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Role Of Infrastructure Planning On Industrial Presence In A Region: A Case Of Durgapur

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Abstract - *A designated infrastructure design, planning and implementation is mandatory for any region to be ready to host industries and industrial activities. The various infrastructure sectors like land based transportation services, water supply, waste management, power services management need to be planned in an efficient way to support an industrial setup in the region. These services act as basic pillars on which the functioning of the industries and the town/city as a whole largely depends, and thus need to be emphasized upon when the future of the industries are concerned because it directly affects the economy of the state and eventually the country. In case of industrial towns where the basic functioning and economy of the town is driven by one or more dominant industries, it is mostly seen that a pilot industrial development takes place in the region, which boosts the infrastructure development and thus a capacity building takes place which means that the particular town or region becomes competent enough to accommodate more industries, thus leading to the development of the region as an industrial town. Further with the drive to keep on supporting the industrial functions and as the economy generated from the industries is circulated in the town, the town experiences growth. To have a better understanding of this phenomenon, the case of Durgapur is being studied. This research paper, thus attempts to study the various factors with respect to infrastructure planning and management that enabled Durgapur to become a successful industrial hub in its inception. The study of these factors will ultimately lead to the findings which suggest the role of infrastructure planning in determining the growth and success of an industrial region. The paper deals with the key decisions, developments and guiding forces with respect to planning and allotment of necessary services and implementations regarding infrastructure development of the region.*

Key Words: **Industrialization, Infrastructure, Industrial planning, Hydroelectricity, Thermal power, Road networks, opportunities, Raw materials, Transportation, Utilization, Production, Generation**

1. INTRODUCTION

A region marked by the presence of several medium-scale or large scale industries points towards certain pre-determined requisites which have been fulfilled in the first place to make the region suitable for setting up the industries – the basic and advanced services that are essential for their functioning (Hauff, 2016). Study of different such industrial towns and regions enables a better understanding of the infrastructures in place. Durgapur is a planned integrated industrial city in West Bengal, India; planned by architects Joseph Allen Stein and Benjamin Polk in 1955. It has proved itself as a major industrial hub in West Bengal by becoming the fourth largest urban agglomeration after Kolkata, Asansol and Siliguri in the state (Chakroborty, 2014). In the second five-year plan, an investment of 1000 crore rupees was planned for Durgapur as a part of the large scale investments being made in the heavy industries sector (Jagannathan, 1987). There were few primary objectives for this decision, one of which was to efficiently use the rich mineral resources available nearby. Accordingly the transport networks and connection routes to major markets were planned for transportation. The Durgapur Barrage project by Damodar Valley Corporation (DVC), completed in 1955 was one of the forerunners among the major development projects were undertaken in the region post-independence. As a result of this, various industries started to be set up in the region which led the region to be established as an industrial stronghold and a prime pole of the Durgapur-Asansol industrial belt with the likes of Kolkata being a major export and import market for the produce and materials. Agricultural production was predominantly low in the region and the regional economy mostly comprised of mining activities in the Raniganj-Jamuria coal belt (City Development Plan, 2006). The various aspects of planning Durgapur as an industrial city includes holistically developing the infrastructures required and taking care of each sector for a sustained industrial development.

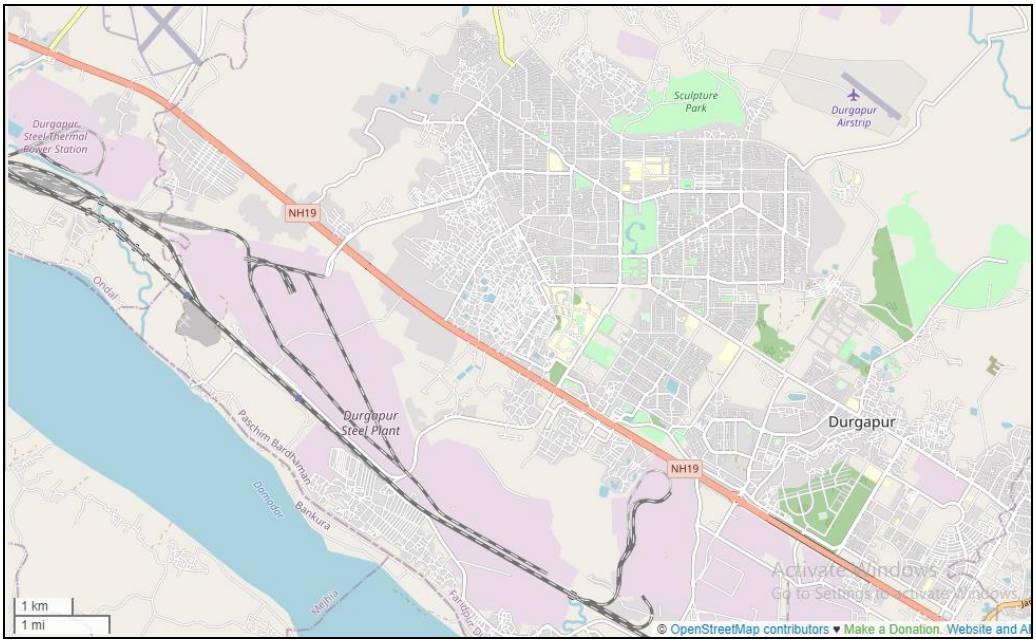

Fig-1: Map showing the Durgapur integrated industrial township (OpenStreetMap, 2023)

2. INDUSTRIAL DEVELOPMENT IN POST-INDEPENDENT INDIA

2.1. The Second Five Year Plan

The Planning Commission was set up in 1950 for the "balanced and most effective utilization of the country's resources". Even before the First Five Year Plan was implemented, the blueprints of various major projects like multipurpose schemes and steel plants, were under study, and some important projects had already been commenced. For industry and mining, the outlay proposed under the Second Plan was approximately nine times the actual outlay of the First Plan. The development of coal resources was assigned as a high priority. The target for coal output in 1960 was fixed at 60 million tons, an increase of 22 million tons over 1955, of which 12 million tons was to be extracted from collieries under the holdings of the public sector (Mohan & Aggarwal, 1990).

Table-1: Distribution of India's plan outlay in the industry and mining sector during the First and Second Five Year Plans (Commission, 1956)

Sector	First Five Year Plan (1951-56)		Second Five Year Plan (1956-61)	
	Total provision (million rupees)	Percentage distribution	Total provision (million rupees)	Percentage distribution
Industry and mining	1,790	7.6	8,900	18.5
Large and medium-sized industries	1,480	6.3	6,170	12.9
Mineral development	10	--	730	1.5
Village and small industries	300	1.3	2,000	4.1

The industrial priorities laid down in the Second Plan (for both public and private sectors) were increased production of iron and steel and heavy chemicals, development of heavy engineering and machine-building industries, expansion of capacity in respect of other producer goods, modernization and re-equipment of existing large-scale industries, such as cotton and jute textiles and sugar, better utilization of existing capacity, expansion of capacity for consumer goods. The expansion of the steel industry was given the highest priority, and heavy engineering industries (including structural fabrication and machine tools)

had a priority second only to steel. Three new major steel plants, each with a finished steel capacity of about 0.7–0.8 million tons and costing in all Rs. 3.5 billion (since revised to Rs. 5 billion), were proposed to be set up in the public sector; simultaneously, the existing steel mills in the private sector were planned to be expanded (Sharma, 1958).

2.2. The inception of the industrial towns

Thus, with the budget allocation and the drive to boost industrial development and production in the nation, actions were taken to set up these large scale industries and for supporting these industries, arose the need to set up planned industrial towns to generate and sustain the human resources required for running the industries. For a functional planning and design to take place, some key issues are addressed.
Following the addressal, the foundation for a well planned industrial area is laid. The various issues identified were:
- A site suitability assessment.
- The pollution potential of the proposed industries were studied and accordingly categorization and zoning was done based on the prevalent restrictions on degree of pollution contributed by the industries.
- The necessary widths of the infrastructure corridors according to industrial development norms and the environmental regulations were taken into consideration. These also included aspects like green corridors for seamless transportation of goods and services for industrial activities.
- Planning of the various mandatory infrastructures which include logistics and transportation, water supply and waste water, energy, waste management, blue-green infrastructure, security, disaster management, etc.
- Climatic conditions and accordingly efficiency of the units.

3. INFRASTRUCTURE PLANNING IN DURGAPUR

With the setting up of the Durgapur Barrage by DVC, different public sector units started showing interest in establishing industrial units in the region looking at the potential and locational advantages of Durgapur. The massive follow up consisted of Durgapur Steel Plant (1960), Alloy Steels Plant (1965), Durgapur Projects Limited (1961), Durgapur Chemicals Limited (1963). The drive for industrialization was accompanied by the establishment of ancillary and downstream units (Basu, 2018). Thus catering to the needs of the upcoming industrial corporations, the infrastructure planning of the region was taken up to provide quality facilities for smooth operation of the industries.

Table-2: Major forerunners of industrial corporations and their years of commission/incorporation (Basu, 2018)

Name of industrial corporation	Year of commission/incorporation
Durgapur Steel Plant Ltd.	1960 (commissioned)
Durgapur Projects Ltd.	1961 (incorporated)
Durgapur Chemicals Ltd.	1963 (incorporated)
Alloy Steels Plant	1965 (commissioned)

3.1. Water

Post-independence, the country saw an urgency for the industrial sector to be looked after and contribute to the economic upliftment of the nation. The Damodar Valley Corporation (DVC) was set up in 1948 with the primary aim of flood control, irrigation, power generation and navigation in the Damodar river. The long term plans of operating industries in Durgapur gave rise to the need for water and power generation in the factories. Thus the Durgapur Barrage was opened in 1955. It redirected and supplied water to the industries and the residences along with the other primary aims of keeping the flood under check and subsequently generation of hydroelectricity, currently capped at 1000 MW. Therefore, the major requirement of water in the industrial activities was solved and along channelizing the water for use, came the opportunity of generating electricity, which was successfully explored as well.

3.2. Thermal Power

With the estimation of the total power requirement of the industries in 1950-60, the Damodar Valley Corporation set up the Durgapur Thermal Power Station (DTPS), initially with two units of 75 MW and one unit of 140 MW in the First Stage. In the Second Stage, a new 210 MW unit was installed in September 1982 to cater to the rising power demands of the expanding industries (Carmen, 2021). This power generated in the thermal power station was fed to the industries to power the industrial operations. Easy availability of non-coking coal is primary for production of thermal power in the plant.

Table-3: Capacity of installed units under DTPS (Corporation, 2008)

Stage	Unit number	Installed capacity (MW)	Date of commissioning	Status
I	1	75	--	Closed in 1985
I	2	75	--	Closed in 1985
I	3	140	December, 1966	Active
II	4	220 (Output 210)	September, 1982	Active

3.3. Raw material: Coal

The Raniganj coalfields were the site of first commercial coal-mining in India and has been yielding coal since 1820. It is spread across an area of 443.50 square kilometres and contains total coal reserves of around 49.17 billion tonnes. It is the second largest coalfield in the country in terms of reserve. The coking and non-coking coal mines were nationalized in 1972 and 1973 respectively; and Coal India Limited was formed in 1975 of which, The Eastern Coalfields Limited was a subsidiary that managed the coal extraction and production in the Raniganj coalfields (MSME-Development Institute, 2017-18). Coal being one of the major ingredients of the plants in Durgapur, the location of Durgapur with respect to the coal reserves is extremely important. Non-coking coal from the reserves are used majorly in the Durgapur Thermal Power Station as steam coal for power generation, whereas coking coal is used to produce coke which in turn is an essential fuel and reactant in the blast furnace used in industrial steel-making. Some amount of prime coking coal with low ash content is imported (Limited, 2022).

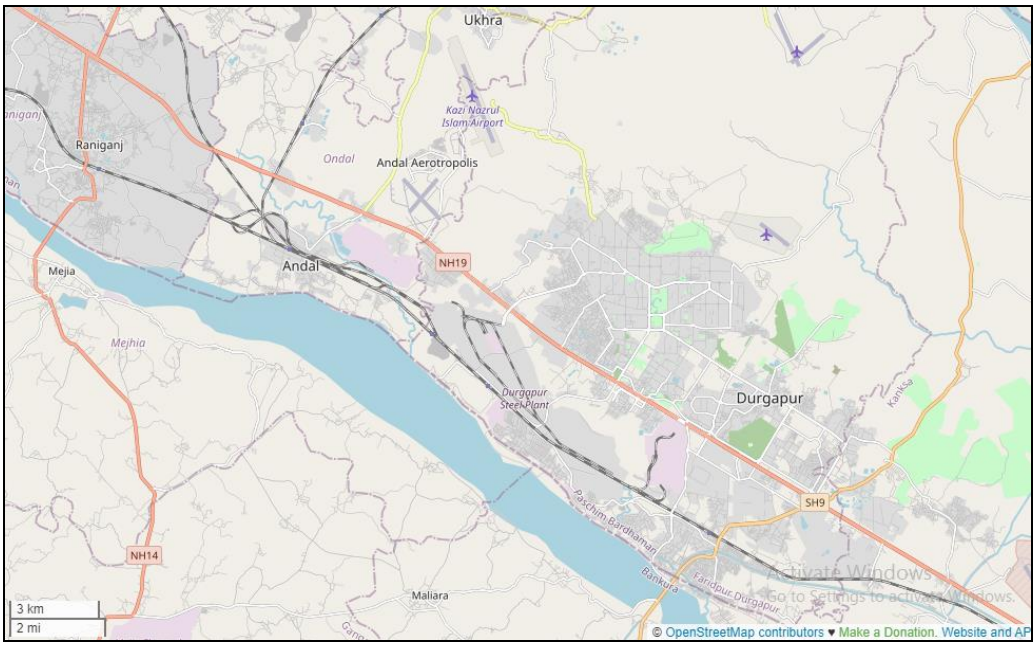

Fig-2: Map showing the location of Durgapur with respect to the Raniganj coalfields and their linkage (OpenStreetMap, 2023)

3.4. Raw material: Iron ore

Steel Authority of India Limited (SAIL) operates 8 iron ore mines and 2 flux mines spread across Jharkhand, Odisha and Madhya Pradesh to supply iron ore to its plants (SAIL, 2022). The Durgapur Steel Plant gets its share of iron ore majorly from the Bolani iron ore mines of Odisha (bharatonline.com, 2018). It is transported mainly through roadways namely the Durgapur-Raghunathpur Road which later merges into the National Highway 19 and reaches the steel plant. The plant consumes about 2.9 million tonnes of iron ore lumps and fines.

Table-4: Consumption of iron ore, 2016-17 & 2017-18 (in 000' tonnes) (Mines, 2018)

Steel plant	2016-17		2017-18	
	Lumps	Fines	Lumps	Fines
Durgapur Steel Plant	1431	2363	1363	2408

3.5. Transportation network: Road and rail

Durgapur is a linearly planned city along the National Highway 19 also known as the Grand Trunk Road which connects Kolkata and Delhi. The Grand Trunk Road is one of Asia's oldest and longest roads passing through cities like Dhaka, Kolkata, Allahabad, Delhi, Kabul connecting vast parts of Southern Asia for almost 2500 years. It is an important trade route providing commercial opportunities to the various cities and peri-urban areas it passes through. Thus planning of an integrated industrial city on it seems reasonable considering, logistics and transportation.

The industrial city had to be at an optimum distance from the supply region of the raw material and resources, and from the major markets where the produce can be sold and exported from. Thus, the transportation corridor was designed taking into consideration two major aspects :
- The transportation of non-coking coal from Raniganj coalfields for thermal power generation to power the industries.
- The transportation of steel - the primary product from the industries to Kolkata, which is the biggest import-export market in Eastern India. Also offering connectivity to other major markets of the country like Delhi, Varanasi, Kanpur. Allahabad.

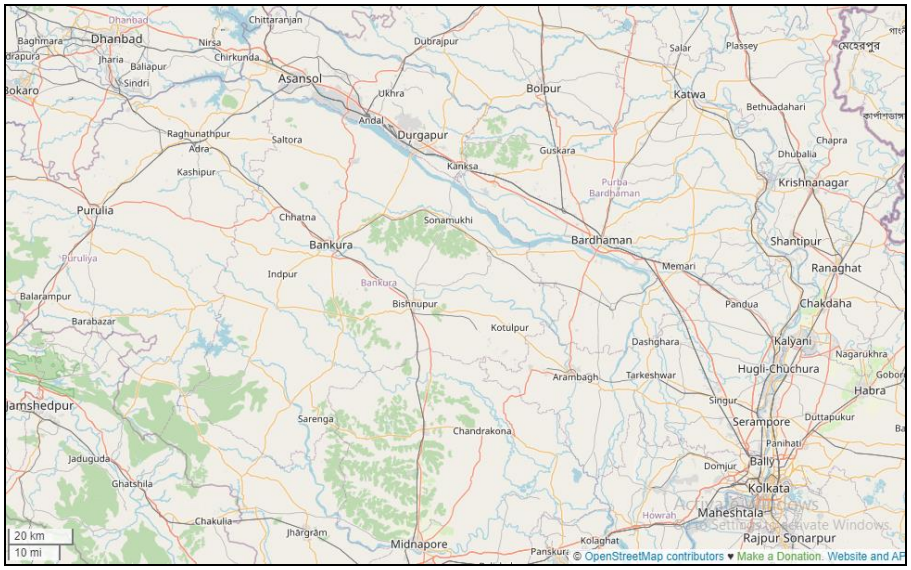

Fig-3: Map showing the location of Durgapur with respect to the major cities in the region (OpenStreetMap, 2023)

The city is divided into two distinct regions by the National Highway 19 passing through the heart of the city. The Northern part consisting of the residential sector of the city based on grid iron planning pattern. And the Southern part which has land parcels exclusively consisting of industrial properties and units. The main road (NH 19) acts as the spine of the city and facilitates both the industrial sector as well as the other sectors. The location of the road in the city plays a major role in the transportation of

industrial goods and logistical solutions as it acts as an arterial road in the urban level and also being a National Highway, it allows the high speed access of industrial vehicles making it the most important part of the industrial corridor.

Durgapur was conceived to be at a distance of approximately 40 kilometers from the rich coal producing region of Raniganj. The railway track present since 1855 in the Raniganj region were worked on and allowed for easy transportation of extracted coal from the mines to the industries (Wikipedia, n.d.). As the industries in Durgapur were set up, the railway lines were extended with regular stations in the name of the industrial units like Durgapur Coke Oven Plant. Thus, a direct linkage between the source of raw materials and the industries was achieved. The prospective industries began to function with the assurance of a regular supply of coking and non-coking coal, primary ingredients for the steel making industries in Durgapur.

4. CONCLUSION

This paper explores the different sectors and the concerned infrastructure development that took place during the inception of Durgapur as one of the first major industrial towns in independent India with the aim of making the nation a manufacturing superpower. The steel plant and the major public sector projects were set up in the city with the help of extensive research and planning in the sectors like water, transportation corridors, power, raw materials, etc. However, there are more aspects to explore in the near future as the region faces stunted industrial growth post the 1990s.

5. RECOMMENDATIONS

Various reasons can be held accountable for the fate of this integrated industrial township, major one being the overall decline of industrial activity in Bengal due to the continuous political turmoil during the 1970s and 80s extending into the 2000s (Bagchi, 1998). With lowered production capacities and shutting down of units, the city faces the risk of outmigration of the young populace in search of better opportunities.

Thus, these conditions definitely demand actions from the public and the private sectors to draw up solutions to restore and upgrade the industrial operations in Durgapur. The existing infrastructure has experienced decline over the course of the lifetime of the city, thus advanced planning can be implemented in line with the global standards to improve the concerned sectors. Besides this, pollution levels in the city should also be brought under check as according to the recent recorded levels, the level of pollution in the city contributed majorly by the industrial activities, is quite high (Basu, 2018).

Some positive actions taken by the governments and the public sector undertakings to revitalize the industrial presence in the region should be noted. The Mining and Allied Machinery Corporation (MAMC) set up in 1964 with the help of Soviet cooperation used to supply equipments for mining industries in the West. However, with the end of the Civil War, the industry began seeing its downfall and in 1992, it started incurring losses, ultimately being shut down in the early 2000s. In 2019, a consortium consisting of Coal India, Damodar Valley Corporation and Bharat Earth Movers acquired the MAMC. The acquisition will help both DVC and Coal India in getting high quality equipments for their thermal power plants and underground mining operations respectively (report, 2010). Further an improved line of mining machinery production with the help of technological inputs from the national and international institutions can enable the unit to export machineries to different mining giants in the world besides producing for domestic use.

Gas Authority of India Limited (GAIL) in 2021, completed a 348 kilometer pipeline project from Dobhi in Bihar to Durgapur in West Bengal at a cost of 2433 crore rupees as part of the Pradhan Mantri Urja Ganga project. It brings environment-friendy natural gas to the eastern region of India benefitting the states of Bihar, Jharkhand, West Bengal and Odisha. Besides providing cheaper cooking fuel connectivity points in the region, it also brings fuel for production of urea, a necessity of the fertiliser industry. Thus this project opens up an opportunity for a range of activities for gas based economy in the region. With the projected production of urea and usage of natural gas, the demand for costly naphtha and polluting coal is expected to go down (PTI, 2021).

One major industrial establishment taking advantage of this newly constructed natural gas pipeline extension is the Matix Fertilisers and Chemicals Limited. It consists of a 1.27 MTPA fully integrated, gas based urea plant, located at Panagarh, near Durgapur. It is among India's largest single-stream fertilizer facilities (Chemicals, 2022). The Hindustan Fertiliser Corporation (HFC) plant which got closed down attracted some attention from Rashtriya Chemicals and Fertilisers (RCF), who expressed interest in reviving the plant in 2007 (Chakraborty, 2007). With the availibilty of a steady supply of natural gas in the region, the right initiatives can revive the unit.

The Deucha Pachami coal block said to be the largest coal reserve in India, is at a distance of around 75 kilometers from Durgapur. It has four coal seams of lowest grade thermal coal but the viability of the entire project is questionable due to the difficulty of extraction and the uncertain condition of usable coal inside. Although the rehabilitation and resettlement policies are lined up, it will be a difficult gamble to efficiently extract the coal and use it thanks to the renewable technologies and the shift of policy focus to renewable options of energy (Bose, 2022). However, it contains nearly 2102 million tonnes of coal reserves, and can prove to be a major source of raw material for the steel and thermal energy plants in Durgapur, boosting up the steel production and power generation. Also, the coal block is owned by the Government of West Bengal thus making the pathway of extracted coal to the industries smooth, without any third party interference.

According to the Digital Employment Outlook Report 2022 by TeamLease, Durgapur is among the 20 emerging destinations for IT in India. The IT companies would look to establish their offices in these emerging locations, taking the jobs to the people as these 20 cities are projected to contribute more than 85% of the workforce from emerging locations across India (Sethi, 2022). The Software Technology Park of India (STPI), Durgapur established in 2004 was set up to promote, encourage and boost software export from the region. The state government has facilitated the setting up of some private IT parks across the city post 2011, attempting to create an ecosystem for the growth of the IT industry, however a lot still needs to be done in terms of facilitation of ease of business to the interested corporations and provision and service with respect to the required infrastructure, for making it a major IT hub in India.

The Kazi Nazrul Islam Airport located at Andal in the outskirts of Durgapur was part of the first private sector airport city project in India in 2012 to re-invigorate economic development in the region. It provides air connectivity to different parts of the country and was envisaged to divert the congested air traffic flow from the Netaji Subhash Chandra Bose International Airport in Kolkata. However, this airport and the entire project has been far from being a success. The condition of the allied industries and the overall industrial economic activity and employment generation in the region will be crucial in deciding the fate of this megaproject.

It is important for the city of Durgapur to evolve and develop according to the recent trends in terms of industry, infrastructure and economics. This evolution should be guided by the policies and strategies of the state and the central governments in line with the modern trends of demand and supply. Durgapur has the potential of being a torch-bearer in industrial development in Eastern India and subsequently India, as it was envisioned to be during its inception, thus bringing a major positive change in the economic state of West Bengal.

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