CHAPTER: IX

9.A. Summary and Conclusion:

9.B. Bibliography:

9. A. Summary and Conclusion:

Chhattisgarh Basin is extended from 19° 47’ North to 23° 7’ North latitudes and 80° 17’ East to 83° 52’ East longitudes (Fig: 1). It is centrally situated in the Chhattisgarh State. It is bounded by the dissected natural landscape of Baghelkhand in the north, Maikal range in the west, Dandkaranya plateau, Rajhara in the south and by Raipur highland, Sonabar plateau and its remanent in the south-east (Fig: 3, 4, 5).

The Basin comprises of ten administrative districts namely Bilaspur, Dhamtari, Durg, Janjgir-Champa, Kabirdham, Korba, Mahasamund, Raipur, Raigarh and Rajnandgaon, covering an area of 68064 km² (Table: 1:1 and Fig: 2).

The centrally geographical location and extension of the Basin has provided the prospects of industrial landscape evolution in the Basin area i.e. Korba, Bhilai, Raipur (Urula, Siltara, Tilda, Mandirhasod, etc.), Bilaspur (Dagori, Tiff ra, Sirgitti), Raigarh (Lara), Rajnandgaon (Joratarai), Mahasamund (Birkauni) and Kabirdham (Harin-Chapra, Bhoramdeo), etc. (Fig: 37).

The Basin, being a part of the Indian peninsula, is a landmass of hard-Archaean rocks, spread in a fan-shape on which the fertile plain of Chhattisgarh Basin lies. The flat and gently dipping sedimentary beds forming the Hasdeo-Mand Plain, Bilaspur Plain, Shivnath Plain, Mahanadi-Seonath Doab and Mahanadi Par Plain with average height of 220m, rest uncomfortably on the Archaean granites. These Doab and Plains have good agricultural potential and have provided bases for agro industries and the Udaipur hills and Raipur uplands have prospects of forest based industries on account of localized resources.

The geographical significance of the Chhattisgarh Basin has correlation between the available natural resources and evolution of industrial Landscape in the area. It is reflected in the evolution of different mineral based industries i.e. the lower and upper Gondwana formation possess the Korba Super Thermal Power and huge aluminum industries and their allies factories, the Dharwar system area possess Iron and Steel industries and the alluvial laterites formation possess cement and agriculture industries, etc (Table: 2:4 to 2:61 and Fig: 10, 18 and 21 to 32).

Physiography determines the characteristics of the physical landscape and physiographic features determine the evolution and diffusion trend of different cultural landscape. So, with reference to the prospects of evolution of industries and industrial landscape (Fig: 13) the physiography of the Basin contributes much. Here, two major Physiographic regions exist namely, the Chhattisgarh Plain and the marginal highland (Fig: 5). The Chhattisgarh Plain is Bowl-shaped, covering an area of 31600 km² and composed of sedimentary rocks overlaying on hard Cuddapah formation. The average altitude of the Plain is...
The surface is almost flat with less than 1° slope towards east. So, the flat and small physiographic hard underlying rocks provide good location for industries.

The Chhattisgarh region has varying resource potential/s as well, which could be an ideal for the location of industries as happened in case of the Bhilai Steel Plant. The plain is overlying on limestone, dolomite, sandstone, quartz of Cuddapah period. Durg, Raipur, Bilaspur, Raigarh, Champa, Korba, Bhatapara, Mandirhasod, Tilda, Lara, Joratarar, Harin-Chapara, Dhamdha, Sakti, Chandkhuri, Tifara, Sirgitti, Borai, Nandani, Siltara, URLA, Indavani, etc. are existing as well emerging industrial clusters of this plain (Fig: 37).

The second prime feature is marginal highland around the plain which has conspicuous forest cover and mineral deposits, which will provide good prospect for industrial development in this region. In the northern highland coal and bauxite deposits at Korba are available, the western rimland of this region makes the western boundary of Kabirdham and Rajnandgaon. This is formidable barrier which provides good sphere for tourism and sanctuary development, small Hydel Power Plants installation and pulp and forest based food processing industries can be established as the first Bio-diesel (Bokrakhar) and sugar (Bhoramdeo) industry have been established here. The highest intensity of agro-industries comprises of large and medium to Small Scale Industries (SSI) and artisan types localized in this part of the Basin (Table: 4:34 and 4:34A).

The southern highland comprises of Durg highland or Rajhara hills, Raipur upland and southern Rajnandgaon district, consist of Dharwarian rocks which contains copper, iron ore, diamond (Kimberlitic) and having economically viable forest cover. Recently, inexhaustible different colour decorative stones of granite and gneiss deposits have been found (Table: 2:34). Apart from this, highly fertile patch of black soil of Basana low land and potential drainage system is one of the most reveling feature of this part of the Basin.

Water is required for agriculture yields and industrial uses in varying capacities. The Mahanadi river system is the prime drainage system of the Chhattisgarh Basin (Fig: 6). The 96.4% area of the Basin (8550 km²) is drained by this system i.e. Dhamtari, Raipur, Durg, Rajnandgaon, Mahasamund, Janjgir-Champa, Bilaspur and Raigarh districts come under the Mahanadi river system. Due to typical (Bowl-shaped) morphometry and relief (inclined towards east) of the Basin, Mahanadi system collects all the rain water of the Basin and carries it to the Bay of Bengal (Fig: 4, Fig: 8 and Table: 16A).

The evolution of industrial landscape in the Basin is also influenced by the different atmospheric phenomenon as this influences the human activities and their working efficiency. In this reference, Chhattisgarh Basin has AW (Tropical rainy climate with dry winter) and CWg (Humid mesothermal warm climate with dry winter). The distribution of rainfall (Fig: 8) in the Basin is clearly influenced by orography and monsoon. In the region excessive sunlight brings biological disorder and reduces the efficiencies of the workforce. The temperature of the Basin remains constantly high in summer and moderate in winter. Temperature constantly varies from 19.8°C in the coldest month January to 34.7°C in May which is the hottest month (Fig: 7, Table: 6). The average temperature of the Basin
remains 25.7°C in the winter and 31°C in summer. Maximum temperature remains at Champa and minimum at Pat (3.9°C). Basin region receives 95% precipitation from July to October. During December-January Basin receives very little amount of rain due to western cyclone (Fig: 8 and Table: 1:6A).

The soil of the Basin region vary according to topographical conditions (Fig: 9). It comprises of red, laterite, red and yellow and black sandy soil. The red soil is rich in lime, aluminium, limonite or iron-oxide (hematite) that makes the soil less fertile and this is suitable for oil and coarse crops i.e. til, alsi, millet, maize, etc.

In the other hand this soil in the Basin at places, where it is laying as waste are potential industrial sites as utilized by Bhilai Steel Plant. Laterite soil (Bhata) containing hydrated-oxides of aluminum, iron, manganese-oxide and titanium, silica, potash, phosphoric-acid is suitable for industrial sites and township development, only kodo, kutki and til (seasamum) like crops grow. This soil is found in large parts of Bilaspur, Janjgir-Champa, Raigarh and Mahasamund and in eastern Mahanadi Basin.

The dark bluish black soil found in low lying Chhattisgarh plain contains lime, magnesium, potash, iron, aluminium. It lacks in biotic materials, nitrozen and phosphorus. It is good for rice, wheat, pulses, sugarcane, sunflower and soybeans and other cash crops. In this fertile soil region food-park (10th Plan) and several food processing units have been installed particularly-in the 5th Plan on wards.

The highland top soil possesses hard soil layer i.e. Bhata or laterite which is good to establish mineral based LSI and MSI industries while in the low land and doab region SSI and artisan type agro based and food processing units are localized (Chapter IV).

In the Basin physical distribution of forest resources is based on different geographical factors i.e. climate, soil composition, variation in floral constitution, etc. Basin accounts for 40.73% forest of the state (Table: 2:5 and Fig: 10). The highly industrialized region possess less forests cover but more than 3000 forest based SSI and artisan and few LSI and MSI types of industries localized in this region. These SSI and artisan industries include saw mills, furniture units, bidi making, herbal intermediate products and finish goods produce units, silk, kuttha, craft, ply wood and board, taining industries etc.

The forest produces have been broadly categories as the major forest produce i.e. timber and firewood and remaining all produces as minor forest produce (Table: 2:6 to 2:18). Out of 320 identified minor produces of the state 120 produces and 21 medicinal and 21 non medicinal produces found in the Basin (Table: 2:17 and 2:18). Few prime minor produces are tendu leave, sal seed, harra and gum (kullu, dawada, khair and babool), mahua, amala, imali, baheda, lac, etc.

Recently, in industrial policy 2004-09, the minor forest produces based industries have been enclosed in thrust sector industries and Dhamtari (The Gateway of Bastar) has been declared ‘Growth Centre’ for the evolution of forest and herbal based industries in the Basin. So, good prospect of herbal and forest based industries visualized in this part of the Basin.
Availability of huge mineral potential is the prime advantage of the Basin. Out of 28 varieties of mineral resources found in the state 23 are available in the Basin and out of 23, 12 minerals have great industrial potential (Fig: 18, Table: 2:19 to 2:22). The 99.96% tin ore, 37.02% quartzite, 13% dolomite, 18.64% coal, 23.23% iron ore, 7% bauxite and 4.41% limestone of the nation are available in the Basin. This huge reserve accounts for 14.4% mineral based industries of the nation which are localized in the Basin region. More than 82% mineral based industries of the state are clustered in the Basin. At the same time 28% iron and sponge iron industries and 20% cement industries of the nation is also localized here (Table: 4:33 to 4:34A).

Recently, in the 10th Plan emplacement of kimberlitic-diamond-ferrous rocks have been explored in block number 4, 5, 6, 7, 8 that lies partially in the Basin (Table: 2:35). The localization of precious diamond in the Basin has raised hope to flourish James and jewellery park in Durg-Raipur region.

In 9th and 10th Plan invention of various shades dimension stones reserve in Durg, Raipur, Rajnandgaon, Mahasamund and Dhamtari (Table: 2:34) has raised the hope of cutting and polishing industries in the Basin.

In 10th Plan three tonnes of gold deposits have been estimated from Rahtikhol-Limhagude area of Mahasamund and availability of garnet and alexandrite in granulate-facic rocks in Gohekala area of Deobhog in Raipur, etc. all together attracted several multinationals i.e. De-Beers, Rhino-Tinto and Geo-Maysoor Pvt. Ltd. to accelerate further exploration and establishment of precious stones processing based James and Jewellery Park in the Basin in 10th Plan.

Due to huge coal reserves (Table: 2:48 to 2:54) the region has been declared power hub. On account of the huge potential of power generation (2:36, 2:38, 2:39, 2:45 and 2:49) the state has been known as power surplus state of the Nation. State's 80% coal deposits of semi-coking to coking coal (Table: 2:48 and 2:49) variety are localized in Raigarh and Korba-Hasdo-Mand Coal fields. The available reserve of coal inspired SECL to provide captive mining facilities to private entrepreneurs in Hasdo-Mand, Panchbhnai and Mand-Raigarh coal fields (Table: 2:50). The above deposits accounted 40,340 crore capital investment proposals in the last three years of 10th Plan period for new LSI and MSI units to evolve at Raipur, Raigarh, Bilai, Korba and Bilaspur (Table: 3:2). In 2007, 2300MW energy of the nation has been produced in the Basin out of which the contribution of hydel energy was only 9.27% (130MW) in two main hydel plants namely Hasdeo-Bango hydro power plant and Gangrel hydro-power plant. Observing the 11.99% industrial power consumption growth in the region more power generation plants installation in required in the Basin.

In view of the availability of agricultural resource the region possess 75.42% (38, 80, 63 ha.) arable land of its total geographical area (Table: 2:1 and 2:2). Cultivation and associated activities are the prime occupation of more than 81% Working population of the Basin, though, in the highly industrialized region, 76% working population is engaged in farming (Table: 6:2). On account of localized agricultural raw materials availability, required to establish rice, oil, pulse, poha, floor, soyabean processing units in the Basin, the region has been ranked top in the state. Durg, Raipur, Rajnandgaon, Janjgir-Champa, Mahasamund and Bilaspur have been the prime locations for agro-based industries since 1st Plan period (Fig: 21
But in the 9th and 10th Plan the diversion of crop pattern i.e. sugarcane, soya bean, sunflower, fruits and vegetables and herbal, etc. laid to the evolution of some new industries at new locations i.e. sugar industry at Bhoramdeo (Kabirdham) and Balod (Durg), Bio-diesel Plant at Bokarahar, food processing unit at Chandkhuri, oil extraction plant at Mohar and Tumambre, Herbal Park at Dhamtari, soya cake and oil extraction plant at Mahasamund and rice brand oil plant at Urla, fodder plant at Rajnandgaon, etc in the Basin.

The 3/4th of land is arable and in spite of abundant water resources, only 38.9% agricultural land of the Basin is under irrigation. In 2001 to 2006 the cropping intensity of the Basin has grow up to 125% which is less than the national average (183%) but more than state average of 117% (Chapter II). The prospect of agro-industry is good as varities of agro-industries raw materials potential is available in the Basin. Keeping this in mind a food park proposal has been made at Indavani (fringe of Durg-Rajnandgaon, Fig: 37).

The basic structure of the transport system comprise of road network and Railways (Fig: 17). In the Basin road network consists of state highways and national highways (Table: 1:4 and 1:4A). The railways operated by SECR and run about 949 route km in the Basin (Table: 1:3 and 1:3A). The presence of comprehensive road network in the Basin is important for transportation of industrial raw materials, intermediate industrial produces and for finished goods as about 85% of passengers and 60% of the freight traffic use road transport.

In spite of the fact that the railways network increased by 7% and the road network increase by eight folds between 1st Plan to 9th Plan but the road have been the preferred mode of transport of the people and cargo both. But, the road density is not adequate to the industrial concerns in the Basin.

The air transport in the Basin is quite limited (Table: 1:5). There is only one major airport in the Basin located at Mana, 14 km south away from Raipur city. As, the Basin has remained on top at national level to attract MoUs for industrial development (Table: 3:2) so to improve quicker connectivity between important cities of the highly industrialized and medium industrialized region in the Basin is must.

Human resource is the reference point for industrial activities because the ultimate aim of any development is directly related to human welfare. The rapid industrialization in the Basin has attracted the people to live in the Basin. In the highly industrialized and medium industrialized region agglomeration of population is growing rapidly i.e. highest decadal growth in population has been seen in Korba (a industrial cluster within medium level industrialized region of the Basin) and lowest at Mahasamund (a very low industrialized region within the Basin) (Fig: 13, 14 and 15 and Table: 5:1 to 5:7). In view of spatial distribution of population the highly industrialized Trio-Axis region (Durg-Raipur-Bilaspur) alone possess 37% population of the Basin. The sex ratio has been greatly influenced by industrialization level (Fig: 16 and Fig: 35). The region of high clusterization of agro based and cottage and artisan industries in individual group of industry segment, have more female population ratio than male (1024 females/1000 males) in Rajnandgaon (Table: 5:3 and Table:4:34 and 4:34A). Whereas in Korba the sex ratio is minimum (964 females/1000 males) in the Basin (Table: 5:3). The 62% of total workers of the state live in the Basin (Table:5:7) Maximum growth between 6th Plan and 10th Plan in industrial workers has been recorded at Durg, Korba and Raipur (21-27%) than in
Rajnandgaon-Raigarh (12-18 %) and minimum at Kabirdham. The average growth in industrial workers in the Basin remain 17.5 % in the beginning of 10\textsuperscript{th} Plan.

Occupational structure is an important factor that shows the trend of sectoral switching over of workers from primary sector to secondary or tertiary sectors. In the last 56 years of planning in the Basin the percentage of industrial workers has grown up to 19 % earlier in 1980’s it was only 2.5 % to 5 %. In this period of planning due to higher rate of industrial growth (Table: 4:20 to 4:25 and Fig: 27 to 32) in the Basin a higher growth of industrial workers has been observed in the highly industrialized region as well as in medium industrialized region. At the same time there is good prospects of industrial growth in low and very low industrialized regions (Table: 3:2, Fig: 27 to 32 and Fig: 37). The occupational shifting is slowly happening but still the percentage of agricultural workers in the low and very low industrialized regions is in between 85 and 90 (Table: 6:2).

A significant composition of workers has been noticed that the female workers supercede the male workers in the Basin in artisan industry group due to the nature of work. Out of total artisan workers 36.6 % are females and 34.2 % are males involve in art and painting, pottery, tiles and bricks, mining, terracotta, silk weaving, bidi making, tendu leaf processing, tinning and dyeing, stitching and embroidery works, etc.

During 56 years of Plan period the objective and policies implemented at national and state level have influenced the evolution of industrial landscape in the Basin (Chapter III and Fig: 21 to 32). During Pre Plan period, due to discriminatory industrial policies of Britishers, insufficient basic infrastructure, lack of proper balance in resource utilization and industrial interface, etc. had caused disparities of industrialization in the Basin (Fig: 20, Chapter III). Other factors i.e lack of rational monitory policy, excise policy, tariff policy, land revenue and factory acts imposed on the traditional entrepreneurs by the Britishers again damaged the traditional base of industries in the Basin (Chapter III). In this Pre–Plan period SSI and artisan industries had been primarily located at the source of raw materials in the central part of the Basin namely Rajnadgaon, Durg, Raipur, Bilaspur and in the northern Basin at Raigarh. The prime centres were Kharigarh, Chhuihkhadan, Bemetara, Kabirdham, Sakti, Champa, Sarangarh, Raigarh, Raipur, Bhatapara, etc. (Table: 4:1 and Fig: 20).

After independence the industrial Plan and policies have become the mirror of present and perspective industrial landscape evolution of the Basin. Because, along with earlier mentioned conducive geographical environment and resource availability, the approaches and directives of industrial policies and planning has reflected and determined the pace of industrial landscape evolution in the Basin in the 56 Years of Plan period (1\textsuperscript{st} Five Years Plan to 10\textsuperscript{th} Five Years Plan). Apart from central Plan the state level implementation of industrial policies, particularly, industrial policy of 1980, 2001-06, 2004-09 contributed to the emergence of new industrial landscape in the Basin at Birkani (Mahasamund), Lara (Raigarh), Joratarai (Rajnandgaon), Harin-Chapra (Kabirdham), Tilda (Raipur), Hathnora (Janjigir-Champa), Indavani (Rajnandgaon), etc. (Fig: 37) apart from the previous existing industrial clusters namely Urla, Siltara, Birgaon, Mandirhasod, Balodabazar, Nandani, Sirgitti, Tifra, Boral, etc.
The above mentioned emerging industrial regions possess no industrial landscape or possess very few industries till 5th Plan period (Fig: 21 to 32). After 7th Plan the policy of globalization and liberalization accelerated the MoUs, (Public Private Partnership) PPP schemes etc. which caused emergence of new industrial clusters around the raw material potential areas of the Basin particularly in 9th and 10th Plans. Because of the fundamental changes in the Plan and policies in the light of a newly formed state which possess huge virgin or untapped resources (Chapter II and III).

The spatio-temporal evolution of industries in different Plan periods laid the ground for the evolution of industrial landscape in different parts of the Basin (Fig:21 to 35 and 37). In this the specific geographical account of the Basin i.e. climate, topography, vegetation, resources availability, peaceful environment, availability of power, stable plan and policies together encourage entrepreneurs to utilize these opportunities to accelerate evolution of industries in the Basin and transformed the distinctive industrial landscape of their choice.

During Pre Plan period there was 3 LSI and MSI industries at Rajnandgaon, Dongargarh and Raigarh and 625 SSI and artisan industries in the Basin (Fig:20, Table:4:1). In the Post Plan period (Between 1st to 10th Plan) this swings up to 224 LSI and MSI and 28804 SSI and artisan industries (Table:4:33).

The above LSI and MSI, SSI and artisan industries spread over the highly industrialized region (Raipur-Durg-Bilaspur), Medium industrialized region (Korba-Raigarh-Janigir-Champa), Low industrialized region (Rajnandgaon) and Very low industrialized region (Dhamtari-Mahasamund-Kabirdham) (Fig:35). The installation of industries in the Basin has been influenced by the objectives of the Plan as well the earlier mentioned conducive environment available for the evolution of industries in the Basin.

In the 1st Plan (1951-56) inaugural stones for Korba Super Thermal Power Plant had been laid and extension work of BNC mill, Rajnandgaon and Mohan Jute mill, Raigarh had been done (Fig:21). In this Plan 101 SSI and artisan units comprises of agriculture and food processing, forest and timber, handicrafts, garment and tailoring, etc. had been established at Rajnandgaon, Raigarh, Durg, Raipur and Bilaspur (Table:4:2 and 4:14).

In the 2nd Plan (1956-61) 4 LSI and MSI industries had been established with the growth of 33.33% over previous Plan. The development of industries confined at Bhilai, Kumhari and Korba (Fig:22, Table:4:15). In SSI and artisan sector 57.43% growth registered and highest growth of 166.66% accounted in engineering and allies sectors (Table:4:3).

In the 3rd Plan (1961-66) 5 LSI and MSI with Plan growth of 25% and 199 SSI and artisan industries with Plan growth of 25.66% had been established. In this Plan highest growth was registered in chemical and fertilizer industry (150%). In SSI and artisan sector growth depreciation accounted in garment and tailoring by 21.43%. The concentration of LSI and MSI industries confined to Trio-Axis region (Durg-Raipur-Bilaspur) (Fig:23 and Table:4:4 and 4:16).
In the annual Plan (1966-69) 6 LSI and MSI industries had been established out of these three comprises of agriculture and forest established at Bhilai, Raipur and Mahasamund. This Plan accounted 20% growth in LSI and MSI sector. In SSI and artisan 188 industries had been established in this sector growth declined of 60% in plastic, 29.03% in engineering and allies, 23.68% in forest, 4.56% in agriculture and food processing industries were accounted. In SSI and artisan only two individual industrial groups registered growth appreciation namely garment and tailoring (24%) and handicraft (14.28%) (Fig: 24, Table: 4:5 and 4:17).

The 4th Plan (1969-74) observed the growth of 16.66% over previous Plan. 7 LSI and MSI industries had been established in this Plan. The industries confined around Trio-Axis region. The SSI and artisan industries observed 191.95% growth. In SSI sector growth of 600% registered in mineral processing SSI units (Fig: 25 and Table: 4:6 and 4:18).

In the 5th Plan (1974-79) 42.85% growth observed over 4th Plan. In this Plan 10 LSI and MSI industries and 1657 SSI and artisan industries had been installed. The 5th Plan registered 42.85% growth in LSI and MSI sector. The SSI and artisan sector registered decent growth of 185.19% over previous Plan. In this Plan industrial clusterization has been observed in the medium level industrialized region of Korba-Raigarh-Janjgir-Champa (Fig: 26, 35 and Table: 4:7 and 4:19) apart from the Trio-Axis region of the Basin. High growth of 200% accounted in cement sector and in SSI and artisan industries maximum number of industries installed in Raipur (541) followed by Durg (425), Bilaspur (202). In SSI and artisan sector mineral processing industries recorded 270% growth followed by chemical and allies (240%).

In the 6th Plan (1980-85), 60% growth had been registered in LSI and MSI industries. The diversification of industrial landscape that began to emerge during 5th Plan has taken shape in the 6th Plan. But due to better accessibility and clusterization of industries in the Trio-Axis region the growth of industries primarily confined to heavy industrial area Bhilai, Nandani, Borai, Urli, Siltara, Bhanpuri, Sirgitti Tifra, etc. (Fig: 27). In individual group of LSI and MSI industries highest growth accounted in engineering and allies sector (400%). There was no growth in aluminium and plastic industries whereas growth depreciation of 33.33% observed in steel and 100% in textile, 50% in cement industries (Table: 4:8 and 4:20). In the 6th Plan 16 LSI and MSI industries established out of this 37.5% agglomerated around Durg at Kumhari, Nandani, Risali areas, 18.5% in Bilaspur at Sirgitti, Dheka, 12.5% each in Rajnagao, Janjagir-Champa and Raipur at Mohar, Dewada, Rawanbhata, Urli, Siltara, Akaltara, Birgahani.

In the 6th Plan SSI and artisan industry registered 175.19% growth with the evolution of 4560 number of industries in the Basin. The above mentioned significant growth of LSI and MSI and SSI and artisan industries motivated the than Madhya Pradesh government to set up M.P. Industrial Growth Corporation Ltd. at Raipur to pursue industrial growth and industrial estates around the Basin (Fig: 39). Hence, in 6th Plan the industrial growth centres have been set up at Sirgitti (Bilaspur), Siltara and Urli (Raipur) and Borai at Durg and one industrial estate at Tifra (Bilaspur).

In the 7th Plan (1985-90) the objectives of the growth was towards backward area development. In this Plan (34) LSI and MSI industries had been established in the Basin. The growth remained 112.50% over 6th Plan. Maximum growth accounted in
chemical and fertilizer sector (250%). In this Plan localization of industries mainly confined at Raipur-Durg-Bilaspur, 82.34% industries have been clustered in the highly industrialized Trio-Axis region (Fig: 28). A marginal decline of 1.92% was registered in SSI and artisan sector of the Basin. Total 4471 SSI and artisan industries had been established in 15 individual groups of industries (Table: 4:9, 4:33A and 4:34A).

In the holiday Plan (1990-92) 9 LSI and MSI industries had been established. This was the period of Plan holiday and transition time for industrial liberalization so sharp decline in all industrial groups observed i.e. 200% depreciation in cement, 100% (each) in explosive, textile, forest industries 80% in food processing, 75% in steel and 71.4% in chemical and allies industries had been observed in the Basin. In the SSI and artisan industries average decline was 73.52% over 7th Plan (Table: 4:10 and 4:22 and Fig: 29).

The 8th Plan formulated in changed industrial scenario (Chapter III) and aimed at private sectors. On account of the available reserves of ferrous and non ferrous raw materials (Chapter II, Table: 2:19 to 2:54 and Fig: 18) the Basin has been flooded with the installation of the integrated steel and Power Plants. A tremendous growth of 433.33% (Highest ever in the 56 years of Plan period) accounted and 48 LSI and MSI industries had been established in the Basin. Highest ever, growth of 2000% observed in integrated steel and power plant and their allies group of industries over previous Plan. 21 integrated steel and power plants have been installed mainly in the highly industrialized region and medium industrialized region of the Basin (Fig: 30 and Table: 4:23). The other industries which were registered growth appreciation after steel sector were plastic and allies (500%), cement and forest 300% (each), engineering and allies 200% while growth remained stagnant in agriculture, aluminium group of industries (Table: 4:8).

Out of 48 LSI and MSI industries installed in 8th Plan, 39 (81.25%) have been established in Trio-Axis region (The highly industrialized region) in Raigarh-Korba-Janjgir-Champa (The medium industrialized region) 14.58% whereas the very low industrialized region (Dhamtari-Mahasamund-Kabirdham) have least industrial evolution in the 8th Plan. In SSI and artisan sector 3577 industries were established with growth appreciation of 40.60% over previous Plan. Maximum growth was registered in electric and repairing (155.47%) than in bricks and tiles (85.00%) but high depreciation was accounted in utensils (51.21%) and in handicrafts (27.68%), etc. (Table: 4:11 and 4:27).

The 9th Plan was the period of the formation of Chhattisgarh State (1st Nov.2000). So, seeing the potential of unlocked resources (Chapter II) for the rapid industrialization hectic Plans and policies have been made (Chapter III). Resources estimation, exploration and excavation lease of mines have been given to private entrepreneurs under Public Private Partnership (PPP) schemes for captive mining at Nandani, Patharia, Saitud, Dhamda, Anda, Tedesara, Gabera, Gare-I to IV, Korba coal fields mines and diamond exploration at Raipur, Dhamtari, Durg, etc.

The 9th Plan has been known for the period of policies formation (Vision-2010, Industrial policy 2001, 2004 etc.). This was the Plan of liberalization and economic reforms and for Basin it was the period of industrial transition also (Chapter III).
to above reasons this Plan accounted depreciation by 56.25 % over previous Plan. In this Plan 21 LSI and MSI industries had been established. Maximum growth appreciation registered in agro and food processing industry sector (150 %). Highest depreciation in the 56 years of Plan period was registered in plastic and allies sector of the Basin. In 9th Plan too the core of industrial evolution remained the Trio-Axis region as 33.33 % industries have been established in this highly industrialized region of the Basin(Fig:31,Table:4:24 and 4:28).In the 9th Plan 3377 SSI and artisan industries have been flourished but decline was 433.11 % over 8th Plan (Table:4:12 and 4:27).

In 10th Plan with a 142.05 % growth appreciation 61 LSI and MSI industries (Highest number of LSI and MSI industries in 56 years of Plan Period) have been established.Out of 61 industries 47 comprises of iron and steel, 8 integrated steel and Power Plant (5MW to 80MW).The stake of steel industry remained 77.04 % followed by agriculture and food processing 6.56 % and power and engineering (3.28 % each).In steel sector 422.22 % growth accounted. Out of total industries 88.12 % have been established in the highly industrialized Trio-Axis region than in the medium industrialized region (Fig: 32).

In LSI and MSI sector 10th Plan registered a clear landscape diversification as district Raigarh of the medium industrialized region, western Mahasamund, north-west Kabirdham, northern Dhamtari of very low industrialized region and the Durg-Rajnandgaon fringe region at Rajnadaon of low industrialized region became the other emerging regions of industrial development (Fig:32 and 39 and Table:4:25, 4:28).This happened because of the objectives of the Plan, inclusion of industrial policy 2004-09, backward area development schemes, allocation of land and resources to the entrepreneurs at reasonable costs and deeds, implementation of the captive mining policy and invention of new resource pockets, etc., (Chapter II and III).

In the 10th plan special care has been taken for SSI and artisan industries evolution in the Basin because of 43.11 % growth depreciation registered in the 9th Plan. So, in the 10th Plan thrust sectors (Chapter III) of SSI and artisan industries have been made and several privileges to entrepreneurs were announced hence, at the end of the Plan, growth appreciation by 25.71 % have been registered and 4497 SSI and artisan industries have been established in the Basin, out of which 53.43 % (Table: 27) have been installed in the highly industrialized region, 30.43 % in medium industrialized region, and 16.03 % in low industrialized region (Fig: 33 to 35, Table: 4:27).

During Pre Plan period there had been 3 LSI and MSI industries and 394 SSI and artisan industries which swing up to 224 LSI and MSI industries and 28804 SSI and artisan industries in 56 years of Plan period (1951-56) and a significant change in industrial landscape evolution has been taken place (Fig: 20 to 35 and 37) in the Basin. In this period the average growth of 63.06 % has been accounted in LSI and MSI sector and 50.5 % growth appreciation has been registered in SSI and artisan sector of industry (Table: 4:27 and 4:28).

In view of industrial group wise growth the steel and integrated power industry, steel rolling, Ferro-alloy obtain high growth of 235.8 %. The agro and food processing industries ranked second with 66.66 % growth appreciation, cement industry ranked third with 40.27 % growth and forest, jute and textile grown by 25 % each, engineering and allies appreciated by 18.05 %, power

204
and aluminium by 16.66% each, explosive industry grown by 12.5%. Only the plastic and allied group of industries registered marginal depreciation of 0.25% in the last 56 years of Plan period in the Basin in LSI and MSI sector (Table:4:28).

In the consecutive Plan period SSI and artisan industries grown by 50.59% (Table: 4:27). The high growth in SSI and artisan industry have been registered by leather and leather articles (108.46%) then in bricks and tiles appreciated by 99.47%. The other individual group of industries which accounted growth appreciation in 56 years of Plan are printing and photocopying (95.77%), utensils (86.78%), electric goods and repairing (25.49%), garment tailoring and design (77.07%), handicraft (8.28%), engineering and fabrication (50.06%), agriculture and food processing (49.73%) and forest and paper industries. Only two individual groups of SSI and artisan industries have shown decline namely mineral based traditional artisan industry (18.36%) and ice and ice candy (0.77%) (Table: 4:27).

On account of above spatio-temporal industrial landscape evolution in the Basin in subsequent Plan periods, the author has calculated the intensity, degree of industrialization and level of industrialization for perspective delimitation of industrial regions in the Basin by means of using several statistical methods.

The industrial intensity level (LI) of SSI and artisan and LSI and MSI industries have been calculated and found that in SSI and artisan sectors Raipur alone ranked very high intensity level (35.22) industrial region in the Basin, Durg and Bilaspur ranked high intensity level industrial region, Korba and Raigarh ranked medium intensity level industrialized region, Rajnandgaon and Janjgir-Champa ranked low industrial intensity level region and Dhamtari ranked very low intensity level industrial region the Basin (Fig: 33, Table: 4:31).

In LSI and MSI sectors the Trio-Axis region (Durg-Raipur-Bilaspur) has been ranked very high intensity level (>12) industrial region. The Raigarh district of the Basin comes under high industrial intensity level region. The intensity of Raigarh is between 8 and 12. The medium industrial intensity level 4 and 8 observed in Korba, Janjgir-Champa. The low level intensity has been seen at Rajanandgaon where intensity (LI) ranges between 2 and 4 and Mahasamund-Dhamtari-Kabirdham observed very low industrial intensity level which is <1 (Fig: 33A, Table: 4:30).

The degree of industrialization has also been calculated and found that in 56 years of industrialization (1951-2007) Bilaspur district of the Basin has observed very high degree of industrialization (Fig: 34) because of large number of industrial workers (191367 persons) employed in South Eastern Coal Field Ltd. (SECL). In Bilaspur the ratio of industrial workers per 1000 is highest (96.07 persons) in the Basin. Durg and Raipur have been categorized as high degree of industrialized region. Here, the nature of industries and less requirement of manual operation in industries together reduced the degree of industrialization. The medium degree of industrialization has been observed at Raigarh (29.44), Rajnandgaon (25.67) and Korba (22.00). The degree of industrialization in Korba has come down due to less number of MSI and LSI installation and less number of employment generation, due to technical upgradation of BALCO and Korba coal field's coal washeries and refineries. Raigarh has come up in the medium degree industrialized region rapidly due to rapid industrialization in 8th to 10th Plan period (Fig: 30, 31, 32 and 34). Janjgir-
Champa and Mahasamund districts come in low degree of industrialized region where out of per 1000 persons 10.27 and 5.23 persons are industrial workers, respectively. Dhamtari and Kabirdham districts come under the category of the very low degree of industrialization (Fig:34) here less accessibility and late exploration of resources and delayed process of industrialization, etc. affected the industrialization processes.

Similarly, to measure the degree of localization of individual group of industries in the Basin Location Quotient has been obtained by using the formula of location quotient (L.Q) = Z / Z'. The L.Q measures the degree or level to which a specific region within the Basin has less or more than its shares of any particular industry. The tables:4:32 and 32A show that the agro based industries are reaching towards saturation in Rajnandgaon (L.Q = 1.27) and Mahasamund (L.Q = 1.22), Raipur (L.Q = 1.11) and Durg (L.Q = 1.06) and relatively, creeping towards stability in Bilaspur (L.Q = 0.50) and Dhamtari (L.Q = 0.14).

In aluminium and allies group of industries, Korba has reached to saturation where L.Q comes to 5.71 but in rest of the Basin region it is zero. The location Quotient of cement industry is highest in Raipur (1.96) than in Janjgir –Champa (1.86) and in Durg (1.71) this shows that in these locations of the Basin the localization of cement industry is marching towards saturation but at Dhamtari, Kabirdham, Korba, Mahasamund and Rajnandgaon L.Q is zero and have prospects due to potential reserves of limestone, dolomite, etc., required for cement industry (Chapter II), particularly in Bilaspur, Rajnandgaon districts of the Basin.

The suitable locations for chemical and fertilizer industries are at Rajnandgaon (L.Q = 1.89), Raipur (1.68), Durg (1.00), Bilaspur (0.990) and Kabirdham (0.03).

Forest based industries have reached to saturation in Bilaspur (L.Q = 2.22), Janjgir-Champa (1.26 to) and in Raipur (1.26). It is nearer to saturation in Raigarh (L.Q = 0.62) so some prospects of further evolution is there.

The Jute and textile and garment industry at Raipur (L.Q = 3.28) and Raigarh (L.Q = 1.20) have reached to saturation and Bilaspur (L.Q=1.00) it is creeping towards stability.

The plastic and nylon articles industries are not much significant in the Basin. In Raipur this industry has reached to saturation (L.Q = 5.71).

The steel and alloy industries are localized in 8 districts of the Basin. The highest concentration is at Durg (L.Q = 4.11) here it has reached to saturation level, in Raipur (L.Q = 0.96) it is marching towards saturation level, in Raigarh (0.33), Bilaspur (0.17) it is nearer to stability and at Rajnandgaon (0.04) and Janjgir-Champa (0.08) have much scope for steel and alloy industries.

The highest degree of localization of power and coal based industries is in Bilaspur (L.Q = 5.30) while Korba (0.28) is marching towards stabilization as this has been curved out as a new district from Bilaspur so the L.Q of coal based industries is less though huge unexploited coal resources are available in Korba and in Raigarh (L.Q = 0.16), the localization of power and coal industries is yet to stabilized in Raigarh as power generation at Raigarh begun in 9th Plan and expansion work for thermal power generation under PPP scheme has begun in 10th...
Plan also. Recently, in 10th Plan Durg (L.Q = 0.05) has emerged as new location for power industry in Basin (At Purena, Bhilai a 250 MW power plant is installed).

The degree of localization of individual group of industries in the Basin gives a clear picture to which a specific region has less or more than its share of any particular industry as well regions specialization under different groups of industries.

The author has tried to delimit industrial regions with the help of Deviation System Analysis using several indices i.e. percentage of workers in industry, number of industrial units and percentage of workers to total population of the Basin.

The mean of all these indices indicate the level of industrialization which caused by the multiple effect of the above indices or variables. The result obtained for the study region has been tabulated (Table: 4:33, 4:33A, 4:34, 4:34A, 4:35 and 4:35A) and plotted in Fig: 35.

Four industrial regions have been identified in the Basin. Namely, (i) Highly industrialized region of the Basin it is comprises of the Trio-Axis region (Durg-Raipur-Bilaspur) the Deviation index (Di)of this region is >1.50, (ii) Medium industrialized region this is comprises of Korba-Raigarh-Janjgir-Champa. Its Di is 0.75 - 0.1.50, (iii) Low industrialized region comprises of Rajnandgaon with Di in between 0.50 and 0.75 and (iv) Very low industrialized region comprises of Dhamtari, Mahasamund and Kabirdham. Its Di is < 0.50 (Fig:35).

The delimitation of high, medium, low and very low industrialized region visualize the status of industrial landscape evolution in different Plan periods in the Basin. In 56 years of Plan period maximum growth appreciation have been observed in steel and alloys industries (235 %), agriculture and food processing industries (166.66 %), cement and allies industry (40.27 %) and in chemical and fertilizer industry (24.6 %).

The above mentioned industrial landscape evolution in different Plans (1st Plan to 10th Plan) period in the highly, medium, low and very low level industrial regions of the Basin (Fig: 20 to 35) presents a clear picture of spatial evolution of industrial landscape within the Basin. The acceleration of industrial development after 5th Plan onward and in 8th to 10th Plan (Table: 4:1 to 4:28) has a positive impact on the socio-economic condition that ultimately improved the quality of life of the habitats of the Basin, primarily in the highly industrialized region, medium industrialized region and industrial clusters of the Basin (Fig:36). Because of improved social infrastructure indices i.e. sectoral employment, safe drinking water availability, per capita income, urban population, total fertility rate, access to electricity, toilet facilities, pucca houses, female work participation, per capita forest cover, total employment, etc. The industrial Cluster Korba and Durg have topped in human development ranking not within the Basin but in the State (Fig: 36, Table: 6:5, 6:6 to 6:6C). In these highly and medium industrialized region's industrial clusters sectoral shifting of employment is quite significant within the Basin. As in the highly industrialized region the regional average of primary sector employment has depreciated to 76.5 while in the very low level industrial region it accounted 88.66 %. The secondary sector employed percentage improved maximum at Durg (13 %).
and the tertiary sector employment grown to 16% in this highly industrialized region of the Basin (Table: 6:1 to 6:2 and 6:3).

In the high and medium industrialized region(at some important clusters) the work force is shifting from primary sector to secondary and tertiary sectors in the Basin (Table: 6:2) this shifting ultimately add to creation of additional income opportunity apart from agriculture and that resulted in the increase of per capita income in the Basin (Table: 6:4),Sectoral stack of income generation of Net State Domestic Products (NSDP) begun to switchover from primary to secondary and tertiary sectors (Table:6:3).This positively influenced the social infrastructure due to improve in human development indices (HDI) of the Basin (Table:6:6 to 6:6C).

Out of the above industrial groups some of them are quite vulnerable to the environment i.e. maximum pollution emits from aluminium, coal, steel and chemical industries. The clusterization of these industries has been seen in the highly industrialized and medium industrialized regions of the Basin. In this region at Siltara, Ural, Mandirhasod, Nandani, Jamul, Korba, etc., air and water pollution is alarming. In the medium industrialized region around NTPC Korba, SECL mines area air and water quality is very poor at Dengur nallah, Balgiri nallah (BALCO) (Table:7:1), at Hasdeo river COD level is 22.32 mg/l near Dengur nallah (Table:7:1A), near aluminium plant waste discharge point in Dengur nallah the total solid presence (TS) is 686 mg/l which is very high (Table:7:1B), in industrial area Bhilai at borewell no.2 AsCaCO3 is 2240 mg/l which is much higher than the normal level of 200 mg/l (Table:7:2) and BOD remain high during summer (27 mg/l) (Table:7:3), Calcium level remained high 34.4 mg/l in monsoon season (Table:7:4). In the industrial cluster Dhamdha (Durg) coliform presence was 1100.00 MPN /100ml as large number of agro processing units installed in this part of the Basin (Table:7:6). Around Super Thermal Power Plant, Korba at the distance of 2.5 km to 5km at Pragatinagar and Jamnipalli locations the SPm presence in air was between 184 and 308.60 mg/m3, SO2 11.80 mg/m3 and 21.50 mg/m3 (Table:7:8). The deposition of fly ash, red, black mud, spand cathode, lime slag, vanadium slag is increasing the span of waste land around BALCO and NTPC, Korba plants (Table:7:9), around industrial area Bhilai SO2, NO2, RSPM, SPm presence is above normal level near Vishak hostel and L.U.N Bhilai (Table:7:13), in the highly industrialized region near Grasim Cement Plant, Raipur at Suhaila location, Tulsi, Guma, Fundaradih SPm presence ranges between 228 and 280.3 mg/l. The highest SPm presence in the air observed around Monet Ispat Ltd. at Mandir Hasod Chowk (1km south from the plant 1045 mg/l) (Table: 7:11).

Though pollution is being monitored and tried to keep it at moderate level the pollution level varies due to the high concentration of steel, cement, aluminium, thermal power, chemical like pollutant emitting industries in the above mentioned highly and medium industrialized regions of the Basin. The noise pollution is confined around industrial clusters of Raipur and Bhilai (Table: 7:14).

The above analysis of industrial landscape evolution in the 56 years of Plan (1st to 10th Plan) describes the transformation pace of mono agrarian landscape of the Basin into industrial landscape particularly in the highly and medium industrialized regions (Fig: 21 to 35) and also describes the perspective evolution of industrial pockets in the low and very low industrialized regions at certain locations of the Basin (Fig: 35 and 37).
The Basin, as discussed, has huge potential of resources, low cost land and power availability. But geographically the region is landlocked, the North-west region, South-east, South Basin region and Middle East region of the Basin is relatively less accessible due to lack of proper transport network, the non availability of skilled workers, lack of best quality infrastructure, over crowding of industries at few locations namely Siltara, Urla, heavy industrial area Bilal, lack of market networking for SSI and artisan industries, increasing number of industrial sickness, late initiation to expand industrial growth centres and clusters and problems of pollutants emission in the peripheral areas of the highly venerable industrial sites of cement, steel, aluminium, thermal power plant, coal washeries and chemical industries is of concern to the nearby residents and arable lands. But these are the common consequences of the industrialization world-wide which can be short out by virtue of better management and proper monitoring keeping in view the geographical account of the industrial surroundings of the Basin wherever industries are localized and will have prospects of industrial localization.

All through the study, the author has tried to bring out the spatio-temporal pattern of the industrialization, their characteristics, their causes of evolution and clusterization in a particular industrial region, potentials of industrialization and their further prospects of development.

The exploration of the level of pollution caused by industrial development in different industrial regions, has also been endeavoured by the author.

The author has tried to illustrate the impact of industrialization on the quality of life on account of the level of industrialization within the Basin. This has shown positive correlation between the level of industrialization and quality of life upheaval. The author has also tried to justify this study in the present context of welfare approach.

The author further hopes that the entrepreneurs, industrial houses, plan and policy makers, regional planners, geographers and academicians would find this study of some use to themselves.