



## A Study on the Impact of Industrial Effluents on environment in Hazaribagh district

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### ABSTRACT

Industrialization brought economic prosperity; furthermore, this resulted in more population, urbanization, obvious stress on basic life systems while bring environmental impacts closer to tolerance thresholds. Booming industrial growth and a relatively low land mass, environmental sustainability is becoming a Important decisive factor in the industrial development process. Accumulate evidence constantly indicate that the transition of existing industries to an eco-industrial network through the successful implementation of ecological approaches provides a viable solution to preserve the natural resources of the region while strengthening the regional economy in a durable base. Requires proper planning and a harmoniously integrated framework with the environment, after careful evaluation of past and current conditions. Empirical Knowledge about the affected area helps to understand the local context and to develop more action plan based on the realities on the ground. To do this, a study was carried out on the current industrial pollution and environmental environment of Hazaribagh district. An analysis of the causal chain indicated severe impacts of industrialization on the local environment while highlighting its immediate effects and root causes. The results form a basis for suggesting durable solutions to curb the epidemic pollution in the Hazaribagh district region and similar scenarios found around the world.

Keywords: Industrialization; Booming; environmental sustainability; urbanization

### 1. Introduction

For ages, industrial growth began to affect the environment with serious degradation problems. It Causes enormous stress on the entire bio-network and components of the natural system such as water, air, soil, biodiversity, including the surrounding ecosystem. Aware of the seriousness of the problem, the impacts of industrialization on the environment must be analyzed with more intensity and feeling. Industrial effluents contain many essential nutrients or have properties that can easily be used to many value-added purposes with commendable benefits for society and the environment. Application of green approaches based on 6R technologies (reduce, reuse, recycle, recover, redesign, rethink) and Closed-loop systems within the integrated framework of Industrial Ecology (IE) provides an excellent possibility of preserving the region's natural resources while improving the economical on a sustainable basis. It calls for appropriate strategic planning encompassing technical aspects, ecological, socio-cultural and economic factors that can affect the industrialization process. Before moving a practical approach towards strategic development, it will always be essential All tables and figures will be processed as images. You need learn from other similar situations. With a systematic way of looking at what happened with identical consequences, by critically analyzing the situations, policies, activities and scenarios related to the problem, it may be helpful to better understand the ways in which the example has occurred. In this context, the industrial profile and the impacts of industrialization on environment were examined in Hazaribagh .India over past few years Based on the lessons learned, this study indicates how a green strategy approach can be generated and applied in the Hazaribagh region and the corresponding context in other parts of the world.

## 2. Location of The Study Area

Perched atop a plateau and surrounded by several mountains and valleys, Hazaribag, popularly known as city of thousand gardens," is the principal town and administrative headquarter of the district. Hazaribag city also serves as the headquarter for the North Chotanagpur Division.

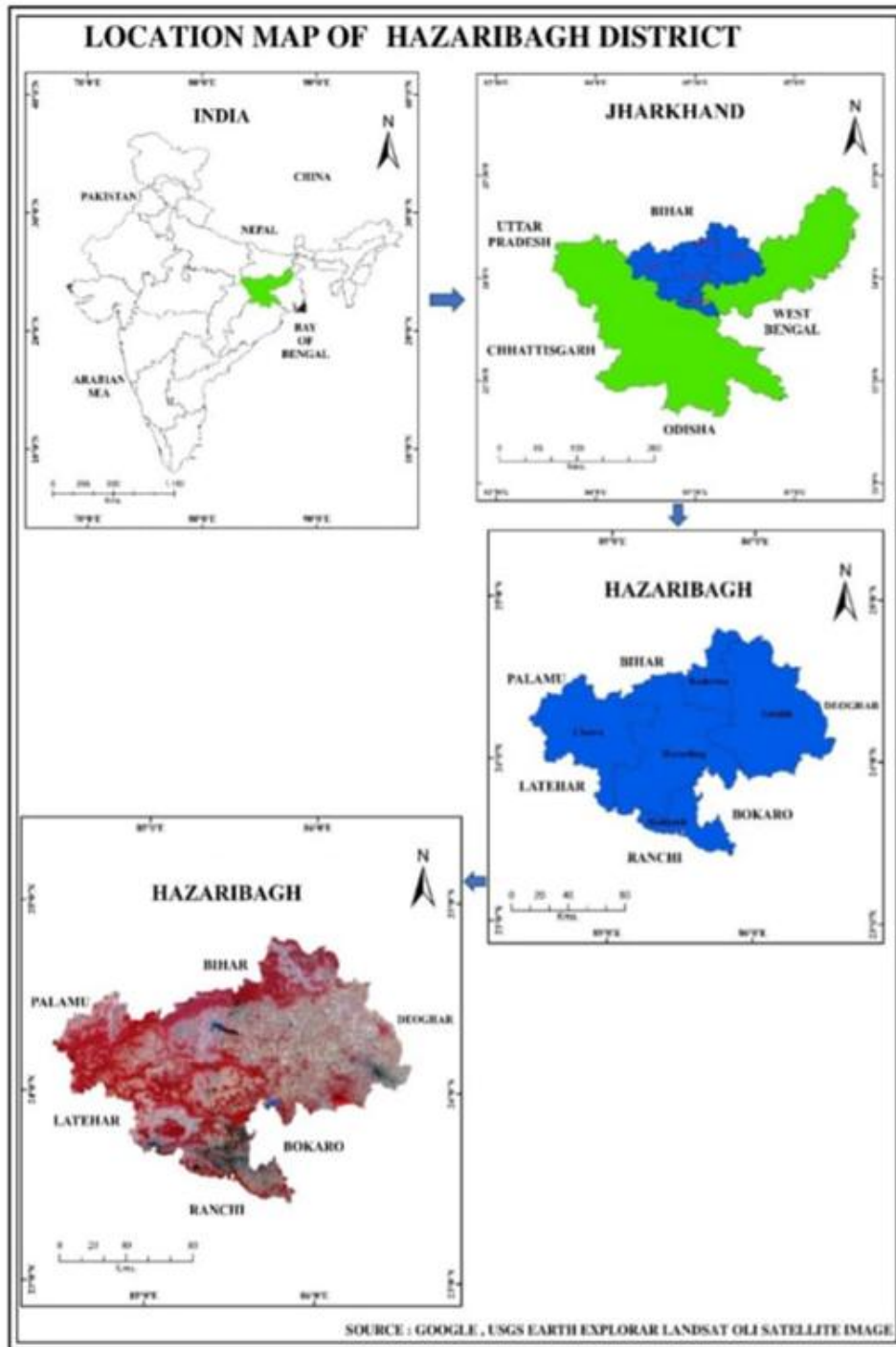


Figure1: Location of the study Area

The boundary of this district consists of Gaya and Koderma in the north, Giridih and Bokaro in the east, Ramgarh in the South and Palamu and Chatra in the west. The district of Hazaribag is endowed with rich mineral deposits. Coal can be found in abundance here, and there exists sufficient deposits of Limestone, Mica and Quartz. Explorations of these minerals have provided job opportunities to the inhabitants of this district. Hazaribag district ranks 7th in terms of population 1734495 and 12th in terms of area (4302sq km.) in the state of Jharkhand. The economy of the district mainly depends on

agriculture and allied activities. More than 63% of the total workers are engaged in primary sector. This district consists of two subdivisions, namely, Hazaribagh Sadar and Barhi. There are 16 Blocks, 16 Revenue Anchals, and 257 Gram Panchayats in the district.

### 3.Literature Reviews

Few studies were included in this section.

Cherniaeva (2013) studied on industrial waste constitutes a toxicological and epidemiological risk as it penetrates into soil, air, groundwater and surface water bodies and vegetation directly or indirectly affecting human health.

Behera (2015) explained that there are both positive and negative effects of mining, refinery, aluminum smelting and industrial effluents on human and ecological health, livelihoods, income, education and settlement of the local population, etc. (The rapid industrialization seriously affects the quality of the river and its ecology with the discharge of untreated industrial sludge containing heavy metals, residues and by-products at several levels. Laxmi et al (2015) analyzed that the Hazardous chemicals and metal ions seep into groundwater and affect water quality causing various health problems Kapoor (2014) said that industrialization has created various problems such as involuntary displacement of people, human rights, loss of livelihoods and sustainable traditional properties and increasing ecological imbalances in the region. Rybicka (1996) argued that industries also cause great devastation of land and water environments at the level local and regional. u (2003) vilified that the consumption of toxic water polluted by industrial effluents causes various health problems such as skin allergy, respiratory infections, systemic allergy, gastritis and ulcers. Chhonkar (2000) pointed out that industrial effluents also affect soil, health and agriculture. Hazarika and Dutta (2017) found that Brahmaputra Cracker and Polymer Limited, a result of the Assam Accord, was intended to promote socio-economic development in Assam. But the project degraded the environment and common property resources of ten villages surrounding the factory, negatively affecting the health, food security, livelihoods and cultural life of the villagers. Williams (1995) and Graves (1991) compared different environmental studies of at least two of the techniques for valuing non-traded goods They examined residents' awareness of the value of the river system using logistic regression analysis based on the contingency valuation method to assess total benefit and determine socio-economic factors influencing willingness to pay. residents. Nallathiga and Paravasthu (2010) adopted the contingent valuation method to estimate the economic value of conserving water from the Yamuna River. The results show that there is a will among the residents residing in the Yamuna basin for the conservation of the water quality of the river which is about 14.93 percent higher for the restoration of the quality of the river. river. water only for the current maintenance of water quality. Markowska (1999) studied the protection of the Baltic Sea in Poland against the excessive influx of substances such as nitrates and phosphates. He used the contingent valuation method and the result showed that the Poles would be willing to pay to protect the Baltic Sea and the Baltic beaches from the negative effects of eutrophication. Foster (2008) assessed the willingness of Columbia Country residents to pay for the improvement of the springs and the Ichetucknee River using the contingent valuation method. The results revealed that the majority of residents were concerned about protecting the water quality of the river. Variables that have influenced individuals' willingness to pay include the value of the offer, political affiliation, how often they visited the site, and the importance of maintaining the quality of the river's water. He found that in all cases, the estimates obtained were close, fairly close, or roughly similar. Chang et al. (2012) studied the degradation of river networks due to increasing urbanization and population growth in Shanghai, China.

### 4. Objectives of the Study

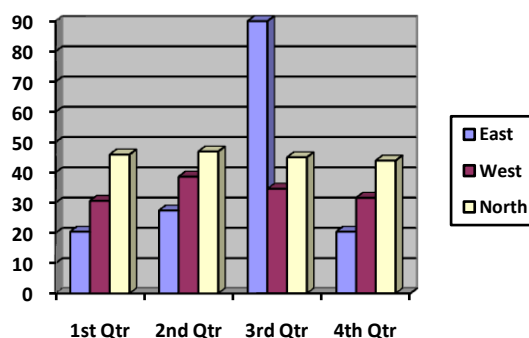
The specific objectives of the study however are as follows:

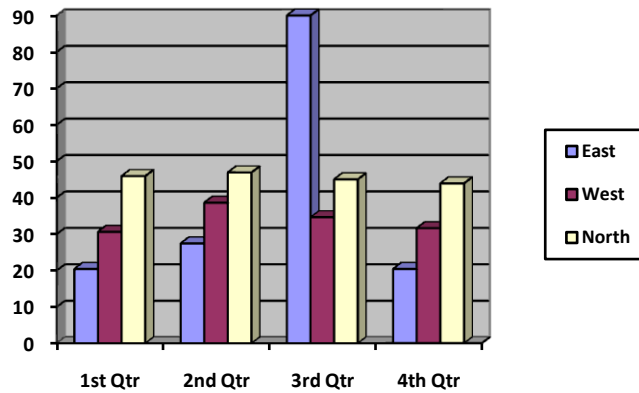
- To study the nature and types of industries in the study area.
- To explain the industrialization impacts on environment in Hazaribagh district.
- To outline the recommendations for durable solutions.

### 5.Methodology

The study based on secondary data source which have been collected from different gram Panchayet office, B.D.O and S.D.O. office, Various journal and Newspaper, Webside, census record (2011) and district statistical handbook etc . collected data are presented by Arc GIS.

### 6. Result and Discussion





**A. Nature and Types of Industries**

Basic conventional methods of bringing industry closer to settlement and agglomeration have been implemented with the aim of stimulating economic growth by providing greater employment opportunities in the region. The need for revitalization and rejuvenation of urban life leads to an ideology that development and town planning must go hand in hand. The main pull factor for locating an industry has always been the availability of the raw materials necessary for the production and processing of goods in order to achieve the desired results. However, it is seen that there are other important and important factors that must be taken into account before finalizing the site location for the industry.

Table1: Existing Status Of Industrial Areas In The Distric of Hazaribagh

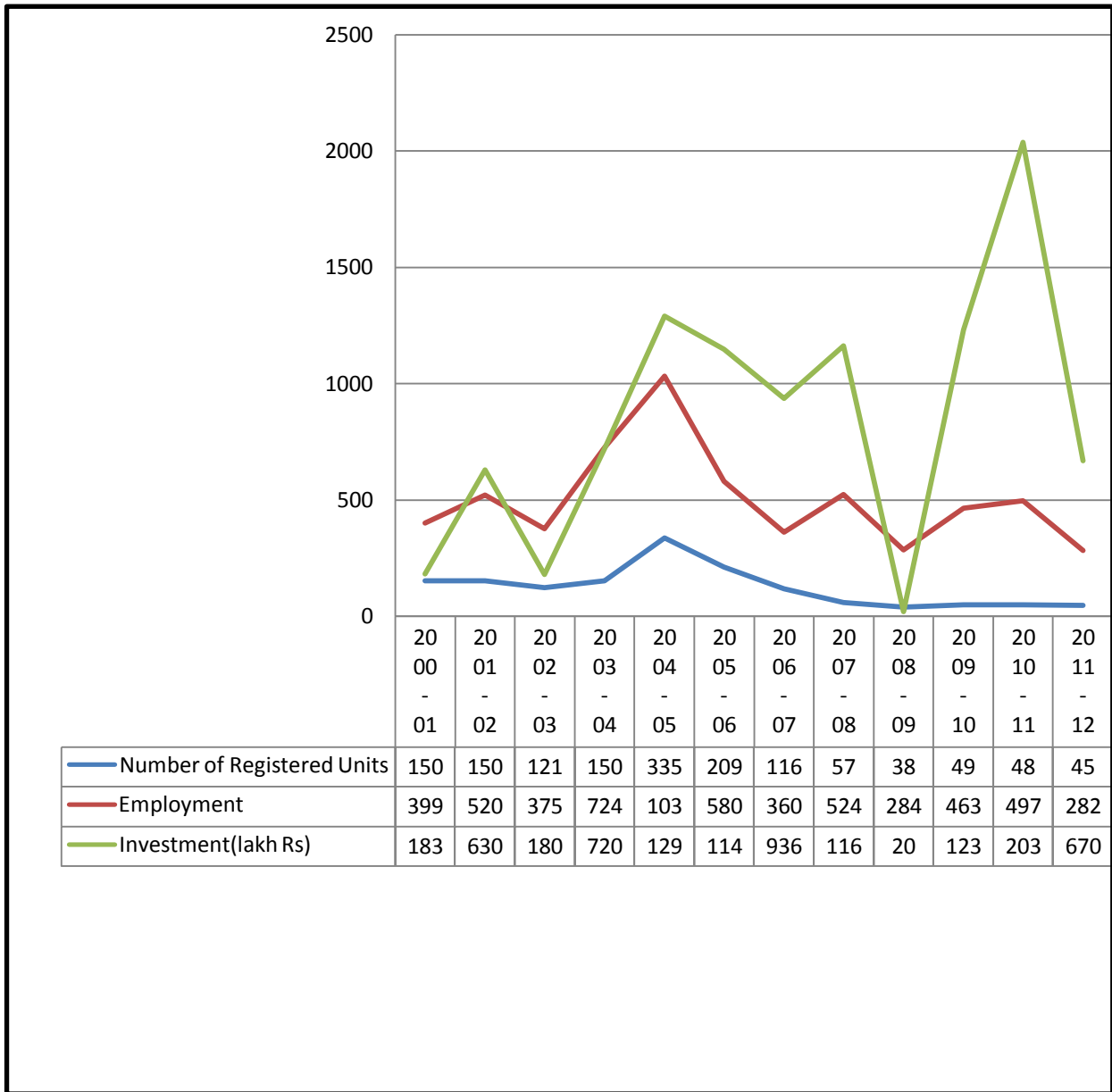
Sl.No	Name of Ind. Area	Land acquired (In hectare)	Land developed (In hectare)	Prevailing Rate Per Sqm (In Rs.)	No of Plots	No of allotted Plots	No of Vacant Plots	No. of Units in Production
1	Hazaribagh	15.513	15.513	315.30 (for Mgf. unit) 394.13 (for Service unit)		11		7
2	Industrial Growth Center, Barhi	161.519	Yet to development					

Source: website of RIADA, Ranchi

During the 20th century mankind has experienced tremendous growth in technological advancements in industry and production with exponential use of natural resources and the environment to meet ever increasing needs and demands. Industries scenario of Hazaribagh is found in the following figure 2. Total registered industries are 1468 and not registered industries are 132

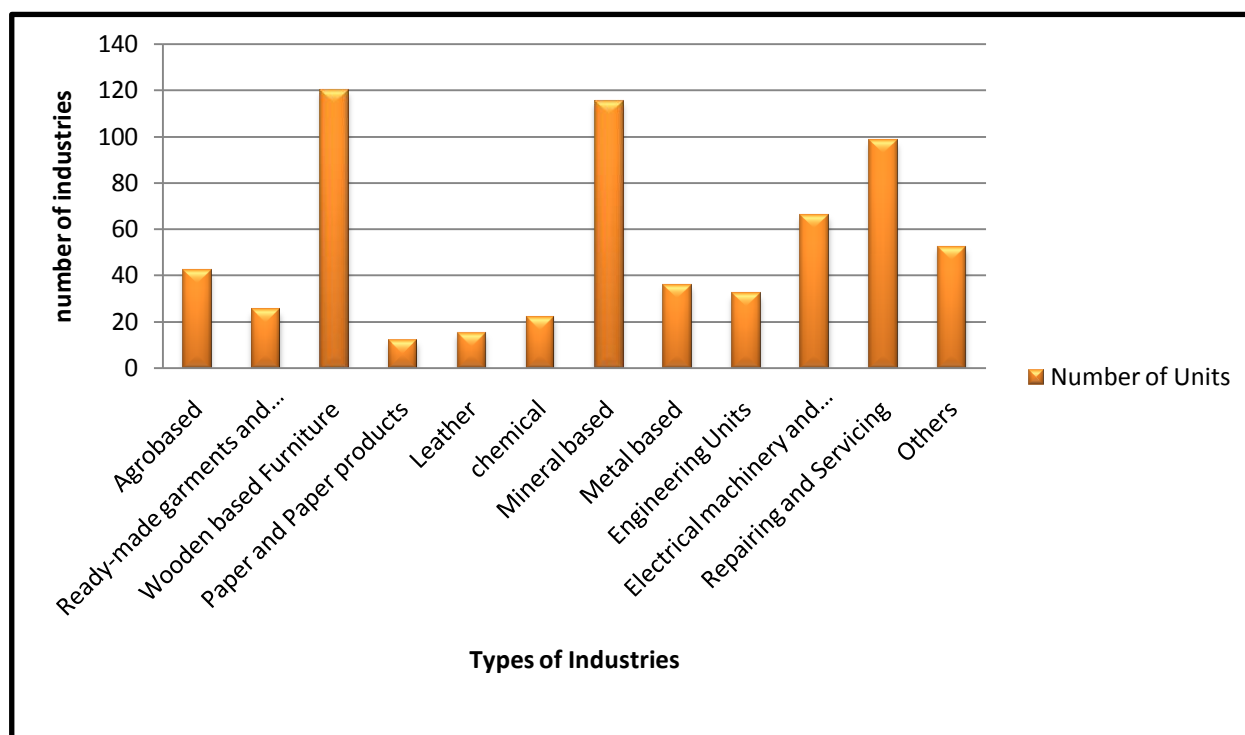


Figure2: Nature of Industries



**Figure3: Year wise distribution of registered units, Employment, Investment**

Various industries are found in this district(Figure4). There are 42 units in Agro based Industry, 25 units in Ready-made garments & embroidery,120 units in Wood/wooden based furniture,12 units in Paper & Paper products,15 units in Leather based industry, 22 units in Chemical/Chemical based ,115 units in Mineral based,36 units in Metal based (Steel Fab.),32units Engineering,66 units in Electrical machinery and transport equipment,98 units in Repairing & servicing The state of Jharkhand has immense potential for industrialization with its large deposits representing 40% of the country's total minerals.



**Figure4: Types of Industrie(Number) in Hazaribagh district.**

It is noted that number of registered units are 150 in 2000-01,150 in 2001-02,335 in 2004-05,45 in 2011-12.It is noted that number of employment are 399 in 2000-01,520in 2001-02, 103 in 2004-05,282 in 2011-12

The state is the sole producer of coking coal, uranium and pyrite. It ranks first in the production of coal, mica, kaynite and copper in India. Besides minerals, it has about 1/3 of the forest cover as oxygen bank and raw material for several economic activities which provide living cover in the rural area as minor forest products, aromatic fruits, medicinal and dry and Tasar. It has an extensive network of rivers, power plants and industrial bases with around 1/3 of the urban populationIt owns several central and state government institutes, for example IIM, XLRI, CCL, Birsa Agriculture University, DVC, SAIL, CMPDI, Mecon, NIFFT, NIT, BIT Mesra, etc. With its large mineral deposits, Jharkhand is one of the pioneers. to attract a large number of investors. Almost Rs. 56,000 crore of investment proposals were received during the 11th five-year plan for the establishment of mineral industries and other manufacturers of auto components, auto truck manufacturing, cement, processing food, textiles, education, health, etc. in addition to the public investments of NTPC / DVC / VOILE / STPI etc.

,52 units in Others . Besides these proposals, there are several proposals with the Department of Energy, Labor, Science and Technology and Tourism that were not included. Several projects with an investment of Rs 21,621 crore were ordered in addition to investments in the Govt.-CPSU-Power sector. Few projects with Rs. 12000 crore and capacity of around 3.4 million tons need to be expanded and put into operation in steel production etc. during 2012-13.

## ***B. Impacts of industrialization on the environment of Hazaribagh District***

### **Water impacts :**

A detailed analysis of the environmental impacts of industrializationrevealed that industries established before the 1990s mainly included textiles, sugars and distilleries which consumed a lot of water and had a higher pollution potential, putting enormous pressure on the environment. Indiscriminate discharge of industrial effluents with municipal solid wasteredisposal is the main source of contamination of surface water. Heavy metal, salt and fluoride effluents from the chemical production, metal processing and papermaking industries of the industrial zone, established in 1979 on the outskirts of Hazaribagh, contaminated the surrounding groundwater. This polluted water table moves at an average speed of about 30 m per year, migrating towards the Hazaribagh well field which houses the main drinking water supply wells. Comparing the quality of groundwater over the past 20 years, from 1981 to 2001, Ramesh (2005) found an alarming drop in water level from 6 m to 26 m. The study by Sivasankaran (1997) on the state of pollutants in groundwater in the Pondicherry region revealed the presence of pesticides and heavy metals.

The study on heavy metal concentrations in the industrial area of Hazaribagh by Aruna Devy (2002) indicated that cadmium and lead were present at levels above prescribed standards in various industrial areas. Several studies have shown that the accumulation of these metals in the food chain has become a huge environmental hazard .Various studies carried out to assess the physicochemical characteristics of water have indicated that the values of conductivity, total dissolved solids, calcium, magnesium, hardness and sulphate ingroundwater has increased twenty-fold in recent years, chloride and sodium values have increased fifty-fold and potassium six-fold. Based on the linear regression forecast of Ramesh (2005), it is estimated that by 2020 the total suspended solids load (TSS) will reach 592.18 TPA, the biological oxygen demand (BOD) load will be 1958.93 TPA and the chemical oxygen

demand (COD) will be 4667.27 TPA. The discharge load of oil and grease will reach 66.65 TPA during this period. The expected annual use of groundwater by the industrial sector will reach 5,727,715.75 KL (5.727 mcm). However, the annual replenishment would remain at 155 million cubic meters (mcm). Thus, the deficit will fall to 3.6 mcm by 2020. It will lead to an additional depletion of the water table in the north-western part and to an intrusion of salt water in the south-eastern part of Hazaribagh. Faced with this situation, strict measures must be taken by the government for the sustainable use of water resources for future industrialization. .

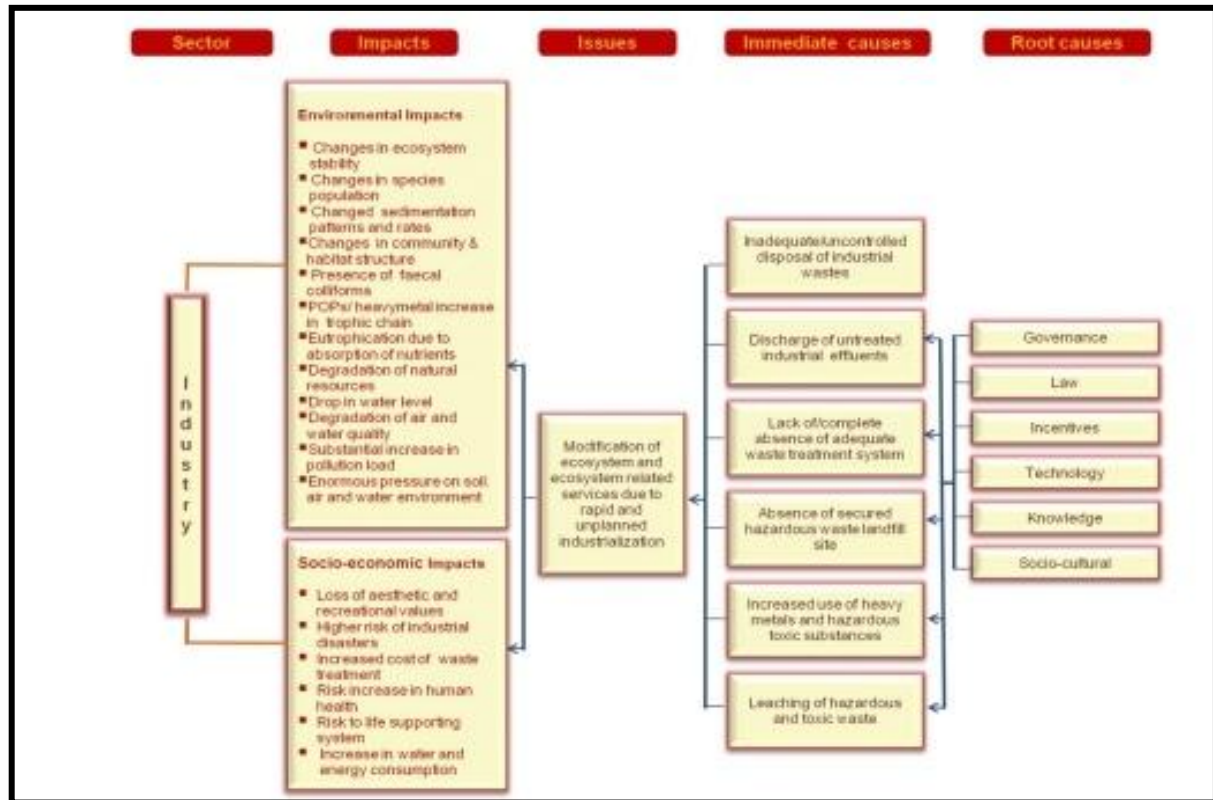


Figure 5: Causal chain diagram illustrating the causal links for Industrial Pollution in the Hazaribagh.

#### Air impacts:

Air quality is also affected by industrialization. At the end of 18th century, Hazaribagh received 499 tons of suspended particles (SPM), 2.88 tons of sulfur dioxide (SO<sub>2</sub>) and 1.99 tonnes of nitrogen dioxide (NO<sub>x</sub>) per year. At the end of the XIX century, several potentially polluting installations such as M.S. ingots, ferroalloys and calcium carbide were established and the pollutant level increased by almost ten times for PMS and NO<sub>x</sub> and fifteen times for SO<sub>2</sub>. The total emissions from these industries are still vast, even after the application of advanced air pollution control devices such as bag filter, dual channel scrubber and multiple cyclone. In 2005, 65 have been identified as a "point source" (stack emission) of air pollutant release units in Hazaribagh. In 2012, pollutants such as PMS, CO, SO<sub>2</sub> and NO<sub>2</sub> exceeded limits or almost reached [17], requiring immediate implementation of continuous monitoring and oversight mechanism. .

#### Ecosystem Impacts:

This uncontrolled industrialization has resulted in changes in the community and habitat structure. The forest cover of Hazaribagh has become very reduced, threatening the ecosystem. With this sudden boom in industries, the pattern of resource use in the form of energy, water use, etc. have increased dramatically, leading to inevitable disruption of resources and imbalance. Today, the land looks nothing like its past, except in a few pockets in the region. It has already affected sedimentation patterns, the distribution of major and trace elements, and the rate of soil formation, which in turn brought significant changes in the stability of the ecosystem. The regular influx of industrial effluents into the ponds has disturbed their ecological balance. Therefore, water that previously could be used for domestic and agricultural purposes has become extremely unusable. This in turn affected the cropping pattern. Although not conspicuously alarmingly, the slow and steady pollution of heavy metals in the environment is quite dangerous. They reach the aquatic environment and being non-degradable, remains in suspension or partially dissolved in water and subsequently accumulated in organisms.

#### Impacts on flora and fauna

Due to climate change due to industrialization most areas of Phazaribagh, several endangered and threatened plant species such as *Derris ovalifolia*, *Mallotus philippensis*, *Atlantia monophylla*, *Pamburus missicnsis*, *Glyccsmis pentaphylla*, *Lepisanthus tetraphylla*, *Diosypyros ebum*, *Gloriosa superba*, *Gymnema sylvestre*, *Combretum ovalifolium*,. It also poses a great risk to the very survival of rare and endangered species of the wild animal population. Among the five species.



### **C. Immediate causes**

The present study identified the inadequate / uncontrolled disposal of industrial waste, the discharge of untreated industrial effluents, absence / total absence of appropriate facilities for waste treatment system, no safe landfill for hazardous waste, increased use of heavy metals and toxic substances, the leaching of hazardous and toxic wastes as immediate causes of industrial pollution in Hazaribagh region (figure 5). With rapid industrialization, there has been a substantial increase in the generation of various hazardous wastes, discharges of industrial effluents and polluting emissions groundwater resources. The crisis of aquatic pollution and its impact on the health of organisms has been a major current problem mainly due to the reckless discharge of industrial effluents containing heavy metals like iron, chromium, zinc and lead etc. As the industrial structure of the region transforms into polluting sectors, industrial effluents increasingly contain heavy and non-biodegradable metals toxic and hazardous waste, the leaching of which increasingly contaminates groundwater resources chemically and microbial. Currently industries such as electroplating, pharmaceuticals, chemicals, steel, textiles, electronics, distilleries are important polluting industries, mainly responsible for the production of hazardous waste from diverse nature. ETP sludge, waste oils, zinc oil, dichromate waste, used pickling acids are major waste or pollutants of concern. The uncontrolled, inadequate and unsystematic management of this waste constitutes a greater risk and significant environmental burden in this region.

### **D. Root causes**

Various issues related to governance, law, knowledge, technology and socio-cultural aspects have been identified as the main causes of industrial pollution in this region. These causes include the lack of long-term commitment of companies to environmental initiatives, insufficient management systems, ineffective institutional mechanism for strategic planning, development, implementation and monitoring of pollution management, lack of access to appropriate technology and know-how, a lack of awareness of the specific potential of green approaches, a lack of time and resources, corporate conservatism and reluctance to radically change business practices regardless of the economic and environmental benefits. Other challenges include the company's belief that pollution reduction is always a cost and never a saving and a business orientation towards selling maximization rather than minimization of costs. Therefore, in this alarming situation, if we fail to "green" industrial activities, then industrial pollution will be much more serious in this ecologically sensitive coastal region. Hazaribagh must now renovate its infrastructure to meet growing sociological, economic and environmental requirements simultaneously, without further ado.

### **E. Recommendations for durable solutions**

Strategic planning is necessary to address the environmental impacts of economic development on a acceptable level. In this scenario of a degraded environment and pressure for constant industrialization, the development of the eco-industrial network provides viable solutions to evolve towards industrialization. However, it will take a base of supporting infrastructure to make this happen. Industry will need the perfect combination of incentives, regulations, management mechanisms, information and other infrastructure to provide the conditions under which industrial symbiosis (IS) can thrive.

A subsequent SWOT analysis by this author and his doctoral research largely highlighted that significant potential exists for the development of industrial clusters in different sectors in Hazaribagh. For companies looking for inter-organizational interfaces for by-products and resources, potentials look attractive. 5 types (one-one, one-many, many-one, many-many and one-all) and 28 in total a number of potential synergies have been identified for trade in by-products and resources over the course of the same research. This can be underpinned by elements of policy that emphasize and encourage companies to evolve in directions aligned with the principles of the IS. Regional development agencies and local government, which have increasingly accepted the responsibility of balancing economic development with other pillars of sustainability, have a welcoming approach to the concept diversity, continuous production of waste, existing motivation in the work environment, willingness of the government, industry-friendly incentives / subsidies, huge investment in industrial sector, good transportation access, proximity to industrial players, local academic skills / expertise offer promising prospects opportunities for successful implementation of EI principles. All this creates a support atmosphere for the creation of an eco-industrial park in this region based on materials and by-products Exchanges.

## **7. Conclusion**

Industrialization and urbanization have been very important causes of pressure on natural resources and also cause varying degrees of environmental degradation. The industrial base in India has been experiencing a similar situation for several decades. There is an urgent need for initiatives guaranteeing the sustainability of industrialization both in terms of measures to prevent environmental damage and promote more environmentally friendly measures Industries. A transition of sectors into eco-industrial sectors has emerged as a dynamic approach to preserving the region's natural resources. Build strong links between industry and related services can accelerate this transition to a diverse, high-income economy while providing a safer environment. The situational analysis of the Hazaribagh region revealed the existence of important potential for the development of industrial clusters and inter-organizational interfaces for by-products and local resources. The main lessons learned from Hazaribagh can form a good basis for the development of a strategic action for areas with similar environmental problems. Based on a comprehensive analysis of local environmental contexts, strategies can be developed to overcome the problems, by modifying or by introducing appropriate approaches and filling in missing aspects of related policies to strengthen sustainable industrialization. However, there is no single system that will work in all cases. The same frame alone not bring a successful eco-industrial model. In light of this, the case of each industry must be analyzed separately; however, other examples of successful strategies can serve as a basis for inspiration. The realization of the eco-industrial network depends on the in-depth study of each industrial characteristics and determining factors. It requires strong determination and full dedication from key stakeholders, especially participating companies. It is important to do the participating companies understand that the eco-industrial network will undoubtedly provide them with opportunities to achieve long-term environmental and socio-economic benefits and increase the sustainability of the system. However, we need to address a number of concerns regarding implementation, dissemination and adoption. New management approaches to move industries towards more sustainable practices and prepare them for the acceptance of recycled products and materials. Such solutions cannot be imposed from the outside and require a holistic approach that is widely understood, or at least hosted by local industrial systems. This will further allow it to be easily absorbed into the corporate culture while helping to improve overall efficiency,

and thus possibly assist in a benign transformation of an existing 'culture of the status quo' into a 'culture of sustainability culture'. To achieve this, it suffices to approach the strategy in a logical manner, through linking all the essential elements rooted in the social, economic, environmental, technical, scientific, cultural and intellectual green components in an integrated way. Implement an achievable green approach along these lines will create the very desirable integrated structure necessary for the development of sustainable industrial base in regions with similar characteristics.

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