

Impact Assessment of Kollam Bypass

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Abstract—The construction of bypass roads is an integral part of urban infrastructural development. Often these developments bring along various direct and indirect impacts on the immediate surroundings and the bypassed area. The growth along the bypass corridor is an inevitable factor. This paper studies the impacts of the Kollam bypass of Kerala on the corridor area. A buffer area along the part of the bypass is taken and analyzed to know the impacts. The growth of the area before and after the development of bypass was studied using the old and existing master plans and spatial data. The paper also studies about the various positive and negative impacts of bypass on the commercial establishments and residential livability of the area. The data on residential and commercial nature of the area were collected through primary surveys on local residents, business owners and real estate dealers. Identification of the growth pattern in the corridor has to be done and planning should be done to prevent overdevelopment so as protect the purpose of constructing bypass.

Keywords— Bypass, development, impact assessment, transportation corridor

I. INTRODUCTION

A transportation project like a bypass may impact land use both directly and indirectly. Direct impact is generally immediate and include conversion of productive agricultural land and removal of existing buildings to accommodate the new roadway, as well as changes to the overall character of the affected area due to construction.

Indirect impact generally occurs over a long period of time. These impact may involve changes in development and growth patterns along the road that is bypassed, as well as in the area adjacent to the bypass and between the bypass, the town, and other developed land [1]

If development along the bypass corridor should be controlled and regulated, or else the increased uncontrolled development can lead to increase in the built-up areas and traffic congestions. This might result in failure of purpose of bypass.

In the absence of any planned zoning policy, the majority of the retail centers attempted spreading out in tentacles following the major routes through the upper and middle class residential areas using the street level frontage to form a ribbon pattern of development. However, the residential areas changing into commercial areas have shown a higher rate of increase in land value than the commercial areas [2]

II. NEED FOR STUDY

In the past researches related to historical growth process it is found that, with the development of bypasses or new roads the retail centers get shifted mainly along the major accessible routes in the city. [3]

If there are no strong land use controls, buildings are often built in town along a bypass, converting it into an ordinary town road, and the bypass may eventually become as congested as the local streets it was intended to avoid. Petrol stations, shopping centers and some other businesses are often built there for ease of access, while homes are often avoided for noise and pollution reasons.

Bypass routes are often controversial, as they require the building of a road carrying heavy traffic where no road previously existed. This creates a conflict between those who support a bypass to reduce congestion in a built up area, and those who oppose the development of (often rural) undeveloped land. Some of those in the bypassed city may also oppose the project, because of the potential reduction in city-center business.

Businesses should be included in planning for change from the outset. In many cases, when faced with a bypass, there is a sense of impending doom from the residents of the town.

The aim of the paper is to study the impact of bypass in land use transformations along the corridor.

The main objectives are

- To understand present land use and identify the changes in land use in the area
- To understand the impact of land use change on local residents, economy, ecology and land values
- To identify the issues that the local residents face due to the recent developments

The impact study helps in understanding the likely trends in land use changes and also the positive and negative impact on the local residents.

Wafa Elias and Yoram Shiftan [4] identified that the variations of land use in bypass corridor was influenced by various factors as the specific location of the road in relationship to the town space, its distance from the town center, local zoning plans and rules, planning policy, the socio-economic condition of the local residents, the traffic volumes and the local population growth rate. Thus it is necessary to study buffer zones considering the influence of bypass.

In the study conducted by Jonathan C Comer and Allen Finchuim [5], three different types of businesses were identified that showed distinct levels of impact. Traffic dependant businesses (such as restaurants and gas stations); traffic related businesses (such as downtown shops and professional services); and non-traffic related businesses (such as factories and mines) were the identified businesses.

The limitations of the study are that transportation corridor development study can be applied in case of any modes of transportation, here only the bypass road is selected and studied. Impact study can be also to the study impact of bypass on the bypassed city, here study is limited to the impact on the bypass corridor. Here the study is limited to phase 1 stretch of Kollam bypass

III. METHODOLOGY

The methodology of study was divided into 4 stages.

Stage 1, The study was focused to understand the effect transportation had on land use variations. Literature review of various journals studying the impact of bypass has been done so as to understand the methodologies used and to understand the impacts. The methodology formulation for impact of Kollam bypass on land use was based on the literatures studied.

Preliminary study of the area which involves a pilot survey was also done in this stage. Interaction with town planner to understand the various phases of bypass construction, land use zoning adopted in regard to Kollam master plan, details of land acquisition for bypass was discussed. Based on the pilot survey and discussions with town planner the area for study was delineated considering the area of most development

In stage 2, Secondary data collection is conducted. The data collected involves old master plans of Kollam city, aerial maps of the study area and feasibility study of various phases of Kollam bypass. These data were collected from town planning office Kollam and road feasibility studies from NATPAC.

In study 3, Study on existing condition includes obtaining the current land use map of the area identification of built up and vacant spots, intended use of the vacant lands. Understanding the accessibility and alternate routes

available is also part of existing area study. GIS analysis and land use conversion was identified.

The detailed understanding of impact is done through primary survey on residents, real estate developers and firms on the bypass corridor. A convenience sampling was opted.

In Stage 4, Analyzing the changes in land uses over the period and the impacts of these changes was studied with reference to the data collected in stages 2 and 3. Identification of issues is also done in this stage.

IV. STUDY AREA

Kollam is the fourth largest city in Kerala and the fifth largest in terms of corporation area. Pathanamthitta, Alappuzha and Thiruvananthapuram are the neighboring districts to Kollam as shown in **Fig. 1 Regional setting of Kollam**

The Kollam urban area includes suburban towns such as Paravur in the south, Kundara in the east and Karunagapally in the north of the city. Other important towns in the city suburbs are Eravipuram, Kottiyam, Kannanallur and Chavara.

Administrative divisions - The District has five taluks; namely Kottarakkara, Kunnathur, Pathanapuram, Karunagapally and Kollam. The Kollam bypass comes under the Kollam corporation area. The district has comparatively good regional connectivity due to the two National Highways (NH-47 and NH-208) having a length of about 135-km within the district, and the railway route network with Kollam as the railway junction. [6]

The National Highway 66 Bypass has approximately 13.3 Kms length from Mevaram to Kavanad.

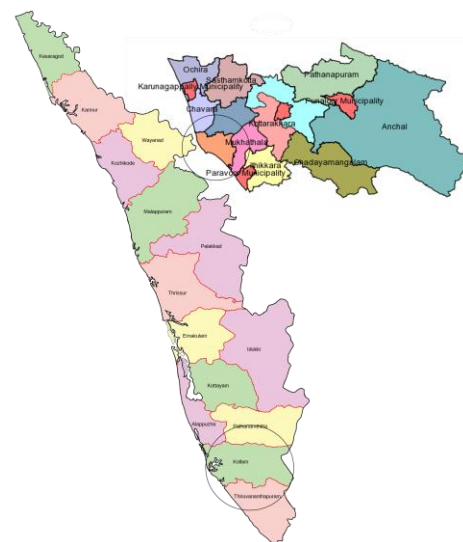


Fig. 1 Regional setting of Kollam

Majority of the stretch (approximately 80%) is undivided 2-lane road with carriageway width of 7 to 8 m and about 20% (2.7 km) of the road is divided 4-lane carriageway with carriageway width of about 7 m each on both sides. All sections allow two-way traffic. Paved/Unpaved shoulders are available throughout the road stretch and about 70% of the road provided without footpaths. The adjoining land use is predominantly commercial and residential.

A. Kollam bypass

The proposal was first mooted by NH department and the alignment was approved in 1978. Kollam bypass takes off from NH 47 at KM 489/120 at Kannada and re-joins NH at KM 5027826 at Thattamala. Total length of the proposed bypass is 13.14 Km.

The bypass shown in **Fig. 2 Location of Kollam bypass** starts at Mevaram in the south to Kavanad in the north, via Ayathil, Kallumthazham, Kadavoor and Kureepuzha in Kollam city.



Fig. 2 Location of Kollam bypass

Various time frames of bypass opening

- 1972 Proposal for constructing NH Bypass road at Kollam and stone laid in February at Kavanad
- 1975 Token amount allotted for Kollam Bypass project 1978 Permission received from Central Road Ministry on 3rd May to construct NH Bypass in Kollam city
- 1993 3 km long Mevaram-Ayathil stretch of Kollam Bypass completed (Phase-I - Construction cost: ₹3.75cr)
- 1999 1.5 km long Ayathil-Kallumthazham stretch of Kollam Bypass completed (Phase-II - Construction cost: ₹2.75cr)
- Works on 8.6 km long Kallumthazham-Kavanad stretch started on 27 May 2015 (Phase-III - Construction cost: ₹277.24cr)
- 2019 Kollam Bypass inaugurated on January 15 by Prime Minister Narendra Modi

B. Area delineation

The first phase of Kollam bypass extending from Ayathil to Mevaram is chosen as the study area, since the stretch was the first opened and seemed to show the most developments. Buffer areas are selected at 100m, 200m and 300m from either side of bypass as shown in **Fig. 3 Buffer zones selected in the corridor area**

The first phase was opened in 1993, which is a 3 km long stretch. Major hospitals, schools, commercial developments can be seen along this corridor. It passes through Ayathil, Palathara, Manakkadu and Punthalathazham wards of Kollam corporation.

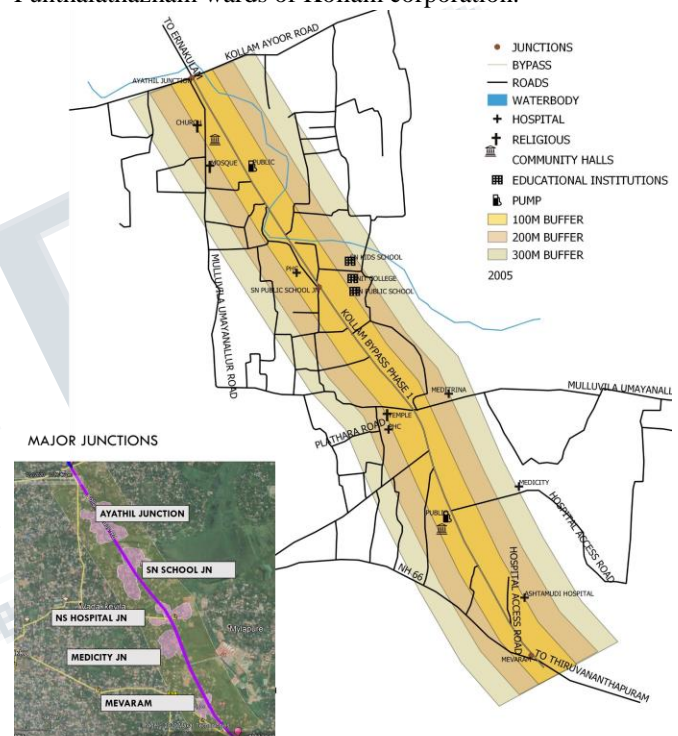


Fig. 3 Buffer zones selected in the corridor area

V. DATA COLLECTION

Collection of primary data was conducted by commercial and residential surveys. The 3km corridor was divided into 5 zones based on the concentration of built-up for carrying out the survey

The major junctions in the zone identified area Ayathil Junction, NS hospital junction, SN school junction and Mevaram. Interviews with overseers, assistant engineers and real estate dealers

Town planning office Kollam to obtain various land use map and integrated district plan of Kollam. NATPAC to obtain data regarding the feasibility studied conducted. Zonal corporation office Vadakevilla to obtain present

landuse of the area

A. Land use and land value in the bypass corridor

In order to analyze the variations in land use, a comparison of the 2012 and 2019 land use has been done. This was done through digitalization of the maps obtained from the town planning department and google temporal earth map.

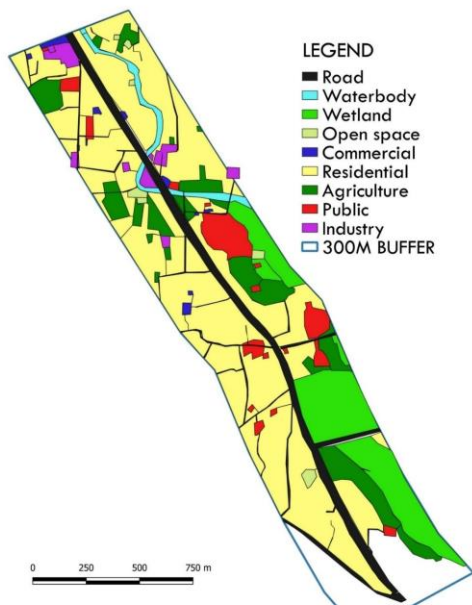


Fig. 4 2012 Land use of the study area

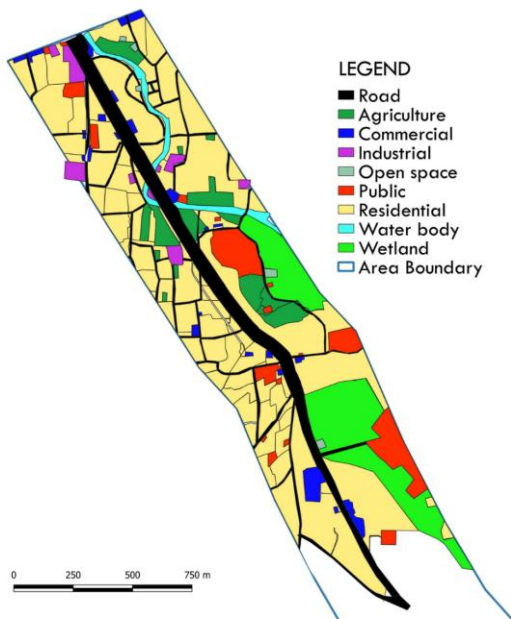


Fig. 5 2019 Land use of the study area

The Fig. 4 2012 Land use of the study area and Fig. 5 2019 Land use of the study area were used to analyze the variation

The land use in the area was predominantly residential and wetland. The commercial, industrial and water body in the area accounted to only 1% each.

The 2019 land use was prepared in association with the land use map prepared for the Kollam master plan and Google earth map.

The number of by roads in the area can be seen increased. This can be accounted to fragmentation of large plots to smaller plots. The increase in land value can also be seen as a reason for breaking and selling of larger plots. The commercial and industrial land use has increased. Considerable reduction in the agricultural area and wetlands can be observed from the Fig. 6 a) Land use distribution 2012 b) Land use distribution 2019 and I. Variation in land use percentage

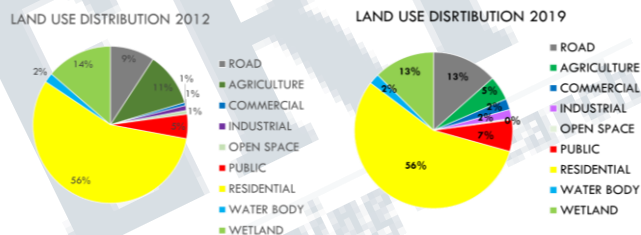


Fig. 6 a) Land use distribution 2012 b) Land use distribution 2019

I. Variation in land use percentage

Land use	2012	2019	Variation
Road	9.3	13.4	4.1
Agriculture	11.1	5.1	-6
Commercial	0.6	2.3	1.7
Industrial	1	1.8	0.8
Open space	0.8	0.3	-0.5
Public	5	6.5	1.5
Residential	56.4	56	-0.4
Water body	2	2	0
Wetland	13.8	12.5	-1.3

1) Variation in land values

The land value has increased drastically from the period of sanction of bypass to completion of bypass. The land values varied with distance from the bypass road. Plots having direct access to bypass had a comparatively higher price per cent than those in the interior.

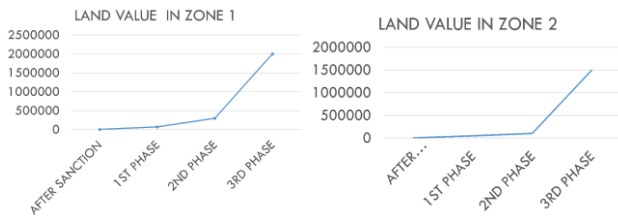


Fig. 7 a) Land value in zone 1 b) Land value in zone 2

In the study of land values done the variation in zone 1 and 2 can be understood from Fig. 7 a) Land value in zone 1 b) Land value in zone 2.

The increase has been accounted to about 50000% when compared to the land value in 1950's. The present land value for per cent of land with direct access from bypass is about 25 lakhs.

B. Variation in buildup

There is a considerable variation in the buildup in the corridor area after the opening of the phase 2 of Kollam bypass and can be understood from Fig. 8 Variation in buildup in the years 2011, 2015, 2020. The buildup in the area has increased by a percentage of 10.7 i.e. after opening of second phase as shown in **Fig. 9 Variation in percentage of build up.**

Plots under a single ownership has been redistributed and sold to multiple individuals creating a major conversion of land use from vacant plots to other purposes. This variation can be observed from the data obtained through primary surveys.

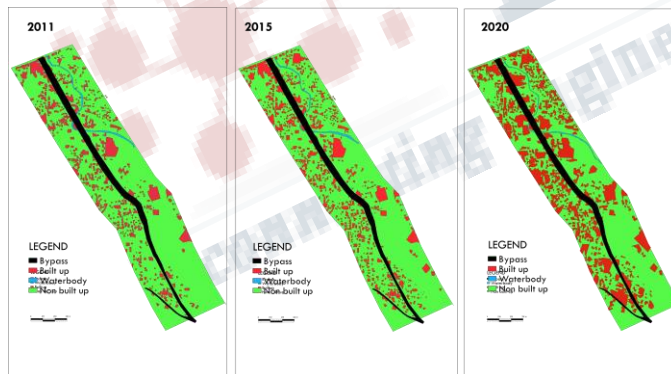


Fig. 8 Variation in buildup in the years 2011, 2015, 2020

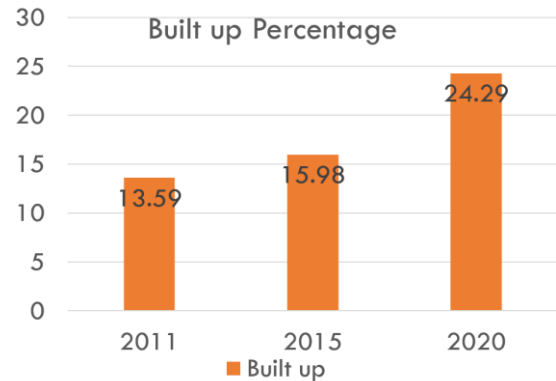


Fig. 9 Variation in percentage of build up

C. Commercial sector

Existing situation of commercials

The types of establishments in the corridor mainly constituted vehicle oriented businesses and other shops which had been opened mostly during the 2nd phase of bypass construction. The percentage distribution of the type of commercials in the area is shown in Fig10 a) Type of businesses in the area

On completion of bypass the recent developments or establishments that came include fast food restaurants and vehicle oriented establishments like showroom and workshops which require large parking space

The most number of establishments are noted in Ayathil and Mevaram Junction. The majority of commercials has direct access from the bypass road and are mostly rented. The percentage of shops rented can be seen in Fig 10 b) Percentage of commercials in different zones.

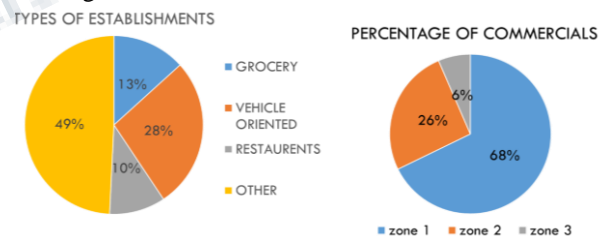


Fig. 10 a) Type of business establishment b) Percentage of commercials

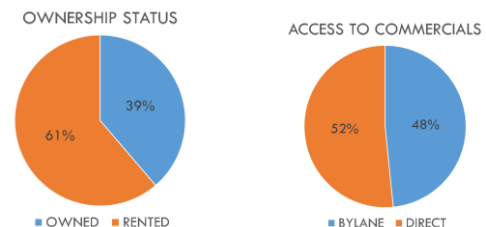


Fig. 11a) Ownership status b) Access to commercials

Majority of establishments have direct access from the bypass through the area acquisitioned for service lane as seen in Fig 11b) Access to commercials. Parking area is a large factor which is responsible for opening of new businesses along bypass

Variation in commercial sector with various stages of bypass opening

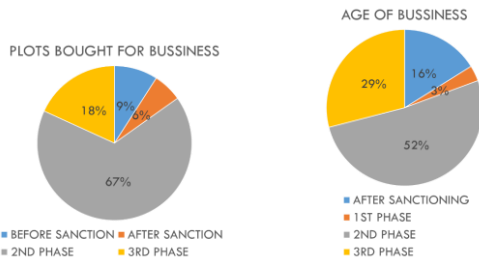


Fig. 12 a) Plots bought for business b) Age of business

Majority plots were bought after the opening of second phase of bypass. This phase the phase with varying land values. The rate at which new business is started is higher after the third phase than after second phase. 73% of the plots had been vacant initially when bought for various commercial purposes

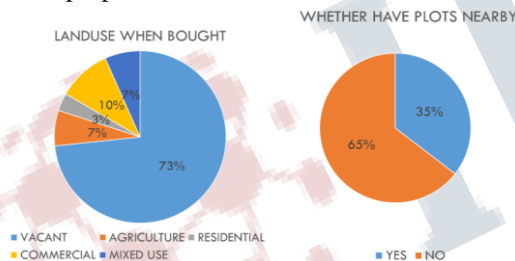


Fig. 13 a) Land use when bought b) Whether have plots nearby

35% of the people having commercial establishment has plots on the vicinity of bypass which is predominantly of residential nature, buildings rented for commercial purpose or other branches of parent establishments

There has been a negative impact for the local shops on opening of bypass. This can be accounted for the increased number of accidents. The lack of stop over facility has also decreased the sales.

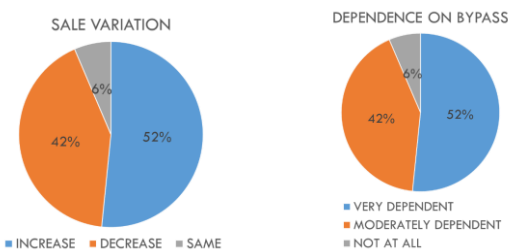
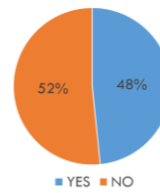


Fig. 14 a) Sale variation b) Dependence on bypass

IMPACT OF BYPASS COMPLETION ON DECISION MAKING



EXPECTATION OF INCREASE IN SALES IN ABSENCE OF BYPASS

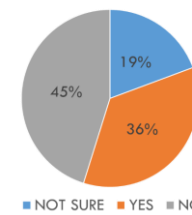


Fig. 15 a) Impact of completion of bypass on decision making b) Expectation of increase in sales in absence of bypass

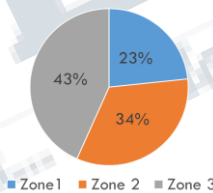
An increase in sale variation can be noted for automobile dependent industries like workshops and spare parts shops. This is due to the presence of vehicle showrooms in the near vicinity.

D. Residential sector

Existing situation of residences

Majority of residences in the area is located in the right side of the bypass corridor. Residences having direct access from the bypass are less. Most of the residences area located in the zone 3 area or at least 200 to 300m away from the bypass.

LOCATION OF RESIDENCES



AGE OF RESIDENCES WITH VARIOUS PHASES OF BYPASS

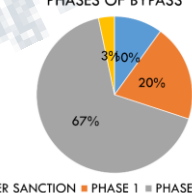


Fig. 16 a) Location of residences b) Age of residences

Residential livability

According to the primary survey conducted, liveability indicators relevant for the community were environment and pollution, culture and communication and transportation. Almost 100% of people have reported an increase in noise and air pollution after the development of bypass. Road safety was another issue faced by the local residents

Due to frequent accidents reported in bypass, crossing of road has become a challenge to the local residents. Due to fragmentation of larger plots into smaller residential plots have also resulted in decrease in community cohesion. An area which was initially of suburban nature has shown shifting to urban nature.

REASON FOR OPTING RESIDENCE NEAR BYPASS

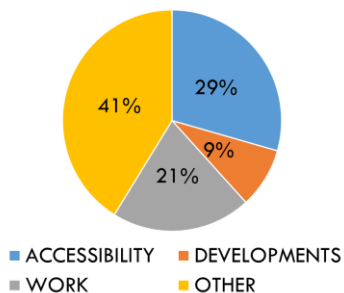


Fig. 17 Reason for opting residence near bypass

II Percentage variation in factors with coming of bypass

Factor	Better	No change	Worse
Accessibility	87	13	0
Traffic congestion	13	20	67
Employment	67	23	10
Shopping	50	17	33

E. Transportation sector

The 3km first phase of NH66 bypass joints with the road has NH66 at Mevaram junction. The Kollam Ayoor major road meets with bypass at Ayathil junction. The 45m wide stretch has land acquisition for service lane on both sides. The area faces problems of encroachment of this area for unauthorized parking and temporary extensions of commercials as shown in **Fig. 18 a) Unauthorized parking in acquisitioned area**.



**Fig. 18 a) Unauthorized parking in acquisitioned area
b) Queing of vehicles at Ayathil Junction**

The bypass road is at a raised elevation when compared to connecting byroads which in turn has resulted in reduced vicinity for vehicles approaching leading to accidents at junctions.

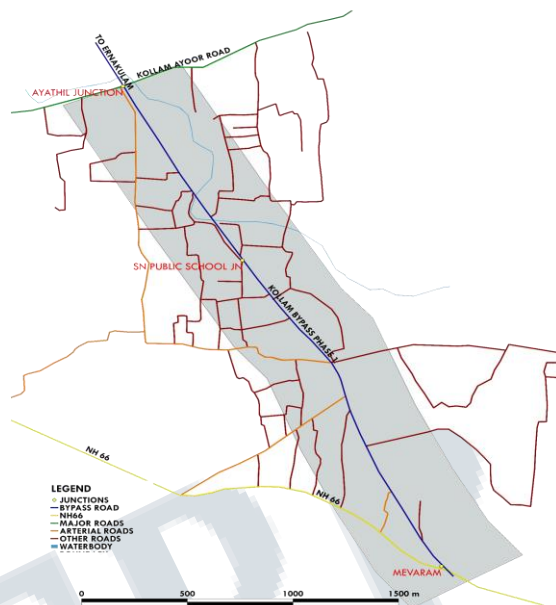


Fig. 19 Road hierarchy in the study area

From the residential livability study it has been identified that the area faced considerable amount of traffic and is an accident prone area. The Fig. 19 Road hierarchy in the study area shows the network of roads that are directly and indirectly connecting to the Bypass.

It can be observed from the study conducted by NATPAC [7], Ayathil has the largest peak hour volume which is a major junction in the study area.

On NH Bypass, the maximum average journey speed of 46.55 km/hr. was observed between Kadavoor junction and Toll Plaza during peak hours. [7] The average journey speed of the entire road stretch is 39.84 km/hr. during peak hours and 43.71 km/hr. during off-peak hours.

III Peak hour volumes at intersections

Sl. No	Name of road/ intersection	No. of arms	Peak hour	Peak hour volume (PCU)
1	Mevaram	3	18.00-19.00	4958
2	Aythil	4	15.30-16.30	8248
3	Kallumthazham	4	8.15-9.15	7492
4	Kadavoor	4	17.00-18.00	3716
5	Kavanad Bypass Junction	3	9.45-10.45	4210

The delay is mainly caused due to increased waiting time at signals is the major causes of delay for traffic flow on both NH and NH Bypass. On bypass, during peak-hours total delay of about 141 seconds is observed because of traffic signals which is the only reason of delay. The Fig. 18 b) Queuing of vehicles at Ayathil Junction shows the long queue of vehicles.

Major facilities as hospitals, school and college are present at zone 1 area of the corridor. The stretch lacks adequate pedestrian crossings even at these locations.

VI. CONCLUSION

The bypass roads initially intended for relieving the traffic from the CBD area sometimes becomes stretches of unscientific process of growth leading to increase in the area of core city. This kind of growth has to be controlled and proper attention has to be given to developments along bypass corridors.

From the evidences in the paper, if the trend of growth is analyzed, the corridor area is more susceptible to increase in commercial establishments due to good accessibility. Such an increase in commercial pattern results in attracting large vehicular crowd. This in turn increases the demand for stop over facilities. In the case of Kollam bypass this increase is evident from the transformations in buildup and land use patterns of the area over the recent decade.

The increase in demand of land also resulted in rising land values in the area. The property value has to be stabilized to reduce its impacts on the community.

The sub urban area which was initially of residential character is in the state of conversion to a fully urban area. The bypass has greater impact on the residential livability in terms of pollution and safety. Detailed livability studies are required to be conducted in the area and necessary steps should be taken to improve the desirable conditions.

The improvement in safety can be done by access controlling the stretch. Proper service lanes have to be provided at the earliest to prevent encroachment of bypass shoulder area and to control access to bypass. Direct entry to bypass can be controlled through provision of service lanes.

Land use that increase the number of trips should be reduced in the corridor and less traffic oriented activities has to be promoted. Proper zoning of the corridor area helps in prevention of unscientific growth resulting in over developed congested stretches.

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