps in covering the physical and human geographical aspects of a region. The development of a region is quite inevitable but at the same time through these case studies, we will be able to analyse the scenario of the developmental impacts and how the trend exists in a region. The importance of our bypass case study is quite relevant. The bypass has brought a lot of changes to that region both economically, socially,

physically etc. The introduction of the NH bypass in tan underdeveloped region has brought a lot of changes. Bypass has brought both positive and negative impacts on land and its people

OBJECTIVES OF THE STUDY

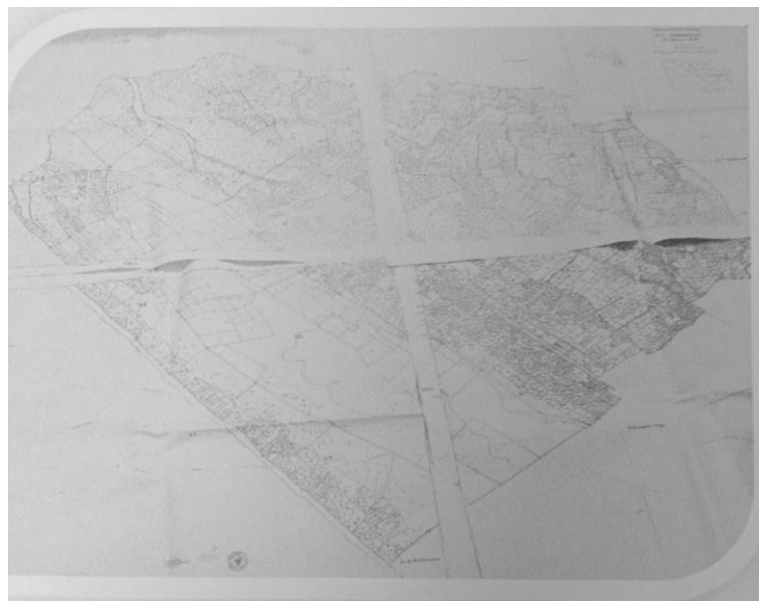
- 1) Analyse the dimensions of land use change after the completion of Trivandrum bypass from Kazhakootam to World Market junction.
- 2) Examine the implications of bypass on local economy as well as environment and analyse people's perception towards the new developments.

METHODOLOGY

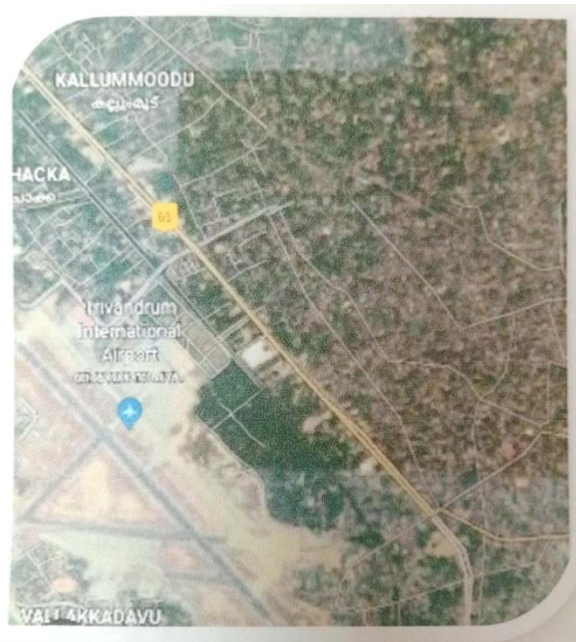
Present study is based on the analysis of both primary as well as secondary data. The first objective is to examine the land use change along the Bypass corridor. The land use of Bypass corridor has studied on the grounds of cadastral map of the region provided by the directorate of Survey and Land Records, Govt. of India. The present land use is traced out by field survey. Transect survey is used for Collecting land use details. The change in land use and land cover has cross checked with google images also. The second objective is to analyse the implications of land use change. Traffic flow survey has been conducted in peak hours at different junctions. In depth study of the bypass corridor has been carried out through frequent field visits. Questionnaire survey has conducted among the local people in order to collect their perception towards the new development.

RESULT AND DISCUSSION

In order to study the land utilization of Kazhakuttom region before the advent of Bypass, the cadastral map of the region has studied in detail. The cadastral map gave the information about the region in 1965.



The study area sprawl into four cadastral sheets the study area. The bypass road has completed by 2010. Even now the construction process is going on. The map shown here is the old cadastral map of Kazhakuttom. Village area before the construction of bypass. As we can see, the land is fully covered with vegetation. The northern parts have settled area so people practiced agriculture from the fields we can see. Since the area was a marshy area, no major calamities were experienced here. Agriculture was the primary activity. Some areas are covered in jungle or thickly vegetated. From the map we can understand that the area is only a village one and least touched by and secondary, tertiary or quaternary activities. * Since the primary activity of agriculture and to a lesser amount of fishing prevailed here, people were happy and least amount of pollution here. Therefore, not many diseases were common during this time. Many communities have migrated here because of the influence of the kzhakuttom temple. The area was a Hindu population during the ancient times which gave importance and respect to the agricultural practices. Overall, we can say that the land was the sole dependence of the people living there and agriculture and nature were given importance. The landuse after the construction of bypass has undergone many changes.



The image shown here is the satellite image of the kzhakuttom region which the bypass crosses. The area has become a developed spot with the construction of this bypass and the presence of IT hubs like Infosys and Technopark. The area which gave importance to agriculture during the past has changed to giving importance to tertiary and quaternary activities. The Kazhakuttom-World market bypass road has lot of changes from agricultural and marshy lands to commercial and huge residential buildings. The introduction of IT hubs is integral to the economic growth of the region. Urban agglomeration is quite common in this area. The area itself has become globalised.

As we can see in the map, due to agglomeration the small houses are not at all enough to accommodate people and the construction of multistorey buildings began. The economic activity has completely shifted from agriculture to the quaternary sector. Since the construction of bypass solid waste management is misused in this area. People have become more self-centred and it can be resulted in their lifestyle. Even

the land has become barren because of the pollution experienced here. The natural streams here have become polluted and the wells have also become unable to drink. Therefore, diseases through airborne has become common. The region has completely deforested the jungle wilderness to make it a commercial and residential one. In some parts vegetation can be seen.



The map shows the result of primary survey conducted by a team to study the present landuse from the Kazhakuttom to World market junction. It is obvious that that the area is mostly comprised of commercial and residential buildings. Barren lands are also seen more. Mixed crops can be seen in some parts of the area. From this data a table of percentage is made to show the landuse of the kazhakuttom bypass corridor.

SL NO	LAND USE	AREA IN PERCENTAGE
1	COMMERCIAL BUILDINGS	29.1
2	RESIDENTIAL BUILDINGS	15.0
3	BARREN	20.6
4	IT HUBS	14.5
5	MARSHY	8.4
6	OTHERS	10.5
7	MIXED CROPS	1.6

This traffic flow survey was taken between 10:15am to 10:45am on Monday. From this data we can understand that the morning traffic is very high. People prefer two wheelers and hence the data is high on the two wheelers. * Four wheelers and heavy are also used in the morning. The traffic is so heavy during Monday because it is the first working day after a holiday. The number of two wheelers are high from Attingal and the number of four wheelers are more from the World market region (Table 3.2). * The heavy

vehicles mostly come from the Attingal and is less from and towards the world market because the heavy diverts to kariyavattom road.

Route	Four wheelers	Two wheeler	HEAVY Vehicles
Kollam-Attingal to Kazhakuttom	682	983	444
Kazhakuttom to Kollam-Attingal	441	406	16
Kazhakuttom to Technopark	590	400	12
Technopark to Kazhakuttom	449	489	23
Technopark to World market	175	134	12
World market to Technopark	864	755	16

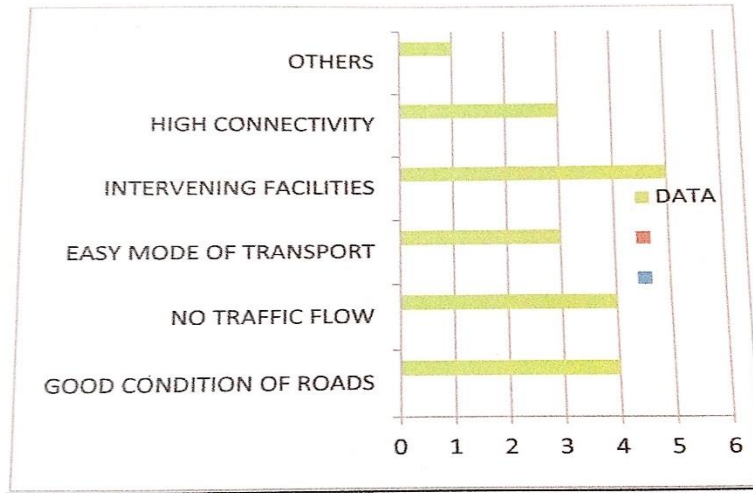
The construction of bypass has made all the vehicles to pass through here and the congestion is mostly affected in working days. But the point is that the accident rates are not at all high because of junctions and working of traffic systems and people obeying the traffic rules. But due to heavy traffic because of the presence of Technopark contributes to air and noise pollution in the nearby regions. Hence airborne diseases are common. To a certain extent the construction of bypass has reduced the traffic when we take whole working days but at the same time during Monday and Friday which is the start and end of working day, traffic flow peak is the highest. Another type of survey conducted is the functional analysis survey based on the functional services. The survey was taken on sides from Kazhakuttom to World market junction and vice-versa.

SERVICES	RIGHT SIDE	LEFT SIDE	TOTAL
1.Hotel	23	28	51
2.Bank With Atm	6	4	10
3. Lodge	4	7	11

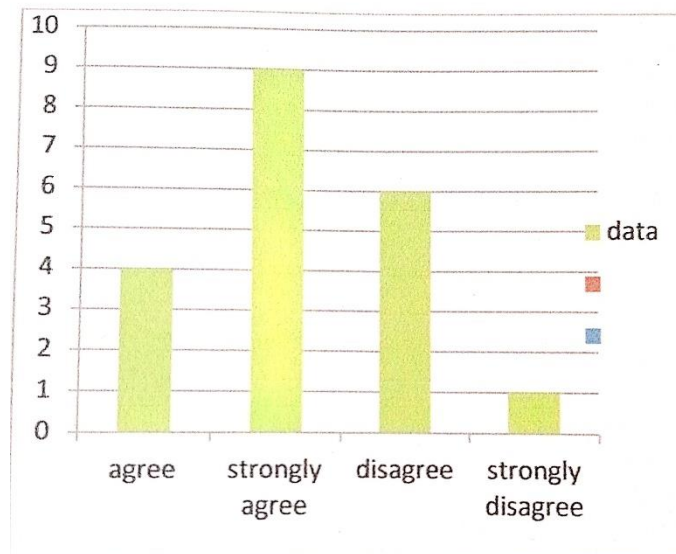
SERVICES	RIGHT SIDE	LEFT SIDE	TOTAL
4.Church	0	1	1
5.School	1	2	3
6.Office	0	3	3
7.IT Park	0	3	3
8.Medical/Hospital	2	4	6
9.Vehicle Showroom	7	6	13
10.Temple	3	2	5
11.Petrol Pump	1	2	3
12.Hypermarket	0	1	1
13.Workshop	0	6	6
14.Service Centre	5	7	12
15.Computer Service Centre	1	1	2
16.Beauty Parlour	3	5	8
17.Wood Industry	2	1	3
18.Construction Consultants	1	0	1

The arrived conclusion is that people prefer the bypass road due to easy mode of transportation. Changes are taking place in the bypass region. A new elevated highway is being built up there. Hence the congested traffic flow will be at ease. From the survey it can be understood that the flow of traffic is at peak on working days- Monday and Friday. The flow of traffic is more on Monday because of the beginning of a working day after a holiday and the flow of traffic is more on Friday because the day is the end of working day week. People mostly prefer two wheelers and four wheelers because of the consistency of these types of vehicles. Even though the flow of traffic is high, accident rates are very low because of proper functioning of the traffic systems. We can also arrive at a conclusion that the flow of traffic is high because of the development of that place and the influence of bypass as well as IT companies there.

There have been asked the questions to 20 household families living in the Kazhakuttom-World Market junction bypass area. The graph is as follows:



From this graph we can understand that people prefer bypass road is mainly due to intervening opportunities. It is because of high facilities available here, that people tend to cluster here and use the bypass road. Second preference is the condition of good roads. Of course, people intend to travel in smoother new roads rather than travelling in rugged roads. From the survey it came to know that bypass construction has to some extent lessen the traffic which prevailed before the construction. Then people prefer here is because of high connectivity in this region. An urbanized area will have access to service sectors like bank, hospitals, educational institutions etc. It came to understand that the main reason for the agglomeration is the employment opportunities of this region. Based on these criteria a graph was prepared as follows: -



People strongly agree to the employment opportunities available in the region. In fact, lots of companies from abroad are looking for skilled people who work there. But at the same time there are also people who disagree because of sudden dismissal from their jobs due to new people coming yearly and since it is a private company, people fear about a firm stand and pension facilities which are not available. There are also others who agree and disagree at the same time. But on the whole for skilled people looking for jobs, IT hubs like Technopark is definitely a boon.

Kazhakuttom is an emerging technocentric zone on the urban edge of Trivandrum city, characterized by IT developments forming a special economic zone. The landuse changes in the Kazhakuttom-Chackai due to the influence of bypass is a remarkable one. From a underdeveloped to a highly developed are, the region has seen many phases of economic growth. The bypass has brought many negative as well as positive impacts on the people and natural landscape followed by environmental pollution. Also, the presence of numerous educational and technocentric campuses have created a dehumanized and inactive realm in the edges of city. It came to understanding find that the aborigines of this Kazhakuttom region have been wiped out in the name of development. From the case study it was found out that the bypass is getting more and more modified. The new construction of a flyover towards the Technopark campus will reduce more the difficulty posed during traffic and will create an easy mode of transportation. After the construction of bypass urban agglomeration is followed by the increasing crimes and violences in the region. Therefore, it is essential that such developments are well integrated within the local context and setting. IT hubs have paved for a lot of job opportunities for skilled workers. The companies like Infosys, UST GLOBAL etc have become a boon for the people and society. The construction of bypass has led to easy and fast mode of transportation for all. The bypass has led to the setting up of service sectors mostly hospitals which have become more accessible for the people living there. Intervening opportunities have increased and this led to more accessibility for people. Moreover, educated people are more concerned with the wetland reclamation of this place. From the marshy lands to a settled agriculture to an urbanized centre is the change that took place in a span of hundred years in the Kazhakuttom region. The landuse changes which have learned through this case study makes us understand that within a short span of time, a large development has paved way into this region. From a region of environmental determinism to a region of possibilism, a vast change has taken place on either side of the bypass regions. Along with the construction of bypass, with technocentric ideas, the region has become a source of all economic activities which gradually changed the lifestyle of the state itself. A cultural change has taken place in this region. The region was home to aborigines but now a western culture has been followed. The influence of bypass is seen in every layman living in this area, in their economy and lifestyle to even their environment.

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