### Chapter 6: A Case Study of Kengeri and BIAL Road

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6.1 Introduction

Functional classification is the process by which entity and features are grouped into classes, or systems, according to the character of the particular features that they are intended to provide. Many classes can be classified depending on the character of the feature. For example functional classification can be performed for the Road Network, classifying the road network into different classes, like National Highways, State Highways, District Roads and Other types of roads.

Functional Classification plays a major role in the design process. The first step in the design process is to define the function that the facility is to serve. The level of service required to fulfill this function for the anticipated volume and composition of traffic provides a rational and cost effective basis for the selection of design speed and geometric criteria within the range of values available to the designer (for the specified functional classification). The use of functional classification as a design type should appropriately integrate the highway planning and design process.

Once the functional classification of a particular feature has been established, so as the allowable range of design speed. With the allowable range of design speed defined, the principal limiting design parameters associated with horizontal and vertical alignment are also defined. Similarly, a determination of functional classification establishes the basic features and character in terms of lane width, shoulder width, type and width of median area, and other major design features.

The importance of the functional classification process as it relates to Emerging design lies in the fact that functional classification decisions are made well before an individual project is selected to move into the design phase. Moreover, such decisions are made on a system wide basis by city, country, or State DOTS or MPOs as part of their continuing long range transportation planning functions. Such systematic reassessments are typically undertaken on a relatively infrequent basis. Thus, the functional classification of a particular section of Current features may well represent a decision made 10 or more years ago. The current unit research is made on the major functions related to Residential area (Kengeri) and Functions related to Diversified area (BIAL Road).
6.2 Selection Criteria for Case Study Pockets – (Residential Area)

Residential area is one of the important categories in the Urban Built-up class. In all the corners of the Bangalore Metropolitan Region there are many Residential Area located. The major residential areas are Vijayanagara, Rajajinagara, Jayanagara, Indiranagara, Ramamurthy Nagar, Banasawadi, Lingarajapura, Austin Town, Ulsoor, Dasarahalli, K R Puram, Nagarabhavi, R P C Layout, Hanumantha Nagar, Kengeri, Ullal, Thyagaraja Nagar, N R Colony, Banashankari and others.

Residential area has different classes like high class residential area, middle class residential area and low class residential area. Some of the area has many apartments, but some areas have only the housing boards and individual houses. These are depending on the people living on the particular areas and their income.

Kengeri has been taken for the research under the Residential Area because it is one of the developing residential areas in the fringe of the Bangalore Metropolitan Region. It is having all the characteristics of the Residential area, around 50 layouts are existing in the study area, which comes under the administration of BDA Layout, BDA Approved Layout and Private Layouts. Good number of Educational Institutions and huge number of Health centers are concentrated on the study area. So this is one of the suitable residential areas to understand the peri-urbanization of the Bangalore Metropolitan Region.

6.3 Kengeri – Geographical Setting

Kengeri is situated on the outskirts of Bangalore. It is about 14 km from city center and lies on the Mysore-Bangalore Road. Evergreen Estate and a Toyota factory are located here. The place is linked with the Bangalore Outer Ring Road. Bangalore University is about 6 km from here. Kengeri Railway Station is on the Bangalore–Mandya rail route.

This place which was so calm and beautiful few years ago is totally neglected by BBMP, BDA and other Beaurocrats and none of them want to take responsibility of developing this place when it comes to their duty. But everyone wants to come forward to take credit for something happening due to demands of the residents. This place needs lot of civic support from Government departments like BBMP, BDA, KEB, BWSSB etc so that this becomes a real
SATELLITE town for Bengaluru. Only for the sake of collecting more taxes, this has been added into Greater Bengaluru but no one is bothered about the amenities.

The co-ordinate location of Kengeri is 12.911 N Latitude, 77.484 E Longitude and Altitude is 854 Mts. Kengeri Residential Area covered by the 8 BBMP Wards they are Kengeri, Rajarajeshwari Nagar, Nayandahalli, Uttarahalli, Hemmigepura, Chandralayout, Ullalu and Bangalore University (Jnanabharathi). Kengeri Residential Area have 17 Villages in the East corner that is the Peri-urban and rural area. The total population of the Kengeri Residential area is about 1,45,256 Persons, average density of the study area is 927 person per sq km.

Kengeri Residential area is having the Rushabhavathi River, now this is not a river but used as the sewage. World’s one of the biggest educational Institute that is Bangalore University is also located in the study area. Kengeri Residential Area is also considered as the richest spot of the Real Estate Agencies.

6.4 Location of the seed of Kengeri Residential Area

The Kengeri Residential Area is covered by many areas, which are having the characteristics of Residential areas. The seed point of Kengeri Residential Area has been selected as center part of the Kengeri on the basis of the location. The actual location of Kengeri is 12.911 N Latitude, 77.484 E Longitude and Altitude is 854 Mts.

The study area have been demarcated using the 5km radius, that means from the seed point all the corners (North, South, West and East) have a distance of 5km. The major areas of the Kengeri Residential areas are Nayandahalli, Bangalore University, Nagarabhavi, Kenchenahalli, Gottigere, Patanageri, Mallasandra, Oddarapalyam, Nagadevanahalli, Muddaiyanapallya, Mariyapanapallya, Sonnenahalli, Ullal, Ullalbasti, Manganahalli, Rampura, Chikkahalli, Komagatta, Kodipalya, Chodenapura, Hemmagepura, Gotigerepalya, Venkatapura, Rajrarajeshwari Nagar, Kambipura, Sulekere, Bairahalli, Bettahalli, BEML Layout, Challaghata, Girpalya and Kumbalagodu.

East corner of the study area is having the urban areas dominantly, west and the south west corners dominated by the peri-urban region and the rural areas.
Map 6.1: Study Area – Kengeri Residential Area

Map 6.2: Seed Point of Kengeri Residential Area with BBMP Boundary
6.5 Favorable factors for Kengeri Residential Area

Kengeri is one of the Residential areas in the Bangalore Metropolitan Region. In the early 2000, local governing bodies and the government neglected the Kengeri Residential area but they found the importance of the growing Bangalore and Kengeri is one of the fringes, so they started to concentrate on the Kengeri. Many projects and area development planning has been made for the Kengeri. Every Residential Area is having its own favorable factors, in the same way Kengeri is also having the favorable factors. For the creation of Cellular Automata Modeling, some of the favorable factors have been chosen they are:

1. Major Road Network
2. Major Bus Stops
3. Layouts
4. Medical Facility
5. Educational Institutions

Road Network is one of the important factors for all the areas, in the same way Residential area is also having its own importance for the Road Networks. Roads creates the connectivity for the areas, and make them into easy accessible. The study area is well connected with all the type of roads like State Highway, Ring Road, Nice Road and Arterial Roads. Bangalore Mysore State Highway passes through the Kengeri. Outer Ring Road is connected to the study area in Nagarabhavi and ends in Nayandahalli. Around 16.5 km of NICE Road passes through the study area. The other roads are connected to the major areas, villages, Educational Institution and Hospitals. There is 227 km of road network spread across the Kengeri study area.

Transportation facility creates a well connectivity in the study area, BMTC Buses are the important transportation provider for the study area, so Bus stops are the major favorable factor. 41 Bus stops have been identified throughout the study area. 22 bus stops have been taken for the consideration because these are major once, and the strength of the passenger is also high. The major bus stops are Kengeri, Kengeri Satellite Town, R V College, Jnanabharathi Campus, Ullalu, Mariyappanapalya, Rajarajeshwari Nagar, Channasandra, Hemigepura, Gottiger, Nayandahalli, Suleker, Sonenahalli, Srinivasapura, Challaghatta and Kumbalagodu.

Layouts, Villas, Apartments, Housing colonies and individual house are the type of residencies. The study area is having may layouts, some are created by the BDA, and some
layouts approved by the BDA and others are owned by the private peoples. The major layout spread across the ring road, namely Kempegowda Layout, Jnana Jyothi Layout, Shirke Housing Board. Some of the layouts are created by the land lords, private real estate companies.

Medical facility is one of the favorable factor in the Kengeri Residential area, where we have huge number of residence there we require the Medical facility. BGS Hospital, Global Hospital, Rajarajeshwari Hospital, Swathi Nursing Home, Government Hospital in Kengeri, more than 50 clinic and 80 plus medical shops are there in the Kengeri study area. BGS is one of the world level facilitated hospitals. Good number of Lab facility is also available in the Kengeri Residential study area.

Educational Institutions are also important favorable factors for study area like Kengeri. Kengeri Residential area is having good number of Schools and colleges. Worlds one of the biggest Universities that is Bangalore University is located in the Kengeri Residential Area. It is having the distance of 6 km. more than 35 departments are there in the University. Jnanabharathi campus is the head quarter for the entire Bangalore University and its affiliated colleges. National Law school of India University is also located in the Jnanabharathi Campus. There are 7 engineering colleges in the study area; they are R V College of Engineering, Dr. Ambedkar College, East West College, Surana College, and Don Bosco College. Rajarajeshwari is one and only medical and dental college in the study area. The other major schools and colleges are Padmashree Group of Institutes, Embassy Public School, Baldwin School, Government Degree College and Kengeri First Grade College.

The last favorable factor is Parks and Playgrounds. Kengeri study area is having huge parks and playgrounds, namely SAI (Sports Authority of India), University Sports Club, Kengeri Sports Club, Kengeri outdoor stadium. Bangalore University is having good vegetation that is more than Cubbon Park and Lalbagh. Nagarabhavi BDA Park, Kengeri BBMP Park, and Ullalu Parks, are the important parks in the study area.
Map 6.3: Map of Favorable Factors in Kengeri Area

Map 6.4: Map of Non-Favorable Factors in Kengeri Area
6.6 Non-favorable factors for selecting Kengeri Residential Area

Kengeri Residential Area has many Non-favorable factors but for the study purpose two major factors have been taken. Further these factors are used to create the cellular automata Model for the study area to understand the growth of the peri-urbanization region.

Sewage of Rushabhavathi River is one of the non-favorable factors. This river begins from north east corner of the study area and flows through central, south and finally enters west corner of the study area. There are many slums identified namely Nayandahalli, Mariyappanapalya, Hemigepura slum, undeclared slum in Kengeri. Nayandahalli slums are developed by the government under the different programs.

6.7 C A Model for Kengeri

Cellular Automata Model for Kengeri Residential Area has been created using the Major Road network, Major Bus Stops, Layouts, Medical Facilities, Education Institutions, Park and Playgrounds, Slums and Sewage. Further these cellular automata model is examined with the reality.
Map 6.6: Euclidean Distance Map of selected criteria of Kengeri Area
Map 6.7: Reclassified Map of selected criteria of Kengeri Area
Modeling Peri-Urbanization of Bangalore Metropolitan City – A Geoinformatic Approach

Map 6.8: Weighted Overlay Map of Kengeri Residential Area

Map 6.9: Cellular Automata Model of Kengeri Residential Area
On the basis of Cellular Automata Model created using certain criteria, shows the result that the peri-urban region in Kengeri Residential area is spread towards the north, east and south corners of the study area. The peri-urban area in this study area is growing rapidly because of the Bangalore- Mysore Highway, Ring roads and Nice Roads.

Kengeri is surrounded by many BDA BBMP Layouts and it is calm and peaceful except 1st main. All facilities are available like shopping malls, big parks, good Residential Apartments, group of senior citizens, Hospitals, bus facility to all parts of the city, accessible through nice road and ring road, big roads, no revenue layouts within, good water and sanitary, at least 29 nationalized banks etc. what is needed as per my assessment is as below:

1. Completion of metro line as early as possible.
2. Taking up of project to extend fly over where ever it is necessary.
3. No good hotels in the area. It is need of the hour.
4. Up gradation of Kengeri Railway Station and making compulsory halt to all trains coming from Bangalore and Mysore.
5. No planned market for vegetables except of course good malls.
6.8 Selection Criteria for Case Study Pockets – (Diversified Area)

There are some areas which are performing all the functions; they are diversified in the nature. BIAL Road is one of the areas which come under this category. BIAL Road (Bangalore International Airport Limited Road) engages all the functions, namely Industrial, Informational Technological, Residential, Commercial and Foreign trade. Because it is the road of International Airport, growth is very good. After the declaration of construction of International Airport in 1996, the upliftment of agricultural land have taken place and converted it in to yellow belt. Along the road side many Mall, Education Institutions, Industries, Information Technological centers have been established. Bangalore have many diversified area in their functions, but BIAL Road is different from all the above, so this area is taken for the research purpose.

6.9 BIAL Road - Geographical Setting

BIAL Road is one of the diversified functional areas in the Bangalore Metropolitan Region. Bangalore International Airport is one of the India’s biggest airport, the co-ordinate location of BIAL Road is

1. Yelahanka New Town 13.1N Latitude and 77.6 E Longitude
2. Hunusmaranahalli 13.142 N Latitude and 77.62 E Longitude

These are the Co-ordinate of the BIAL Road. Yelahanka, Jakkuru, Putenahalli and Yelahanka New town are the few BBMP Wards coming under the study area. The Population of BIAL Road is 1, 18,596 Persons, average density of the study area is 869 persons per sq km. The distance from the CBD to study area is about 19 km; the growth can be seen on either side of the BIAL Road.

6.10 Location of the seed of BIAL Road

BIAL Road is one of the Diversified Region in the Bangalore Metropolitan Region. In the region Hunusmaranahalli is considered as the Seed Point of BIAL Road. The actual location of the Hunusmaranahalli is 13.142 N and 77.62 E. the total geographical area is 100 sq km. The major areas and villages covered by the seed point are Puttanahalli, Mitaganhalli, Srinivasapur, Saranuru, Bagaluru, Hosahalli, Kodigalahalli, Bilmaranahalli, Vidyaganar, Huttanahalli, Doodajala, Minakunte, Channahalli, Kadigodahalli, Narayanpura, Timmasandra, Harohalli and others.
Map 6.11: Study Area – BIAL Road

Map 6.12: Seed Point of BIAL Road

Modeling Peri-Urbanization of Bangalore Metropolitan City – A Geoinformatic Approach
6.11 Favorable factors for BIAL Road

The favorable factors of BIAL Road are Major Road Network, Major Bus Stops, Layouts, Industries, Hotels, Educational Institutes and others. For creating the Cellular Automata Model only four favorable factors have been selected they are: Roads, Bus Stops, Layouts and Industries.

Major Road Network is one of the favorable factors in the BIAL Road, the study area is having the National Highway number 7, which connect to Bellary and Hyderabad. The total length of road network is 148 km. in the study area.

There are 43 Bus Stops in study area but for the study purpose 21 Bus stops are taken into consideration. The major bus stops are Yelahanka, Tarahunuse, Gantiganahalli, Harohalli, Mitaganahalli, Bagalur, Doddajala, Minakunte, Bettahalsur and others.

The study area is well connected with the International Airport, so land values have been increased day by day. In the early 1996 1 hectare was available in 10 to 13 lakhs, but in the 15 years of duration 1 hectare cost increased to 4 to 5 crores. Bangalore Metropolitan Regions have never seen this kind of real estate since 25 years. Along the road side many agricultural lands have been converted into Yellow belts and have created layouts. The price of the site is about Rs. 15,00,000 to Rs. 45,00,000.

The study area is also having many house hold industries, there are no large scale industries. Some of the Informational Technological Industries are also located, but all are small scale industries only.

6.12 Non-favorable factors for BIAL Road

The selected non-favorable factors are Quarry and Slums, there are 6 slums identified in the study area. They are located in Yelahanka, Puttanahalli, Kotegenahalli, Bettahalsur, Chikkajala and Tarahunse. There are 7 quarries in the study area, some are sand quarry and some are stone quarry.
Map 6.13: Map of Favorable Factors in BIAL Road

Map 6.14: Map of Non-favorable Factors in BIAL Road
6.13 C A Model for BIAL Road

Creating a Cellular Automata Model for Diversified Area like BIAL Road is to examine the growth of the peri-urban region. To create a cellular automata model for the study area, some selected criteria have been chosen, those are: Major Roads, Major Bus Stops, Industries, Layouts, Slums and Quarry.

Map 6.15: Selected Criteria’s to show the expansion of Peri-urbanization in BIAL Road

After examining the cellular automata model created for the BIAL Road, show the peri-urban regions and rural areas influenced by the urban areas. In this study area existed urban area is very low because this area is far from the Central Business District. Around 70 percent of the area under the influence of existing urban area, point of view this is also known as peri-urbanization region of the study area. The remaining area is comes under rural and actual peri-urban region of the study area.
Map 6.16: Euclidean Distance Map of BIAL Road
Map 6.17: Reclassified Map of BIAL Road
Map 6.18: Weighted Overlay Map of BIAL Road

Map 6.19: Cellular Automata Model of BIAL Road