Section A-Research paper

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Role of Industrialization and Urbanization in Regional Sustainable Development – Reflections from Tier-II Cities in India

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ABSTRACT

This study is an attempt to assess the dynamic role of industrialization and urbanization in providing references for regional sustainable development in the specific context of selected Tier-II cities of India, namely – Bikaner, Jodhpur, Jaipur, and Kota. Based on the review of extant literature and secondary data compiled from various sources, the study observes that industrialization is one of the main catalysts of the urbanization of Tier-II cities. With the establishment and expansion of industries, the Tier-II cities have experienced population growth, physical & demographic expansion, increased manufacturing and commercial activities, better employment opportunities, and infrastructure development. Industrialization and urbanization are quite determinants of sustainability, apart from the economic growth and opportunities for individuals and businesses. The study concludes that with developed infrastructure and connectivity, low pollution levels, fewer traffic bottlenecks, and rising industrial & employment opportunities, Tier-II cities have the potentiality to attract new capital investment. Hence, policymakers should think hard and act seriously to minimize the consequences of industrialization and urbanization so that they are useful for the sustainable development of not only Tier-II cities but all urban centers across the country.

Keywords: **Sustainability, Sustainable Development, Industrialization, Urbanization, Tier-2 Cities.**

INTRODUCTION

Globalization has driven the rapid development of the world economy, and the flow of workers, capital, and products has become more convenient and faster. With the development of globalization, a concept that is in full swing is urbanization. Urbanization is an important modern phenomenon, conceptually an integral part of the development process. Urbanization is the concentration of the population in discrete areas. Through urbanization, cities grow, and most of the population gets concentrated in and around cities. This concentration has resulted in land conversion for industrial, commercial, residential, and infrastructure purposes (US EPA, 2023).

Urbanization is a dynamic process, manifested as the transformation of villages into towns and towns into cities, thereby increasing the proportion of the urban population to the total population (Hussain & Imitiyaz, 2018). Industrialization is one of the major causes of urbanization. Historically, industrialization has led to urbanization by attracting people to cities to create economic growth and employment (Boyle, 2021). With industrialization comes a change from an agriculture-based economy to a manufacturing-based economy driven by technology, where mass production and assembly lines replace manual and professional workers (Boyle, 2021). However, location of an urban area should be immensely favorable for industrial development, as it enriches the public services and infrastructure of the area. Industrialization thrives in societies with better infrastructure.

Industrialization is not harmful to the health of societies, but societies have generally resisted industrialization in the past. Perhaps no society has adopted industrialization voluntarily. This is mainly because industrialization has created and continues to create many problems that have shaken the existing social foundations. Various aspects of industrialization have profoundly affected society and social institutions in a variety of ways. Undoubtedly, industrialization and urbanization have a significant impact on changing the economic structure of any region (Voumik & Sultana, 2022). Industrialization accelerates the pace of urbanization, which creates obstacles in the way of sustainable development. Thus, the dynamic role of industrialization and urbanization requires special consideration to assess the impact and identify the issues on sustainable regional development.

Cities in India are classified into Tier-I, Tier-II, and Tier-III cities according to their degree of business and commercialization. Tier-I cities are highly commercialized metropolises and the most developed cities. Tier-II cities are the next level of Tier-I cities and are basically smaller cities with a population of less than 1 million, usually state capitals or industrial centers. Tier-III cities are developing cities that have just started and are starting to take shape. In terms of sustainability, investment opportunities, and economic prosperity, Tier-I cities are flooded with investments in industry and services, resulting in a crowded real estate structure. As a result, many industrial establishments seek alternatives in smaller cities, mainly Tier-II cities.

Based on the above background, this article attempts to assess the dynamic impact and role of industrialization and urbanization on sustainable regional development with a special focus on Tier-II cities of India. Thus, the primary objective of this article is to analyze how various key variables, including industrialization and urbanization, support sustainable development along with posing obstacles in the way of sustainable development in the specific context of select Tier-II cities in India.

REVIEW OF LITERATURE

Ahluwalia (2014) in her book titled "Transforming Our Cities: Postcards of Change" highlights the enormous challenges that most cities in India face in various aspects mainly due to lack of good roads, electricity, water, housing, infrastructure, etc. She observed that the

governance of urban centers is a big issue, although she gave some examples of Indian cities that have taken proactive steps to address the problems created by urbanization. It is therefore imperative to ensure major transformations of Indian cities.

Sadashivam & Tabassu (2016) in their research article titled, "Trends of Urbanization in India: Issues and Challenges in the 21st Century" emphasized that the population in India has historically been predominantly rural, but since the beginning of globalization in 1991, there has been a gradual increase in the urban population. While India's urbanization has been backed by rapid economic growth, the rural economy is being transformed into a modern economy linked to industrial activities. However, as India becomes more and more urbanized, its negative impacts are visible in urban areas. The article focuses on the emerging issues and challenges related to the process of urbanization in India.

Patnaik (2018) in the conference paper titled, "Impact of Industrialization on Environment and Sustainable Solutions – Reflections from a South Indian Region" asserted that industrialization has undoubtedly brought economic prosperity; however, the accompanying urbanization put a palpable strain on essential life-support systems, pushing environmental impacts to threshold limits of tolerability. With the rapid development of industry, environmental sustainability is becoming an important determinant in the process of industrial development. A consistent trend shows that transforming existing industries into eco-industrial networks through the successful implementation of green approaches offers a viable solution for preserving the region's natural resources while boosting the regional economy. This requires proper planning and a comprehensive framework tailored to specific circumstances.

Simandan (2020) in the book titled, "Industrialization", broadly explains the process of industrialization, pointing out ways to measure it, and highlighting the inherent limitations of a proper scientific explanation of the phenomenon. The author illuminates the causal links between industrialization, modernization, and urbanization, and provides a brief assessment of the relative costs and benefits of industrialization.

Agarwal et al. (2021) asserted that metropolitan as well as tier-II cities in India are growing rapidly due to endogenous and exogenous pressures, such as better infrastructure development, job opportunities, immigration from surrounding areas, etc. Despite the enormous challenges posed by industrialization and urbanization, India's tier-2 cities are vital to the national economy and are expected to generate 6 billion city dwellers by 2050, as reported by the authors.

Shukla et al. (2021) observed that Tier-II cities with elevated terrain have the highest density of urban land in the city center. Tier-II cities with flat terrain have a significant increase in the density of urban land at the boundaries.

Majeed et al. (2022) in their article titled, "Perspectives into the Industrialization Process of India through the New Economic Geography Lens" argued that, based on the economic theory and empirical research, the process of industrialization is one of the fundamental and prolonged

methods for changing the basic driving force of an economy and promoting growth and development. Despite the positive spillover effects of this phenomenon, regions across the country are not reflecting the accelerated pace of industrialization. The study focuses on integrating national industrialization processes to prevent development gaps between regions.

METHODOLOGY

This quantitative study was conducted using secondary data, mainly collected and compiled from the Census of India. The study area covers four selected Tier-II cities of the state of Rajasthan (India) – Jaipur, Jodhpur, Kota, and Bikaner. These cities are becoming major industrial centers, with a growing number of micro, small, and medium-sized enterprises, and IT centers. With good infrastructure and connectivity, low pollution levels, fewer traffic bottlenecks, and rising industrial & employment opportunities, these cities are attracting new capital investment. The figure-1 presents the study area of the study, created using https://gramener.com/.

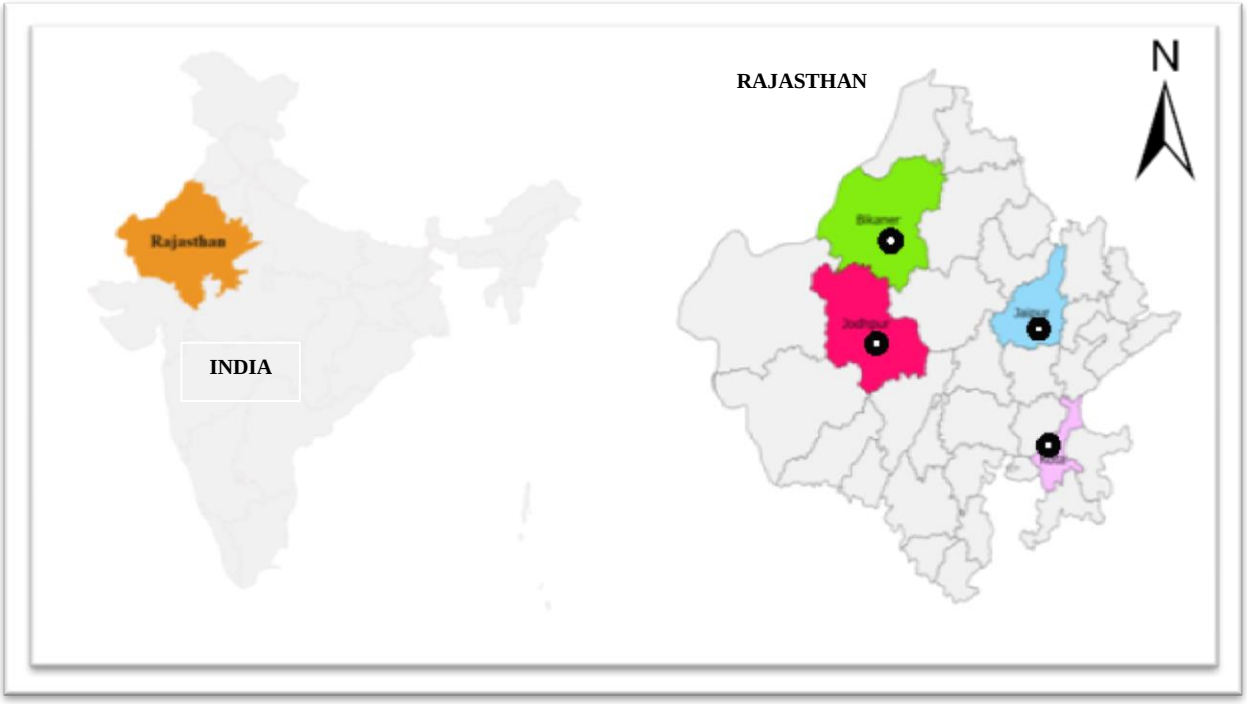

Fig.1 – Location Map of Study Area

RESULTS AND DISCUSSION

Assessing the Role of Industrialization and Urbanization

Undoubtedly, industrialization is one of the main catalysts of urbanization. With the gradual advancement of the industrialization process, the urbanization process also gradually advances. Both industrialization and urbanization are interrelated. Based on the review of extant literature, several key factors were considered to assess the role of industrialization and urbanization in promoting the regional sustainable development of the select Tier-II cities.

Population Growth: The study of Reedy (2017) considered population growth as a key factor to assess the role of industrialization and urbanization. Reddy (2017) observed that once workers are employed in any factory, they begin to settle in new places with their families. Cities must respond to this migration of workers and natural population growth by expanding. Table-1 evidences the population growth rate in identified cities leading to their urbanization and development.

Table-1: Decadal Population Growth in Identified Tier-II Cities

Census	Bikaner City		Jodhpur City		Jaipur City		Kota City	
	Population	Growth Rate	Population	Growth Rate	Population	Growth Rate	Population	Growth Rate
2001*	525810	24.17%	1069654	27.59%	2415626	44.71%	694316	29.21%
2011#	644406	22.55%	1138300	6.42%	3073350	27.22%	1001694	44.27%

***** Taking Census year 1991 as base to calculate population growth rate for 2001

Taking Census year 2001 as base to calculate population growth rate for 2011

Source: Data Compiled from Census of India 2001 and 2011

Demographic Expansion: The study of Polinesi et al. (2020) considered demographic expansion as a key factor to assess the role of industrialization and urbanization. Polinesi et al. (2020) observed that urbanization often leads to an expansion in the physical and demographic characteristics of a city. With an increase in the population, urbanization experiences an increase in physical area and rise in the number of households. This results in an overall decline in the population density of the city. Table-2 evidences a rise in the number of households, along with an increase in population and physical area of the identified cities, resulting in a decline in the population density.

Table-2: Physical and Demographic Expansion of Identified Tier-II Cities

Census	Population	No. of Households	Area (Sq.Km.)	Population Density
Bikaner City				
2001	525810	113257	270.03	1947
2011	644406	115380	270.03	2386
Jodhpur City				
2001	1069654	180740	233.5	4581
2011	1138300	187991	233.5	4875
Jaipur City				
2001	2415626	329207	467	5173
2011	3073350	391447	467	6581
Kota City				
2001	694316	130266	221.36	3137
2011	1001694	210135	221.36	4525

Source: Data Compiled from Census of India 2001 and 2011

Manufacturing & Commercialization: The working paper of Hofmann & Wan (2013) considered production & commercialization as key factors to assess the role of industrialization

and urbanization. They argued that urbanization often begins with the establishment of a few factories in a specified region to meet specific needs. In case of identified Tier-II cities, a number of new factories such as the manufacture, production, and processing of textiles, food, and natural resources established during the past three decades. Along with the establishment of factories and the growth of population, these cities experienced establishment of retailers and other service providers to grab the opportunity to sell goods/ render services directly to the public.

Employment: Industrialization is often characterized by the development of a few production facilities in a given area (Chen et al., 2023). This creates a demand for skilled workers. Although machines can simplify the production process and make output faster, factories still need workers to operate, manage, and maintain these machines. Table-3 evidences a rise in the demand for both agricultural workers and industrial workers in the identified cities.

Table-3: Employment Growth in Identified Tier-II Cities

Census	Demand for Agricultural Workers	Growth Rate	Demand for Industrial Workers	Growth Rate
Bikaner City				
2001	3752	---------	149795	---------
2011#	3669	(2.21%)	182767	22.01%
Jodhpur City				
2001	55145	---------	279137	---------
2011#	59501	7.9%	355704	27.43%
Jaipur City				
2001	36566	---------	552028	---------
2011#	37943	3.77%	709675	28.56%
Kota City				
2001	4656	---------	192922	---------
2011#	14531	212.09%	313722	62.62%

Taking Census year 2001 as base to calculate employment growth rate for 2011

Source: Data Compiled from Census of India 2001 and 2011

Infrastructure development: As the population grows, so does the need for developing urban infrastructure (Li et al., 2017). This means laying new roads and highways, underpasses, housing facilities, educational institutions, and healthcare centres, and installing sewage, water, electricity, and establishment of adequate banking and communication network systems. Recently, many infrastructure developments can be seen all over the state of Rajasthan, such as the Amritsar-Jamnagar and Delhi-Mumbai Expressways to reduce traffic congestion and pollution levels, the Abhay Command Center for smart police services, crime control, traffic management, security control, etc.

Identifying the Issues of Industrialization and Urbanization

The idea of urbanization may seem good because it paves the way for economic growth and opportunities for businesses and individuals. But urbanization also comes with considerable

downsides. One of the major problems associated with urbanization is the inability of cities to keep pace with population growth, including the influx of new job seekers and the natural growth of households far outpacing the number of available jobs in these areas. A growing population puts enormous pressure on existing resources, infrastructure, and the availability of residential units.

Industrialization has a profound impact on urban societies by creating problems and putting pressure on them. The handicraft sector suffers a serious setback, as machines are capable of producing goods in better ways, faster, and at lower costs, with better finishing. As a result, people prefer to buy machine products instead of handicrafts, resulting in lower incomes, lower living standards, and economic hardship for local communities. Local communities working as Artisans suffer a lot due to the "unorganized nature of the sector, lack of education, low capital, poor exposure, absence of market intelligence and a poor institutional framework" (Dash & Mishra, 2021).

Due to the establishment of industries and the increase in employment opportunities, the population is concentrated in the cities. As people migrate from the countryside to the cities, it becomes increasingly difficult to provide them with accommodation, even at higher rents. Due to difficulty in finding suitable accommodation, people start living in jhuggis and shanties. This leads to serious moral, health, law, and order problems due to the development of slums.

Table-4: Growth of Slums and Slum Population in Identified Tier-II Cities

Census	No. of Slums	Growth Rate in No. of Slums	Slum Population	Growth Rate in Slum Population	Slum Population as a % of Total Population
Bikaner City					
2001	15880	----------	128535	----------	24.44%
2011#	20761	30.74%	121855	(5.2%)	18.91%
Jodhpur City					
2001	25995	----------	154080	----------	14.4%
2011#	45183	73.81%	273875	77.75%	24.06%
Jaipur City					
2001	67062	----------	368570	----------	15.26%
2011#	61858	(7.76%)	326390	(11.44%)	10.62%
Kota City					
2001	35573	----------	151955	----------	21.89%
2011#	66413	86.69%	319309	110.13%	31.88%

Taking Census year 2001 as base to calculate growth rates for 2011

Source: Data Compiled from Census of India 2001 and 2011

Urban areas are epicentres of traffic congestion. Congestion occurs when the volume of vehicles are more than what the road can normally handle. This is a serious nightmare for most

cities, mainly due to the increasing need to move from one part of the city to another. This makes travel time longer, speed slower, and vehicle queuing longer. This, apart from imposing burden on the economy, also generates multiple negative consequences on people residing in urban areas. Uniyal & Gandhi (2018) pointed out that narrow roads, inadequacy of traffic police, illegal parking, and improper lane management are the major reasons behind traffic congestion in Tier-II cities.

Air quality is poor in most cities around the world, highlighting poor health or associated health risks (Folk, 2021). While the government has given serious consideration and efforts to address this issue, it has proven difficult to reduce because of the economic stakes attached to it. Illegal industrial activity in most urban centres affects air quality. Lin & Zhu (2018) found in their study that urbanization has a significant negative impact on air pollutant concentrations. Their research found that cities with more industrial activity tended to be more urbanized and thus have poorer ambient air quality.

Table-5: Level of Pollution in Identified Tier-II Cities

Indices	Bikaner City		Jodhpur City		Jaipur City		Kota City	
Overall Pollution Index	49.32	Low	75.45	High	61.57	Moderate	71.92	Moderate
PM2.5	30	Low	98	High	105	High	84	Moderate
PM10	93	Moderate	180	High	193	High	156	High
Air Pollution	38.10	Low	66.25	High	55.95	Moderate	71.00	High
Noise Pollution	43.75	Moderate	62.5	High	50.95	Moderate	50.00	Moderate
Water Pollution	54.17	Moderate	63.89	High	63.38	High	51.47	Moderate
Inadequate Garbage Disposal	70.24	High	77.78	High	56.01	Moderate	72.22	High

Source: Numbeo Survey (2022) and WHO Data

CONCLUSION

This study aims to assess the dynamic role of industrialization and urbanization in providing references for regional sustainable development in the specific context of select Tier-II cities of Rajasthan (India). Based on the review of extant literature and secondary data collected from various sources, the study observed that industrialization is one of the main catalysts of the urbanization of Tier-II cities. With the establishment and expansion of industries, the Tier-II cities experienced population growth, physical & demographic expansion, increased manufacturing and commercial activities, better job opportunities, and infrastructure development. In addition to economic growth and opportunities for businesses and individuals, industrialization and urbanization also poses considerable consequences for sustainability. The study concluded that policymakers should think hard and act seriously to minimize the consequences of industrialization and urbanization so that they are useful for the sustainable development of not only Tier-II cities but all urban centers across the country.

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