Peri-urbanization and its impacts on rural livelihoods in Mumbai's urban fringe

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1. Introduction

The 21st century is the century of the cities and of urbanization. There are currently 19 megacities in the world and there are expected to be 27 by 2020 (Hall, 2000). Over half of this growth will be in Asia where the world's economic geography is now shifting. Caused in part by the needs for both efficient land use and expanding functionally-distributed areas, Asian modern cities have experienced excessiveness of growth not only in population but also in spatial dimensions at an explosive pace. Since the globalization trend has pushed on restructuring of industries and zoning of land use, which has consequently helped promote the economic growth in Asian megacities on one hand, have brought severe ecological, economical and social inequalities between regions and classes (Fujii, 2004).
The influence of megacities reaches well outside their administrative boundaries to the peri-urban and regions beyond. From the viewpoint of rural areas, human quality of life and agriculture environment sacrificed for urbanization and industrialization and it led to the failure of localization of agriculture and diversification of local economy after all. Over-concentration of the population in urban area in developing countries resulted from these inequalities between urban and rural area. For example, Mumbai, Calcutta and Chennai metropolitan region in India have more than 50% of total population who live in the squatter settlements; most of them are migrants from rural area. It is now widely recognized that there exists an economic, social and environmental interdependence between urban and rural areas. Thus, it is essential that metropolitan region be managed inclusively to ensure equal opportunities to access to regional resource from urban and rural side, taking into account the needs for balanced and mutually supportive approach to development of both urban and rural areas.
This research aims to analyze long-term trends in land-use change, to clarify various factors which have influenced spatial pattern of urban expansion in Mumbai metropolitan region, and to discuss on the relationship with the land use management system operated within the context of preservation of prime agricultural land. A detailed case study on accessibility of physical assets and rural livelihood transformation of urban-rural fringe villages in Panvel block, Raigad district revealed urbanization trends on the local society and their implications for urban-rural relationships in the region.

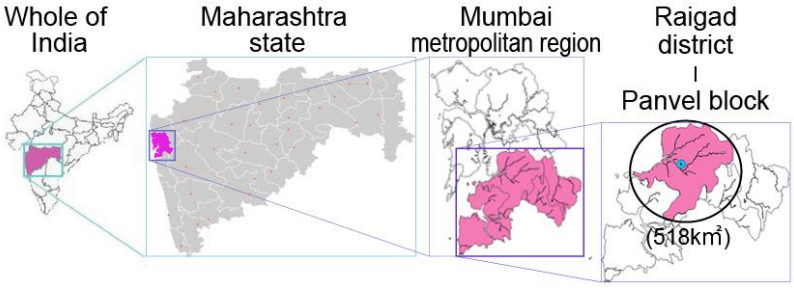

Figure 1: Location of Panvel block, Raigad district

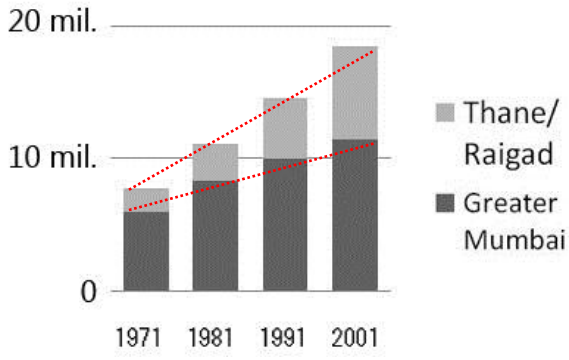

Figure 2: Population changes in MMR 1971-2001
(Source: Population and Employment Profile of Maharashtra state, 2005)

Mumbai Metropolitan Region (MMR) has an area of 4,355km² and a population of approx. 17,700,000 (2011 Census). The MMR consist of 8 Municipal Corporations, 11 municipal councils as for urban municipalities, and 995 village panchayats (rural local bodies). Its administrative region includes entire district of Greater Mumbai (consists of Mumbai city and Mumbai suburban district), and parts of Thane and Raigad districts. As shown in Figure 2, population in Thane and Raigad district has increased at a higher rate than that in Greater in recent decades. The entire area is overseen by the Mumbai Metropolitan Region Development Authority (MMRDA), a Maharashtra state government organization in charge of town planning, development, transportation and housing in the region. In the late 1960s, regional development was considered a necessity to solve a multitude of the problems faced by Mumbai. Therefore, a much larger region was integrated for planning in accordance with the establishment of Regional Plan. Raigad district is located in the southeastern part of the MMR (see Figure 1). The district is geographically subdivided into three parts as 1) coastal lands in the west, 2) Central Belt having a vegetation cover, 3) north-south running hilly areas and reserved forests of Sahyadri range. Panvel block is located in east-central Raigad. It is characterized by competition between agricultural and urban land use in the MMR region.

2. Urbanization trends and main factors in Mumbai metropolitan region

2-1. Population growth, transportation network, industrial location and peri-urbanization

Prior to land use change analysis, MMR's sub-regions were categorized into 8 zones based on the degree of urbanization using the following 4 indicators from census data: 1) density, 2) population growth rate, 3) number of employee, 4) number of regular farmer. Figure 3 shows the three directions of the spread of urbanization along the transportation network. First direction stretches to Gujarat toward the northern part along the western railway. It includes Mumbai city, Mumbai suburban and Vasai block where the city growth had happened at the first period. The second direction runs parallel to central railway to Kalyan toward the northeastern part. It had formed since 1970s and most of dense areas in Thane district are around this arbor. The last direction toward the southeastern side appears parallel to the national highway no.4 and no.17 stretch to Pune and Goa. It has become obvious with the development of the satellite city, called Navi Mumbai and several industrial complexes on the seaside since 1980s. The overlap comparison with population and its increasing rate proves that urbanization trend in MMR has strong relationship with the period and direction of transportation network due to the location of urban center: on the finger of the peninsula (see Figure 4).

Raigad district has been witnessing a giant stride of industrialization, especially that by the chemical industries. The district was a natural zone of expansion for Mumbai based industries (Dalvi, 2000). It has topped among all the districts in Maharashtra state in terms of financial investment since the enactment of state's new Industrial Location Policy in 1992. The new policy declared that polluting and hazardous industries should be banned from Mumbai and Thane, and they are going to be moved to Raigad for promoting of Mumbai as a global financial center. As the result, secondary manufacturing industry in Raigad has rapidly grown since 1990s and industrial land use in Raigad district has increased 5.7 times between 1985 and 2011.

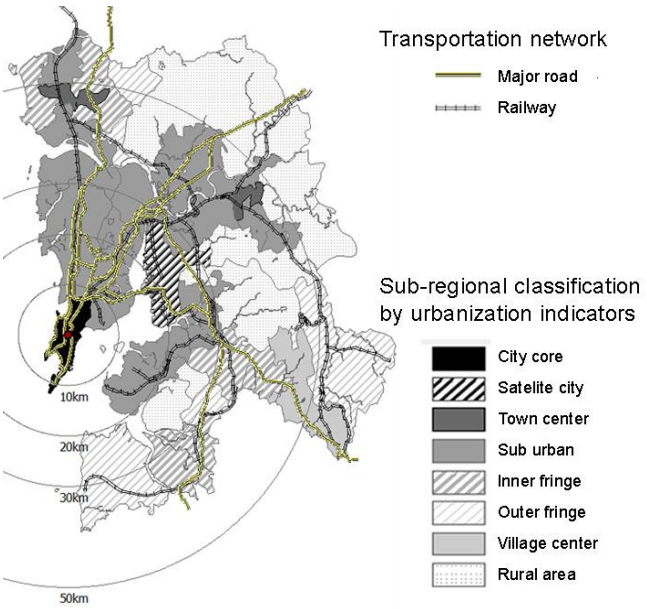

Figure 3: Comparison of the direction of urbanization spread with the transportation network

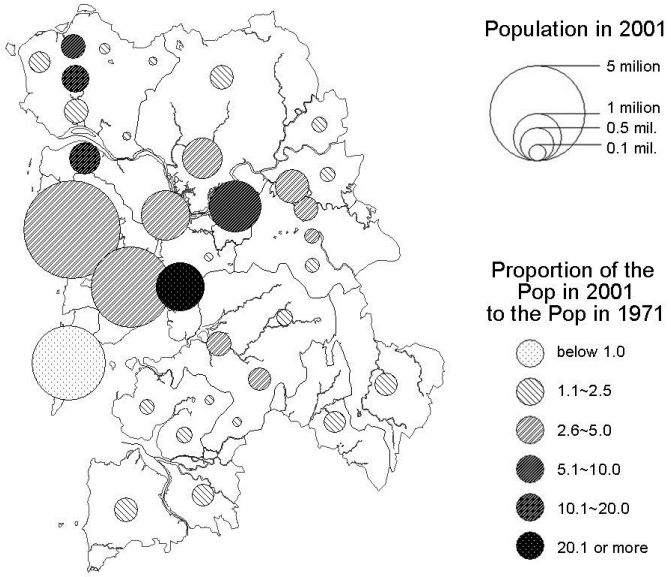

Figure 4: Distribution of population and its increasing rate in Mumbai metropolitan region.

2-2. Analysis on the spatial pattern of urban expansion

In this section, remote sensing image analysis with satellite data used for classification of land cover and extraction of built-up areas are described.
Landsat ETM+/TM images in 1992, 2002 and 2010 used here were obtained from US Geological Survey (USGS) at http://glovis.usgs.gov.
Implementing cluster analysis and supervised classification method, each of the detected clusters was placed into one of eight pre-defined cover classes: Water, Urban, Bare land, Agricultural land, Forest, Field, Paddy field, and Mangrove. From the obtained classified images, urban area change detection results were extracted using a simple masking operation. The result of the change detection for the 1990s (1992 ~ 2002) and 2000s (2002~2010) shows obvious different urban footprints of the region.

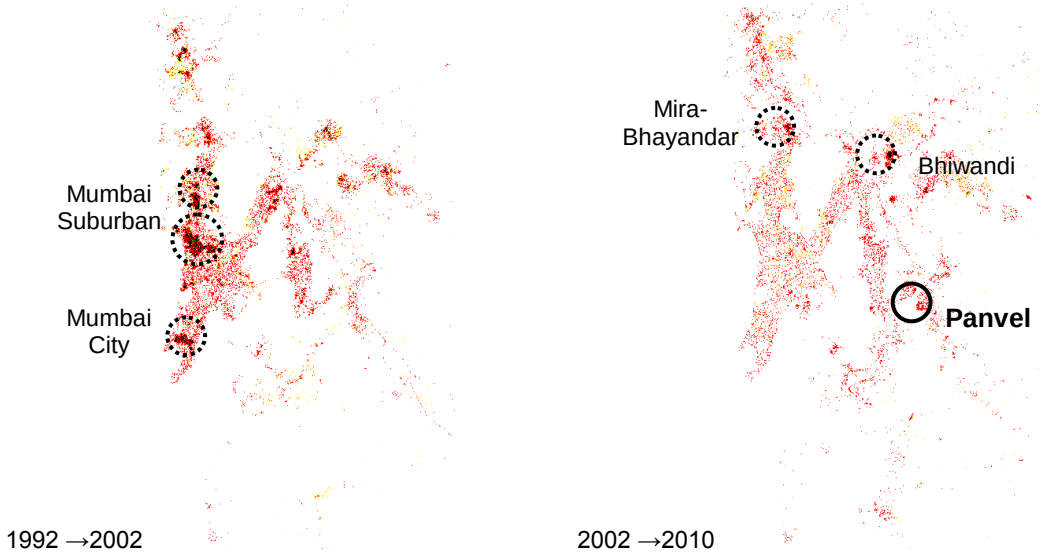

Figure 5: Change detection of urbanized area of MMR from 1992 to 2010

According to Regional Plan, the growth took place mostly in Greater Mumbai until the 1970s. The polycentric structure and development of satellite cities increased due to the land shortage and degradation of living condition in the urban center in the same decade. As a result, urbanization was observed beyond Greater Mumbai, mainly at Navi Mumbai, Thane, and along Manori Creeks in Greater Mumbai in the 1980s. Figure 5 shows that several urban redevelopments occurred in Greater Mumbai in the period from 1992 to 2002, large urban cores have been formed on the extension of axial growth lines to the outskirts such as Mira-Bhayandar, Bhiwandi and Panvel since the 2000s.

2-3. Planning and development control system

As the urbanization in Mumbai metropolitan region progresses, the limits of the region have been expanded and almost half of the Raigad district has been included in its jurisdiction since the enactment of revised Regional Plan in 1996. The implication of this process in the present context is that land use priorities have been changed in the district by MMRDA's own development plan with a top to bottom approach (Dalvi, 2000). A number of infrastructure developments and Special Economic Zone plans are being implemented which have acquired residents' land. Recent new express highway projects and new international airport has also displaced the village households in the vicinity. Through the land use change analysis, average of 23% of agricultural land in suburban area and 6% of that in fringe area were confirmed to have brought under urban development in the region.
Despite the statutory land use plan and the host of laws, acts, regulations and policies, the development control system in the Region has remained weak. It has not been able to

prevent undesirable development. Some of the examples such as industrial development, construction of shops and huts can be seen along Thane-Belapur Road in Navi Mumbai and developments along highways in Green Zone in Panvel block. Apart from the unauthorized construction, there have been developments, which though legally authorized, are unplanned and disorderly, or contrary to the intentions of the Regional Plan. The reasons for this can be traced to a number of factors, such as, inadequacy of development control rules, absence of proper authority to enforce development control rules, lack of monitoring of the development. With reference to areas beyond local authority's jurisdiction, regional plan proposed to extend the planning jurisdiction of local authorities to enable them to plan and regulate development in such areas. Furthermore, amendment of relevant act was suggested to enable the local Authority to function as a Special Planning Authority for its surrounding area. However, according to MMRDA source, the proposals have still not been carried out in full.

3. Analysis on transformation of accessibility of physical asset and rural livelihood and its implications for inclusive urban-rural linkages

3-1. Selection of target villages

To explore in depth the local physical and socio-economic circumstances under the influence of recent urbanization trend, case study was conducted at 3 villages in Panvel block's fringe area. Target villages are limited to Green Zone 1, which is designated by Regional Plan includes agricultural land, plantation areas, and hilly areas to protect agricultural activity, preserve area for recreational use and arrest urban sprawl, in Panvel block. However, selective developments such as farm houses, weekend houses on 2000 sq.m. plots, hotels and resorts, and certain obnoxious or hazardous uses with adequate environmental protection measures are permitted in G-1 Zone by the Development Control Regulations in the reflection of non-remunerative farmers' intention to convert their land for non-agricultural use.

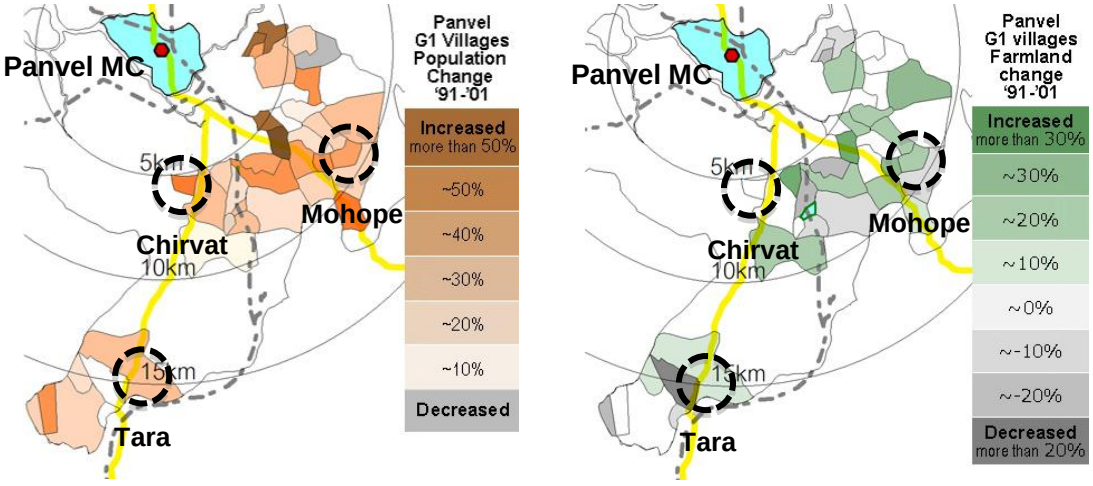

Figure 6: Village mapping by Demographic trends and Changes on area of agricultural land around Panvel

According to the results of compiled and categorized Panvel village map based on Census data 1991-2001 (Figure 6), demographic trends differ between the villages and range from increasing areas at a higher rate than country's natural increase rate (e.g.Chirvat, Mohope) to a region with the similar level (e.g.Tara). In terms of the area of agricultural land, it has

increased only in Mohope. From the combined results of village categorization, Chirvat, Tara, and Mohope village was chosen as target villages.
The main part of the case study was conducted during January to February, 2012, using a structured complete household interview questionnaire with a written pre-tested interview forms. The survey collected valid responses from 31 households in Chirvat, 109 households in Tara, and 42 households in Mohope. Stakeholder interviews were conducted with key people at metropolitan region, district, and village level planning agencies, administrative head of villages, local social workers and NGOs.

3-2. Basic information

Area, total population, number of household and land use change based on Census 1991-2001 are listed on Table 1. Distance of Panvel to each village is 7km, 10km, and 15km in the order of Chirvat, Mohope and Tara. These villages are connected to Panvel by state bus and auto rickshaw in 30-45min.

		Population change			Land use change (ha)				
		Area (ha)	Population	No.HH	Forest	Irrigated land	Farming land	Cultivatable waste land	Non-cultivation
Chirvat	1991	78	165	26	6.3	0	51	11.8	9
	2001	78	231	48	6	0	51	12	9
	91→01	0%	40%	85%	-5%	-	0%	2%	0%
Tara	1991	796	940	187	124	0	86	118	586
	2001	659	1106	224	143	0	86	333	-
	91→01	-17%	18%	20%	15%	-	0%	182%	-
Mohope	1991	184	318	50	59	0	48	46	31
	2001	184	396	75	59	0	71	26	28
	91→01	0%	25%	50%	0%	-	48%	-43.5%	-10%

Table 1: Basic information of study villages (Source: Census 1991, 2001)

3-3. Rural livelihood and urban-rural linkages

Agriculture is undoubtedly the largest livelihood provider in rural India in terms of engaged population. Agriculture is the largest sector in the economy of the country as well. The sector contributes as high as 18% towards the Gross Domestic Product of the country – next to 51% for services and 27% for industry. However, highly exposed to vagaries of weather, insufficient productivity due to miniaturization of agricultural players and plots, insufficient investment particularly in infrastructure are hindering the agricultural sector growth in India (Mouvement pour une Organisation Mondiale de l'Agriculture, 2008).
In contrast, farming is the main productive activity only for 10% of the people in the study villages (Table 2) although half of the households have possession of their ancestral farming land (Table 4), they stated that farming is supplementary activity conducted only during rainy season. The predominant type of non-farm activities is service industry, however, mostly in less remunerative activities such as housekeeping, peon (servant), casual labor, etc. Only the highly educated second or third generation from the affluent family reported engaging in relatively high-paid occupation such as desk job at governmental office or private company in the city.

Household main activities	No.engaged person	% Engaged person	Average age	Average education level*	Ave. income (INR≒55USD)
Service	35	20%	43.1	1.56	5400
Construction	30	17%	45.5	1.86	10393
Transport	24	14%	40.9	1.84	10632
Manufacturing	21	12%	36.1	2.24	11375
etc.	21	12%	35.7	1.75	15000
Trader	17	10%	32.1	2.00	7500
Farming for sale	9	5%	61.8	1.25	5333
Farming labor	8	5%	43.3	1.67	4000
Desk job	8	5%	32.8	2.67	17600
Teacher	3	2%	42.5	3.00	15000
Total	176	100%	40.4	2.00	9074

Table 2: Main activities in rural settlements

* 1.0: primary, 2.0: secondary, 3.0: higher)

The majority of the farming households reported subsistence farmers, while only 15% are selling their surplus agricultural products to the market (Table 3). Most important crops produced and sold are rice, ragi(millet), and barely vegetables (such as kali, dudi, tomato, kakri and chili). Rice producers usually sell their produce to grain traders from outside. In Mohope village, some farmers hold a joint sale in a group at the wholesale market run by the state government in Panvel town. Land shortage and infrastructure especially irrigation are the main constraining factors (Table 3). In turn, these factors result in reduced harvests, thereby limiting the opportunity for surplus production, and hence urban-rural economic and market linkages.

Table 3: Agricultural type and constraints in villages

Farming purpose	No.HH (total=59)
Self-sufficiency	50
Selling	9

Crop type	
Rice only	53
Rice and vegetables	6

Farming actors	
Family and labor	40
Family only	19

Reason of non-selling	
Lack of farmland	24
Unprofitable	8
Lack of water	6
Unknown	5

Table 4: Access to farming land and ownership change

Farming landowners in acres

	No.HH (total=182	
Landless	68	
0.1-1.0	66	
1.1-2.0	14	
2.1.-3.0	7	
3.1-5.0	3	
5.0-	3	cf. Ave.area
Unknown	21	: 1.3acres

Farming land size change in the last 30yrs

	No. HH	Ave. time (yrs	Reason
Unchanged	106		
Decreased	16	16	Inheritance:6 Expropriat:5 Resale:5
Increased	2	26	
Unknown	58		

Reason of monoculture

Lack of water	25
Lack of farmland	11
Lack of Information/skill	4
Unprofitable	2
Unknown	3

Mode of access of farming land

	No.HH	Ave.time (yrs ago)
Inheritanc	111	
Purchase	3	12
Unknown	68	

The average size of land owned is 1.3 acres (Table 4), which is far less than the national average of 3.7 acres (Mouvement pour une Organisation Mondiale de l'Agriculture, 2008). With regard to size distribution, 66% of landowners cultivate land below 1 acre, which reveals that those with land shortages are the poor farmers with smaller land size. This seems to have a negative effect on the amount of grains marketed, thereby weakening agricultural produce flow. The landless people in villages help large landowners on their farm during rainy season and earn crop productions as a reward for labor. Nevertheless, landlessness strengthens linkages by forcing people to involve in non-farm activities outside the village.
Almost 60% of respondents reported access to land through inheritance. According to the interview with the key person in Tara village, there was an allocation by village leaders under the 1948 Tenancy and Agricultural Lands Act. The majority of respondents mentioned that land size had unchanged during the previous 30 years, while 16 households' land had decreased due to inheritance, resale and expropriation for road expansion or construction of railway. Excessive distribution of family land through inheritance and demographic pressure are the major reasons for decreasing land size and production. These factors also limit urban-rural linkages in terms of the flow of grain supplies.

Destination / Type	Domestic	Same village	Near village	Panvel	Pen	Navi Mumbai	Mumbai	etc.	
Farming for sale	0	4	1	4	0	0	0	0	
Farming labor	0	12	0	0	0	0	0	0	
Manufacturing	0	8	2	4	0	3	1	9	
Construction	0	11	6	3	0	0	1	12	
Transport	0	5	3	10	0	0	0	2	
Trader	6	5	2	1	0	1	1	4	
Service	1	17	9	7	0	1	0	3	
Desk job	0	0	2	4	0	3	1	1	
Teacher	0	2	2	0	1	0	0	0	
etc.	1	8	4	4	0	2	4	1	
Total (%)	8 (4)	72 (36)	31 (15)	37 (18)	1 (0)	10 (5)	8 (4)	32 (16)	199 (100)

Table 5: Major job destinations for commuters

The major job destination for commuters is Panvel in most types of jobs, followed by other town centers such as Rajayani, Khopoli and Apta where there are many opportunities for supply works in industrial complexes. Commuters to Navi Mumbai or Mumbai were less than 10% since they are required to be highly skilled, well educated or be able afford the daily travel cost.
Concerning migration, the young and male account for the majority of the migrants. Approx. 10% of households have at least one migrant member. Half of the out-migrants settled in the villages nearby because of the family divide after marriage, rest of them had moved to urban towns seeking for better job opportunities, which may vary according to educational status and gender. It shows that the reasons for rural to urban migration in the region are mainly related to limited local non-farm employment opportunity and land shortage.

In-migrants' previous places of residence were reported both rural settlements within and outside the state and urban town. It is the young, and especially the poor, who dominate among such migrants. The in-migrants gave land shortage and lack of employment opportunity as important reasons for leaving their previous place of residence. However, most of them remain landless and low-income worker as casual labor or shop tenants. Their week connectedness in the community due to lack of local language skill and unbound state of physical assets can be potentially influential factors for re-migration to urban town center in the future.

Table 6: Information on in and out migration

Out-migrants	Total
Destination residence (rural)	=17
Same village	6
Near village	3
(Sub total)	(9)
Destination residence (urban)	
Panvel	2
Rasayani	2
etc.	2
Pen	1
Thane	1
(Sub total)	(8)
Out-migrants' job at destination	
Manufacturing	4
Transport	3
Construction	3
Service	2
Farming labor	1
etc.	1
Unknown	3
Factors affecting out-migration	
Marriage	9
Better job	7
Lack of land	1

In-migrants	Total
Previous residence (rural)	=18
Village out of the state	6
Village in the state	3
Same village	1
(Sub total)	(10)
Previous residence (urban)	
Pen	3
Panvel	1
Thane	1
Mumbai	1
Other city in the state	1
City out of the state	1
(Sub total)	(8)
In-migrants' job	
Service	6
Trader	4
etc.	3
Transport	2
Farming for sale	1
Unknown	2
Factors affecting immigration	
Better job	9
Better living	2
Education	1
Houseless	1
Unknown	5

4. Discussion & Conclusion: Land tenure issues and urban-rural linkages

Despite land and forest are the main sources of livelihood of rural people, they are perpetually threatened over their land rights. Today this threat has become more alarming than ever as the process of development and industrialization has begun to sweep over the rural region (Dalvi, 2000). Since early times, there were several households used to grow coarse grain on the slopes of hills surrounded the village. The British government, in around 1875, allowed those dwellers who were mostly tribals to cultivate some forest plots to earn their livelihood on annual rent basis and the lease was renewed every year. This practice continued even after independence. In 1970, the state government took a decision to confer individual property rights on the plot holders but it could not be implemented due to lack of

political will. Mass movements were organized by the action groups over villager's ownership right for the land.

At present, the land problem has become compounded due to urbanization and industrialization. The rise in land prices have attracted brokers and agents, still is insufficient to move to urban area for the small plot holders. On the contrary, the wealthy people in urban area have begun seeking for plots for their recreational activity which have resulted in a number of farm houses and resort hotels all along the highway from Panvel to the villages. Landlessness also risks potential conflict among landless and landowners in the community. Even if the aforementioned problems such landlessness, small farm size, and uncertain ownership encourage urban-rural linkages in terms of the flow of people, they weaken them in terms of the flow of agricultural produce from rural to urban areas and the potential of farmers to purchase industrial goods from urban areas. Thus, land shortages can have both positive and negative effects on urban-rural linkages.

The traditional modes of securing livelihood have been changing rapidly. The above survey results on villagers' main activities presents that employment in secondary and tertiary industry is now prevailing in the region, in contrast to the 1970s, when most of villagers were involving in farming and fishing. Now Patalganga-river and other branch rivers in the region have been polluted by the location of petrochemical companies. Thus many of the interviewee in the village evaluated that there are less direct benefits in agricultural income and living environment from industrialization to villages. These factors considered, it may be said that urbanization has led to the diversification of rural non-agricultural economy. However there is much more remains to be accomplished to enhance the livelihood strategies of the people through strengthening linkages rather than assuming villagers to be farmers and urban dwellers to be service providers. Moreover, non-agricultural activities in rural settlements are not well developed yet, it is necessary to slow the pace of the abandonment of agriculture. Without the intensification of farming systems, small-scale farmers cannot produce for sale. Immediate attention should therefore be given to providing rural farmers with sustained intensification by making inputs, farming implements and credit accessible and affordable to them, especially to the marginal farmers.

In regard to the relationship with the superior urban centers, main destination for out-migrants is relatively vicinal cities such as Panvel. The significance of Mumbai and Navi Mumbai as an urban destination for out-migrants is, however, negligible. This indicates limited employment linkages with the main urban centers, considerable potential role of town centers in rural livelihood. Hence, those centers and surrounding rural communities have to be undertaken inclusively through micro-level area-based rural-urban integrated planning which specifically takes into account socio-economic variables and characteristics of the area.

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