



Changing land use pattern, Encroachment and their related problems in Patna Municipal Corporation

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Abstract : One of the major problems of rapid urban growth is changing land use patterns. Growth in urban population increases with no equivalence in the growth of land size. The pressure exerted by increasing population and rapid urbanization has ignored the need of land in other sectors. Agricultural land and forest area are mostly affected by the growing urbanization. Land use for residential, industry, commercial, civic and cultural purposes tend to dominate in the bid for space in the urban place. Urbanization and encroachment both are leading to various ill effects on the environment, people and their surroundings. Encroachment

is one of the main side effects of urbanization. It refers to illegally entering (gradually and unlawfully) upon the land, property, other possessions, or the rights of another. For example, a building extending beyond the legal boundaries to the neighboring private or public land, or beyond the lawful limit of road or street. The twin pressures of rapid urbanization and resulting encroachment have led to the mismanagement of land which is a common sight in Patna Municipal Corporation. Today the city has been facing problems like unplanned development of residential and commercial areas leading to various sets of problems like traffic congestion, drastic climate change, pollution, slum and squatter settlement, garbage disposal and many health and environment hazards. Thus this paper tries to analyze the changing land use pattern, Encroachment and its related problems in Patna Municipal Corporation area, with the help of a set of questionnaires and selected sample survey.

Keywords: Urbanization, encroachment, land use pattern, unplanned development.

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Introduction :

Land use pattern is the utilization of land for various purposes depending upon physical factors like topography, soil, climatic condition as well as upon human factor such as density of population, duration of occupation, land texture, etc. (Mandal,2011) On the other hand, **Encroachment** refers to unauthorized entry upon the land, property of other possessions or the rights of other. For example – a building extending beyond the legal boundaries to the road or street is called encroachment (Siddhartha and Mukherjee, 2009). Patna is an ancient city which has evolved with the passage of time. It has expanded enormously in all direction except to the north because of river Ganga. It has become one of the densely populated cities in India by considering its area under forest cover and agricultural land. It has seen drastic changes especially for the last 10 years. The large size population, unchecked rural migration and unplanned growth have led to the problem of encroachment in a greater way causing several problems which are discussed in this paper. Nevertheless poor planning leads to inefficiencies and institutional rigidity that hasten diminishing returns and causes inoperative capacities (Mandal, 2011), such is the case with Patna Municipal Corporation. From 1991-2001 the rate of urbanization increased from 21% to 42% which brings out the present scenario of Patna and the working condition of Patna Municipal Corporation.

Objectives :

Thus the main objectives of this study are: (i) To observe the ill effects of encroachment and land use pattern in the city environment.(ii)To analyze the traffic congestion, transportation and parking problems created by encroachment and land use pattern.(iii)To observe the consequences faced by the urban population and government due to encroachment and changing land use pattern.

Hypotheses :

The working hypotheses of this study are(i)Expanding urban infrastructure has led to depletion of agriculture as well as aquatic resources.(ii)The problem of parking and traffic congestion has increased due to encroachment and changing land use pattern.(iii)Government negligence and mismanaged city planning have promoted encroachment in the city.

Methodology and Data Base :

This research work based on a distinct methodology which follows 3 stages-

- Pre-field survey: Study of relevant literature, collection of materials, data and maps, government offices (PMC office) and concerned websites.
- Field survey: Preparation of questionnaire, schedule survey of 100 samples (urban people of 20-50 years of age) and generation of primary data.
- Post-field survey: Compilation, tabulation, cartographic representation and analysis of primary data and preparation of report.
- Sample selection: 100 household were selected for the primary survey which was further categorized into housewives, student, shopkeepers and office goers; 25 each for deeper observation regarding the problem of encroachment.

Study Area :

This study was carried out in Patna Municipal Corporation area. Patna is the capital city of Bihar and is situated on the right bank of river Ganga. On the basis of physiography the city of Patna lies within the south Bihar plain, spreading across an area of 104.22 square kilometers. It consists of 72 wards and is divided into 4 circles.

Changing and use Pattern and Related Problems :

For the past 10 years Patna has urbanized at very rapid pace and a new land use pattern has evolved Bridges, pavements, markets, commercial and residential areas have been constructed. The city is expanding due to large scale rural migration and increasing population. All these led to a change in the land use pattern which is most visible in the last decade. The following table shows recent land use pattern of Patna, where one can see the reduced forest area and increasing land use under residence as a part of changing land use pattern of PMC. This leads to various problems such as water logging, slum development, garbage disposal problem, pollution of air, land, water, etc.

Table – 1. Existed Lands use - PMC Area

LAND USE	AREA IN SQ. KM.	PERCENTAGE
1. RESIDENTIAL	49.56	47.55
2. COMMERCIAL	4.65	4.46
3. MIX USE	3.52	3.37
4. PUBLIC/SEMI-PUBLIC	10.61	1.18
5. RECREATIONAL	3.20	3.07
6. INDUSTRIAL	1.09	1.05
7. TRANSPORTATION	6.15	5.09
8. AIRPORT	1.10	1.05
9. BRICK KLIN	0.73	0.70
10. RIVER/FLOOD PLAIN	3.49	3.35
11. WATER BODY	1.06	1.01
12. VACANT LAND/AGRICULTURE	18.40	17.66
13. FOREST	0.67	0.64
TOTAL	104.22	100

Source : PMC, Department of agriculture and Cooperation.

Land use pattern has changed rapidly since last 10 years making Patna urbanized but it has led to several problems due to encroachment which cannot be ignored as it creates havoc. Some of the burning problems are as follows:-

1. DEVELOPMENT OF COMMERCIAL, RESIDENTIAL AND INSTITUTIONAL AREAS:

Residential areas have increased without proper planning of drains and garbage disposal in areas like Danapur , Jagdeo Path upto Khagaul to Bypass, Ashiyana Nagar and Phulwari Digha which were earlier used as agricultural land are now facing the problems of drainage and traffic.

Earlier the main markets of Patna were, Patna Market, Khetan Market and Maurya Lok, now many new markets have come up in the already populated areas of Frazer Road, Patliputra (P N M Mall), Boring road (G.V. Mall), Exhibition Road Market etc. adding to the problem of unplanned growth and overcrowding in the evenings.

In the absence of proper place in the centre of the city, many educational institutions have been shifted to outskirts of Patna such as D.A.V. has setup many branches at Khagaul, Digha, Sheikhpura, Saguna More etc., DPS at Shahpur, Gyan Niketan at Gola Road, Don Bosco at Digha Ghat. and Chanakya Law college at bypass. This requires private transportation like buses auto rickshaw and other private vehicles adding to the problem of pollution and traffic congestion during school hours.

From table 1 it is clearly seen that to provide shelter to huge population of Patna, cultivable land and forest have been converted into commercial and residential purposes. Hence, due to deforestation, carbon dioxide does not get absorbed from the environment resulting in the rise of temperature .On the other hand, transpiration has decreased due to loss of vegetation leading to varying and reduced rainfall. During winter the temperature decreases more than the average in the absence of trees which could have trapped the cold breeze from entering the city area.

**Table - 2. Change in Temperature
Temperature in Degree Celcus**

YEAR	2000		2005		2013	
	MAX	MIN	MAX	MIN	MAX	MIN
WINTER	24.6	9.3	26	7	24.4	2
SUMMER	38.6	22.1	42	21	45.5	26.3

Source : World Weather Organisation

Table - 3. Total Rainfall (in mm)

YEARS	TOTAL RAINFALL (MM)
2000	915
2005	710
2010	573
2013	914

Source : Directorate of Static Evaluastion Bihar

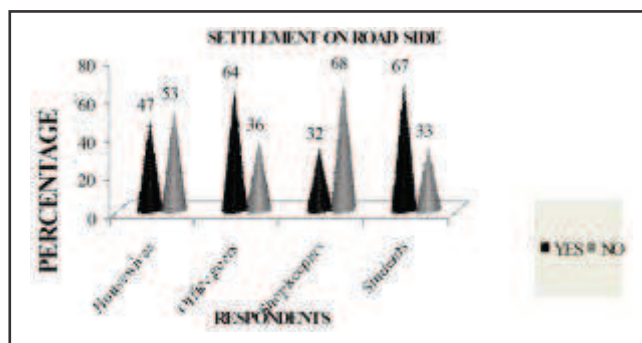
From the above data it is clear that for the past 14 years Patna has experienced major changes in climatic conditions; winter has become cooler with minimum temperature 9.3°C in the year 2000, 7°C in the year 2005 and 2°C in 2013. In the same way, summer has become warmer with maximum temperature 38.6°C in the year 2000, 42°C in 2005 and 45.5°C in 2013. In the last 10 years rainfall has also decreased by 342 mm. Thus the first hypothesis has been proved right.

2. THE PROBLEM OF SLUM AND SQUATTER SETTLEMENT : Unchecked Migration has increased the land price in Patna. Hence it has become unaffordable for the poor people to make shelter so they squat on unoccupied areas. It has resulted in growing number of slums in the city. These slums lack proper drainage, garbage disposal and most important toilet facility, encroach the nalas and dumping ground thus further adding to the problem of cleanliness and hygienic conditions around the city. The pavements have become the dwelling

places for the slum people which can be seen at Nayatola (Kumhrar), R.Block , Dinkar Gulambar, Adalatganj Raja Bazar and many other places.

The problem of slum has been also observed by the respondents and, it was found that 47% of housewives, 64% of office goers, 32% of shopkeepers and 67% of students, have observed slum settlements on road sides and pavements.

Fig.1. Percentage of respondents facing slum and squatter settlement



Source : Field Survey, 2014

3. INCREASE IN THE UNAUTHORISED SHOPS AND ROAD SIDE VENDORS: The number of shops has increased due to rapid growth of population, industrialization and urbanization. The most important reason is the scarcity of jobs in the urban areas for the poor people, who are forced to open illegal shops on roads or street as road side vendors selling fruits and vegetables or clothes, leading to encroachment of roads and congestion of city areas.

ENCROACHMENT AND RELATED PROBLEMS

Encroachment is one of the biggest negative outcomes of urbanization. Around Patna Municipal Corporation (PMC) area, the roads are congested and encroached by many activities which have adverse effect on physical, social, and economic field of the city. Commonly encroached sites in Patna can be seen at Ashok Rajpath, Station Road, Khetan market, Antaghat etc. Where

encroachment is done by vendors and shopkeepers it occupies about 2-3 metres of the road from both sides. Encroachment is caused due to illegal and unplanned constructions, and human interventions (vendors, road side shops and parking, unplanned migrations etc.) According to the survey, following problems have been observed due to encroachment:

1. THE PROBLEM OF TRAFFIC CONGESTION: Traffic congestion is a condition where a number of vehicles on road become stand still or slow down leading to traffic jam. It is caused due to the rapid growth of population, increase in the number of bikes and cars as well as commercial vehicles.. Construction on the road side and related building materials kept on the road side result in the encroachment of roads leading to traffic congestion. On the other hand, an unauthorized shop which causes encroachment by capturing 2 to 3 meters of roads from both sides also results in the congestion of traffic.

Table - 4. Traffic Congestion (in %)

RESPONDENTS	YES	NO	SOMETIMES
Office goers	75	10	15
Shopkeepers	70	15	15
Students	35	47	18

Source : Field Survey, 2014

According to the field survey it was calculated that, every day the people of Patna waste an average of 40-50 minutes on road in traffic which is around 6 hours in a week and 24 hours in a month and approximately 10 - 12 days in a year which is a matter of concern. It was also found that the students, that is, about 35% of them face maximum problem due to traffic congestion while going to their study places or institutions, this is followed by office goers that is 75% of them who often get late to their work place due to traffic congestion. The

last group is of shopkeeper about 70% of them are affected only during festival and on special occasions like rally and political processions.

2. REDUCTION IN PARKING SPACE: The encroachment either permanent or temporary has further aggravated the problem of parking. It is mainly caused due to the road side vendors, increasing numbers of vehicles, markets and unplanned expansion of the city area. The best example is the Railway Station area which is encroached and overcrowded due to parked auto rickshaw and the buses that move to and fro from the station. Rampant encroachment by street vendors is one of the reasons behind the everyday congestion and reduction in parking space near Railway station in Patna. Similarly there is no proper parking at Gandhi maidan, Raja bazar, Dak banglow road, Frazer road etc. So people are compelled to park their vehicles on the roads leading to temporary encroachment. On the other hand, limited parking space at P&M mall, Boring road, Patna market and Hathwa market does not serve the purpose as population and numbers of vehicles have increases over the years.

According to the survey while 65% of the office goers have the facility of proper parking lot, 22% of the shopkeepers have the facility of parking left while 5% of office goers are with no parking facility, hence compelled to park on the street followed by 53% of shopkeepers all this has aggravated the problem of encroachment of the roads.

Table - 5. Parking area of Vehicles (in%)

RESPONDENTS	PARKING ON STREET	PARKING LOT
OFFICE GOERS	5	65
SHOP KEEPERS	35	22

Source : Field Survey, 2014

3. GARBAGE DISPOSAL PROBLEM:

Garbage disposal in Patna is pathetic, since there is no proper disposal area due to encroachment, garbage is thrown either on the corner of the main road, on bridges and road side. Such is the common site in the case of major commercial areas, established at the side of the main roads. On the other hand, due to the lack of management and negligence of PMC; garbage is also thrown in the open land or field due to which parks and playground have been converted into dumping ground. A survey was done regarding the location where garbage was usually disposed, the results are as follows:

Table - 6. Location of Garbage Disposal (in %)

LOCATION	DUSTBIN	OPEN SPACE AREA	STREET
% OF DISPOSAL	44	20	36

Source : Field Survey, 2014.

During the survey it was found that only 44% of respondents threw garbage in dustbin while 20% of respondent threw it in the open area. These open areas are either parks or play grounds which are converted into dumping grounds. Another 36% of respondents threw garbage on streets, dividers, nalas etc.

Areas under observation were Kankarbagh road, Rajendra nagar over bridge, Jagdeo path, Ashok Rajpath, Boring Road, Frazer Road , colonies like Patliputra, Nageshwar colony, Buddha colony, S.K.Nagar, Kumhrar, Mahavir colony Hanumannagar etc. The respondents gave various reasons for improper garbage disposal as shown in the table 7 :

Table - 7. Respondent's opinion about Improper Waste Disposal

RESPONDENTS	GOVERNMENT NEGLIGENCE	PEOPLE CARELESSNESS	OTHERS
HOUSEWIVES	47	45	8
OFFICE GOERS	52	43	5
SHOPKEEPERS	30	56	14
STUDENTS	56	40	4

Source : Field Survey, 2014.

The above data shows that majority of people that is office goers and student observe that improper disposal of garbage is caused due to government negligence on the other hand 56% of shopkeepers, 43% of office goers, 45% of housewives, and 40% of students think it is caused by the carelessness of the people.

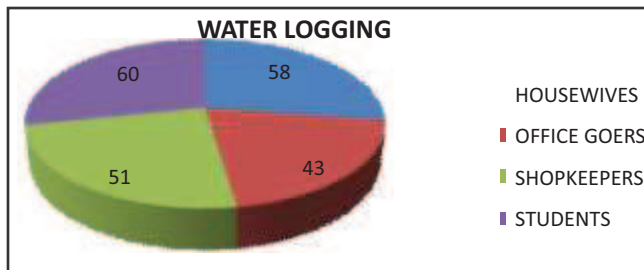
A survey regarding CHAKACHAK PATNA ABHIYAN was carried out among the housewives and it was found that only 32% have benefited by this scheme while 40% have not benefited by the scheme and rest 28% were unaware about such scheme running in the city.

4. WATER LOGGING PROBLEM: As there is no proper place for dumping due to encroachment garbage is thrown into 'Nalas' which choke the drainage system causing water logging in rainy season. Encroachment over drains cause choking of drains at several places which divert the flow of drain water to residential areas and busy roads of the city, e.g. drains of Antaghat, BazarSamiti etc are encroached by vegetables vendors.

It was also observed from the survey that illegal occupancy like slums and unplanned constructions over drains further aggravate the problem of water logging, it can be seen all over the PMC area such as Kankarbagh, Kadamkuan, Boring road, Station road etc. It was observed from the survey that every group faced problems of water logging due to encroachment as shown in

following figure-

Fig. 2. Percentage of respondents facing the problem of Water Logging



Source : Field Survey, 2014.

It is evident from the above table that 60% of students are badly affected by the problem of water logging followed by housewives 58%, shopkeepers 51%, office goers 43%, due to encroachment.

ROLE OF PATNA MUNICIPAL CORPORATION (PMC) ALONG WITH PUBLIC WORKS DEPARTMENT AND TRAFFIC POLICE DEPARTMENT

After observing the changing land use pattern and encroachment the concerned departments like Patna Municipal Corporation, Public Works Department and Traffic Police were approached in order to find out what actions have been carried out to solve the problems discussed above. The findings are as follows:-

- According to them new parking areas have been constructed in major residential and commercial areas of Patna like Boring Road, Mauryalok , S.K. Puri and Railway station to reduce traffic jam and encroachment by vehicles on road side.
- Proper actions and notices have been given to eradicate slum settlement on pavements and roadsides, and also proper housing facilities have been given to slum dwellers at Nayatola and Nala Road.
- The construction of several parks in and around residential colonies have been

done decreased the pollution level and to increased the greenery in the city area such as Eco Park, Buddha Park and other children's parks. A survey was carried on to illustrate how many respondents are benefited by the parks and the result was as follows :-

Table - 9. Parks Facilities (in %)

RESPONDENTS	PARKS
Housewives	20
Office goers	38
Shopkeepers	26
Students	33

Source : Field Survey, 2014.

Thus, it was observed that 38% of office goers enjoy the facility of parks in thier working area followed by 33% of students benefited by parks and playgrounds and only 20% Housewives and 26% shopkeepers enjoy the facilities like parks and playgrounds respectively.

- 'Nala Urahi' is carried out every year before the rainy season, from April to June; to prevent drainage problem and water logging and water pumping is done to remove excess water from the roads and fields of the city.
- Garbage is collected early in the morning before 9am and dumped near Ramchak Bariya which is a 47acres open land.
- Construction of flyovers on the Bailey Road is a major step taken to lessen the pressure of traffic.
- Demission of traffic during rush hour is also practiced to ease traffic jams.
- Shifting of bus stand, auto stand from the middle of the city to decongest the city especially during the festival season, political programmes, strikes etc.

It was also found out that human manpower is not sufficient in the PMC leading to delay in carrying out many ongoing programmes. Here is a data representing the workers in Patna.

Table - 10. Workers in PMC

	POST	POPULAYION PER WORKER		WORKER PER KILOMETER	
		1975	2012	1975	2012
DEMAND FORCES	- SANITARY LABOUR	135	481	111	32
	- SANITARY SUPERVISOR	2140	7616	7	2
	- SANITARY INSPECTOR	2252	80152	0.67	0.19
	- DRIVER	6757	24016	2.22	0.64
WORKING	- SANITARY LABOUR	135	517	111	29
	- SANITARY SUPERVISOR	3262	17718	4.60	1
	- SANITARY INSPECTOR	22523	336640	0.67	0.05
	- DRIVER	6391	105200	2.35	0.15

Source : Gazette of Bihar, 2014.

The responsibility of PMC is massive and extensive. All its work cannot be done manually, so PMC department needs certain tools and equipments to expedite its work. PMC has been provided certain tools, machines and Lorries to help the work of cleaning and repairing the city. The following data shows the available machines to the PMC.

Circle wise Machines of PMC

MACHINES	NEW CAPITAL CIRCLE		BAKIPOR CIRCLE		KANKAR-BAGH CIRCLE		PATNA CITY CIRCLE		CORPORATION'S (PMC)	RESE-RVES (RESE.)	TOTAL
	PMC	RESE	PMC	RESE	PMC	RESE	PMC	RESE			
BOCAT	2	0	0	0	1	0	1	0	4	0	4
TIPPER	6	6	0	0	0	0	4	0	10	6	16
JBC	1	0	5	0	0	0	0	2	6	2	8
COMPACT	3	0	0	0	0	0	0	0	3	0	3
TRACTOR	20	23	7	21	2	14	10	26	39	84	123
COMVAK	1	0	0	0	0	0	0	0	1	0	1
FOGGING MACHINE (BIGGER)	1	0	0	0	0	0	0	0	1	0	1
FOGGING MACHINE (SMALLER)	2	0	0	0	0	0	0	0	2	0	2
POLKAING	1	0	2	1	1	0	0	0	4	1	1
POLKING(200)	0	1	0	0	0	0	0	0	0	1	1
POLKING (70)	0	1	0	0	0	0	0	0	0	1	1
HIGHWAYTIPPER	0	1	0	3	0	2	2	2	0	8	8
TROLLEY	145	0	60	0	50	0	100	0	355	0	355
TOTAL	182	32	72	24	55	17	116	30	425	103	528

Source : Gazette of Bihar, 2014.

PERFORMANCE OF PMC:

After considering the facts and figures from PMC, a question was asked to the different categories of respondents whether they were satisfied with the work of PMC and how the working of PMC has benefited them. The report was as follows: –

Table - 11. Respondents benefited by the workings of PMC (in %)

WORKINGS	HOUSEWIFE	OFFICE	SHOP-KEEPER	STUDENT
WIDENING OF ROADS	23	48	38	40
MANHOLE CONSTRUCTED	43	46	33	32
PUMPING OF WATER WHEN WATER LOGGED	53	47	42	38
VENDORS REMOVED	33	52	56	47
PROVIDED WITH GARBAGE BIN	59	57	21	51

Source : Field Survey, 2014.

The above data shows various activities done by PMC and the percentage of respondents who observed their work. From the given response of the respondents it can be concluded that PMC department is not working as per the expectation of the people and they are highly dissatisfied with the work of PMC which includes removal of vendors and slums, road maintenance, widening of streets and roads, garbage collection, drain management etc.

According to the survey it was found out that 84% housewives and 92% of the students are highly dissatisfied with PMC, whereas 20% of office goers and 35% of shopkeepers were not satisfied with the slow working of public departments.

Conclusion :

Urbanization is a continuous process which helps in the growth of a city benefiting the people

residing there. It includes activities like construction of new residential areas, children parks, drainage systems, roads and flyovers, etc. The city of Patna is also being urbanized and is expanding rapidly, but with increase in population and rural migration, the city has expanded without any proper planning. All these result in the illegal capture upon the land, road and property of others or government creating the problem of encroachment.

According to PMC and PWD departments, they are working in and around city but they lack in resources and manpower which adversely affects the maintenance of the city. They also complain about the people’s attitude towards cleanliness and encroachment in the city. Still there is an urgent need that departments like PMC, PWD, and traffic police along with general people should work together to improve the changing land use and act against encroachment.

Suggestions :

- Government and concerned authorities cannot do anything without the help of common people. They should co-operate with the PMC department.
- Awareness is needed to change their mentality and increase their understanding about the importance of cleanliness around them.
- PMC and PWD should take action against illegal constructions.
- PMC should be work effectively for proper disposal of garbage.
- The street vendors should be given appropriate place on the basis of license and registration basis so as to decrease the problem of temporary encroachment in Patna.

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