

An Appraisal in the Infrastructural Facilities for Industrial Growth in the District of Purba Medinipur, West Bengal

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A higher industrial growth requires well-connected infrastructural facilities and it is vital for India to maintain the momentum of higher sustainable economic growth. West Bengal is a densely populated state where the main occupation of the people is agriculture. Hence land for industrial activities is out of reach for the needy enterprises. In remote areas where land is available, some infrastructural difficulties like power, transportation, labour supply arise. To overcome these shortfalls, West Bengal Industrial Infrastructure Development Corporation (WBIIDC) has actively pursuing for balanced and well planned infrastructural facilities for the growth of industries all over the state. Haldia has been set up as a nodal centre for industrial activities in Purba Medinipur district of West Bengal. Huge amount of land and capital, enthusiastic entrepreneurs, availability of raw materials, cheap supply of semi skilled labourers, ample water supply, uninterrupted supply of power, good network of transportation, well developed market and proper waste disposal facilities have attracted large scale industrial enterprises to set up their factories in and around Haldia.

Keywords: Infrastructural Facilities, Sustainable Economic Growth, Enterprises, Balanced Development, Industrial Activities.

Introduction

Industrial infrastructure in India is greatly supported by the initiative of the Local and Central Government and foreign investors. The sectors which are most in demand for the development of industrial infrastructure include iron and steel, power, construction, oil refining and petrochemicals, textile, health, engineering, education, shipping, port and others. The Government has undertaken strong developmental policies that promote growth in infrastructural projects for the improvement of living conditions of the people.

The industrial growth in the district of Purba Medinipur is experienced only during the last fifty years. Though the district has a long standing history of small scale industries like rice milling, brass and bell-metal products, mat making and conch- shell products; but only after the commissioning of the Haldia Dock Complex large scale industries are set up at Haldia. Today Haldia and its surroundings have emerged as an important and integrated large and medium scale industrial complex not only in the district but in the country as a whole.

West Bengal Industrial Infrastructure Development Corporation (WBIIDC) was conceived and established as a key agency of State's Commerce and Industries Department for provision of requisite industrial infrastructure spread over West Bengal to ensure balanced and well planned industrial development. The corporation is now actively pursuing this role through innovative models and extension of activities into social infrastructure.

Objectives of the Study

The objectives for this article are as under

1. To study the infrastructural facilities available for the industries in Purba Medinipur district
2. To study the role of the State and Central Government for attracting the large enterprises to set up their factories at Haldia
3. To analyse the facilities provided by the local administration and municipality authorities for smooth running of the factories.

Research Methodology

This research paper is based on secondary data collected from various research articles, newspaper, reports, e-journal and different websites and from the office of Haldia Development Authority, West Bengal.

Research and Findings

Infrastructural development for industries is necessary not only for industrial sector alone but also for the social sector. It is of foremost important for proper development of economically backward areas.

Capital

In economics capital are factors of production used to create goods or services that are themselves significantly consumed in the production process.

Industrial finance is the task of providing the funds for industries' activities. For small business, this is referred to as SME finance (Small and Medium Enterprises). It generally attempts to maximize an entity's wealth and the volume of its stock.

Financial capital gives the business the power to buy goods to be used in the production of other goods or the offering of a service. Financing for industry arranges funding from simple business loans to complex multi-million dollar corporate and industrial transactions.

The largest industry in the district - Haldia Petrochemicals Limited which is a joint venture project with the State Government, has initially invested 29133 lakhs in its first phase during 1995. This amount has risen in the successive years. As for the public sector industries the investment has been made by the Government and in the private sectors, entrepreneurs have invested their own funds.

As for the Micro, Small and Medium Enterprises (MSME) sector, investment is limited up to 10 lakh in tools and equipments for Micro Service and up to 25 lakh in plants and machinery for Micro Manufacturing. Small Manufacturing sector can invest more than 25 lakh but not more than 5 crore in plant and machinery and Small Services can invest more than 10 lakh but not more than 2 crore in tools and equipments.

There are numerous funding schemes operated by the Central and State Governments to ensure employment to the rural youth in setting up their own business venture. Purba Medinipur district too ensures the following Self Employment Scheme –

1. Bangla Swanirbhar Karmasansthan Prakalpa where disbursement is made from Youth Welfare Department
2. Pradhan Mantri Employment Guarantee Programme
3. Udiyaman Swanirbhar Karmasansthan Prakalpa where disbursement is made from the employment exchange
4. Minority Development and Finance Corporation Scheme
5. Self Help Group which is operated from the Zilla Parishad.

The objective of these schemes is to assist validly registered unemployed youth to take up economically viable projects by providing subsidy

from the Government and credit on easy terms from banks and financial institutions. The primary eligibility to receive the assistance is to be aged between 18 and 45 years. The person should be registered unemployed or partially unemployed and has "fully paid" any loan or advance taken previously from any bank/financial institution or Central or State Government.

In the Udiyaman Swanirbhar Karmasansthan Prakalpa the loan amount varies according to the size and type of the scheme, subject to a maximum of A 50,000 per person. Schemes which are financed under this project are cottage and small scale sector, retail trade, small business, service sector, transport sector, agriculture and activities related to agriculture including pisciculture etc. The loan amount is to be repaid within five to seven years after the disbursement. As for the Pradhan Mantri Employment Guarantee Programme for the year 2008-09 the total amount of subsidy was A 371.92 lakh and 994 numbers of cases have been sponsored. Disbursement is made by the banks in 408 numbers of units.

All these efforts are attracting more and more people to engage in production and at the same time thus reducing the unemployment and level of poverty.

Entrepreneurship

Entrepreneurship is a French word which means 'one who undertakes innovations, finance and business acumen in an effort to transform into economic goods". This may result in new organizations in response to a perceived opportunity. The most obvious form of entrepreneurship is that of starting a new business. Industrialization in the district of Purba Medinipur started only during 1970s when the largest public sector company Indian Oil Corporation (IOC) has set up their oil refinery in 1971 at Haldia. This was possible after the setting up of an oil jetty at Haldia in 1968. During this period another public sector giant Hindustan Fertilizer has also set up their base at Haldia. After the commissioning of Haldia Dock Complex (HDC) in 1977 a number of entrepreneurs are attracted to this port city to invest in establishing their industrial units.

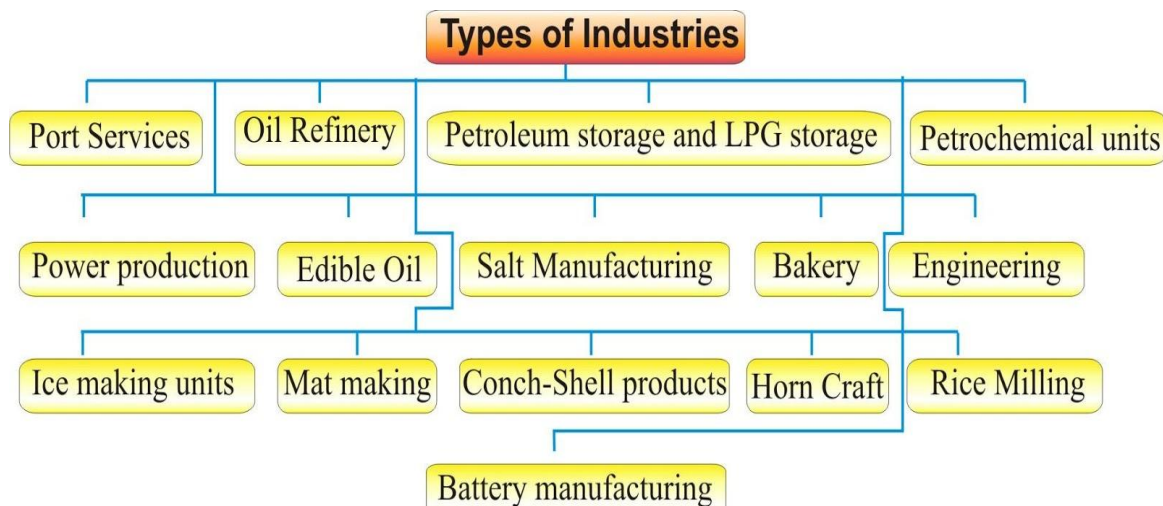
In time entrepreneurs like Hindustan Lever, Exide, Shaw Wallace, Reliance Group of industries, Mitsubishi, Tata Group of industries, Ruchi and many more have invested in various projects in and around Haldia.

Not only these large scale industries, the district of Purba Medinipur has a long tradition of cottage and small scale industries from the colonial period. Locally available raw materials, huge market of handcrafted and small scale products have pushed the economically sound people to invest in setting up of small production units in all over the rural areas of the district. In this context it is well mentioned that Purba Medinipur district is rich in agricultural products like rice and betel leaves (locally called pan). Cash returns from pan baraj are easy and comparatively higher than other crops. So this easy source of capital has attracted people to set up small and household enterprises in the district.

Raw Materials

Raw materials are used by human labour or industry to provide products for human being. Raw material in natural state is of little use but, when

transformed into something else, is a source of wealth and prosperity. The vast network of large, medium and small scale industries of Purba Medinipur district may be broadly classified into the following groups –



Most of the raw materials used in these various sectors are available in the district only.

Haldia Refinery of Indian Oil Corporation is a public sector oil company. This refinery uses crude oil and chemicals from Digboi and Barauni through pipe line; chemicals are brought from Gujrat (India). But bulk of the oil in this unit is imported from abroad through Haldia Port.

Fertiliser plants and Petrochemical units which are located at Haldia, consume Naphtha which is partly supplied from the oil refinery and partly from outside countries.

Large scale battery unit of Exide Industries of Haldia and other medium and small scale units located throughout the district as a household production. They use lead as the main raw materials. It is brought outside the district from other parts of the country. Liquefied Petroleum Gas is stored and distributed from Hindustan Petroleum.

Edible Oil units use crude vegetable oil, bleaching earth, phosphoric acid, caustic soda, lime, nickel catalyst, sodium methoxide, activated carbon and hydrogen gas. Crude vegetable oil is imported from Argentina, Malaysia, Indonesia, Brazil, U.S.A. mainly through the Haldia Port. AT Kolaghat Thermal Power Plant mainly coal and oil are used as raw materials. The supply of coal is made through Eastern Coal Limited (ECL), Bengal Coaking Coal Limited (BCCL) and Mahanadi Coal Limited (MCL). Some amount of coal is also imported from Australia by Power Development Corporation (PDC) and is supplied to the unit. As for the source of oil the supply comes from Indian Oil Corporation (I.O.C.) – Haldia.

As for the small scale and micro enterprises the materials ranging from horns of domesticated cattle's, flour, sea products, rice to mat sticks, hogla, pati bels – all of which are locally available and used as cheap raw materials in the units,

Tourism is another lucrative industry developed along the sea coast of Bay of Bengal at

Digha, Sankarpur, Mandarmoni and Junput which uses the natural aspects as its main raw materials.

Labour Force

The labour force is defined as the number of individuals aged over 16 years, who are either employed or actively looking for work. Neo classical economists view labour market as similar to other markets where the forces of supply and demand jointly determine price (in this case the wage rate) and quantity (in this case the number of people employed). However, the labour market differs from other markets in several ways. Perhaps the most important of these differences is the function of supply and demand in setting price and quantity. Higher wage might cause people to work more.

Households are suppliers of labourers; industry employs a major part of the population. Industries employ skilled, semi-skilled and unskilled labours in the process of production. Purba Medinipur district has a population of 4417377 (2001 census); among which 36.66 percent are workers. This refers that a very small portion of people are engaged in the industries as labourers. All the skilled and semi-skilled labours are outsiders of the district, either from Kolkata, other parts of the State or from other States. Only some unskilled workers employed in the industries are indigenous people residing in the district. Household and small scale industries employ the local folk but in this sector the wage is not high enough to maintain the luxuries of life. As the district has a handsome amount of population there is ample scope to utilize this rest of the 64 percent of the non-working population in the industrial sector. These people after giving certain training might be utilized as cheap labour force in the industries.

Water

The existence of liquid water and to a lesser extent its gaseous and solid forms on earth are vital to the existence of life on earth. Some run-off water is trapped for some period of time in lakes. At high altitudes, during winter and in the far north and south,

snow collects in ice caps, snow pack and glaciers. Water also infiltrates the ground and goes into aquifers. These groundwater later flows back to the surface in springs particularly in hot springs and geysers. Groundwater is also extracted artificially in wells. This water storage is important, since clean fresh water is essential to human life not only for drinking and household purposes but also for agriculture and industries.

Water is used for industrial purpose in cooling of machinery to prevent over heating or prevent saw blades from overheating. It is also used in many industrial processes and machines, such as the steam turbine and heat exchanger, in addition to its use as a chemical solvent. The industries that produce metals, wood and paper products, chemicals, gasoline and oils, power plants and food processing units are the major users of water. Many manufactured products use water during some part of the production process. Industrial water includes water used for such purposes as fabricating, processing, washing, and diluting, cooling or transporting product. Water is also used for cooling towers in power plants.

It is estimated that 22 percent of worldwide water use is industrial. Major industrial uses include power plants, ore and oil refineries which use water in chemical processes and manufacturing plants, which use water as a solvent. The portion of industrial water usage varies widely, but as a whole is lower than agricultural use.

The district of Purba Medinipur has well knit river systems of Rupnarayan, Haldi, Kangsabati, and Kaliaghai. Among them, Rupnarayan and Haldi are the main rivers which supply the bulk of water in the industrial sector in the district. Kolaghat Thermal Power Plant is just located beside the Rupnarayan river bank and therefore has the easy proximity of river water for use in the Plant. Rest of the large industries which are located in Haldia are served by rivers like Rupnarayan, Haldi and Hugli that ensure water for industrial purposes. Haldia is strategically

located along Haldi River and at the meeting point of Haldi and mouth of the Hugli River. So round the clock treated industrial water supply has been made by the Haldia Development Authority (HDA) to the manufacturing units. Due to current water demand of industries, HDA augmented 25 Million Gallon Day (MGD) Water Treatment Plant of its existing 20 MGD Water Treatment Plant (WTP). For future demand a new 25 MGD Water Treatment Plant will be constructed.

HDA offers –

1. Sufficient and adequate water for domestic and industrial purpose through existing 20 MGD water supply scheme.
2. Capacity of WTP augmented by 5 MGD by technology upgradation (tube settler method)
3. Lowest water tariff in India.
4. To ensure quality and quantity of water first phase (25 MGD) of 50 MGD, WTP Project awarded to M/S Ranhill of Malaysia, JUSCO and IDFC JV.
5. Operation and maintenance of entire water supply scheme awarded to M/S Ranhill of Malaysia, JUSCO and IDFC JV for 25 years on concession agreement.
6. Rs 100 crore distribution network being implemented by HDA in next 2 years.

Power

To facilitate and meet the fast emerging needs of the State's ever growing industrial and domestic requirement, the West Bengal Power Development Corporation Limited (WBPDCL), a fully state owned company, was incorporated in 1985. The primary objective was to promote electric power generation both for domestic and industrial purpose. Conveniently located near Haldia, Kolaghat Thermal Power Station (KTPS) is located at Mecheda in the district of Purba Medinipur along the main line of South-Eastern Railway on the banks of Rupnarayan river. The Plant has the highest electric generating capacity among the State sector utilities of West Bengal.

Table1: Installation of power generating units at KTPS

UNIT	I	II	III	IV	V	VI
Date of Synchronization	13.08.1990	16.12.1985	24.06.1984	29.12.1993	17.03.1991	16.01.1993

Source: WBPDCL, Salt Lake

In its first phase, three units were commissioned between 1984 and 1990. In the next phase another three units were commissioned between 1991 and 1993. Today, with six units, all are in operational condition, the total installed capacity of Kolaghat is 1260 Mega Watt (MW), with each unit having 210 MW installed capacity.

Prior to adopting the New Technology, of ammonia based Flue Gas Conditioning system, the level of Suspended Particulate Matter (SPM) at the outlet of the chimney was 750 mg/NM³, a level that was higher than the prevailing stipulated value, 150

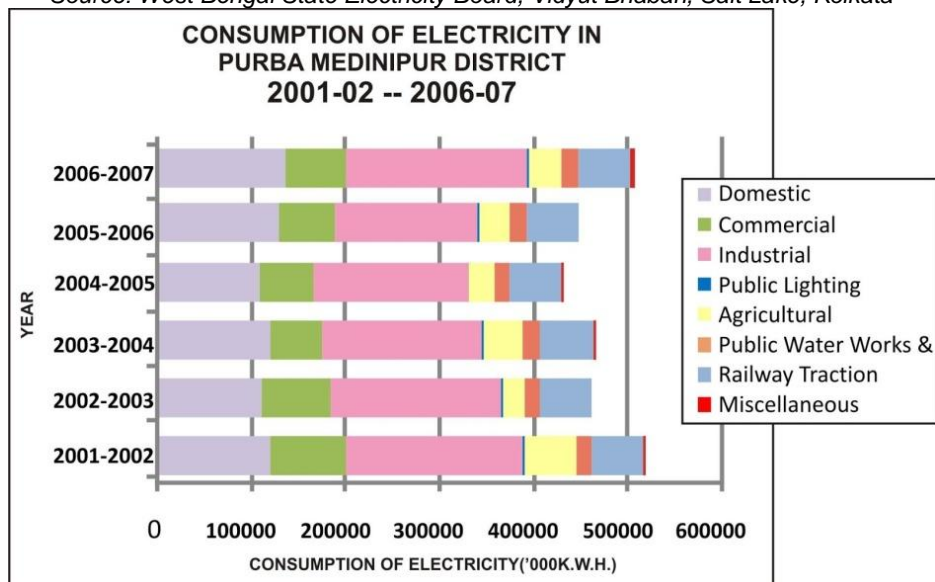
mg/Nm³ of the Pollution Control Board. After adopting this system, the level of SPM is reduced to a remarkable value, less than 100 mg/NM³.

The whole of the electricity consumed in the district of Purba Medinipur is supplied by the Kolaghat thermal Power Station. Therefore it is clear that the industrial units have an easy source of power within the district which boost for industrial growth. The large sector industries have uninterrupted and dedicated power supply from Kolaghat Power Plant. There is local distribution of sub-stations in Haldia to make the steady flow of electricity to the industrial units.

Table2: Consumption of electricity by different sectors in the district of Purba Medinipur, 2001-02 – 2006-07.

Year	CONSUMPTION OF ELECTRICITY (' 000 K.W.H.)								Total
	Domestic	Commercial	Industrial	Public Lighting	Agricultural Irrigation	Public Water Works & Sewage Pump	Railway Traction & Non-traction	Miscellaneous	
2001-2002	120533	81177	188024	2458	53480	17630	54000	1856	519158
2002-2003	112080	74190	180860	2500	21270	15840	54730	-	461470
2003-2004	120951	55226	170568	2034	40848	19145	57058	2177	468007
2004-2005	110188	56037	166202	233	26299	16494	54007	4164	433624
2005-2006	130360	59930	151810	2140	31740	17390	54480	-	447850
2006-2007	138443	62384	193372	2153	33271	18132	57156	3414	508325

Source: West Bengal State Electricity Board, Vidyut Bhaban, Salt Lake, Kolkata



Source: As in Table-2

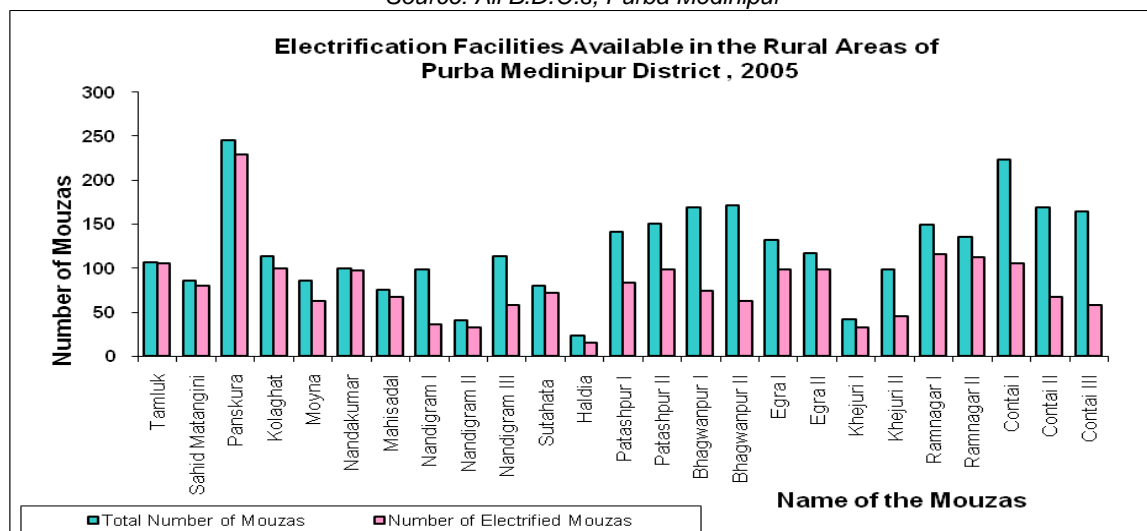
Fig. 1 From the given table (Table-2) we can say that the highest consumption of electricity is in the industrial sector. About 33-38 percent of the total consumed electricity is used in industries. This trend is followed during the past six years.

Table3: Electrification facilities available in the rural areas of Purba Medinipur district, 2005

Community Development (C.D.) Blocks	Number Of Mouzas	Number Of Mouzas Electrified
1. Tamluk	107	105
2. Sahid Matangini	86	80
3. Panskura	246	229
4. Kolaghat	114	100
5. Moyna	86	62
6. Nandakumar	100	97
7. Mahisadal	75	67
8. Nandigram I	99	36
9. Nandigram II	40	33
10. Nandigram III	114	58
11. Sutahata	80	72
12. Haldia	23	15
13. Patashpur I	141	83
14. Patashpur II	150	99
15. Bhagwanpur I	169	74
16. Bhagwanpur II	172	62

17. Egra I	132	99
18. Egra II	117	98
19. Khejuri I	42	33
20. Khejuri II	99	45
21. Ramnagar I	149	116
22. Ramnagar II	136	112
23. Contai I	224	105
24. Contai II	169	67
25. Contai III	165	58
TOTAL	3035	2005

Source: All B.D.O.s, Purba Medinipur



Source: As in Table-3

Fig. 2 In case of rural electrification it is seen that more than 66 percent of the mouzas (Fig. 2) have been electrified within the year 2005. In most of the Community Development Blocks (CD Blocks) more than 80 percent of the mouzas have been electrified. Only some Blocks are lagging behind below the Block average. The trend of mouzas being electrified is increasing. This indicates that the rural areas where household and small scale industries are abundant have also a steady supply of electricity. These areas could also be used as large industrial sites in near future. As for the large industrial units at Haldia there is an upcoming project of 2000 MW Thermal Power Plant of CESC to be set up in Haldia.

Land

Land is the first and foremost criteria for setting up of industries. Flat and vast open land is required to establish large and medium scale industries. Purba Medinipur district has an area of 4295 square kilometers (2011 census) among which 297.50 thousand hectares (2014-15) is under agriculture. From the land use map (Fig.3) of National

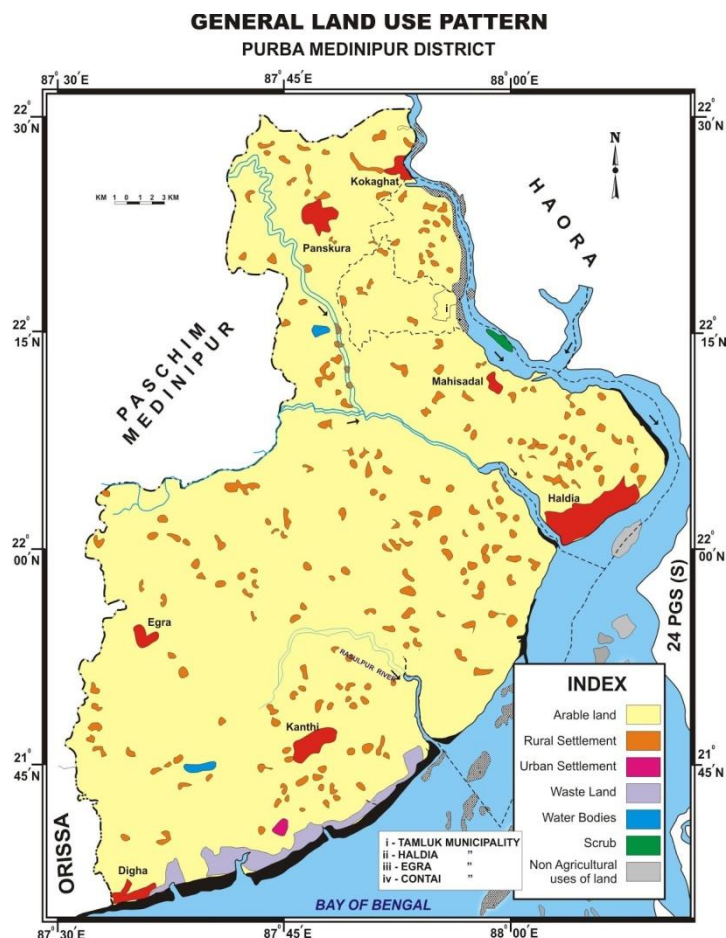
Atlas and Thematic Mapping Organization (NATMO) we can perceive that only 2-3 percent of the land is available for non- agricultural purpose.

Small and micro enterprises do not require much open land; these have grown as household industries in the rural areas of the district. Haldia Industrial Growth Centre which has all the large scale sectors and almost all the medium enterprises of the district has facilitated land from West Bengal Industrial Infrastructure Development Corporation (WBIIDC) through Haldia Development Corporation (HDC).

With passage of time more attention has been given to acquire land from the land-owners. About 1600 hectares of land has been vested with Haldia Development Authority. So land is not a big problem for large or small scale industries. Land is given to the industries for a long term (99 years) lease by the Government. Not only for industries, has land also been used for residential and other social sectors.

According to the WBIIDC source at Haldia there are-

- Area of land -120 Acres
- Allotable land - 100 Acres
- Already allotted - 100 Acres
- Lease premium - A 23 lakhs/Acre
- Service charge - A 2 square meter/year



Source: NATMO, 2019, Department of Irrigation, Government of India

Fig. 3

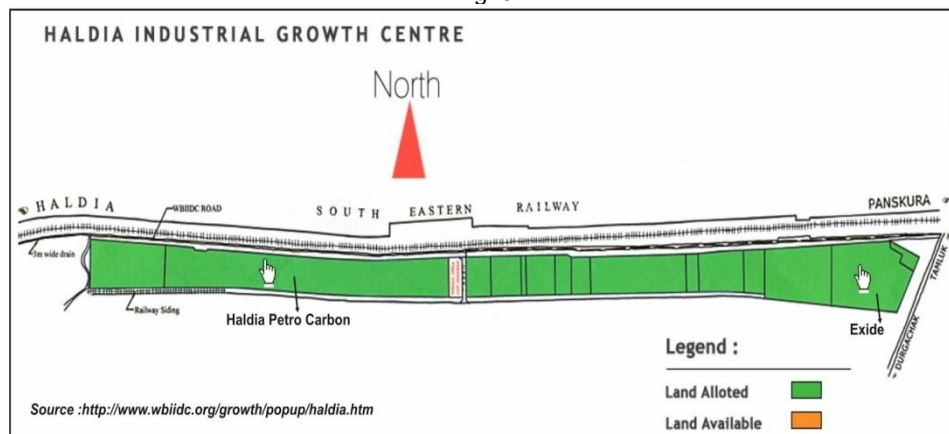


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Fig. 4

Entrepreneurs have to apply for their required land to the WBIIDC through application forms. Offer letter is issued provided the applicant has to pay 50 percent of the lease premium and 50 percent of one year advance maintenance charge. Allotment letter is issued only after one can fulfill this norm. On realization of full lease premium land is handed over to the factory owner.

WBIIDC has a bird's eye on the utilization of the allotted land. The entrepreneurs have to submit

the factory or building plan within 6 months with requisite fee. The owner is scheduled 12 months for commencement of construction and 36 months for starting production. With increasing land possession it has enthused the investors to set up various industries along this industrial belt.

Transport

A road is an identifiable thoroughfare, route, way or path between two places. Modern roads are normally smoothed, paved and prepared to allow easy

travel. The importance of adequate road infrastructure for a developing country cannot be overstressed. Purba Medinipur district is well connected with Kolkata by railways and roads (Fig. 5). The South Eastern-Railway which passes along the northern boundary connects the district to Kolkata in the east and to Chennai in the south. Kolaghat, Mecheda and Panskura are the major nodal stations on this railway track. Panskura-Haldia and Panskura-Digha electrified rail route is connected to this broad-gauge railway which is highly suitable for the movement of goods and passengers. The district is well connected by NH 6 and NH 41. NH 6 which connects Kolkata to Mumbai passes through the northern boundary of the district. NH 41 connecting Haldia to Kolaghat via Tamluk and Mecheda joins NH 6 at Kolaghat. The district has several State Highways like Panskura-Haldia via Tamluk, Panskura-Digha via Tamluk and Contai and Egra-Junput via Contai.

Besides major highways, the entire district has an extensive network of metalled roads. Recently under the scheme of Pradhan Mantri Gram Sadak Yojana each and every mouzas has been connected with un-metalled earthen roads.

Haldia Development Authority (HDA) has maintained a well-connected road network with good conditions of the roads to attract entrepreneurs. New roads have been constructed along with widening of existing roads in full swing. The port city is traversed by a good network of the industrial area. Roads recently repaired-

1. Balughata-Chaitanyapur road (9 kms)
- a. Roads recently strengthened and widened-

2. Ranichak-Haldia Law College road (1km) – A 3 crores
3. Haldia Law College-Khudiram Nagar Colony (1 km) – A 3 crores
4. Manjushree More to Sutahata
5. Haldia Law College-Meghnad Saha Poly technique (1 km) – A 3 crores
6. Manjushree More to Durgachak Railway Crossing
7. Manjushree More to MCC PTA
8. CPT Market-Ranichak via Exide and Ruchi Soya
- a. Roads recently constructed-
9. 4 lane internal road in Gandhi Nagar Colony (A 1.7 crores)
10. Utsab Bhawan to Gandhi Nagar via Haldia Court (A 1.5 crores)
- a. Schemes under implementation-
11. NH 41 to Emami via HIDPE (1.4 kms) – A 3 crores
12. Behind STPI for City Centre Commercial Complex – A 1.5 crores
13. Near LPG Tanker Terminal – A 2.8 crores
14. Near Manastala Canal – A 70 lakhs
15. From Enmore core to IBP – A 2.8 crores
16. From Manaksia to Modern Concast – A 1.8 crores
17. From Central Bus Terminus to Azad Hind Nagar Colony – A 50 lakhs
18. Road in Purbashrikrishnapur
19. Geonkhali WTP to Barda Railway Crossing (8 kms) – A 3 crores

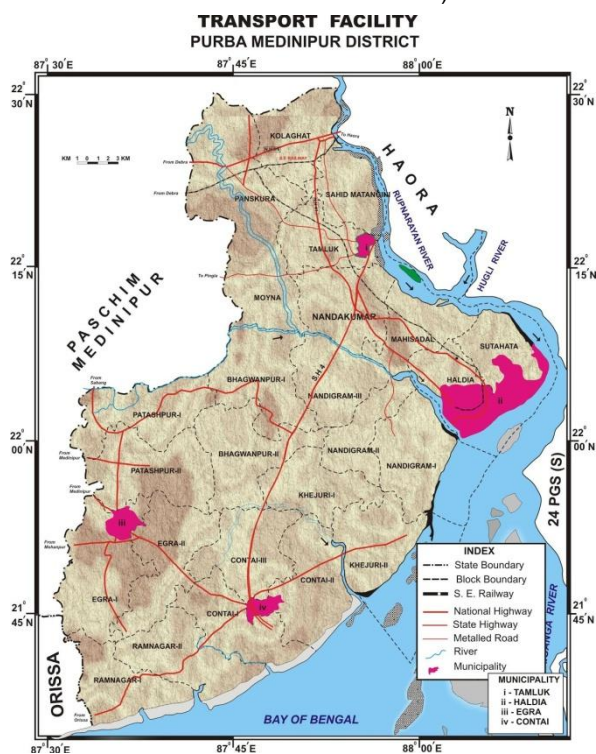


Fig. 5

Besides these, there are various other projects to commence in near future like Bye-Pass road from ferry terminal of Kukrahati to Balughata road, from Chaitanyapur to Kukrahati, from Barda Railway Station to Geonkhali and many others.

A well-knit system of navigation canals and rivers serve the region. The Allahabad- Haldia stretch of the Ganga- Hugli River serves as National Waterways No.1. With Haldia Dock Complex the country's 5th largest port with all modern facilities for industrial growth, the district has its gates open to the Far East and other ports along the Indian Coast Line.

Market

A market is any one of a variety of different systems, institutions, procedures, social relations and infrastructures where trade, goods and services are exchanged forming part of the economy. The concept of a market is any structure that allows buyers and sellers to exchange any type of goods, services and information.

The district of Purba Medinipur has a long tradition of cottage and small scale industries. The handicrafts like mat, conch-shell products, brass and bell metal goods, horn crafts produced as a household goods in all over the rural areas of the district have a huge market not only in the district and West Bengal but all over India and abroad.

The products of Haldia Petrochemicals Limited (HPL) are of benchmark quality, meeting the highest international standards and are used extensively by packaging consumer durables, house wares, automobiles, furniture, container or luggage manufacturers in India and abroad. Due to superior quality, HPL products are in demand in various countries from European Union, Southeast Asia and USA. HPL products are marketed to more than 20 countries in the world.

Refined oil and liquified petroleum gas is supplied to different regions of India and the demand is ever increasing. Kolaghat Thermal Power Plant is the largest captive plant in West Bengal in terms of power generation. The electricity generated here is supplied not only to the district but all over West Bengal. Detergents, pesticides, other chemical products, edible oil and all the products of the industrial sector have a huge market in not only the district but in India as a whole.

Waste Disposal

Waste is unwanted or unusable materials. Waste is directly linked to human development, both technologically and socially. The composition of different wastes has varied over time and location, with industrial development and innovation being directly linked to waste materials. According to United Nations Environment Programme (UNEP) waste is "substances or objects which are disposed of or are intended to be disposed of are required to be disposed of by the provisions of national law."

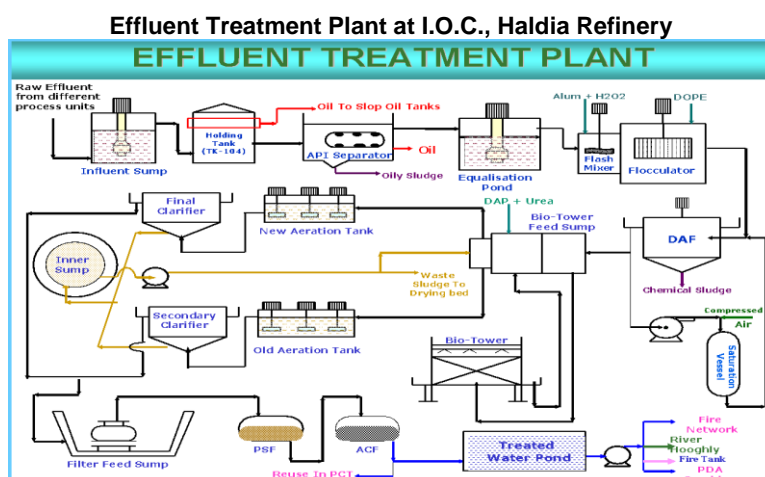
Depending on the types, wastes can be classified as (a) solid wastes, (b) liquid wastes and (c) gaseous wastes.

Furthermore wastes can be grouped according to source or origin, such as (a) domestic wastes, (b) municipal wastes (c) industrial wastes and (d) biomedical wastes.

Industrial solid wastes denote ashes, demolition and construction wastes, hazardous wastes which are originated due to industrial activities. Hazardous industrial wastes sometimes become fatal for human being and environment. This is due to their physical, chemical, biological or radioactive characteristics like toxicity, reactivity and alike. Liquid industrial waste may also be hazardous like the residues of solvents, paints or pesticides.

Some components of waste have economical value and can be recycled once correctly recovered. The more waste we generate, the more we have to dispose of. The most common disposal methods are landfill and to a lesser extent incineration. As landfill waste decomposes methane that is released in considerable quantities which contribute to global warming. Furthermore, the leachate fluids formed from decomposing waste can permeate through the underlying and surrounding geological strata, polluting ground water which may be used for drinking water supplies. Incineration is the second largest waste disposal method in most countries. When burning waste, a large amount of energy, carbon-di-oxide and other potentially hazardous air pollutants is given off. Modern incinerators, however, can use this waste energy to generate electricity and hence prevent the energy from being wasted. A less common but more sustainable method of waste disposal is anaerobic digestion. In this process waste decomposes in an enclosed chamber. Digestion takes place in an oxygen free environment. Bacteria live on the chemically combined oxygen within the waste. These bacteria decompose waste by breaking down the molecules to form methane gas and small amount of solid residue. Now this methane can be burnt to generate electricity. Recycling is another method of waste disposal. Recently in the developed nations industrial wastes such as sludge, deposits and cyanides which cause environmental pollution are transformed into solid blocks by incorporating a coagulant. This mixture is sealed at the outer periphery by means of concrete coating and is discarded in the sea. No environmental pollution is brought about by this method.

The Kolaghat Thermal Power Plant generates dry ash and bottom ash. These are processed and are sold for cement manufacturing and for construction of roads. For waste water treatment there is an Effluent Treatment Plant (ETP) where zero discharge is maintained. Haldia Refinery has its own ETP.



Source: I.O.C., Haldia Refinery, 2017

Fig. 6

The waste water is treated and recycled here for watering the planted trees, partly used in firework and other non-drinking purpose. The treatment of Refinery waste is carried out in three steps:

1. Physical separation of free oil
2. Chemical coagulation of emulsified oil and
3. Biological treatment for the removal of BOD, phenol and other toxic materials.

The West Bengal Waste Management Limited (WBWML) has a fully integrated waste management complex in Haldia. The first Common Storage, Treatment and Disposal Facility (CSTDF) for hazardous waste (CHWSTDF) under the Public Private Partnership (PPP) have been developed in Haldia. In April 2003, the HDA and M/s Ramky Enviro Engineers Limited formed a joint venture project (WBWML) at Purba Srikrisnapur under Sutahata Police Station near Haldia. The amount of hazardous wastes to be landfilled is 1,20,000 tonnes per annum, 60,000 tonnes per year of hazardous wastes can be stabilized and treated and 20,000 tonnes per year of hazardous wastes can be incinerated. There is a facility of storage, waste stabilization and analytical laboratory. More than 300 hazardous waste generating units have become members of CHWSTDF at Haldia.

Conclusion

Industry promotes economic growth which ultimately results in the overall development of a region. The oil refinery and the dock system have opened a new era in the district to set up innumerable industrial units by public, private and joint companies. The vast natural resource potential has immense possibilities. The large open tract and the long and narrow coastal strip might be used for industrial location. The excellent infrastructural facilities provided by the Government have attracted numerous large and medium scale industries in and around Haldia. Among them, Haldia Dock Complex, Indian Oil Refinery, Haldia Petrochemicals, Mitsubishi Chemicals, Hindustan Lever, Exide Industries, Tata Chemicals are some important ones. There are more or less thirty five large scale factories which have set up their base at Haldia. Apart from them, quite a

handsome number of medium and small scale industries have set up in the district. Floriculture based industries and artisan based industries are some of them to be worth mentioning. It can be concluded that all these facilities will help more large scale industries to set up in Haldia and provide opportunities for small scale and downstream medium scale industries to flourish throughout the district.

References

1. Annual Report (2006-07), West Bengal Pollution Control Board, Government of West Bengal, pp. 26-32.
2. Datta, A.K. Rao, M.N. (2007), Waste Water Treatment, Oxford & IBH Publishing Co. Pvt. Ltd., pp. 291-294
3. Ganguly, D.S. (1979), Regional Economy of West Bengal – A Study Of Urbanization, Growth Potential And Optimization Of Industrial Location, Orient Longman, New Delhi, pp. 133-139, pp. 172-173
4. Ganashakti – Weekly Updated – Mar 30, 2009
5. Haldia Development Authority: The Future Is Haldia, p. 6, p. 8
6. Haldia Development Authority: Where Industrial Entrepreneurships Find Birth, pp. 1-4
7. Kolaghat Thermal Power Station..... An Overview: The West Bengal Thermal Power Station, WBPDC, p. 1.
8. Prabhakar, V.K. (2001), Principles Of Pollution Control, Anmol Publications Pvt. Ltd., pp. 122-123
9. Ramachandra, T.V. (2006), Management Of Municipal Waste, Capital Publishing Company, pp. 1-5, pp. 112-135

Online References

1. <http://en.wikipedia.org/wiki/infrastructure>
2. [http://en.wikipedia.org/wiki/labour_\(economics\)](http://en.wikipedia.org/wiki/labour_(economics))
3. <http://en.wikipedia.org/wiki/waste>
4. http://en.wikipedia.org/wiki/water_resources
5. <http://ga.water.osgs.gov/edu/wuin.html>
6. http://www.ace.mmu.ac.uk/ea/sustainability/oide/waste_Disposal.html
7. www.hdaindia.com/haldia/planning_area.html
8. www.wbiidc