



# Urbanization And Sustainability: Challenges And Strategies For Sustainable Urban Development In Ludhiana City

Professor (Dr.) Dharam Singh

## Abstract:

Sustainable development means attaining a balance between environmental protection and human economic development and between the present and future needs. The rapid and worldwide urbanization of the human population raises concerns about the sustainability of cities. Ludhiana tops the list in respect of urbanization in the state. With rapid urbanization and industrialization of Ludhiana metropolis, large number of problems associated sustainable development has emerged recently. Despite urban authorities are concerned about this issue; they often fail to address the problems due to the fact of uncontrollable and unpredictable migration, and negligence of urban poor's sustainable living and access to basic services. Inadequacy of infrastructural services, basic amenities and environmental goods; environmental degradation; traffic jam and accidents; violence and socioeconomic insecurity are the major challenges, which are created through rapid urbanization. There is an increasing need to improve the environmental performance of Ludhiana city. The paper concludes providing some strategies that might be helpful to the policy makers in formulating development policies for sustainable urban services.

**Keywords:** Urbanization, Sustainable Development, Amenities, Contamination

## Introduction

Urbanization, generally, refers to an increasing shift from agrarian to industrial services and distributive occupations. These services and occupational opportunities as a pull factor offer many people to migrate to urban areas from rural areas being stimulated by push factors like, natural disasters, economic stagnant, and poverty. These trends in developing countries as a substantial difference from Euro- American industrial urbanization. However, the overwhelming population growth in urban area is a complex product of 'pull' and 'push' factors. In the context of developing countries, this kind of urbanization possesses a dualistic nature of opportunities as well as challenges. Therefore, cities have both positive and negative dimensions. Positively, it is a center place of modernization and communication, and engine of a country's economic development. Moreover, cities are the agglomeration of the riches, economic activities, and modern technological advancement and opportunities. On the contrary, cities, particularly in developing countries, are now very vulnerable places to live and enjoy quality of life because of environmental problems, rapid growth of urban poor, and terrorism. Many argue that urbanization does not reduce poverty, rather it gives rise to enormous problems and challenges, from which urban poor are direct sufferers.

In India, this situation might be more dangerous while overwhelming rural-urban migration is uncontrollable, good governance is rare, and unequal resources distribution is explicitly visible. For example, the urban poor in the city and their informal living in precarious settlements is a big issue of sustainable urban development. Despite the authorities are concerned about this issue, they neglect it in the name of limitation of resources,

urban poor's entitlement in the city, and administrative and political difficulties. Therefore, the trend of present urbanization and lacking in good governance pose huge challenges to the future of sustainable city. This paper attempts to examine this situation drawing upon examples of developing cities in general and Ludhiana city of India in particular. The paper indicates that inadequacy of infrastructural services, basic amenities and environmental goods, environmental degradation, traffic jam and accidents, violence and socioeconomic insecurity are the major challenges for the city.

## Study Area

The city is located in district Ludhiana, which is most centrally located district amongst the 20 districts of Punjab state. It falls within the Malwa region of the state of Punjab. Geographically the city lies between north latitude 30°34' and 31°01' and east longitude 75°18' and 76°20'. The city is located on Amritsar-Delhi G.T Road (NH-1) and Amritsar-Ambala railway line which are considered the back bone of the state. The city is located at the distance of about 100 kms. North-West of Chandigarh, "The Capital of Punjab". River Satluj flows at a distance of about 8 kms. to the north of the city. Ludhiana city was founded on a ridge of Budha Nala, which once was a bed of the River Sutlej. Previously the urban area was confined south of Budha Nala but due to population explosion, the low lying area between Budha Nala and river Satluj has now become an integral part of the urban area. Many villages surrounding the city are now part of the Ludhiana Municipal Corporation.

The growth of the cities both in terms of areas and population has consistently been faster than the growth of infrastructural provisions and services in Ludhiana City. As a result, a large section of the urban population does not have access to basic infrastructural services. The services include housing, water and sanitation, drainage, roads, gas, and electricity supply.

## Objectives

1. To study the role of population growth and urbanization.
2. To find out the impact of air pollution in urban area by different sources.
3. To highlight the water pollution and its impact on health of people.
4. To study the causes behind the growth of slums in Ludhiana city.
5. To study the amount of generation of solid waste in the urban areas.
6. To study the management of process of generation, segregation and transportation of solid waste.
7. To find out the suggestive measure for sustainable urban environment.

## Methodology

The present study is based on both primary and secondary sources. Secondary sources include published data from different governmental agencies. The land use data were acquired through Municipal Corporation Ludhiana. The vehicular traffic data related to traffic congestion, volume of traffic mobility etc. were gathered through field surveys on the main roads of Ludhiana city. The data regarding the statistics of relevant printed literature regarding the present status of Air quality & the steps taken by government was collected from Ludhiana Pollution control Board. The information regarding Number of registered large scale, small scale of other industrial units was provided by the office of district Industries offices. Steps taken to control pollution by buses were also acquired from transport department Punjab. We visited the area near Buddha Nullah and observed various sources of pollution. We visited Industrial area and observed that Industrial Waste was not properly disposed resulting in creating unhygienic conditions and also observed the increasing intensity of Air Pollution by vehicles.

## Urban Sustainable in Punjab: Major Challenges

Urbanization has brought remarkable development in Ludhiana City, even though it has been a great challenge environmentally, socially, and economically to build a sustainable city, these challenges need to be faced efficiently and successfully. Thus, the question is what is a sustainable city? What are the big challenges that need to be considered at this moment? In general, a sustainable city must be economically viable, socially peaceful, and environmentally friendly. More specially, a sustainable city is where people live in peace with sufficient income earning and quality of life, and without social and mental anxiety.

A sustainable city provides healthy environment and meets multiple goals i.e., healthy living and working environments: access to water and sanitation, waste disposal, drains, paved roads, and other forms of infrastructure and services essential for health and for a prosperous socioeconomic base. Buckingham and Turner (2008) suggest that it depends on society's relationship with its environment which is a product of how powerful and influential groups in that society create, control, and maintain knowledge. Girerdar (1999) defines sustainable city as "organized so as to enable all its citizens to meet their own needs and to enhance their well-being without damaging the natural world or endangering the living conditions of other people, now or in the future". Haughton and Hunter (1994, p. 27) define sustainable city is "one in which its people and businesses continuously endeavor to improve their natural, built, and cultural environments at neighborhood and regional levels, while working in ways which always support the goal of global sustainable development".

These definitions indicate major challenges of urbanization as well as characteristics of a sustainable city. Drawing upon these definitions, this paper tries to describe major challenges, particularly in Ludhiana city, which are very important for sustainable urban development. The challenges include the issues like rapid population growth; scarcity of basic amenities and infrastructure; poverty, violence, and social insecurity; pollution and environmental health; natural and man-induced hazards; and lacking in governance system.

### Population Growth

Ludhiana is the first metropolitan centre of Punjab. Ludhiana's share has been highest in total population of class-1 towns as well as total urban population of the state. The city has experienced unprecedented growth in its population; its growth rate (71.77%) had been recorded comparable with the other fast growing metropolitan cities like Vishakhapatnam (74.27%) and Hyderabad (69.12%) during 1981-91.

According to 2011 census, Amritsar with a population of 11, 32,761 become the second city of the state as million plus city. One out of every six urban dwellers (16.92%) in the state is residing in Ludhiana city and out of every nine (11.83%) in Amritsar city. It signifies that 3 out of every 10 urban dwellers (28.75%) in the state are residing in only these two metropolitan centers in the state. It is significant to note that the industrial hub of Punjab-Ludhiana city, rightly called as the 'Manchester of India', is experiencing rapid growth. It has a density of 10150 people per sq. km. as per the 2011 census, which is very close to that of Delhi U.T. (11,297).

**Table -1**  
**Population Growth**

Years	Urban Population of Punjab (Persons)	Population of Ludhiana Municipal Corporation (Persons)	Population of Ludhiana Municipal Corporation as percentage of total urban population of Punjab	Decadal Growth rate of Urban Population of Punjab (%)	Decadal Growth rate of Population of Ludhiana City (%)
1901	934766	48649	5.20	-	-
1911	813224	44170	5.43	-13.00	-9.21
1921	869526	51880	5.97	6.92	17.46
1931	1168413	68586	5.87	34.37	32.20
1941	1657414	111639	6.74	41.85	62.77
1951	1989267	153795	7.73	20.02	37.76
1961	2567306	244032	9.51	29.06	58.67
1971	3216179	401176	12.47	25.27	64.39
1981	4647757	607052	13.06	44.51	51.32
1991	5993220	1042740	17.40	28.95	71.77
2001	8245566	1395053	16.92	37.58	33.79
2011	10387436	1613878	15.53	25.97	15.68

*Source: - Census of India*

During the decades of 1951-71, Ludhiana grew 2.5 times in population (from 1.54 lakh to 4.01 lakh) but more than 5 times in physical size (from 1292 to 6421 Acres) with sharp decline in density from 119 to 62 persons per Acres. Most of city growth was haphazard and unplanned, resulting in highly uneconomical use of agricultural land for urban purpose. Outcome of such a development was visible in serious shortfall in urban infrastructure.

Ludhiana city had a population of only 30,000 in the year 1947. However due to sudden influx of refugees from West Pakistan, around 75,000 more people descended at Ludhiana. The city population profile indicates that during the decades of 1961-1971 and 1971-1981, it registered a growth of 51% whereas; in 1981-1991, the growth in population touched 67%. However, during the period of 1991-2001, the growth rate came down to 37.8%. In December 2005, city population was estimated at 16.65 Lakhs (Statistical Abstract of Punjab-2005). Population projections suggest that in 2021, there might be 3.29 million people in Ludhiana and the population size of the city might cross 4.0 million before 2025.

### Environmental problems

With Ludhiana metropolis becoming home to large number of industrial units and centre for trade and commerce, city has been rated as one of the most industrialized and commercial capital state of Punjab. Industry has not only been found to be the major growth driver of the city but also major polluter of the city environments. Accordingly, Ludhiana has emerged as the 2<sup>nd</sup> most polluted city in northern India. Impact of pollution has been witnessed in the city in the form of quality of air, quality of water both surface and underground, noise pollution, degradation of the natural resources, low vegetation cover etc. these environmental problem have already reached a critical stage, calling for an immediate action. The intensity of the pollution in term of air, water and noise have been evaluated in order to clearly understand the level and cause of pollution existing within the city so that appropriate strategies are put in place to tackle the problem of pollution.

## Air Pollution

Existence of large number of units including the polluting industries has adversely affected the quality of air in the Ludhiana metropolis. Emissions generated by fuel burnt by industries have also contributed to the lowering of quality of the air. With a view to clearly assess and monitor the status and quality of ambient air in Ludhiana, data with regard to quantity of suspended particles, SO<sub>2</sub> and NO<sub>2</sub> present in the air is being collected and analyzed by the Punjab Pollution Control Board. The data is collected for the entire year and is categorized into three distinct periods involving January to April, May to August and September to December. For this purpose, the board has set up four monitoring station in different parts of the city. These stations have been placed at the most vulnerable parts of the city which include Milk Plant (Residential), Bharat Nagar Chowk (Commercial), Industrial Area and Sherpur Chowk (Industrial). These areas are not only carrying large volume of traffic but also large number of industrial/ residential/ commercial units.

**Table-2**  
**Ambient air quality in Ludhiana (2004)**

Sr. No.		Jan-Feb-Mar-Apr			May-Jun-Jul-Aug			Sep-Oct-Nov-Dec		
		SPM µg/m <sup>3</sup>	SO <sub>2</sub> µg/m <sup>3</sup>	NO <sub>2</sub> µg/m <sup>3</sup>	SPM µg/m <sup>3</sup>	SO <sub>2</sub> µg/m <sup>3</sup>	NO <sub>2</sub> µg/m <sup>3</sup>	SPM µg/m <sup>3</sup>	SO <sub>2</sub> µg/m <sup>3</sup>	NO <sub>2</sub> µg/m <sup>3</sup>
1	Milk Plant	136	9.1	29.8	118	8.7	29.0	160	9.1	29.2
2	Bharat Nagar Chowk	160	10.2	29.9	146	9.8	29.1	175	11.7	29.2
3	Industrial Area	228	13.5	32.0	249	13.7	32.4	257	13.9	34.7
4	Sherpur Chowk	250	10.0	27.3	206	9.9	29.9	284	9.7	27.2

Source: CDP (2007-2021), Ludhiana

### Permissible levels:

Residential and commercial area: SPM= 120 µg/m<sup>3</sup>, SO<sub>2</sub> = 80 µg/m<sup>3</sup>, NO<sub>2</sub> = 80 µg/m<sup>3</sup>

Industrial area: SPM= 200 µg/m<sup>3</sup>, SO<sub>2</sub> = 120 µg/m<sup>3</sup>, NO<sub>2</sub> = 120 µg/m<sup>3</sup>

Looking at the data given in above tables, it has been seen that air contains large volume of suspended particles and higher presence of such particles has been recorded at all stations against the permissible limit of 120µg/m<sup>3</sup> at all four stations indicting lower quality of air in Ludhiana. The higher level of SPMs has been found to exist throughout the year with lowest recorded during the period of May to August and highest during September to December the presence of higher level of SPMs can be attributed to mixing of dust from open land, pollutants from industrial area and smoke from vehicular traffic. Out of the four stations, the best quality of air has been found to exist in area surrounding Milk Plant due to presence of well-planned/ developed residential colonies and Punjab Agriculture University. Next in the order of quality of air has been found to be area around Bharat Nagar Chowk whereas the worst placed area are the Sherpur Chowk and in the Industrial area which large no. of industrial units and large volume of traffic. With regard to level of SO<sub>2</sub>, it has been found to be within limits. Also the level of NO<sub>2</sub> has been found to be within the permissible limits and well below the prescribed standards at all the stations. However, the data in all above table indicates the higher presence of the SPMs, SO<sub>2</sub>, and NO<sub>2</sub> over the years indicating the deteriorating quality of ambient air in Ludhiana.

### Major contributors to the air pollution have been found to be:-

- Vehicular exhaust due to the presence of large number of vehicles and higher use of personalized private vehicle.
- Absence of effective and efficient system of mass transportation
- Narrow road width (with average varying between 4.5 to 7 mts.) low capacity of the roads and high intensity of traffic.
- Smoke emitted by the large scale use of kerosene/ diesel based power generators.
- Presence of large number of intermediate public transport vehicles and use of kerosene as the fuel.
- Smoke emitted by industries.
- Use of rice husk by the industries.

### Water pollution

Rapidly increasing urbanization and industrialization of Ludhiana has not only adversely impacted the quality of ambient air in the city but also has affected the city's water resources. Budha Nallah, unlined canals, is the major surface water resource of the city. Being the recipient of city's untreated domestic and toxic industrial waste, dumping of solid waste, dumping of ash from burnt rice husk, the quality of water degraded considerably. As a result of perennial flow of sewage into Budha Nallah, it has been converted into an open sewer. The pollution of Budha Nallah has adversely affected the quality of surface water as well ground water of the major part of the city and its environs.

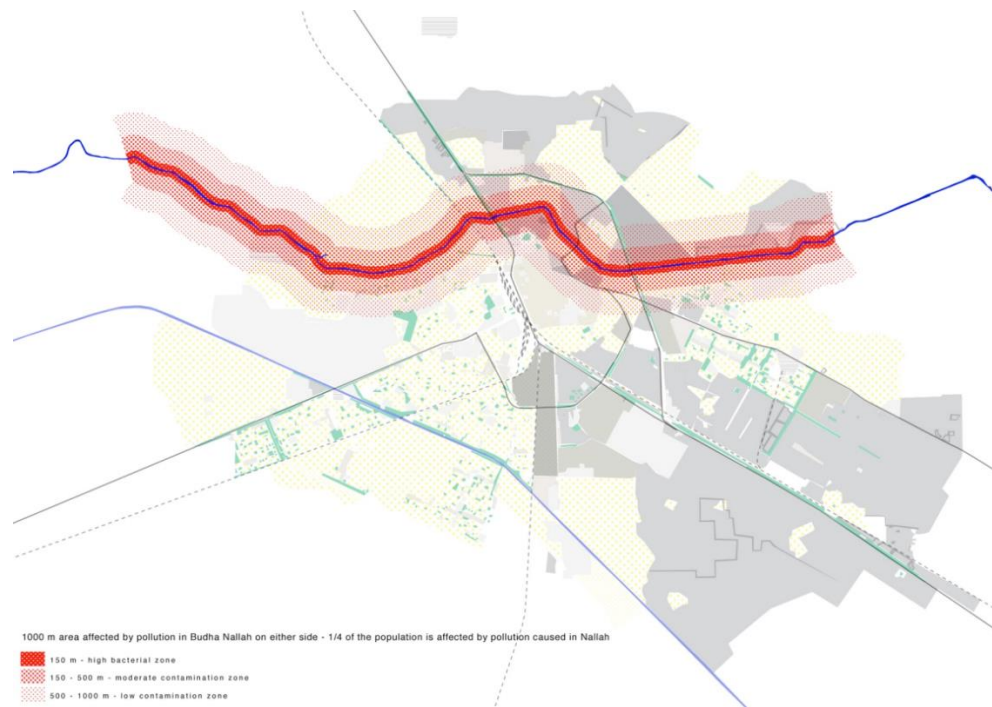
For assessing the status and level of contamination of surface water pollution in Budha Nallah a detailed analysis in respect of Bacteria, odour, mosquitoes and aesthetics has been carried out. It is revealed that more than 1/4<sup>th</sup> of the population of the city and 1/7<sup>th</sup> area of the city is considerably affected by the water pollution caused in Budha Nallah. A strip of 1000 mts on either side of Budha Nallah has been affected by the water pollution for assessing the impact of pollution the entire area under the impact of pollution has been divided into 3 distinct zones. High bacterial contamination has been found to exist within the first 150 mts whereas moderate contamination has been observed in the middle zone (151 to 500mts) whereas low contamination has been found to exist in the last 500 mts. In this area more than 55% population is affected by incidence of high and moderate bacterial contamination. Similar position has been found to exist in respect of the aesthetic aspect.

**Table-3**  
**Budha Nallah water contamination analysis (Bacteria aspect)**

Zone (distance from the source)	% age of area affected	% age of population affected
High contamination (up to 150 meters)	2.45	4.6
Moderate contamination (151 to 500 meter)	5.70	10.15
Low contamination (501 to 1000 meters)	8.15	13.4
<b>Total</b>	<b>15.30</b>	<b>28.15</b>

Note: percentage of area and population is based on the total area and population of city

Source: CDP (2007-2021), Ludhiana



The water pollution in the Budha Nallah has also adversely affected the quality of ground water. Accordingly, table-3 revealed that the 28.15% of the population living in 15.30% influence area is forced to consume the contaminated water. Thus study has further shown that population living in this area has been subjected to water borne disease like gastroenteritis, dysentery, jaundice etc. The table-4 shows that 29% of the total population living in 16.3% of the city area suffers from the above health hazards caused by the contaminated water of Budha Nallah.

**Table-4**  
**Budha Nallah health affected zone**

Zone (distance from the source)	% age of area affected	% age of population affected
High effected zone up to 1000 meters	16.3	29.0

Note: percentage of area of population is based on the total population of the city.

Source: CDP (2007-2021), Ludhiana

## Strategy for sustainable Development

### Environmental goals

- Use the existing law for preparing the national land use plan based on carrying capacity of the environment.
- Define achievable horizon of National Sustainable Development.
- Application the results and outputs into the national level programs.
- Good governance and management through the existent law for pollution control and finding the necessary cooperation, and public participation (NGOs).
- Organize Youth participation for neighborhood recreational programs

## Urban development planning goals

- Preparation of a new law for urban planning, urban design and their implementation process and providing monitoring system.
- Define a new complementary role for Ministry of Housing and urban planning in cooperation with Department of Environment.
- Planning to achieve the necessary speed for research and use the global experiences to satisfy crescent social needs.
- Prevent the gaps and pitfalls with systematic continues monitoring and planning.
- Decentralization of the new settlement with Regional strategic planning development.
- Focus on small town and cities in relation with development axes.

## Urban activity and land use goals

- Prepare new vision and policy focusing on urban and rural sustainable development in consideration the changing world and entity of new population and their needs, using existent law for preparation new settlement texture.
- Prevent the new centralization with urban regeneration in old cities with public participation in process of planning, design, and implementation monitoring.
- Create a new and sustainable vision for surveying and reviewing urban planning process and its outcome in various levels as regional, municipal, and rural planning.
- Up-to-date the methods of preparation of plans in sense of continue planning.
- Use the national traditional knowledge and combine it with up to date environmental, social, technical and economical sciences.
- Create new policies for urban good governance with public participation and stockholders and their organizations to prepare new policies for implementation and instruments.

## Conclusion

Rapid urbanization in the cities of developing countries has been a dilemma of economic development and environmental sufferings. The paper tries to emphasize the issues of urban population growth and consequential challenges of urban sustainability focusing a case of Ludhiana city. It is evident that the Ludhiana city is overwhelmingly growing because both of the pull factors and push factors, while the service provisions and income earning opportunities are not provided with a same pace. Thus, the city is gradually going to be suffering from inadequate infrastructural services, social insecurity, natural and man-made hazards, and poor urban governance.

The paper addresses the issues of urban sustainability focusing on a general under-standing of rapid urbanization and challenges in developing cities. It also introduces the major environmental problems in the cities, which might be stimulating to the future researchers.



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