



Impact Assessment of Commercialization of Main Roads in Planned Housing Schemes: A Case Study of PIA Housing Scheme

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The phenomenon of commercialization of residential properties is taking place rapidly. Although conversion of land use from residential to commercial in built-up areas is not new in developing countries but planned housing schemes also start experiencing this land-use conversion, and now are no more predominantly residential. Furthermore, declaring a road commercial by the competent authorities, even without taking necessary improvements in infrastructure and consent of the community, further exaggerate the problem. The negative consequences of this phenomenon have a severe effects on residential areas and include environmental problems, traffic congestion, noise, and air pollution, and affect the residential character of the area in negative manner for which they were initially developed. The aim of the study is to describe briefly about remits of commercialization policies in Lahore and then to assess the functionality of commercialized residential roads through assessment criteria based upon the indicators established to assess capacity of road infrastructure before declaring it commercial. This includes road management plan, details of road network with condition of road, its width, Pedestrian and Public transport facilities, structure, including the primary, mixed-use, and secondary nodes. Perception of the users and residents regarding the change in the use of land is also weighed up. The findings of this research will draw the attention of responsible authorities to improve the design guidelines, which are essential to consider before commercializing the residential roads.

Keywords: Commercialization; Impact Assessment; Land Use Conversion; People's Perception; Residential Neighborhoods.

Introduction

Developing countries, like Pakistan, experiencing rapid urban growth, even the planned residential schemes are bearing the burden of increased population [1]. To cater the needs of increased population, conversion of residential land use into commercial activities with or without official consent of the authority is increasing, causing unfavorable impacts on adjacent land uses in general and residential neighborhoods especially [2]. In Lahore, present estimated population of 11.13 million is expected to cross the figure of 14 million by the end of 2022 [3]. Lahore Development Authority (LDA) and City District Government Lahore (CDGL) are responsible to establish a continuous process of planning and development of the metropolitan area. However, Master Plan, principal planning document, has not been revised at regular intervals to made necessary adjustments to accommodate changing circumstances [4]. It causes rapid uncontrolled commercialization with the market operating freely and guiding the whole process at the expense of increasing traffic jams, smoke, and noise pollution and, above all,, destroys the peace of residential community [5]. LDA announced its updated Land Use Rules 2014 [6], under which major roads of the city are project to commercialize time to time, these rules were to inform all stakeholders by advertisement and with the authority consent. Permitting conversion of land use without improvement of road seems not only withdrawal from planning principles but also endangering the spatial structure of Lahore city, causing serious problems, other than that, most plots and roads are illegally commercialized by their owners without official consent. Which have resulted in parking problems, reduction in capacity of roads and, increase in congestion, traffic delays, air and noise pollution, burden on utility services; this will also make pedestrian mobility difficult, increased costs of conflicts along with many other associated problems.

The research mainly focuses on the assessment of commercialization of residential roads and suggests the measures for improving to achieve the goal of sustainable development. For this study, Main Boulevard of PIA Housing Scheme was selected as case study area. A literature review is carried out to the regulations and guidelines for commercialization prepared by LDA. Opinion of residents regarding the commercialization of main road was recorded without any improvement work through questionnaires. Finally, the semi-structured interviews were conducted with the officials from the relevant authority (i.e., Lahore Development Authority). Later, suggestions and recommendations are made by analyzing the data. The findings of this research will draw the attention of responsible authorities to improve the design guidelines, which are essential to consider before commercializing the residential roads.

The aim of research is to understand the effects of commercialization of residential roads in Lahore. However, the specific objectives of the study are as follows:

1. To review the literature on policies, prevailing practices, and institutions dealing with commercialization in Lahore.
2. To identify criteria for the evaluation of functionality of commercialized residential roads.
3. To study the perception of the user through questionnaires and to conduct interviews of officials regarding the change in the use of land.
4. To draw the conclusion and give commendations for measures regarding commercialization of major residential roads.

Material and Methods.
Investigation site.



Figure 1. Boundary of PIA Housing Scheme, Lahore (Source: Google Maps)

The study site was selected keeping in view the problem of commercialization. The focus of this research is to study the impact assessment of commercialization in main residential roads of planned housing schemes and to examine the perception and level of satisfaction about it. The case study was Main Boulevard PIA Scheme, starting from Wapda Round About to Hakim Chowk PIA Scheme. The land use of this main boulevard had been converted from residential to commercial. The PIA Housing Scheme has an area of 2171.70 Kanal (Source: Lahore Development Authority). This case study area has been selected on the basis of its location, representation of all the socio-economic groups of people, and because these are fully developed and occupied private housing schemes under the Lahore Development Authority (LDA), which is the planning agency to plan and regulate development in the city. The scheme is linked with Wapda Town block D3, D2, and B4 and also with M.A Johar Town phase II, Iqbal Avenue. It comprises nine sectors i.e. A, AI, B, BI, C, D, E, F, and G. Sector C has mainly commercial activities. There are three categories of plot sizes i.e., 1 kanal, 15 marla, and 10 marla Sector BI, C, and D have 1 kanal plots. Between sector G and F Wapda By Pass passes having width 200'. Figure 2. shows the digitized map of PIA Housing Society. The Land use is given in table 1. below:

Table 1. Land use of PIA Housing Society (Source: LDA)

Sr.No.	Land use	Area (Kanal)	Percentage
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1.	Residential Plots	1439.62	66.29
2.	Roads	480.60	22.13
3.	Open Spaces	123.14	5.67
4.	Public Buildings	43.65	2.01
5.	Commercial Zone	43.87	2.02
6.	Graveyard	40.82	1.88
	Total Area	2171.70	100

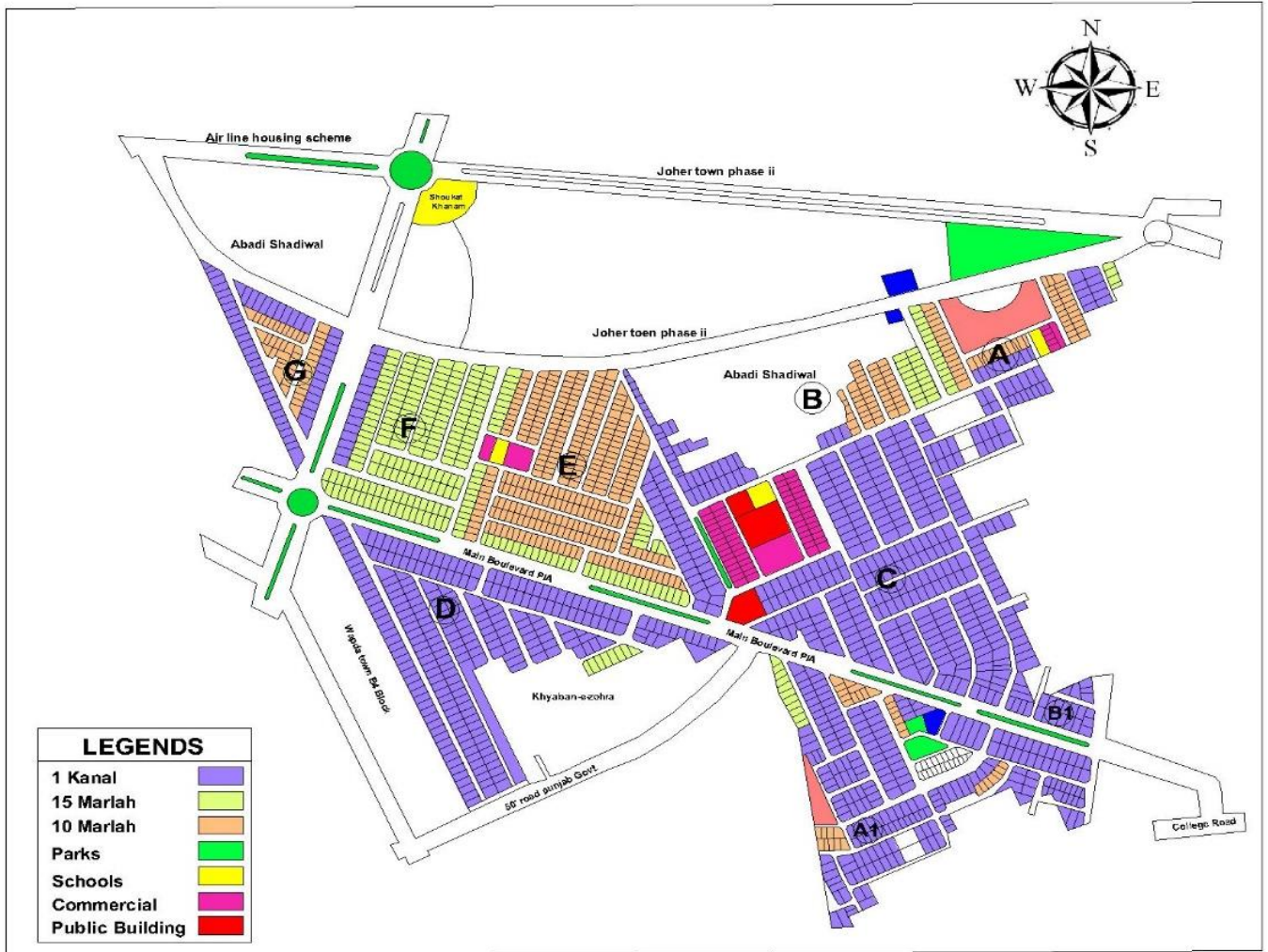


Figure 2. Digitized Map of PIA Housing Scheme (Source: Digitized by Researchers)
Primary Data Collection

The data selected for the case study has been broadly divided into three parts. The first part includes the questionnaires filled by the residents of the housing scheme. Secondly, land use and commercial activities on the selected road has also been investigated through personal observation through interview/visual observations of the researcher. Lastly, interviews with the competent authority dealing with the commercialization have been conducted. Thus, the nature of the analysis adopted for the research is:

- i. Analysis of the land use survey of Main Boulevard.

- ii. Analysis of the field surveys to find user perception about commercialization of Main Boulevard.
- iii. Analysis of the observations done by the researcher.
- iv. Interviews with authority officials dealing with commercialization process.

a) Questionnaire Formation:

Officials and resident questionnaire and checklists were designed keeping in mind the research objectives. The first part contains the general questions about the age, gender, ownership of house. The main part of questionnaire consists of commercialization impacts, involvement and opinion in commercialization process, improvement of road, and need of commercialization, usage of road, pedestrian facilities, and parking on the road.

b) Selection of sampling technique:

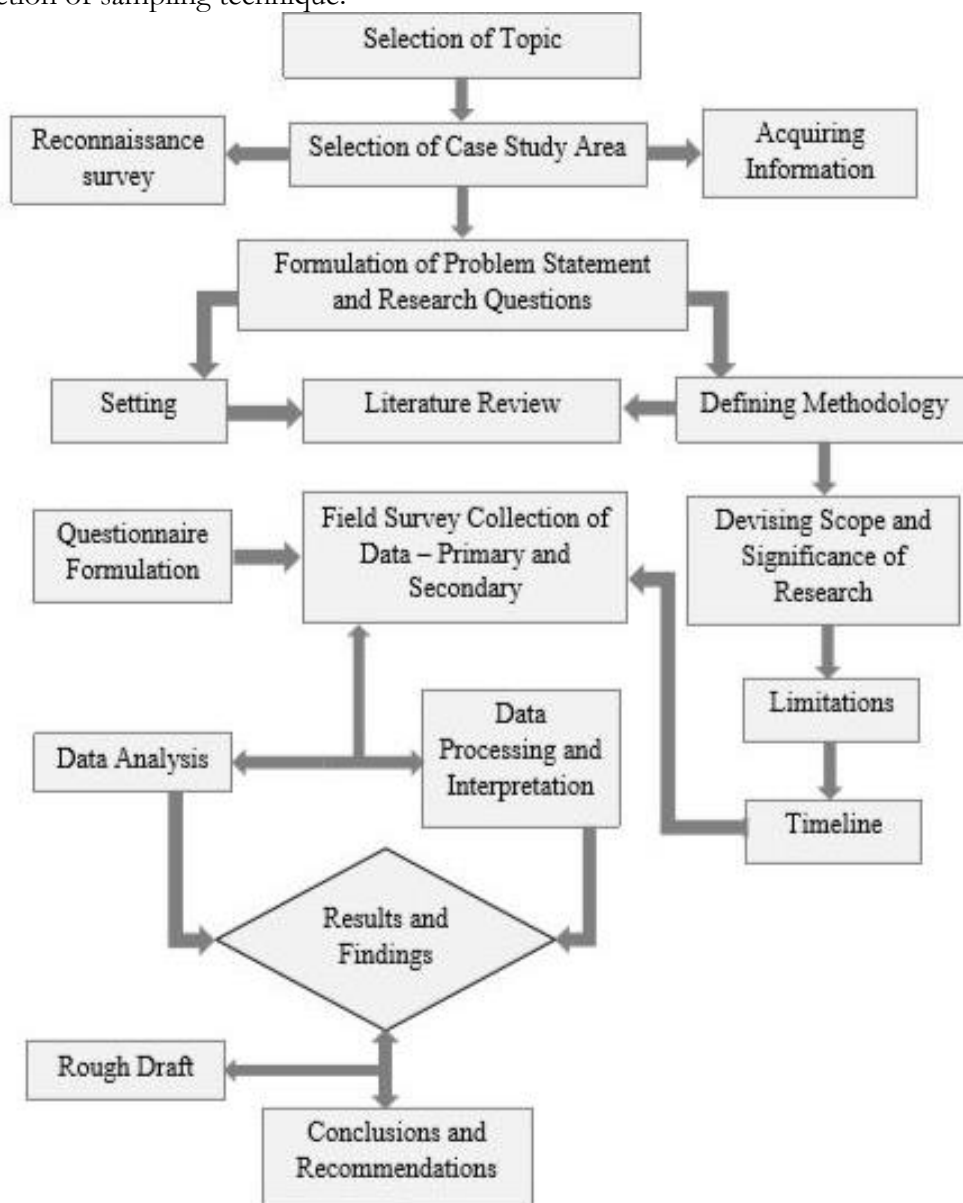


Figure 3. Flow of methodology

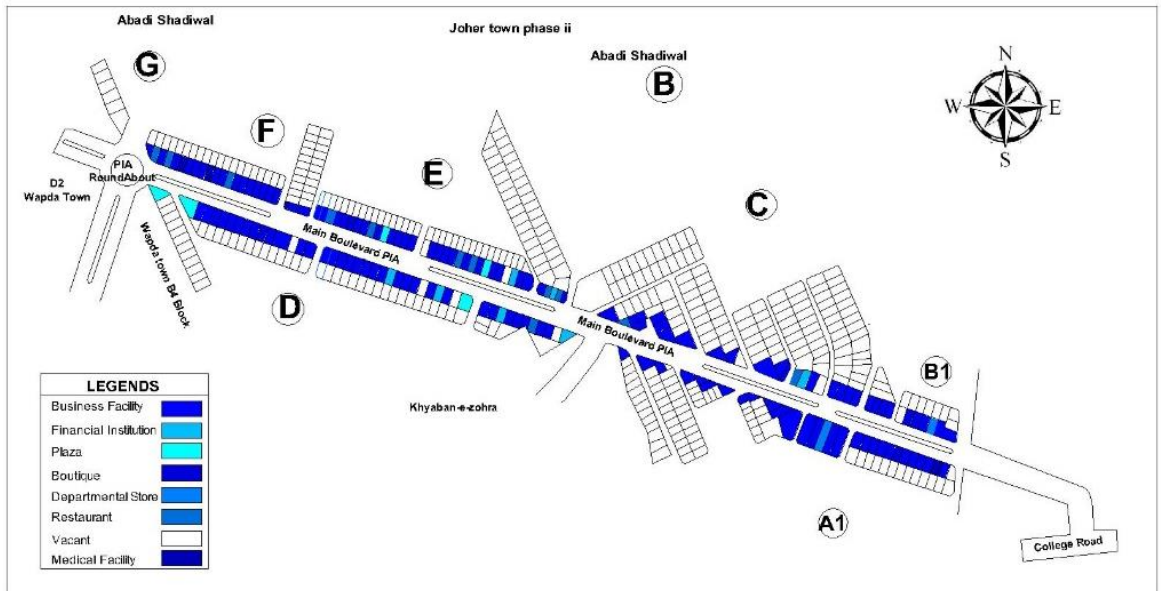
Probability sampling technique is used to interview the residents regarding the commercialization of PIA Main Boulevard. It is the most popular method for choosing a sample among population for a wide range of purposes. Hence 25 questionnaire-based interviews were carried out from the residents of the area.

c) Interview with LDA officials:

After finalizing the questionnaire and adopting a systematic approach to collect the necessary data, the questionnaire-based survey was conducted with the LDA officials; based on open-ended questions. The information gathered from the officials was based on structured talk about the reason of commercialization, measure taken before commercialization, the involvement of residents and users, the rules and regulations and their views about commercialization process.

d) Land use survey of main boulevard and its digitization:

Land use survey was conducted on PIA Main Boulevard. All the plots along the road had been commercialized and having different types of commercial activities. All the commercial activities had been noted on that road, and categories are made according to LDA Land Use Rules 2014. The categories of commercial uses along that road are Business Facilities, Medical Facilities, Boutique, Plaza, Departmental Stores, Restaurants, and Financial Institutions. Different categories of commercial activities are shown on the map by using different colors. (See figure 3).



Secondary Data Collection

The data was collected from the official sources, Lahore Development Authority, regarding the commercialization of roads under LDA. The rules and regulations for commercialization in Lahore city are also studied, which are as follows:

INSTITUTIONAL POLICIES OF COMMERCIALIZATION OF MAIN ROADS IN LAHORE



Upon comparing all these institutional policies of commercialization[7], [8], [9], [10], [11] over the years, the approaches considered in all policies does not have all the factors that should be considered during the process of change of use of land for residential roads.

Result and discussion.

Profile of the Area

Socio-economic profile of the residents was made by asking the age, Family structure, no. of household, and the no. of family members.

Table 2: Profile of the Area

Sr. No	Type of Family	Percentage	No. of Household	Percentage	No. of Family Members	Percentage
1	Single	60	1	46	1-5	64
2	Nucleus	0	2	38	More than 5	36
3	Joint	40	More than 2	16	-	-
Total		100	Total	100	Total	100

Community and extent of Public Involvement in Commercialization Process

As per the survey, most of the residents were not involved in the commercialization process. Table 3 shows the percentages of involvement in commercialization process.

Table 3. Community Involvement in Commercialization Process

Involved in Commercialization Process	Frequency	Percentage (%)
Yes	4	16
No	21	84

From those 16% who were involved in commercialization process, 50% of them stated they were involved on complaint level, 25% stated that they were involved on the design level, and 25% stated that they were involved on planning level.

Table 4. Extent of Public Involvement

Extent of Public Involvement	Percentage (%)
Planning	25
Design	25
Complain	50

Improvements Done by Competent Authority before Commercialization

This question was asked to check whether any improvements have been made on the road. Most of the residents said there were no improvements by the authority. Table 4.10 shows the percentages of responses taken. Almost 36% respondents stated yes, 60% respondents stated no, they have not seen any improvement, while 4% respondents said they were not sure about the improvement of road.

Table 5. Improvements Done by Competent Authority

Improvements by Competent Authority	Frequency	Percentage
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Yes	9	36
No	15	60
Not sure	1	4

Provision for Vehicular Parking and Pedestrian Facilities

It is important to know about the availability of vehicular parking at PIA Main Boulevard, to identify whether parking is a problem or not. Most of the people said that they park their vehicle on street. Table 6. shows the percentages of the vehicular parking.

Table 6. Provision of Vehicular Parking

Vehicular Parking	Frequency	Percentage
On street parking	23	92
Parking provided by plaza/Shop	2	8

Responses were taken from the residents regarding the parking of their vehicle when they visit PIA Main Boulevard. Almost 92% respondents stated that they park their vehicle on service road or main road while making a trip to commercial area, while 8% respondents stated that they park their vehicle in the parking provided by the shop/plaza.

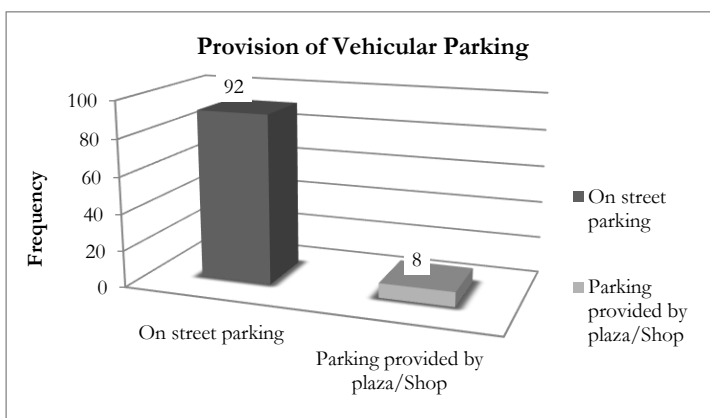


Figure 4. Provision of Vehicular Parking

Pedestrian facilities were categorized in terms of signage, footpath, zebra crossing, bus stop, and pedestrian convenience. Total

11% respondents graded them as average, 32% respondents graded them as least convenient, while 56% graded all the pedestrian facilities not convenient. Table 7. shows the percentages of the pedestrian facilities.

Table 7. Provision of Pedestrian Facilities

Pedestrian Facilities	Signage (% age)	Footpath (% age)	Zebra Crossing (% age)	Bus Stop (% age)	Total (% age)
Most Convenient	4	0	0	0	1
Convenient	0	0	0	0	0
Average	12	12	8	12	11
Least Convenient	40	32	20	36	32
Not Convenient	44	56	72	52	56

On individual bases, 4% of the respondents stated signage as most convenient, 12% stated average, 40% stated least convenient, and 44% not convenient. In case of Footpath, 12% of respondents stated average, 32% stated least convenient, and 56% stated not convenient. In

case of Zebra Crossing, 8% respondents stated average, 20% stated least convenient, and 72% stated not convenient. In case of Bus Stop, 12% respondents stated average, 36% stated least convenient, and 52% stated not convenient.

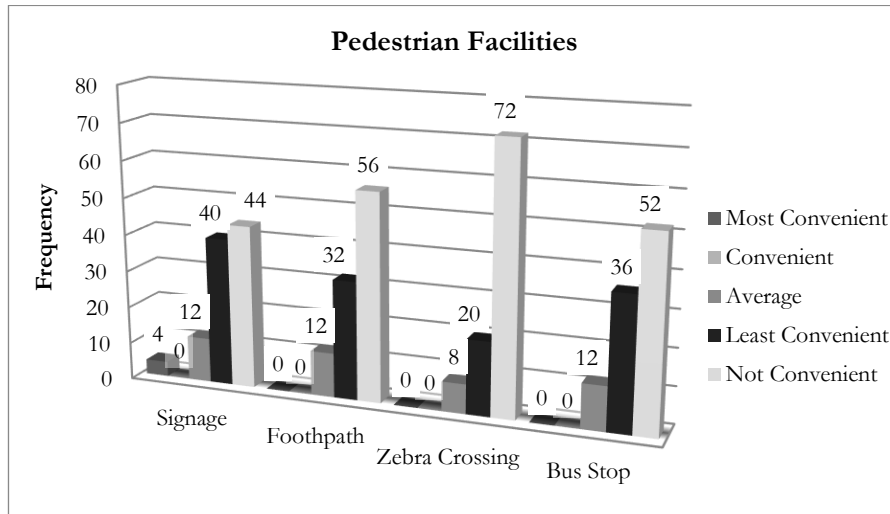


Figure 5. Provision of Pedestrian Facilities

Traffic Calming Measures

Traffic calming uses physical design and other measures to improve safety for motorists, pedestrians, and cyclists. It aims to encourage safer, more responsible driving and potentially reduce traffic flow. All the residents of PIA housing society said that there were no traffic calming measures taken. Table 8. shows the percentages of the responses.

Table 8. Traffic Calming Measures

Traffic Calming Measures	Frequency	Percentage
Yes	0	0
No	25	100

Environmental Impacts on society after Commercialization

Responses were taken from the residents regarding the Measure of environmental impacts categorized as noise pollution, air pollution, risk, disruption of livelihood, traffic congestion, and parking problems in terms of high, medium, and low. Total 46% respondents stated the level of all the impacts is high, 41.3% respondents stated medium, while 12.7% stated the level of all the impacts is low. Table 9. shows the percentage of impacts after commercialization of PIA Main Boulevard.

Table 9. Measure of Environmental Impacts on Society

Impacts	Noise Pollution (% age)	Air Pollution (% age)	Risk (% age)	Disruption of Livelihood (% age)	Traffic Congestion (% age)	Parking Problem (% age)	Total (% age)
High	36	44	24	24	72	76	46
Medium	56	52	32	60	28	20	41.3
Low	8	4	44	16	0	4	12.7

On individual bases, 36% of the respondents stated level of impacts noise pollution as high, 56% stated medium, and 8% stated low. In case of level of impacts of air pollution 44% respondents stated high, 52% stated medium, and 4% stated low. In case of level of impacts of risk, 24% respondents stated high, 32% stated medium, and 44% stated low. In case of level of impacts of disruption of livelihood, 24% respondents stated high, 60% stated medium, and 16% stated low. In case of level of impacts of traffic congestion, 72% respondents stated high, and 28% stated medium. In case of level of impacts of parking problem 76% respondents stated high, 20% stated medium and 4% stated low.

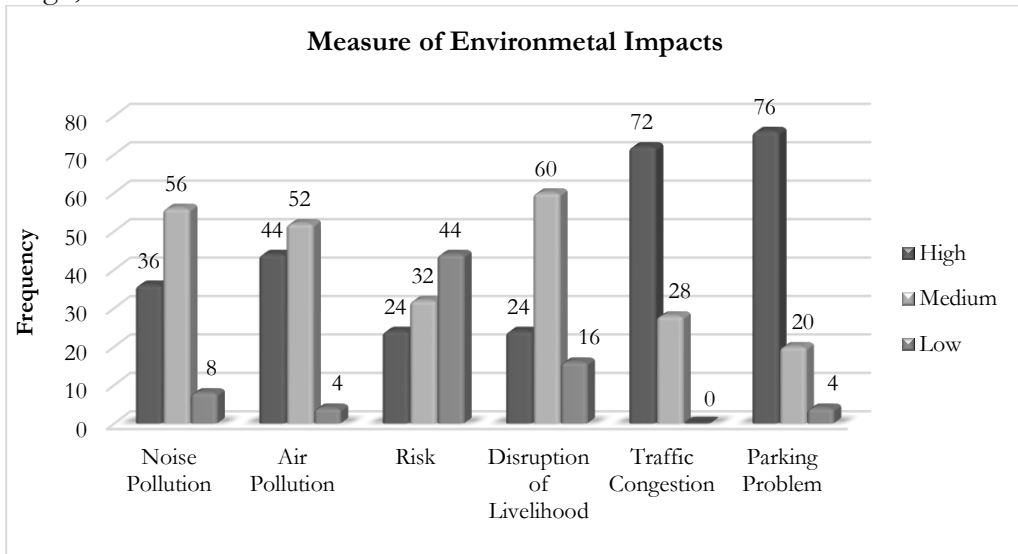


Figure 6. Measure of Environmental Impacts on Society

Views of Officials about Impact Assessment of Commercialization in PIA Housing Scheme

The official expressed about commercialization of PIA Main Boulevard as it was a main residential road, so there was a huge demand for the commercialization, and commercial activities were already emerging in the area and to cope with the demand of public, the land use from residential to commercial has been changed. According to LDA officials, the reason behind commercializing the main boulevard was to cater the increasing demand for commercial area along with resource generation, regularization of illegal commercialization, and people grievances. According to them, proper survey and assessments were conducted, which includes Land Use Survey and classification; Traffic Impact Assessment (TIA), Environmental Impact Assessment (EIA), and Origin and Distribution Survey. Questions regarding permanent commercialization mailed after investigation from the residents of PIA various questions were asked including:

- The setbacks of commercial activities,
- Which commercial use should not be allowed,
- Asked about the minimum size of commercial on these roads and;
- Building height of commercial activities.

This questionnaire was required to be filled by the residents of PIA housing scheme and send to given e-mail address by the development authority. They also considered public opinion

that was taken through mass media, letters, and advertisement in newspapers was given in the process.

According to the officials, LDA is trying to regularize already built-up commercial buildings at Main Boulevard. Regarding the extent of involvement of residents during the commercialization process, Non-Objection Certificate (NOC) was required from neighbors of the building in case of annual commercialization. According to LDA Officials, measures for parking provision were taken as per Building Regulations of LDA. While Punjab Horticulture Authority (PHA) is responsible to take measures of streetscape and landscaping at PIA Main Boulevard. All the permitted, permissible were defined as conferring to LDA Land Use Rules 2014 and Master Planning Rules while discussing type of commercial activities allowed in main boulevard.

When asked about any considerations taken before commercialization of PIA Main Boulevard, they specified:

- Road widening of boulevard
- provision of service lanes
- Improvement of sewerage system
- New road designed and constructed by Traffic Engineering and Transport Planning Agency (TEPA)

In their view, commercialization of PIA Main Boulevard is done as per policy and to regularization of illegal commercialization. However, road encroachment by shopkeepers makes circulation difficult.

Considering all the findings through user perception survey and official’s statements, a criterion has been developed for evaluating the functionality of residential roads before declaring it as a commercial corridor:

Criteria for evaluating the functionality of commercialized residential roads

It is intended that the road to be designated as commercial shall adopt and implement the urban design development strategies to guide the approval of development on the land. The factors that should considered during assessment of the main roads includes Preparation of Development Profile, Traffic Operation Assessment, Built-form, Parking, Site Access and Circulation, Landscaping, Signage, and Streetscape. The authority should consider Road Network Details, including Road Condition and Width, Pedestrians and Public Transport Facilities, Existing daily traffic volumes, and Peak Periods.

These guidelines provide the necessary tools and the review and evaluation of development applications with in the commercial corridor.

Table 10: Criteria for Evaluating the Functionality of Roads

Components	Indicators
Preparation of Development Profile	Road Network Details, including <ul style="list-style-type: none"> • Road Condition and Width • Pedestrians and Public Transport Facilities • Existing daily traffic volumes and Peak Periods
	Consider On-site aspects, i.e., on-street parking and access with other developments
	Development Details, including <ul style="list-style-type: none"> • Current use and future changes of road,

	<ul style="list-style-type: none"> • Current and intended use of adjacent parcels and size of development
Traffic Operation Assessment	Assessing future traffic volumes (traffic volumes with and without the development that were determined as part of the development profile)
	Level of Service
	Main Roads require an analysis of crash rates
Road Pavement Impacts	Consider Impact on pavement management; <ul style="list-style-type: none"> • a need for extra pavement width or to bring forward pavement rehabilitation; • a change in surfacing type or pavement thickness; • an increase in maintenance
	Design details of any proposed rehabilitation scheme
	Road use management plan <ul style="list-style-type: none"> • specifically designed for managing road-related issues. • negotiations with owners to best manage current and future increases in road use • manage adverse traffic management risks and road impacts.
Nodes	Defining a structural framework <ul style="list-style-type: none"> • Hierarchy to direct the most demanding development within the Corridor. • Development within the nodes should provide suitable transitions and buffering with adjacent Stable Neighborhoods through setbacks, buffering, and landscaping.
Interim and Ultimate Development	Phasing of development on a site.
	Achieving the ultimate built form by <ul style="list-style-type: none"> • Defining the land uses which provide for street-related and pedestrian uses; • Future integration with adjacent land uses; • Location and sizing of infrastructure.
Streetscape	Traffic calming measures
	Linkages between parking areas, buildings, and sidewalks within the right-of-way.
Parking, Site Access, and Circulation	The location of parking areas provided within the building.
	Parking areas should be well-designed to minimize potential conflicts
	Footpath provided on both sides of the road for the pedestrian safety.
	Site access to corner lots should be appropriately setback from the intersection to accommodate sight triangles and ensure vehicular and pedestrian safety.

Landscaping	Treed boulevards.
	Road Lighting <ul style="list-style-type: none"> • Regular pedestrian-oriented lighting. • Lighting should be designed to ensure that both the vehicular carriageway and pedestrian/cycle path are sufficiently illuminated. • Lighting on road should minimize obtrusive light into the adjacent houses and provide safe access for pedestrians.
	Provide suitable outdoor amenity space for users.
Signage	Signs should be clearly visible, attractive, and of an appropriate scale.
	Installing official traffic signs to restrict heavy vehicle movements during certain times of day/days of week

Conclusions and way forward. Government authorities have formulated regulations for commercialization process, yet these regulations are very indistinct in nature. Review of literature and practices reveals that EIA and TIA has barely considered before commercialization. It is also noticed that no improvements of the road by the competent authority. So that the parking problems, reduction in capacity of roads and resultant increase in congestion, traffic delays, air and noise pollution, difficulty in pedestrian mobility, burden on utility services can be observed. On-street parking creates traffic congestion because of the unavailability of off-street parking/parking lot, and the analysis also shows that respondents are least convenient with the provided pedestrian facilities in terms of proper sidewalks, signage, minimal safety, road pavement, and minute landscaping. Service road was mainly occupied by the car parking, and the road encroachment by shopkeepers makes circulation difficult.

It is essential to introduce studies and strategies that lead to sustainable commercialization. This paper has identified a number of elements which should be considered as part of commercialization process. These include Preparation of Development Profile, Traffic Operation Assessment, Built-form, Parking, Site Access and Circulation, Landscaping, Signage, and Streetscape. Furthermore, the study presents a conceptual idea in which all the four said factors are integrated in holistic manner to get the adequate result.

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Author’s Contribution.

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Shaker Mahmood Mayo: Supervision and Guidance

Hafiza Saba Islam: Data Analysis and formatting

Warda Ali: Data processing, write up

Conflict of interest. We declare there exists no conflict of interest among authors for publishing this manuscript in IJIST.

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SURVEY QUESTIONNAIRE DESIGNED FOR IMPACT ASSESSMENT OF COMMERCIALIZATION IN PLANNED HOUSING SCHEMES

The purpose of the survey is to collect information about the research paper. The survey is conducted for study purpose. The information collected will be kept confidential and will not be used for any other purpose.

Name of Respondent: _____

Address of Respondent: _____

1. Age of respondent?

- a) Less than 15 years
- b) 15 to 25 years
- c) Above 25 years

2. Number of family members?

- a) 1 to 5
- b) More than 5

3. Ownership status of your home?

Rented	Owned
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4. Have you heard the term ‘Commercialization’?

Yes	No	Not Sure
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5. Is your property commercial?

Yes	No
-----	----

6. If yes, were you involved in the commercialization process of PIA Main Boulevard by competent authority?

Yes	No
-----	----

7. If yes, on what level? _____

8. Have your opinions/objections incorporated in the commercialization processes?

Yes	No
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9. Have you seen any improvement by competent authority before commercialization of the road?

Yes	No	Not Sure
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10. Do you think there was a need to commercialize the main boulevard of PIA?

Yes	No
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11. If yes, in what manner? _____

12. How often do you use this road?

- a) Everyday
- b) Occasionally
- c) Rarely

13. Where do you park your vehicle when vesting PIA Road?

- a) On street
- b) Front Space of Shop
- c) Basement of Plaza

14. Are the pedestrian’s facilities convenient to you? (in terms of easy to use and time saving)

- a) Most Convenient
- b) Convenient
- c) Average
- d) Least Convenient
- e) Not Convenient

15. What is the safety level of pedestrian’s facilities?

- a) Excellent
- b) Good
- c) Neutral
- d) Poor
- e) Worst

16. What Impacts, do you foresee after commercialization of this road?

Rank your remarks by following:

- a) High
- b) Medium
- c) Low

Sr no	Impacts	Remarks	Sr no	Impacts	Remarks
1.	Level of Noise		4.	Disruption of Livelihood	
2.	Level of Dusk		5.	Increase in traffic congestion	
3.	Level of Risk (accidents)		6.	Parking Problems	

17. Any traffic calming measures implemented by authority before commercializing the main boulevard?

Yes	No
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18. What are your views about commercialization of a main residential road?

18. What are your suggestions for improvement of road before commercialization of a main residential road? (Specify Priority Wise)

- i). _____
- ii). _____
- iii). _____
- iv). _____