CHAPTER-5

LAND USE PATTERN AND TRANSPORTATION IN FRINGE AREA: PRESENT ISSUES AND FUTURE CHALLENGES

5.1 Introduction:

Transportation and supply of land are interconnected terms in urban development as transportation changes extend the supply of urban land for settlement while research established that urban expansions were promoted through transportation advances in addition to evolution of national urban system. The fundamental relationships of transportation and its linkage with land use were explored by researchers which indicate land use generates traffic carried by transport and land use-transportation system exists in socio-economic environment while change in road network stimulates change in land use. This chapter presents study and analysis of land use changes in the fringe area of the city under study and its relationship with transportation network.

5.2 The Study Area:

Study area is a part of national express highway no-04 which starts from Katraj which is located within Pune Municipal limit. It is extended to Khandala with a number of small settlements namely Bhilare wadi, Mangadewadi, Gujarwadi, Shinde wadi, Velu, Khed-Shivapur, Nasarpur. Ketkavale, Kamthadi, Saraola and Shirval. The area under study includes 10 to 15 kms stretch on the both sides of the main highway. Khandala is the last location which is one of the upcoming industrial areas developed as MIDC by the state government. It is which is one of the ambitious projects under government of Maharashtra as it linked with national industrial corridor which starts from Delhi via Mumbai, Pune, Bangalore to Chennai. The following diagram shows the fringe area under study. Frienge area is defined as the adjoining area beyond PMC limit some part from Katraj to is semi urban in character while next part from is presently rural which is supposed to face urbanization in recent future. The study area location and key plan is shown in figure 5.1.
5.3 Land Use Survey:

The land use survey is conducted in two parts where the first part is the physical survey of the area under study. This includes the original gaonthan areas, types of land uses in and around the growth centres. The present pattern of development, the typology of resources and related socio-economic structure based on existing land use. In the second part, Google images of the area in the year 2005 and 2016 were studied and analysed to find out the land use pattern changes. From the Google maps and physical surveys collected information is tabulated and data is analysed. For land use survey the area under study is divided into ten sections starting from Katraj to Khandala. Katraj is one of the developing area which is at the boundary of core and fringe area of the city. This area is also connecting to Solapur by National highway number -9, Mumbai express way via by pass and connecting to western Maharashtra by National highway number -4. The details about settlements and villages and distances from the main road is presented in table -5.1
Table -5.1: List of settlements, growth centers

<table>
<thead>
<tr>
<th>No</th>
<th>Village</th>
<th>Distance in Km</th>
<th>No</th>
<th>Village</th>
<th>Distance in Km</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jambulwadi</td>
<td>4.4</td>
<td>16</td>
<td>Shindewadi</td>
<td>2.4</td>
</tr>
<tr>
<td>2</td>
<td>Shindewadi</td>
<td>9.4</td>
<td>17</td>
<td>Dhangarwadi</td>
<td>5.4</td>
</tr>
<tr>
<td>3</td>
<td>Sasewadi</td>
<td>13.4</td>
<td>19</td>
<td>Yewalewadi</td>
<td>13.4</td>
</tr>
<tr>
<td>4</td>
<td>Khed</td>
<td>14.1</td>
<td>20</td>
<td>Mangadewadi</td>
<td>1.5</td>
</tr>
<tr>
<td>5</td>
<td>Shivapur</td>
<td>15.3</td>
<td>21</td>
<td>Bhilarewadi</td>
<td>1.0</td>
</tr>
<tr>
<td>6</td>
<td>Khopi</td>
<td>19.6</td>
<td>22</td>
<td>Gogalwadi</td>
<td>1.6</td>
</tr>
<tr>
<td>7</td>
<td>Varve Budarukh</td>
<td>19.1</td>
<td>23</td>
<td>Velu</td>
<td>1.5</td>
</tr>
<tr>
<td>8</td>
<td>Kelawade</td>
<td>23.3</td>
<td>24</td>
<td>Kasurdi</td>
<td>2.3</td>
</tr>
<tr>
<td>9</td>
<td>Nasarpur</td>
<td>25.1</td>
<td>25</td>
<td>Shivare</td>
<td>2.1</td>
</tr>
<tr>
<td>10</td>
<td>Kamthadi</td>
<td>25.8</td>
<td>26</td>
<td>Varve- khurd</td>
<td>1.8</td>
</tr>
<tr>
<td>11</td>
<td>Umbrae</td>
<td>27.6</td>
<td>27</td>
<td>Naigaon</td>
<td>2.6</td>
</tr>
<tr>
<td>12</td>
<td>Kapoorhol</td>
<td>28.2</td>
<td>28</td>
<td>Ketzavale</td>
<td>6.2</td>
</tr>
<tr>
<td>13</td>
<td>Dhangwadi</td>
<td>32.3</td>
<td>29</td>
<td>Saraola</td>
<td>2.3</td>
</tr>
<tr>
<td>14</td>
<td>Bhor Phata</td>
<td>34.6</td>
<td>30</td>
<td>Shirwal</td>
<td>0.6</td>
</tr>
<tr>
<td>15</td>
<td>Kikavi</td>
<td>33.8</td>
<td>31</td>
<td>Pisalwadi</td>
<td>3.7</td>
</tr>
</tbody>
</table>

Further land use analysis is carried out by physical survey of area about the distance of 15 to 20 kilometers on the both sides of the main road the details are as under.

5.3.1 Mangadewadi to Shindewadi:
Mangadewadi to Shindewadi is the first part of the frienge area under research. The main roads land use is predominantly commercial in nature which include hotels, shops, workshops, servicing centres, restaurants etc. in addition to two petrol pumps. The surrounding settlements Gujarwadi, Bhilarewadi gogalwadi and Shindewadi are located within 500 to 1000 m distance along the main highway which are residential districts. The area after Bhilarewadi till Gogalwadi is ghat zone section about 5 kilometer length. In this there is reserved forest area and old tunnel passes through it which is no
development zone and forest zone. This part has experienced tremendous changes in land use as shown in figure 5.2 & 5.3.

Section-I: Mangadewadi- Bhilarewadi

![Figure 5.2: Land use of Mangadewadi - Bhilarewadi in year 2005. Source: Google maps and survey by author](image1)

Section-I: Mangadewadi - Bhilarewadi

![Figure 5.3: Land use of Mangadewadi - Bhilarewadi in year 2016. Source: Google maps and survey by author](image2)
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Figure -5.4  Land use of Mangadewadi -Bhilarewadi in 2005 & 2016

Following are the land use changes observed:
There was total absence of industrial land use in year 2005 which was found to 8% in the year 2016. The residential land use was 7 % in 2005 which is increased to18% in the year 2016 while semi public land use was 3 % and reduced to 0%. Major decrease in agricultural land use observed which reduced by 21% while commercial land use increased by 5%. However no substantial development observed in span of 10 years as far as road network development is concerned which increased by just 3%. Land use changes in the period from 2005 to 2006 are shown in fig no.

5.3.2 Sasewadi-Shindewadi village:
Sasewadi is the settlement located at the end of the on the national highway number 4 about 1000 meteres from the main road. The area along the road is found mostly under the residential use. In addition there is some part having industrial land use within this Section along the main road as well as in the adjoining interior areas while some part consists of commercial uses such as selling agricultural and automobile parts. It is observed that agricultural land is reduced considerably in 2016 in comparison with 2005. The land use pattern in year 2005 and 2016 are shown in figure 5.5 &5.6.
Section-II: Sasewadi-Shindewadi village

Figure - 5.5: Land use of Sasewadi-Shindewadi in year 2016.
Source: Google maps and survey by author

Section-II: Sasewadi Shindewadi village

Figure - 5.6: Land use of Sasewadi-Shindewadi in year 2016.
Source: Google maps and survey by author
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Following are the observation based on land use survey:
Industrial land use increased by 3% while residential land use which was 21% in year 2005 is increased to 18% in the year 2016. Considerable decrease in agriculture observed as land use for agricultural activities reduced from 62% to 41%. Marginal increase in commercial activities observed as 3% increase is observed in commercial land use in past 10 years or so. Negligible increase in land use for road construction noticed from 12% to 14% as compared to other land use types in the study area.

5.3.3 Khedshivapur:
This the third Section of the road under study which is connected to various settlement located in the vicinity. The presence of toll plaza in this Section of national express way is one of the important feature which affected the traffic conditions in this Section. On the both sides of main road is full of partly authorised and unauthorise residential and commercial units are observed. This include hotels, restaurants, hospital and other commercial activities like shopping as well as residential units of different scale and type. Another feature is emergent industrial estates which gives the rise to a mixed type
of land use in order to cater for requirement of employees like housing, convenience shopping, clinics etc. Figure 5.8 & 5.9 shows the land use pattern during a period from 2005 to 2016.17

Section-III : Khedshivapur

**Figure - 5.8: Land use of Khed- Shivapur in year 2005.**  
Source- Google maps and survey by author

Section-III : Khedshivapur

**Figure - 5.9: Land use of Khed- Shivapur in year 2016.**  
Source- Google maps and survey by author
Figure -5.10  Land use of Khed Shivapur in 2005 & 2016

Observed land use change is as follows:

Increased industrial activities observed as land use for this head in increased from 5% to 17% which has put more pressure on transportation network. Subsequent increase in residential land use is noticed from 15% to 18% which not much but it result in increase in number of public transportation users. About 14% of agricultural land is converted into industrial, commercial and residential usage in last 10 years which is seems to be increasing. As compared to different land use pattern changes increase in road network is strikingly low as it is increased just by 1% in this period.

5.3.4 Shivare khurd:
The fourth part of the Section of the study area is Shivare Khurd which has entry from the main high way towards west side and located about 1.5 kilometers from the main road. The main road as well as internal road having a mixed development of both authorised and unauthorised structures devoted for residential and industrial use while commercial use is comparatively low. The fertile agricultural land is converted into other
type land uses. Due unplanned industrial and housing growth there is considerable impact noticed on transport network consists of the main road and internal roads shown in figure 5.11 & 5.12.

Section-IV : Shivare khurd village

![Figure - 5.11: Land use of Shivare khurd in year 2005](Shivane khurd)

*Source- Google maps and survey by author*

Section-IV : Shivare khurd village

![Figure - 5.12: Land use of Shivare khurd in year 2016](Shivare khurd)

*Source- Google maps and survey by author*
Observations from land use survey:

In 2005 industrial land use was 3% which is increased to 6% while residential land use was increased from 15% to 20% in the year 2016. The semi public land use was 2% which has been reduced to 4%. This area has experienced large scale depletion of agricultural land which has reduced by 25% in span of 10 years. Marginal increase in road network notices as it is increased from 6% in year 2005 to 12% in the year 2016.

5.3.5: Shivare budruk

Shivare budruk is located in the fifth Section of the study area about one kms from the main road. The main road along this Section has predominantly industrail land use which has significaantly increased in past 10 years in addition to increaese in residentail land use. The land use pattern in year 2005 and year 2016 is shownn in fig while changes in land use pattern is graphically presented in figure5.14 &5.15.
Section-V : Shivare budrukh :

Figure - 5.14: Land use of Shivare budrukh in year 2005
Source - Google maps and survey by author

Section-V : Kondhanapur-Shivare budrukh :

Figure - 5.15: Land use of Shivare budrukh in year 2016
Source - Google maps and survey by author
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Figure - 5.16: Land use pattern of Shivare (bk) in year 2005-2016

The major change in land use pattern is summarized as follows:

Industrial land use was 11% which has increased by 4%. Considerable change is land use pattern observed in terms of increase in residential usage which was 3% in year 2005 and has increased by 15% in the year 2016. Another noteworthy change is from agricultural to other land usage which accounts for a substantial decrease from 60% to 40%. However road network just increased by 4% which is remarkably less considering the need of the occupants resulted from industrial,

5.3.6 Varve khurd:

The Varve khurd village is near to the main high way about 1 kilometer inside. Here residential activities observed on increase in addition to industrial land use. The development is predominantly irregular and unplanned where most of the commercial premises, residential districts are constructed without considerations of local building bye laws. Change in land use pattern can be observed in figure 5.17 & 5.18.
Section VI: Varve khurd:

**Figure 5.17: Land use of Varve khurd in year 2005**

Source: Google maps and survey by author

Section VI: Varve khurd:

**Figure 5.18: Land use of Varve khurd in year 2016**

Source: Google maps and survey by author
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Figure - 5.19: Land use pattern of Varve khurd in year 2005-2016

The change in land use in this area is characterized by the following:
In year 2005 there were no industries in this area which is currently claimed for 8% of land use. The agricultural land use which was 83% in year 2005 is reduced to 60% in the year 2016. New land use emerged in the form of commercial land use which cover 2% area in the year 2016. In 2005 roads land use was 5% which has increased to 8% in the year 2016.

5.3.7 Varve budruk:
Varve khurd was one of the fertile agricultural land most of which is converted in to other land uses in the span of last decade. The residential growth is observed in addition to industrial land use as shown in fig5.20 & 5.21.
Section-VII : Vrave buduruk

**Figure - 5.20: Land use of Varve budarukh in year 2016**
Source- Google maps and survey by author

Section-VII : Vrave buduruk

**Figure - 5.21: Land use of Varve budarukh in year 2016**
Source- Google maps and survey by author
Figure 5.22: Land use pattern of Varve budarukh in year 2005-2016

Following are the observation based on land use survey:

In 2005 industrial land use was 11% which has been increased to 12% in the year 2016. Residential land use was increased by 3% while semi public land use was increased by 2%. Noticeable decrease of 20% observed in agricultural land use while more commercial activities observed which increased from 1% to 3%. Marginal increase in road network noticed as it has increased by 4% in last decade.

5.3.8 Nasarapur:

Nasarapur is one of the settlement located along the main road which has the main approach is from the highway about 500 m from the road. This leads towards Velha region in the Pune District which is about 60 kilometers from the highway and 75 kilometers from the Pune. This area experienced large scale residential development in addition to industrial. This Section often suffers from traffic congestion because of negligible
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development in terms of transportation facilities. The most of industrial land use seen as shown in figure 5.23 & 5.24.

Section-VIII: Nasarpur

Figure - 5.23: Land use of Nasarpur in year 2005
Source: Google maps and survey by author

Section-VIII: Nasarpur

Figure - 5.24: Land use of Nasarpur in year 2016
Source: Google maps and survey by author
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Major observations are:

This Section experienced large scale residential development as it was 3% in year 2005 and increased to 18% in year 2016. It is followed by industrial development attributed to 8% increase in industrial land use in this period. Marginal change of land use observed 4% decrease in agricultural land use and 3% increase in commercial land use. Road network increased to some extent as it was 7% in year 2005 which is increased to 15% in the year 2016.

5.3.9 Kelawade:

Kelawade village is located on the main road and have the mostly residential land use. After the development of small village pockets become the growth centres of that area. Same time industrial growth took place at large scale and land use such residential and industrial increased. But old infrastructure services are remained as it is without any modification, addition or expansions.
Section-IX : Kelawade village :

Figure 5.26: Land use of Kelawade Village in year 2016
Source- Google maps and survey by author

Section-IX : Kondhanapur :

Figure 5.27: Land use pattern of Kelawade village in year 2016
Source- Google maps and survey by author
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Figure 5.28: Land use pattern of Kelawade in year 2005-2016

Following are the observations based on land use survey:

In 2005 industrial land use was 3% which has been increased to 6% while residential land use was increased from 16% to 18% in the year 2016. An alarming land use change noticed in terms of change from agricultural land use to other land usage as 75% of land use in year 2005 is reduced to 30% in the year 2016. Just 4% increase in land use for road network is a matter of concern.

5.3.10: Kondhanapur

Kondanpur is the rural growth centre located at 2 to 3 kilometers away from the main national highway number four. Theis is located on the major district road which connects the singhagad fort area further the ghatzone section. Earlier village has small population but due to development of industries the residential land use is significantly increased. The agricultural land use is mostly converted into industrial and residentail one. This is maintained in the figure 5.29 & 5.30 respectively.
Section-X : Kondhanapur

Figure 5.29: Land use pattern of Kondhanapur- 2005
Source- Google maps and survey by author

Kondhanapur

Section-X : Kondhanapur

Figure 5.30: Land use pattern of Kondhanapur- 2016
Figure 5.31: Land use pattern of Kondhanapur village in year 2005 & 2016

5.4 Summary:
This chapter explored the interaction between transportation development and land use change in fringe area of the city in question. The impact of transport infrastructure on land use change identified which is found necessary for evaluating the role of transportation development in the process of land use and land cover change in the urban-rural fringe. The survey analysis indicated large scale changes in land use pattern which has affected to transportation system. The impact on these changes is further examined from stakeholder’s perspective in the next chapter six.