

INDUSTRIAL COMPLEX AND REGIONAL DEVELOPMENT : A CASE OF BHILAI INDUSTRIAL COMPLEX (M. P., INDIA)

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ABSTRACT : This study assesses the role of industrial complex in the wake of regional development comprising a task to trace out spatio-temporal evolution, regional structural pattern and internal conditions regarding linkage and functional characteristics of Bhilai Industrial Complex. It also seeks and evaluates different kinds of locational, social and environmental problems faced as well as created by this industrial complex.

INTRODUCTION

The study of industrial complexes has been a major research aspect in industrial geography particularly after 1950. A scientific, analytical and systematic study of industrial complexes may leads to the formulation of industrial location models and theories for regional development especially in the context of developing countries like India. Industrial complexes not only minimize production cost (Isard 1956, Balassa 1969, Richter 1969), but mobilize the infrastructural bases, encourage production efficiency and finally, augurs economic betterment of the region. The mobilization of all regional resources-physical, economic and social, through cycle of production in the industrial complex-may initiate a territorial production complex which minimizes costs on production and maximizes the economic effect. Besides these, an industrial complex provides many industrial facilities to establish several medium, small and ancillary units around its nucleus plant (Rechardson 1969, Friedman 1972, Hanson 1972) which

create opportunities for other secondary and tertiary services and thus, leads to regional development (Auty 1990). Therefore, the study of industrial complex has been an important research frontier of modern age not only in developing countries but also in the developed one.

STUDY OBJECTIVES AND APPROACHES

The primary aim of this paper is to present an example of evolution, regional as well as functional characteristics and problems of industrial complexes in the developing world. For this purpose, the main objectives are: (a) to describe spatio-temporal evolution and growth of the industrial complexes; (b) to explain the regional pattern of industrial complex; (c) to highlight the internal condition of industrial complex regarding linkage and functional characteristics and finally; (d) to evaluate different problems, faced and created by the complex and recommend some suggestions for the prospective development.

Bhilai Industrial Complex (based on iron and steel industries) lying in the Durg district (21°5'59"N to 21°15'75" N latitudes, 81° 15'45" to 81° 30'76" E longitudes), Madhya Pradesh, India (Fig.1) has been selected for above analysis. The surrounding rich mineral deposits and other physical, economic, social and infrastructural aspects provide an ideal condition for the growth of industrial complex in Bhilai. Therefore, Bhilai industrial complex is definitely an ideal example for the research in Industrial Geography. The data related to this study are collected during field survey and obtained from the reports published in different offices and census records. These data are cartographically and statistically analysed for the observation of the purpose.

STUDIES ON THE INDUSTRIAL COMPLEXES

Francois Perroux (1950) had developed the concept of industrial complex when he was working on the growth pole strategy of regional development. Isard (1960) and Boudeville (1961) had used and explained it widely. Britton (1961), Logan (1966), Karaska (1969) and Taylor (1969) have worked on the concentration and linkage pattern of economic activities. Recharadson (1969) noted the role of other supporting industries dispersed over the influence zone of the growth point. Balassa (1969) and Richter (1969) defined industrial complex 'as a group of activities having linkages'. Allen and Macleenne (1970) considered an industrial complex as 'auto sufficient system'. Richter (1970), Steed (1970) and Townroe (1970) attempted to identify the structure and functions of the complexes. They have expressed the role of linkages in the development of industrial complex. Friedman (1972) postulated 'General Theory of Polarized Development' to explain a systematic

interrelation between development and space. Hermansen (1972) and Hansen (1972) discussed about propulsive firms as development pole. Peter (1972) worked on the complex analysis in which he considered spatial scheme of incidence and development of grouped industrial units. Luttrell (1972) adopted industrial complex as a factor of measurement for the growth of an economic region. The works of Barff (1987), Benton (1988), Willmore (1989) and Warner (1989) are remarkable which are focussed on the concentration trend of industries in different areas. Richter (1988) demarcated 'Industrial Park' in the case of southeastern Wisconsin. Auty (1990) has shown the impact of heavy industry clustering in the case of south Korea. A few Indian Scholars have also worked in this field. The work of Karan and Jenkins (1959) and Karan (1964) are based on industrial concentration in the case of India. Mukharjee (1970) pointed out the industrial complexes of chhotanagpur. Ghose and Chakravorty (1971), Sinha (1972), Chaudhuri (1972,73) and Dayal (1975) have worked on delimitation of industrial concentration. Pratap (1985) delimited industrial complexes in Bihar, Sharma (1987, 1993) has identified industrial clusters in Madhya Pradesh.

EVOLUTION AND GROWTH OF BHILAI INDUSTRIAL COMPLEX

Initiation of Bhilai Industrial complex was started with the establishment of Bhilai steel Plant at Bhilai, The growth and development of Bhilai Industrial Complex may be studied in three phases. The first phase started with the agreement between India and USSR. on Feb. 2, 1955 to establish the Bhilai steel Plant in which production started in 1959, Expansion had been made in residential area in sector 5 and 6 and about 5000 houses were made near the plant in the sector 1 and 4 for labourers

LOCATION

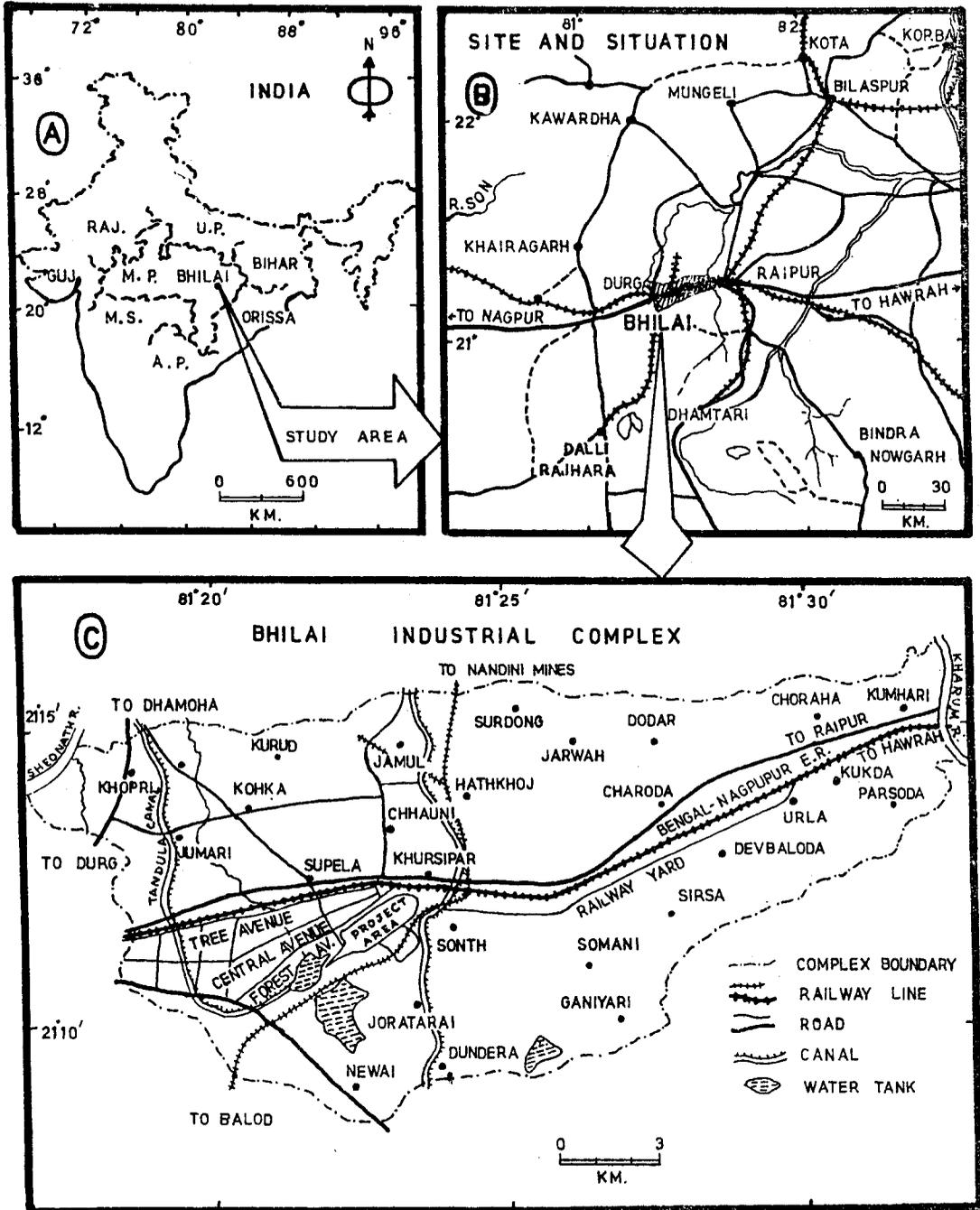


FIG. 1

Fig. 1 : Location

during 1955 to 1962. The population of the complex was 86116 in 1961. The major ancillary units, founded in the complex area, were Simplex Engg. and foundry works (1957). Dharmasi Morarji Chemicals, Kumhari (1961) and Bhilai Engg. Corpn. (1962) etc. In the second phase of the growth during 1963 to 1975, the capacity of Bhilai Steel Plant expanded from 1 M.T. to 2.5 M.T. by 1967 with the commissioning of high speed, multi-strand wire Rod Mill. In 1963, sector 7,8,9 and 10 as well as a hospital sector were developed and further 6000 more houses were constructed to facilitate the workers. The area of the steel complex was, generally expanded from 71.7 km² (1955) to 87.47 km² (1973). Most of the industrial units were established along the Bhilai-Nandani road, Himmat steel Foundry (1964), Asociated Cement Company-Jamul (1964), Hindustan Chemical works Ltd. (1966), Raysinet Chemical Company (1972), Beco Steel Castings Pvt. Ltd. (1973), and Bhilai wires Ltd. (1973) were the prominent establishments during the second phase. After 1975, the third phase started with areal expansion (269 km²) developing new residential colonies. The population of the complex registered 4,32,066 in 1981. Further expansion in Bhilai Steel Plant to four million ton capacity was taken in hand, introducing modern and sophisticated technology in steel making process and a giant 3600 mm Plate Mill. The major ancillary unit-Bhilai Refractory Plant - was established in 1981 followed by Rekha Rolling Mill (1983), Plate Mill in Bhilai Steel Plant (1984) and Abhiji Iron Processers Corporation Ltd. (1988). Many small and ancillary units are also established mainly along the Bhilai-Nandani road. Only 2 units of small scale were in 1961 which increased upto 58 in 1971 and 413 in 1981, while it is recorded 561 in 1988.

INDUSTRIAL STRUCTURE OF BHILAI INDUSTRIAL COMPLEX

The total number of industrial units was 589 with an employmnt of about 91 thousand in the Bhilai Industrial Complex upto 1988. These establishments have been divided in to fifteen categories to analyse the structural pattern in detail, i.e., Engineering, Ferrous and non-ferrous metal based; chemical; Leather, rubber, plastic and safety goods; food products; wooden products; printing, publishing and paper based, Mineral based; Machine tools Jigs and Fixtures; Hardware and fasteners; Rolling mills; Conduit pipe and tubes; Scrap processors; Cycle parts and Miscellaneous industries (Fig.2). Engineering industries including manufacturing of vehicle bodies, iron-boxes, repairing and welding of trunks, tempo etc. and automobile works. Hind Electronics and Automobile works, Sarvan Engg. and Auto works, Panjab Motor body Builders and Hindustan Industrial Automobile are the main units of engineering industry established in the Bhilai Industrial Complex. The second largest industrial activities are based on the ferrous and non-ferrous metals mainly in the small scale and ancillary sectors. It includes heavy and light fabrication, casting and casting products, etc. These industries are situated in industrial estate and Kumhari industrial area. Himmat steel foundry and krishna iron and steel foundry etc. are major establishments. Chemical indusatries include the factories of industrial gases, soaps and candles etc. BSP itself has oxygen unit which produces oxygen, acetylene and nitrogen. Leather, rubber, plastic and safety goods industries manufacture hard gloves, helmets, raincoats, packing, plastic parts, polythene containers etc. Factories of leather goods are distributed in main city at Supela Chaok, Khursipur, Choroda, Bhilai-3, Chhawani along Bhilai-Nandini road. Safety goods and plastic products are manufactured

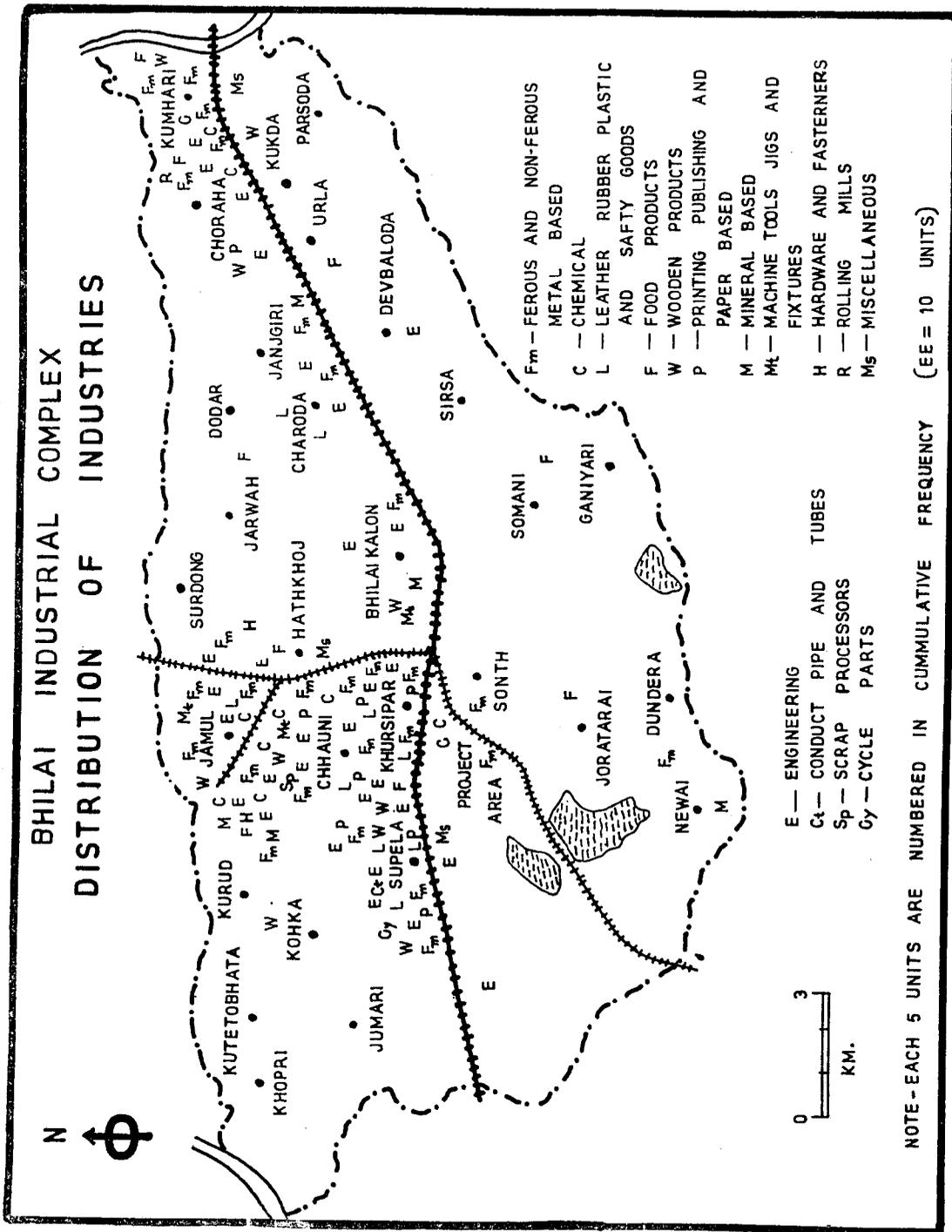


Fig. 2 : Bhilai Industrial Complex : Distribution of Industries

FIG. 2

specially in Bhilai Industrial Estate and in its surroundings. Food products manufacturing industries include rice and flour mills, bakery, beverage etc. Raghuber Prasad Rice and Flour Mill Kumhari, Bhilai Food products Company-Bhilai-3, Beverage Company-Kumhari, R.K. Poultry Farm-Bedi Colony, Gupta and Prakash Bakery-Camp-2 are the main units of this group of industries. Industries of wooden products are located mainly at Supela. Bhilai-3, Kumhari, Camp-2 and Industrial Estate. Adalat saw mill and Furniture Mart (Supela), Ramshankar Chaturvedi and Brothers (Kumhari), Bhilai saw Mill (Bhilai-3), Bhilai Furniture Mart (Camp-2), Kannu Industry (Industrial Estate). Golden Furniture Mart (Industrial Estate) and Rataor Furniture Mart (Industrial Estate) are the main industrial units which produce mainly furniture materials, Most industrial units of printing, publishing and

paper-based are grouped in the small scale sector in Bhilai Industrial Complex which are mainly concentrated in Supela, khursipar Camp-1 and 2 and Bhilai township along Nandini road. Associated cement company (Jamul), BRP Marod (Newai) and Bhilai Cement Pipe Manufacturing Company are prominent cement and mineral based industries producing cement, bricks and cement pipes. The establishments of factories producing machine tools, jigs and fixtures add more complex linkage system to the Bhilai Industrial Complex. These industries are distributed in light industrial area, Nandi road and Bhilai-3, Metal Mining Tools Corpn., Goshuka Mechanical Tools and Kamala Mechanical Company are a few name of machine and machine tools producing factories. Hardware and fasteners factories are scattered in Bhilai Industrial Complex, They produce mainly

Table - 1

Structure of industries in Bhilai Industrial Complex

Types	Percentage of total units	Percentage of total workers
1. Engineering	24.45	4.26
2. Ferrous and non-ferrous metal based	22.75	86.74
3. Chemical	9.17	0.85
4. Leather, rubber, plastic and safty goods	8.14	0.40
5. Food Products	7.81	0.50
6. Wooden Product	6.62	0.51
7. Printing, publishing and paper based	6.45	0.31
8. Mineral based	4.07	4.94
9. Machine tools, jigs and fixtures	2.55	0.19
10. Hardware and fasteners	1.70	0.07
11. Rolling mills	1.02	0.14
12. Conduct pipe and tubes	0.85	0.10
13. Scrap processors	0.85	0.42
14. Cycle parts	0.85	0.04
15. Miscellaneous	2.72	0.53
Total	100.00	100.00

Source : Compiled from Operational Statistics, B.S.P. 1988-89.

J and L bolts, nuts, rivets, wire net and fasteners which is prominently consumed by Bhilai Steel Plant. The number of Rolling Mills, Conduit pipe and tube factories, Scrap processing units and industries of cycle parts are very limited (Table 1), but play a significant role in the Bhilai Industrial Complex. These industries are located mainly in Industrial Estate Supelam Light Industrial area and Kumhart. Bhagat Iron and Steel Rollibg mill and Ganga Re-rolling Mill (Light Industrial Area) are a few rolling mills which produce round M. S. Bars, Angle iron and Steel re-rolling etc. Allied Steel Industries (Industrial Estate) and Bhilai Auxillary Industries (Industrial Estate) etc. are the factories manufacturing conduit pipes, lancing rubes etc. Scrap processing units ate concentrated in industrial area. Abhiji Iron Processors Ltd. is one of them which produces C.I. scrap. Industrial units of cycle parts are scattered allover the complex. Chattisgarh cycle industry is a big unit of this kind producing cycle sheet cover. Some unclassified industrial units are established in the Bhilai Industrial complex, Some of them are Mina Housing and Bag Garments Industry in Light Industrial Area (manufactures jersy, socks, pack long bags, belts etc.). Bhilai Tar Mechanicals industrial Estate, Bhawani Auto electricals at Supela and Rabindra Electrical works at Bhilai-3. Soil pots and mats are produced in kumhari and other parts of the complex as cottage industry (Table 1).

LINKAGE, PATTERN AND FUNCTIONAL CHARACTERISTICS OF BHILAI INDUSTRIAL COMPLEX

The internal organisation of an industrial complex, generally includes its linkage, pattern and functional characteristics. Linkage is a functional link between one firm and another.

It is of four types (Jarrett 1977. Estall and Buchanan 1968, Kuchhal 1969) viz. vertical, horizontal, diagonal and technological. Pattern is spatial arrangement of industries i.e., compact and scattered. Compact pattern leads to a heavily industrial agglomeration whereas scattered pattern denotes less industrialized one. Function is a qualitative activity of a firm based on its nature. Bhilai Industrial plant is a core industrial unit in this complex having more than thirteen units which produce coke, pig iron, blooms, plates, billets mills and slabs as main products. Heavy and light structurals, tar products, benzole products, processed slag and ammonium sulphate are also produced in these units. Coke oven batteries, blast furnances, steel melting shops, blooming mills, furnishing mills and structural producing plants are vertically interlinked in Bhilai Steel Plant itself. Other product plants (coal tar, ammonium sulphate, crude benzol, neptha etc.), finishing mills (sintering plants, calcining plants, pig casting plants, bar forging plants etc.) and railway structurals (wheel, tyre and angle plants) are horizontally linked (Table 2). Power plants, oxygen plants, granulation plants, refractories and shops are diagonally combined and all units are technologically interlinked having one nature of steel groups. Simplex Engg. and Foundary works (industrial estale), Beekay Engg, Corpn., Bhilai Engg, Corpn., Bhilai wire ltd., Becco Steel Casting and Himmat Steel Foundary (Kumhari) are horizontally combined in the Bhilai Industrial Complex, whereas Associated Cement Company (Jamul), B.R.P. Morad and other ancillary plants and research labs etc. perform diagonal linkage. All units of Bhilai Industrial Complex specialize in steel and steel products, and therefore they are technologically interlinked. Industrial units of Bhilai Industrial Complex and combined with all types of linkages (Table 2). Therefore, this complex is

Table 2

Structure and Linkage Pattern of Some major/medium industrial units in Bhilai Industrial Complex

Name of the units and Location	Product item	Raw material used	Linkage with B.S.P.	
			Raw material Procured from BSP	Supply of finished goods to BSP in %
BRP Morad, near Newai Post Office	Basic bricks Silica bricks used Clay high aluminium bricks	Fire Clay, Quartzite, Chromite, Magnesite, Limestone, Sulphate Rexine	Nil	85.00
Associate Cement Cement Company, Zamul	Portland Pozzolama slag cement	Limestone, Slags, Gypsum, Coal, Iron ore	Granulated Slag	20.00
Simplex Engg. and foundry works, 65. Industrial Estate, Bhilai	Machanical equipments for core section industry	Steel plates Pig iron Coke etc.	Steel plates, Angles, Channels, Pig iron Coke	15.00
Beekay Engg. Corpn. 45/47 Industrial Estate, Bhilai	Steel casting Cast iron Machinary	Pig iron Steel Steel Scrap	Pig iron Steel	25.00
Bhilai Wire Ltd. Industrial Estate Bhilai	Steel Wries	Wire rods	Wire rods	100.00
Becco Steel Castings (p) Ltd. Bhilai	Steel castings	Non-metallic refractory M.S. Steel Scraps Ferrous alloys	Pig iron Steel Scraps	15.00
Himmat Steel Foundry, Kumhari	Steel Castings	Pig iron, Steel Steel Scraps	Pig iron Steel scraps	15.00

heavily industrialized with a compact pattern (Etienne, 1992). Main functional characteristics of this complex is its linkage phenomena based on input-output model. As Bhilai Steel Plant,

a prerogative unit of this complex, exists in public sector and the management control and general outlook is oriented to the development of the related region.

PROBLEMS AND PLANNING

Bhilai Industrial Complex is facing many Problems mainly due to its compact structure. As, this complex is functioning as a growth pole of this region, the working people of surroundings as well as entrepreneurs have immigrated for employment and establishments. Thus, an over crowding of not only people but industrie also took place in this complex and it is the main reason of about all problems like, slum and scarcity of civic amenities, traffic jam, different kinds of pollution and over pressure on land etc. The unplanned residential area of the complex is suffering with the problems of slums and overcrowding while the planned residential area is facing different kinds of problems like, scarcity of civic anemities and traffic flow. A serious problem of traffic jam can be seen near Supela Chauk (C.B.D.) and power house. Absence of over-bridge on south-eastern railway is also a cause of this problem. The whole complex is facing environmantal problems viz. air, noise and water pollutions due to iron and steel based industries. Many effluents like, smoke, dust, SO_2 , H_2S etc. are discharged into air by industries which imbalance the natural gaseous ratio of the air (Kumar, 1993). It causes many disorders in the biosphere of the complex. Seriously effected areas are Jamul, Chhawani, Powerhouse, supela etc. where different kinds of disorders can be seen i.e. health hazards, social curruption and vegetational degradation. Noise pollution is also prominent in this complex. The internsity of noise is registered more than 100 decibels at some places like Powerhouse, Cancast shop etc. It is recorded more than 130 decibels, Though, recycling of waste disposals is being made through machanical and chemical processes to utilize it but a number of industrial units discharge their liquid wastes without treatment into nearby rivers Sheonath and kharum. The toxicity

of the water of these rivers is too high to allow aquatic lives (Paliwal, 1993). In the coming years, waste disposal may be great problem in the complex. Bhilai Steel Plant is a prerogative plant in this complex and it engages about 25 per cent industrial employment of the Madhya Pradesh, but the engagement of local people in the plant is limited and they are mostly in labour class. Participation in management is very few. That is why, the economic earning and standard of living of the region remains low. A rapid increase in population and industries is expected in future. Therefore, the problem of land for residential and industrial establishments will be very critical in coming years.

Strengthening of linkages in industrial system, pollution control by purification and reutilization of industrial wastes through treatment plants and growing of small and ancillary labour-oriented industries arround the existing complex may be some of solutions of future problems, Migrating people from rural areas should be checked by providing employment and essential services in small centres throuh the process of decentralization of industrial units, so that pressure on land may be reduced. Self employment should be made in cottage industries like. Shoe-making, biscuit-making, manufacture of cycle and riksha parts etc. to check rural migration. Government should provide infrastructures and subsidies to the entrepreneurs in the backward areas, so that the industries can shift in less developed areas and, thus, balanced regional development can take place. Some new residential colonies may be developed near Khapri, Khamariya, Kurud, Kohka in the north-western part and Umda-

pathara, Dader, Jarwah and Choraha in the north-eastern part of the complex to meet the future accommodation problem. Southeastern part, covering Murena, Sirsavala, Devbalida, Urla and Parsada, may also be accommodated in future. For further establishment of industries, land may be available along Bhilai Nandini railway tract, in Bhilai-3 and in Charoda along national highways. Wholesale market, Shopping complex, ring road, overbridge,

technical educational institutions etc. are also suggested for consideration in future planning.

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