



Economic Growth of Urban Centres with Unemployment and Trajectories of Infrastructure Facilities in Pune district, India

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Abstract: Urbanisation is increasing fast with high investment in physical and social infrastructure in Pune Metropolitan Region. The poor people from rural area migrate to Pune region for employment, health facilities. Few small- and large-scale business firms provide an employment opportunities through production process through circular flow of income. Pune district has maximum profitable investment avenue within India. Pune district shifted its base from manufacturing to Information Technology (IT) sector. The IT cluster is major source of revenue earning sector for state government. High skilled youths attracted to IT sector because of employment opportunities and other services. Pune emerged as industrial powerhouse with several IT parks, business parks, technological industries, educational institutions and physical infrastructure. Employment in commercial units and educational institutions is increasing in Pune, but it is only increasing in growth centres such as Chakan, Khadkwasala, Pirangut, Hinjewadi, Talegaon, Sikrapur, but it is not increasing in Malavali growth centre and other rural area. Physical infrastructure is a major constraint in employment opportunities. Therefore, state government and municipal corporations must invest in physical and social infrastructure in Pune Metropolitan Region. The urban centres must be connected through high-speed metro and local trains. The policies such as housing for all, continuous drinking water supply, roads

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connectivity, quality education will create good impact on development of growth centres and region. Such policies will create sustainable employment opportunities, improve standard of living of people, infrastructure growth. It will automatically accelerate economic growth of district and state.

Keywords: Industrialisation, Growth, Health care

INTRODUCTION

Urbanization is a process of population concentration which occurs by increase in the number of concentration or agglomeration and by increase in the size of individual population concentrations or agglomerations (Kank and Veer 2022). Countries with different populations have reacted differently to the rise in urbanization. Vulnerable employment in higher-income countries has been more significantly affected by the rise in urbanization, and more populous countries are more sensitive to it as well. These findings provide evidence for how urbanization promotes employment and decent work (Chen M. et.al 2023). In developing countries, migration is taking place from rural to urban area. Many educated uneducated are leaving rural area and join labour force in urban area. The poor and destitutes migrate towards cities due to lack of infrastructural facilities at rural area. They get the employment, business opportunities, educational and training, health care access in urban area. The newly migrants involved in variety of economic activities and generate income for the family.

Industrial units generated employment through investment in different units. Investment by industrialist is not done uniformly in region. Employment is scattered at different industrial estates. Government has created space for industrialists through industrial development corporations and industrial policies. Industrialists are provided plots for production at lower prices with good infrastructure facilities. People live nearby industrial areas and work in the various units. Such pattern of investment decides the urbanisation process in developing countries. The Pune city is not exception to this phenomenon. Those people do not get direct employment in industries starts their own shops and other economic activities in that area. In such process maximum direct and indirect employment is generated with forward and backward linkages. An informal sector employment includes six steps named, migration to urban areas, decision to be involved in the informal sector, informal employment selection, place selection, final preparation, and informal sector activity (Huda Ekramul

Muhaiminul Islam 2020). Such steps are followed in all over regions in Pune region. In recent decade, information sector employment grown in Pune region.

Industrial development corporation of Maharashtra allocated space to small- and large-scale industrial units in district. For promoting foreign direct investment, the roads, water supply, electricity are provided by the state government. Over the period, the units are expanded and new units entered in the area. The professional staff took number of assignments in firms and living with better standard of living in city. The settlements also grown of migrants those working in units and live close to their workplace. The number of houses, cars, trucks and tempos, auto rickshaws and buses increased in Pune region. The informal sector also grown because many people migrated in the city. They live nearby industrial units, areas and provide services such as hotels, shops, markets etc. Such activities creased congestion in the region. On every road, there is huge traffic jams with no space for paediatricians to walk. There is continues movement of goods and passenger vehicles on roads. Whole day, there is congestion and traffic jams on roads and near industrial estates. There is no proper parking space available for vehicles and footpath for paediatricians, bus stops and auto stands. Such congestion and traffic issue are observed all over city. At evening and morning hours, there is continues traffic due to workers going for work, children going and coming from schools, the vendors selling items sideline of roads. The autos and buses do not follow the traffic rules and drive how they want. Passengers are full in autorickshaws and buses which crates another traffic jams in city. People spend maximum morning and evening time in traffic jams. They cross little distance in hours of traffic jam in their personnel vehicles. Their health is always affected because of pollution, sewage smell, Noice of vehicles etc. Pune Metropolitan Region and state government has paucity of funds. Building roads, flyovers, footpaths is difficult task, and it is time consuming task for corporations, but population and industrial units are increasing fast. Since many years, traffic issues are not solved at highways and street roads. Industries always show interest in investment, but space for industries is a major constraint in region. The urban centres are overloaded with traffic, illegal constructions, narrow roads, no parking, gardens etc. Lack of basic infrastructure facilities are affecting on the quality of life of people. In Pune city, solid waste is not collected properly (Rode S.2018). We always find that people litter the solid waste near street, empty

spaces, ponds etc. Sewage lines and related work is not properly done in region. Sewage is not processed completely in region. The untreated sewage pollutes the water resources in region because it flows in open area and meets rivers and ponds. City administration does not have control of migration. Urban area is continuously increasing with lower infrastructure facilities to its population. The first part of the paper explains about the data collection and methodology used for this paper. The second part deals with population and industrial units in region. The third part of research paper explains about the regression results. The last part deals with conclusion and policy implication.

DATA AND METHODOLOGY

To study the employment and growth centres and urbanisation pattern in Pune Metropolitan Region, we have used secondary data from different sources. The secondary data is collected from population census 2001, 2011 for Pune district and Pune Metropolitan Region. We have referred Pune city development reports of various years. The Pune district gazetteer has been referred for historical data and economic development. The other reports of Pune Metropolitan Region, environment status reports of Pune city, Pimpri Chinchwad have been referred. Times of India, Loksatta and Maharashtra times newspapers also referred for the employment, physical infrastructure issues in region.

ECONOMIC MODEL

We have developed the economic models for population, urban growth centres and employment in primary, secondary and tertiary sector.

$$\sum_{t=1}^n P = f \sum_{t=1}^n (PMR) \quad (1)$$

Population (P) in Pune is defined as population in Pune Metropolitan Region (PMR)

$$\sum_{t=1}^n P = f \sum_{t=1}^n (PMC, PCMC, MC, NP, Cant, CT) \quad (2)$$

The population in Pune Metropolitan Region (PMR) is further divided as population in Pune Municipal Corporation (PMC), Pimpri Chinchwad Municipal Corporation (PCMC), Municipal Councils, Nagar Panchayats (NP), Cantonment boards, CT.

$$\sum_{t=1}^n UGC = f \sum_{t=1}^n (C, A, W, LK, Ka, Pi, Hi, Ta, Ma, Raj, Si, Uk, Sa, Kh, Na, Ra, Ya, Ke) \quad (3)$$

Urban growth centres (UGC) are classified as Chakan, Alandi, Wghaoli, Loni Kalbhor, Khadakwasala, Pirangut, Hinjwadi, Talegaon, Malavali, Rajgurunagar, Shikrapur, Urali Kanchan, Saswad, Khed Shiwapur, Narsapur, Ranjangaon, Yawat, Kedgaon.

$$\sum_t^n E_m = f \sum_t^n (P, S, T) \quad (4)$$

Employment is divided as primary, secondary and tertiary sector employment in region.

$$\sum_t^n E_s = f \sum_t^n (M, NM) \quad (5)$$

The employment in secondary sector is classified as employment in manufacturing units and employment in non- manufacturing units of region.

$$\sum_t^n S_{NM} = f \sum_t^n (A, AA, Eng, Pha, Biot, Ele, Fpro, HM, O, IC, ITS) \quad (6)$$

Secondary sector in non-manufacturing is related to automotive, auto ancillary, engineering, pharma, biotech, electronic, food process, heavy machi, others, info and communication, IT other services.

$$\sum_t^n SM = f \sum_t^n (SMR, WT, FS, RT, RH, FI, REW, AES, VSTW, OAS, E, HHSW) \quad (7)$$

Secondary manufacturing services are divided as sales maintenance and repair, wholesale trade, Freight and storage, Retail trade, Restaurant and hotels, Financial and insurance, Real estate work, Arts, entertainment, sports, Vocational scientific and technical work, organised administrative and support, Educational, Human health and social work.

HISTORY OF PUNE CITY

Pune city was earlier known as Poona. The Britishers established railway line from Mumbai to Pune. Population growth took place due to its connectivity to Nasik, Satara, Solapur, Kolhapur, Ahilya devi Nagar and Mumbai. The people from different districts migrated for trade, education and other purposes in Pune. Therefore, Municipal Council of Pune established in 1858. But population growth took place further due to number of employment opportunities in government and private firms in Pune. Trade and commerce grown significantly due to investment in infrastructure. Many companies stated exports of commodities. After independence, many engineering, manufacturing companies established in Pune city. Therefore, population

growth took place in short period of time. Municipal council is converted into Municipal corporation in 1950. But number of companies shifted its base of production outside of city boundary. Pune had huge migration of population, growth of vehicles, markets etc. In 1961, the Panshet dam breach and Pune city flooded. The flood resulted into huge damage to houses and building near to riverbanks of Mula and Mutha rivers. Therefore, Pune Municipal Corporation restricted the new establishments near Mula and Mutha riverbeds. Municipal Corporation of Pune promoted industrial outside of corporation area. The manufacturing and IT establishes took place near Bhosari, Aundh Viman nagar, Wagholi, Kharadi, Balewadi. The Pimpri Chinchwad Municipal Corporation established by state government to manage urbanisation and industrialisation. In 1967, the Pune Municipal Corporation (PMC), PCMC, and two cantonment s and surrounding villages converted into Pune Metropolitan Region. Many educational institutions were established in such period. Pune is now called as Oxford of East. Yashwantrao Chavan express road began in 1988 and completed in 2001. It connected cities from South and North part of state. Mumbai came very close to Pune due to new express way. It further helped growth of Pune city in terms of employment and industrial production and IT sector. Pune district is 3rd largest economic contributor to Maharashtra’s economy.

GROWTH OF POPULATION

Due to urbanisation and industrialisation, population of Pune city and district has grown continuously over the period.

Table 1: Population growth in Pune district and Pune Metropolitan Region

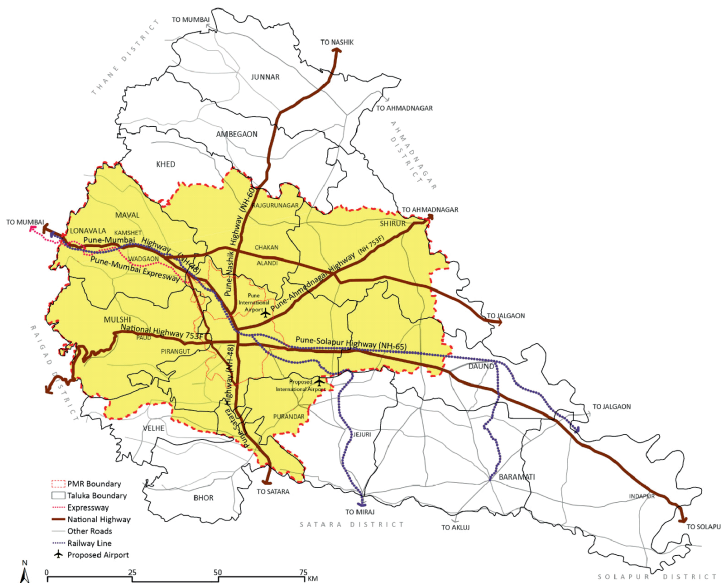
<i>District/Region</i>	<i>Details</i>		<i>Urban</i>	<i>Rural</i>		<i>Total</i>
		2011	Percent	2011	Percent	
Pune district		5751182	61.00	3678226	39.01	9429408
	PMC	3124458	58.54			
PMR	PCMC	1727692	30.00			
	MC	277969	4.83			
	NP	33162	0.58			
	Canto	199426	3.46			
	CT	149248	2.59			
	Total	5511955	78.66			

Source: 2011 Census

The total population of Pune district as per 2011 was 9429408. In which urban population was 5751182 (61 per cent) and rural population was 3678226 (39.01 per cent). In Pune Municipal Corporations (PMC), population was 3124458 (58.54 percent), Pimpri Chinchwad Municipal Corporation (PCMC) 1727692 (30 per cent), Municipal councils 277969 (4.83 percent), Nagar Panchayat 33162 (0.58 percent). Total population of Pune Metropolitan Region (PMR) was 5511955 which is 78.66 per cent in 2011. Population of Pune Metropolitan Region is continuously growing due to high urbanisation, infrastructure facilities. Population growth observed higher in urban centres of region.

ABOUT PUNE METROPOLITAN REGION (PMR)

Pune Metropolitan Region comprises Pune Municipal Corporation, Pimpri Chinchwad Municipal Corporation and 3 cantonment boards. Pune Metropolitan Region spread over 7256.46km². As per 2011 census, the population of PMRDA was 7541946. PMRDA contributes 80 percent of GDP to Pune district and 9.2 per cent GDP to Maharashtra. Pune Metropolitan Region is spread over Rajgurunagar, Shiror, Bhor, Purander, Velhe, Daund, Haveli, Mulshi, Maval tehsil in Pune district.



Map 1: Pune Metropolitan Region in Pune District

Pune is known for industries, commercial activities, education hub, administrative and defence services. A few decades back, Pune was known for agriculture products and market centre. It established a chain of wholesale market for agricultural commodities. Many companies choose Pune for investment. Pune became an industrial hub over the period not only in Maharashtra but it established linkages all over world. Pune has good connectivity to Mumbai, Ahilya Nagar, Sambhaji Nagar, Solapur and Satara. PCMC became the hub of industrial production units. During 1990 and 1992, Kirloskar, Bajaj, Telco Philips established units. Many MNC's chosen Pune as investment destination. It became the base of manufacturing and IT sector. The Hinjewadi, Magarpatta, Hadapsar, Kharadi emerged as IT centres. Tremendous growth of population took place in Such areas. It further affected real estate demand. Pune has educational institutions, many young people migrated to Pune for education and employment. Industrial units did maximum investments in Maharashtra Industrial Development Corporation (MIDC). Industrial clusters spread in MIDC's such as Talegaon, Chakan, Ranjangaon, Kharadi and Hinjewadi. Industrial clusters have seen in Urse along Mumbai Pune expressway along Talegaon Chakan road at Maha lunge in Khed at Kikrapur and Sanaswadi, Koregaon Bhima along Pune-Ahmedkar corridor at Urali Kanchan towards Solapur highway and Sasewadi in Khed Shivapur. Such industries in clusters influenced employment trends in villages as workers engaged in non-agricultural activities. It has shown a increase in numbers and concentration along and around these developments.

INDUSTRIAL DEVELOPMENT IN PUNE DISTRICT

Pune has longer history of industrial development and information technology companies. The degree and development of employment concentration/centralization varies between cities of different sizes and that there are, furthermore, strong differences between different regions with different historical path dependencies regarding urban development (Heider Bastian and Stefan Siedentop 2020). Developments in manufacturing and services sector gave a better shape to economic growth. After 1991, liberalisation policy, Pune Municipal Corporation and Pimpri Chinchwad Municipal Corporation decentralised its urban development. They promoted industrialisation outside of their boundary. Due to higher urbanisation, industrial development,

space constraints, the Pune Metropolitan Region decentralised the industrial development. Number of industries allowed to set up base in various industrial areas. The infrastructure such as roads, electricity, water supply provided to such industrial corridors. Industries such as auto ancillary, engineering, IT pharmaceuticals, chemicals established in such industrial estates. Pune provides employment within and outside of corporation boundary. We have given the distance of industrial estates with major industries from Pune city.

Table 2: Industrial Estates in Pune Metropolitan Region (PMR)

<i>Location</i>	<i>Distance from Pune city (km)</i>	<i>Major Industries</i>
Chakan	35	Engineering, Auto and Auto Ancillary
Hadapsar	10	Engineering, Food, Auto Ancillary
Hinjawadi	19	Pharmaceuticals, Auto Ancillary
Jejuri	45	Pharmaceuticals, Textiles, Engineering
Kharadi	17	Engineering
Pimpri Chinchwad	17	Engineering, Auto and Auto Ancillary,
		Pharmaceuticals, Engineering
Pirangut	25	FMCG, Pharmaceuticals, Engineering
Ranjangaon	50	White Goods, FMCG, Auto, Engineering, Electronics
Talegaon	35	Engineering, Auto and ICD, Floriculture, Inland Container Depot
Sanaswadi	25	Steel, Engineering, Auto and Auto Ancillary
Shirwal	60	Engineering, Consumer Durables, Chemicals, Pharmaceuticals
Uruli Kanchan	33	Engineering, Paper, Agriculture
Rajguru nagar	43	Engineering, Confectionary

Source: PMRDA reports

Chakan is located 35 km from Pune city. Chakan MIDC has engineering, auto ancillary industries. It has created maximum number of employment opportunities. Many skilled labor travel from Pune to Chakan for work. Hadapsar is located 10 km away, but it has engineering food, auto ancillary industries. Workers stay at Pune and Hadapsar and work in different small and large-scale companies. Hinjewadi is 19 km away from Pune city, but it has pharmaceutical, auto ancillary industries and IT industries. Shirwal is 60 km away from Pune, but it had engineering, consumer durable chemical and pharmaceuticals. It is quite far away from city but it is a developing town. Ranjangaon is 50 km away from Pune city but there are white goods, FMCG, Auto engineering and electronics industries. Large godowns are also available in the growth centre because space availability. We can say that the impact of industrial employment on population agglomeration has become insignificant. The impact of modern service industry employment on population agglomeration is still significant, but its influence is gradually decreasing (Xiao, X. 2020). Many industrial units are going far away in region and investing in production activities. After independence, Central government brought number of industrial policies for industrial development in country. Indian Government's policy of supporting and promoting small manufacturing industry, whose aims stressed the generation of employment, the productive use of capital and skills, and the contribution small manufacturing can make to promoting regional and rural/urban balance. A less well publicised aim of the policy has been to create a sector which is viable and self-sustaining (Williams, T. L. 2020). Every industrialist wants to invest in Pune region because of skilled manpower. The growth of small-scale companies is one of the most important components. Several initiatives to maintain, modernize, and advance this set of industries were begun soon after independence, and these initiatives eventually evolved into the current small scale industrial program. Small businesses have played a significant role in the rise of industrial entrepreneurship in the middle class by providing competent technicians and young educated men from that stratum of society with the opportunity to go into business for themselves (Hosahalli Anilkumar and N Honnurswamy 2024). Pune region has wide scope for business and production base. Small scale industries are the second largest employer of human resource after the agricultural sector and produce a wide variety of products ranging from traditional to high-tech. SSI plays a pivotal

role in economy as of being labour-intensive, helps to generate employment in rural as well as in urban areas. The SSIs had also played a cardinal role in the growth operation despite of drastic competition from the big industrial houses and not immensely enriching support from the government. The elemental problem that is confronting the Indian economy is escalating pressure of population on land and needs to create enormous employment opportunities. There are few major industries are also located in Pune district.

Table 3: Major SMEs in Pune district

<i>Major Manufacturing Sectors</i>	<i>Number of Enterprises</i>	<i>Number of Employees</i>
Manufacture of fabricated metal products, except machinery and equipment	4,789	46,913
Manufacture of machinery and equipment N.E.C.	3,196	41,630
Other Manufacturing	3,294	37,568
Computer programming, consultancy and related activities	1,276	37,183
Manufacture of food products	3,115	22,592
Information service activities	462	19,831
Manufacture of rubber and plastics product	1,537	18,557
Manufacture of electrical equipment's	969	17,027
Employment Activities	396	15,802
Manufacture of motor vehicles, trailers and semi-trailers	898	15,479
Manufacture of basic metals	1,659	12,593
Security and investigation activities	211	11,395
Food and beverages service activities	1,866	11,311
Other professional, scientific and technical activities	1,478	11,126
Manufacture of computer, electronics and optical products	5,74	9,652
Total	25,146	3,28,659

Source: PMRDA reports

In Pune region, many small-scale industries are located. Small scale industries (SSI) are engaged in production, manufacturing or service at a micro scale. Small scale industries play a focal role in the economic and social development of India in the post-independence era. Small scale industries constitute the backbone of a developing economy with its effective, efficient, flexible and innovative entrepreneurial spirit (Banik, Subhamoy 2017). Manufacturing of fabricated metal products except machinery and equipment could be 4789 in city and it is providing 46913 people employment. Other

manufacturing could have 3294 unit and providing 37568 employments. The manufacturing of food products could be 462 and providing 19831 employments in city. The manufacturing of basic metals could be 1659 and providing employment to 12593 persons. Total could be 25146 MSL units in city and generating 328659 employments.

INFORMATION TECHNOLOGY FIRMS' GROWTH IN PUNE REGION

In Pune Metropolitan Region, automotive, auto-ancillary, electronics, food processing and engineering firms have increased fast. The manufacturing and services have increased in industrial estates. All industries are established due to skilled workforce, connectivity and infrastructure. The IT/ITES banking finance, trade, hospitality, biotechnology research centres and communication related industries grown. Pune contributes half IT export in Maharashtra. Pune is among four cities as far as software export concerned. It is far ahead than Mumbai in software exports. It has several IT parks, business processing management, Information technology, outsourcing (ITO) and engineering services outsourcing (ESO). Pune is directly competing to other IT hubs of India such as Bangalore, Hyderabad. Pune could have 3 to 34 lakh workforces spread over BPO, KPO, ITO and ESO. Educated youths in IT sector attracted to Pune for employment. There are more than 172 private IT parks in Pune. They are mainly located at Hinjewadi, Koregaon park, Yeravda, Viman Nagar, Karadi, Magarpatta, Phursungi and Talawade. The Rajiv Gandhi infotech park at Hinjawadi is dedicated MIDC park. It is spread across 695 hectors. There are major IT companies located such as Tech Mahindra, TCS, RMZ, Infosys, Wipro, cognizant ascendas, hexaware technologies. Hinjewadi IT Park employs most of the IT staff. Pune is promoting AI, blockchain and other high IT innovation sectors. In Pune, housing, commercial, retail, hospitality demand has grown significantly. Maximum investment took place in real estate. The major IT firms, banking and financial services and insurance has increased. Industrial development driven the development of automobile, engineering, automobile, logistic, e-commerce, consumer durables, wearing facilities. The Chakan, Talegaon, Ranjangaon have major warehousing, micro markets. The industrial units grown in Sanaswadi, Pulgaon, Wagholi and Lonikand. The wear housing and

logistic activities are also available at Wagholi, Lonikand, Koregaon Bhima, Katraj. The real estate parks also developed at such places.

GROWTH OF POPULATION IN PUNE

We estimated the growth of population in Pune, Pimpri Chinchwad Municipal Corporation, Cantonment, Municipal Councils and Nagar Panchayat in Pune Metropolitan Region. People are continuously migrating in Pune from nearby villages, towns, cities. Few started their own small-scale business and few works in different companies.

Table 4: Growth of population in Pune region

<i>Year</i>	<i>PMC</i>	<i>PCMC</i>	<i>Cantonments</i>	<i>Municipal councils and NPs</i>	<i>Total PMR</i>
2021-31	1.79	1.93	0.10	1.46	1.89
2031-41	1.50	1.78	0.10	1.26	1.56
2041-51	1.28	1.48	0.10	1.10	1.33

Source: Author calculation

The population growth in PMC will be 1.79 percent from 1921-31. But in 2041-51, it will be only 1.28 percent. Firstly, the population growth will decline. The migration will also decline in region. The population growth will be 1.93 percent from 1921-31. But in 2031-41, it will be 1.78 percent. It will be recorded as lowest growth of population in region. Fertility in region also declining fast. Population growth (0.10 percent) will not change over the period of study. i.e. 1921-31 to 2041-51. Population growth in Municipal Councils and Nagar Panchayats will decline over the period. It will be 1.46 percent in 1921-31. But it will be 1.10 percent in 2041-51. Population growth in PMR will be 1.89 percent from 2021-31. But in 2031-2041, it will grow as 1.56 percent. In 2041-51, it will be only 1.33 percent. We can clearly observe that population in Municipal corporations, Councils and Nagar Panchayats in Pune region will decline in future.

GROWTH OF POPULATION IN GROWTH CENTRES

In Pune Metropolitan Region, higher population growth observed in few centres. The population growth is decided by infrastructure facilities, housing policies, access to transport. Such factors differ across the urban centres. Employment centres serve as crucial drivers of intra-city development,

especially in the ubiquitous polycentric transformation. Clarifying the role and impact mechanisms of centres in intra-city growth echoes both theoretical basis and actual needs. However, the empirical understanding is surprisingly limited (Zhang et.al 2025). We have calculated the growth of population in growth centres in Pune region.

Table 5: Growth of population as per growth centres (Percent)

No	Growth centre	2021-31	2031-41	2041-51
1	Chakan	2.98	2.81	2.14
2	Alandi	1.34	1.31	1.14
3	Wagholi	1.88	1.96	1.61
4	Loni kalbhor	8.72	4.49	2.99
5	Kadakwasala	3.40	2.54	1.98
6	Pirangut	4.00	2.99	2.24
7	Hinjwadi	5.93	3.68	2.61
8	Talegaon	2.45	2.37	1.87
9	Malavali	1.29	1.38	1.20
10	Rajgurunagar	1.79	1.88	1.55
11	Shikrapur	2.21	2.01	1.65
12	Urali kanchan	0.92	0.88	0.80
13	Saswad	7.55	4.06	2.79
14	Khed shiwapur	1.00	0.90	0.82
15	Narsapur	0.57	0.54	0.51
16	Ranjangaon	2.32	2.31	1.84
17	Yawat	0.97	0.85	0.78
18	Kedgaon	1.26	1.16	1.02

Source: Author calculation

Chakan is a largest automobile and manufacturing hub in India. It is hub for manufacturing and logistics in MIDC. Chakan is a hub of automobile and manufacturing of India, it is developed by Maharashtra Industrial Developed Corporation (MIDC). The automobile manufacturing are Volkswagen, Bajaj, Auto, Mercedes Benz, Hyundai, Mahindra and Mahindra, Jaguar, Land rover, Bajaj Auto, Daimler Benz, General Electric. Chakan city is called as motor city in India. Chakan is a wholesale agriculture produce trading hub. It has a special economic zone promoted by MIDC. Population will decline from 2021-31 to 2041-51 (2.98 percent to 2.14 percent). Alandi is pilgrim centre in region and resting place of Sant Dhyaneshwar. Population growth in

Alandi due to township plans and proximity to Pune. Population growth will decline from 2021-31 (1.34 percent) to 2031-41 (1.31 percent). Wagholi is urban centre which is famous for IT parks and educational institutions. The population will continuously increase from 2021-31 to 2031-41 from 1.88 percent to 1.96 percent. But after 2041-51, population will decline as 1.61 percent. Loni kalbhor will have high population growth (8.72 percent) from 2021-31. In 2041-51, the population will decline (2.99 percent) in this city. Khadakwasala is growing in terms of residential complexes, small business firms. It has high population growth due to proximity to Pune city. Population will grow in 2021-31 (3.40 percent). But in 2041-51, the population will grow as only 1.98 percent. Pirguit is an industrial centre of Pune region. Many small manufacturing companies are in Pirguit. More residential complexes are getting developed in city. Population growth was reported as 4 percent from 2021-31. It will decline to 2.44 percent from 2041-51. Hinjewadi area is known as for IT sector and IT companies. It is place where 800 software related companies established in business parks. State government has developed infrastructure facilities for this infotech and business parks. Therefore, population growth took place in this growth centre. In 2021-31, population growth took place from 5.93 percent from 2021-31 period. In 2041-51, the growth of population will be 2.61 percent. In Talegaon, the residential growth of houses took place. Many senior citizens live happily in Talegaon because it is very silent town with less pollution. Due to local train, population in Talegaon also increased over the period. The growth of population was 2.45 percent from 2021-31. In 2041-51, population growth will be 1.87 percent. Malavali is less developed growth centre. Population growth is very low due to basic infrastructure facilities. In 2021-31, the population growth will be 1.29 percent only. In 2041-51, the population growth will be 1.20 percent. Population will decline slowly in this town. Rajguru Nagar is a proximity to Pune and Pimpri Chinchwad Municipal Corporation. Many people stay in Rajguru nagar and work in Pune. The population will grow from 1.79 percent from 2021-31. It will increase further to 1.88 percent in 2031-41. Rajgurunagar do not have many industries but it is municipal council and place of market. Population in Shikarpur is growing fast because it is developing town located on Pune Ahilya Devi Nagar. Many migrants from Ahilaya Devi Nagar district settled in this town. Small and big industrial units are in this town. The growth of population will be 2.21 percent

(2021-31 period). In 2041-51, the growth of population will be 1.65 percent. The population in Urali Kanchan town will grow 0.92 percent from 2021-31. But in 2041-51, it is calculated as 0.80 percent. Saswad is developing town in Pune region. Due to proximity to Pune city, the Saswad city is developing very fast. The population growth will be 7.55 percent from 2021-31. It will be only 2.79 percent in 2041-51. Khed Shiwapur has very low population growth. It is very small town with less density of population. In 2021-31, the population growth was only 1 percent. In 2041-51, the population growth will be 0.82 percent. Population growth will further decline due to distance from Pune city. Narsapur is small town in Pune region. Few large and small industries are in Narsapur. They provide employment to people in region. But migration will be very low because of lower transport facilities. In 2021-31, population growth will be only 0.57 percent. In 2041-51, the population growth will be only 0.51 percent. Ranjangaon is industrial town in Pune region. Many industrial units are in Ranjangaon. Famous Maha Ganesh is located in Ranjangaon. Many pilgrims regularly visit to this place. Many godowns, automobile and manufacturing units are in town. The population growth in 2021-31, will be 2.32 percent. In 2041-51, the population will 1.84 percent. In Yawat, the population growth in 2021-31 will be 0.97 percent. In 2041-51, the population growth will be 0.78 percent. In Kedgaon, the population growth will be 1.26 percent in 2021-31. It will be 1.02 percent in 2041-51.

GROWTH OF EMPLOYMENT IN PUNE METROPOLITAN REGION

We have calculated the growth of employment in different sectors. Total employment is declining fast in all sectors of the economy of Pune region.

Table 6: Employment in different sectors in Pune Region (CAGR)

	<i>Total employment</i>	<i>Total Primary</i>	<i>Agri. Labourers</i>	<i>Cultivators</i>	<i>HH Industries</i>	<i>secondary and tertiary</i>
2011-21	1.95	0.09	-0.40	0.72	2.48	3.75
2021-31	1.60	0.09	-0.42	0.67	1.94	2.64
2031-41	1.36	0.08	-0.44	0.62	1.60	2.04
2041-51	1.30	0.09	-0.52	0.65	1.50	1.83

Source: Author calculation

The above table shows that total employment in Pune Metropolitan Region was 1.95 percent in 2011-21. In 2021-31, it is expected to be 1.60 percent. In

2041-51, it will be 1.30 per cent. Total primary employment will not change from 2031-2051. Agriculture labour has negative growth from 2031-2051. Agriculture labour has negatively grown from 2011-2021. It will decline from 0.42 percent. to 0.44 percent from 2021-31 to 2031-41. In 2041-51, it will further decline up to 0.52 percent. Growth of cultivators in PMR will also decline from 0.72 percent from 2011-21 to 0.62 percent in 2031-41. Growth of household industries was 2.48 percent in 2011-21. But in 2021-31, it will be observed as 1.94 per cent. It will further decline up to 1.50 percent. The secondary and tertiary sector employment was 3.75 percent in 2011-21. But in 2031-41, it is observed as 2.04 percent. In 2041-51, it will be 1.83 percent. We can conclude that the employment will continuously decline in different sectors in Pune region.

Table 7: Sectors and employment projection in Pune Region (CAGR)

<i>Sectors/Year</i>	<i>2024-30</i>	<i>2031-41</i>	<i>2041-51</i>
Primary sector	0.63	-1.43	-1.71
Secondary sector (non-manufacturing)	4.79	3.33	2.43
Automotive	2.31	5.15	3.26
Auto ancillary	1.54	3.59	2.56
Engineering	2.31	4.70	3.08
Pharma	4.00	10.23	4.70
Biotech	8.91	15.54	5.48
Electronics	2.71	4.67	3.06
Food process	7.71	11.99	5.01
Heavy machinery	-0.62	3.19	2.35
Others	-2.63	-8.19	-3.28
Info and communication	4.35	5.03	3.21
IT other services	2.43	3.27	2.40
Secondary sector (mfg.)	2.50	4.99	3.20
Sales maintenance and repair	3.57	3.34	2.43
Wholesale trade	3.39	3.37	2.45
Freight and storage	5.15	3.27	2.39
Retail trade	2.53	2.56	1.99
Restaurant and hotels	4.97	1.04	0.93
Financial and insurance	6.02	3.23	2.37
Real estate work	4.97	4.85	3.14
Arts entertainment, sports	12.28	2.33	1.85
Vocational scientific and technical work	2.49	1.94	1.60
Organised administrative and support	0.21	2.90	2.19
Educational	5.71	14.33	5.34
Human health and social work	2.73	16.76	5.60
Tertiary	3.81	3.08	2.29

Source: Author calculation

Employment in the primary sector will decline in Pune region. It will be 0.63 percent in 2024-30. But in 2031-41, it will be -1.43 per cent and in 2041-51, it will be -1.73 percent. People will get shift from agriculture to secondary and services sector. Water resources will get polluted, and production of agriculture commodities will not be possible. Secondary (non -mfg.) employment will be 4.79 percent in 2024-31. It will also decline from 3.33 percent to 2.43 per cent from 2031-2041 to 2041-51. Employment in the automotive sector will double from 2024-31 to 2031-41. More automobile companies will enter in Pune region. It will boost employment of skilled people. Employment in engineering will increase from 2.31 percent to 4.70 percent from 2024-31 to 2031-41. Few engineering companies required skilled workforce, and it will grow continuously in future. Employment growth in the pharma sector will grow from 4 percent to 10.23 percent from 2024-31 to 2031-41. But it will show a regular trend in 2041-51 as 4.70 percent. Pharmaceutical research will take place in Pune region. Already Lupin, Serum, Sun pharma are doing research related to medicines. In Biotechnology, the growth in employment will increase from 8.91 per cent from 2024-31 to 15.54 percent in 2031-41. In 2041-51, it will be 5.48 per cent. Demand for skilled workers will increase in different laboratories in Pune region. In the food processing industry, the employment growth will be 7.71 per cent in 2024-31. But in 2031-41, it will be 11.99 percent. Employment in heavy machinery will -0.62 percent in 2024-31. But from 2031-41, it will be 3.19 percent and in 2041-51, it will be 2.35 percent. Employment growth in heavy machinery will be very slow because heavy industries are shifting from Pune city to metropolitan region. Employment in information and communication will grow as 4.35 percent in 2024-31. In 2031-41, it will be 5.03 per cent. We find growth of jobs in information and communication sector in Pune region. Manufacturing industry is an industrial context refers to the process of producing goods on a large-scale using machinery, labour, and resources. It involves several steps such as design, sourcing raw materials, production, quality control, and distribution. Industrial manufacturing plays a crucial role in the economy by creating products that fulfil consumer needs and drive economic growth. Each industry has its own unique processes and challenges, but the overarching goal is to efficiently produce high quality goods (Vyas, Pankaj and Harshal Patel 2024). Employment in secondary sector (mfg.) will 2.50 percent in 2024-31.

In 2041-51, it will be 3.20 percent. Employment in wholesale trade will 3.39 per cent from 2024-31. But in 2031-41, it will be 3.37 percent. There is a constant growth in this sector as far as employment is concerned. Employment in freight and storage will 5.15 percent in 2024-31. But employment in freight and storage will decline continuously from 3.27 per cent in 2031-41 to 2.39 per cent in 2041-51. Employment in retail trade will increase slightly in 2041-51. It will decline to 1.99 per cent. Employment in restaurants and hotels was 4.97 per cent. It will continuously decline from 1.04 percent from 2031-41 to 0.93 percent in 2041-51. Employment in finance and insurance will decline from (2031-41 to 2041-51) 3.23 to 2.37 percent. Employment in arts, entertainment and sports will be 12.28 per cent in 2024-31. But in 2031-41, it will be 2.33 per cent. It will further decline up to 1.85 per cent in 2041-51. Employment in arts, entertainment and sports will have limited scope. Employment in organized administrative and support will increase from 0.21 per cent from 2024-2031 to 20.90 per cent in 2031-41. It will decline to 2.19 per cent in 2041-51. Employment in human health and social work will increase from 2.73 percent from 2024-31 to 16.76 per cent in 2031-41. It will further decline to 5.60 percent in 2041-51. Employment in the tertiary sector will 3.81 percent in 2024-31 and 3.08 per cent in 2032-41. It will be 2.29 percent in 2041-51. We have observed the decline trends in tertiary sector in Pune region.

LEAST SQUARE REGRESSION RESULTS

The ordinary least square regression (Greene W. 2003) is used to find the correlates of employment in different sectors and growth centres in Pune Metropolitan Region.

$$Y_i = \alpha + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{3i} + \dots + \epsilon \quad (8)$$

Where,

Y_i is dependent variable as employment in growth centres.

The X_1 , X_2 and X_3 are independent variable in the regression.

We have used the ordinary least square regression because of nature of dependent variable. It is also useful to find the co-relation factors with dependent variables.

Table 8: Regression results for area and employment

<i>Variable</i>	<i>Co-efficient</i>	<i>Standard Error</i>	<i>T test</i>
IT zones gross area	-10.593*	4.325	-2.449
Employment in commercial and education	0.000*	.000	-4.049
Growth centre area	0.362*	.072	5.014
Net commercial zone	13.229**	6.312	2.096
Constant	-19.501*	4.084	-4.775
R=0.92	R ² =0.85	Adjusted R ² =0.81	Std. Error of the Estimate=7.760

*Significant at 1 percent. **Significant at 5 percent, *** significant at 10 percent.

Gross area in region is dependent variable, and it is negatively corelated to employment. Employment is not related to the gross area commercial and education units. Small IT unit also provides the jobs to skilled workers. Employment in commercial and educational units in Pune is negatively co-related to employment. In long term, such units will not provide employment in region. Growth centre area is positively co-related to employment in Pune region. The net commercial zone is positively co-related with employment in Pune region. The net commercial zone provides maximum employment in region.

Table 9: Regression results for employment as per growth centres

<i>Variables</i>	<i>Co-efficient</i>	<i>Std Error</i>	<i>T Test</i>
Population	-848.352*	146.930	-5.774
Industrial area	0.443*	.012	36.995
Chakan	48448.941*	8085.070	5.992
Khadakwasla	6512.905**	2758.282	2.361
Pirangut	12693.446*	3071.875	4.132
Hinjavadi	15939.561*	3446.790	4.624
Talegaon	37330.564*	8086.768	4.616
Malavali	-7584.702**	2663.408	-2.848
Shikrapur	5082.389***	2733.400	1.859
Constant	2871.082**	1250.161	2.297
R=0.99	R ² =0.99	Adjusted R ² =0.99	Std.Error of estimate=2471.160

*Significant at 1 percent. **Significant at 5 percent, *** significant at 10 percent.

Employment in Pune region is negatively co-related to population. Employment in Pune region is not growing as per the population growth. Many

youths do not find job in different manufacturing and automobile industries. Most of the production units are using maximum technology such as AI and Robot. Employment in Pune is co-related to industrial area. Few industries are providing jobs to skilled people. Many skilled youths are attracted for jobs in the industrial estates. Employment opportunities are in few towns. Few skills oriented industrial units are in such towns. Employment in Chakan, Khadakwasala, Pirangut, Hinjewadi, Talegaon and Sikrapur is positively co-related and statistically significant. But employment in malavali is negatively co-related and statistically significant. The Malavali has very few small-scale units. They provide employment to very few unskilled workers. Therefore, employment in Malavali is not significant.

POLICY IMPLICATION AND CONCLUSION

Population of Pune district is continuously increasing since many decades. Industrial development took place before independence of country. Many small and medium industries established in city, and they created employment opportunities to people. Therefore, many rural people migrated in city for employment purpose. The growth of backward and forward industries took place which booted the employment opportunities in city. After liberalisation, the private industries such as Bajaj, Tata, Kirloskar Philips etc grown fast. In the globalisation period, many multinational companies invested in MIDC's of Pune district such as Talegaon, Chakan, Hinjewadi etc. Pune is called as oxford of east. Many educational institutions and Universities are located in Pune city. The skilled staff is available in Pune for industrial units. The urban centres such as Chakan, Talegaon, Alandi, Ranjangaon, Hinjewadi is providing maximum employment opportunities to newly migrants as well as skilled staff. The backward and forward industries developed across Pune Metropolitan Region which provides maximum job opportunities to people. State government connected Pune with Yashwantrao Chawan highway from Mumbai to Pune, Solapur to Pune highway, Nasik Pune Highway. Such connectivity helped migrants to enter Pune city. Pune has half exports of Maharashtra from IT sector. IT parks located at Hinjewadi, Koregaon park, Yeravda, Viman Nagar, Kharadi, Magarpatta. Population and employment growth took place in growth centres. The employment growth observed in commercial areas and growth centres such as Chakan, Khadakwasala,

Pirangut, Hinjewadi, Talegaon, Shikarpur. There is need of investment in infrastructure development for entire Pune Metropolitan Region. All the urban centres need to connect via metro trains and roads. Newly migrants need training and skills to perform different tasks. Role of computers and machines is important in manufacturing companies. Therefore, more skill development centres required in city. Every industrial estate must display the available employment opportunities at the gate. Decent salary, limited work hours, maternity leave to women labours, weekly off and training will boost the labour productivity in region.

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