

Use of Biodiversity Indicator and Reporting System (BIRS) for Biodiversity Assessment In Mining Landscape

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Abstract— The main aim of the study was to find out the critical biodiversity index of different habitats present within the state of Jharkhand and Odisha where Tata Steel Ltd carries out its Mining operations. The study has focused upon the biodiversity results discussion based on different biodiversity sites present within the areas. The positivism philosophy has been used for the conduction of the research. The research has focused on an inductive approach with a descriptive project design. The first-hand data collected by the Researcher has acted as the project outcomes to depict the clear image of the biodiversity within this range. The delineation method has been used to isolate the habitats and conducting the research.

The biodiversity indexes found from this research have shown a greater than 1 value in every case. For Joda, Keonjhar, Odisha, it has been 4.5, contradictorily in Deojhar, Keonjhar, Odisha, it is 5.9, showing the high range of Diversity present in the ecologies of these places. The research outcome has also opened a future scope of finding out new unknown species that have been seen within the deep forests of this region. The knowledge about BIRS has been also gained with the help of this study that has focused on finding out the generic tendency of conducting biodiversity index analysis research.

Index Terms— Biodiversity Index, BIRS, Canopy, Operational area

I. INTRODUCTION

The term “Biodiversity” refers to the different forms of life on the earth at every level of the ecology. Starting from the smallest unicellular organisms to the complex ecosystem, everything is a part of diversity. It also includes different ecological, evolutionary, as well as cultural processes that help in increasing the sustainability of life. Not only the rare or extinct species are included within the range of biodiversity, but every living organism is a part of it. The dynamicity of the ecology is known as Bio-culture.

Biodiversity indicators are tools to communicate and summarize complex environmental data and issues [10]. These indicators are used to highlight some important issues that can be addressed by the way of policy or management interventions. In order to conserve biological diversity, businesses need some systematic indicators and measurements which can inform them regarding the integrity, health of the biodiversity and actions that can be taken to ensure conservation of biodiversity and using resources sustainably. So, the Biodiversity indicators in turn helps businesses by providing information on how effectiveness of biodiversity policies and management programs can be improved continuously. So, biodiversity Indicators play an important role for monitoring the trends as well as status of biological diversity of a particular area. Biodiversity indicators helps businesses to measure and monitor pressures and threats related to loss of habitats or dominance of non-indigenous species [1], the health of species in a particular area, outcomes of conservation

programs like protection of important biodiversity areas and how has it benefited to people. Today, for businesses it is very important to understand as well as measure the impact and dependencies of their operations on biodiversity [1]. The motivations behind doing this is related to 2 main drivers, external drivers like adhering to environmental regulation and policies, financial lending requirements, certification schemes, or to report against Sustainable Development Goals and internal drivers like to improve operational efficiencies having an environmental co-benefit, to be an environmentally responsible business [1].

So, corporates now with the help of biodiversity indicators measure performance for different business processes which can address the above internal as well as external drivers. Biodiversity Indicator and Reporting System, a process which is created by IUCN, in order to guide the companies in extraction sector to adopt a systematic biodiversity assessment process. The main motto of this is to monitor the biodiversity related to their extractive operations. Every company wants to evaluate its impact on the habitats and ecosystem that is getting affected due to its activity. Moreover, the effectiveness of the mitigation and rehabilitation of the habitat measures conducted by the company can be evaluated with the help of this system. Moreover, measurement of the biodiversity management initiative conducted by the company can be accessed through BIRS. The three most important activities are present within the range of BIRS. This is known as Biodiversity Condition Class and is expressed at different decimal values on a scale of 1 to 10 [4]. It measures relative enhancement of the

biodiversity or its degradation too. Furthermore, analysing the threats or disturbances present within the responsibilities of BIRS is important.

This particular research is related to the critical analysis of the Biodiversity Index and its modification within the operational areas of Tata Steel in Jharkhand and Odisha, states of India. The main focus of the study remains on finding out the causes of the degradation of the ecosystem at the sites in Jharkhand and Odisha due to the existence of the industry. Moreover, the generation of substitute industrial initiatives in order to reduce the negative footprints of the company over the ecosystem present in the places.

Because replication is required for scientific progress, papers submitted for publication must provide sufficient information to allow readers to perform similar experiments or calculations and use the reported results. Although not everything need be disclosed, a paper must contain new, useable, and fully described information. For example, a specimen's chemical composition need not be reported if the main purpose of a paper is to introduce a new measurement technique. Authors should expect to be challenged by reviewers if the results are not supported by adequate data and critical details.

II. AIMS AND OBJECTIVES

The main aim of the research is to find out the negative environmental impact on the ecosystem and the biodiversity located around the 7 sites chosen for assessment. Some objectives are present within the research like:

- To conduct the biodiversity survey in the habitats of the industries
- To find out the samples of the type of Biodiversity sites present in the chooses 7 sites.

Table 1: Different types of Natural Habitats [7]

Terrestrial Habitats	Freshwater Habitats	Coastal Habitats
Forests	Lakes	Mangroves
Woodlands and Shrub lands	Ponds	Coastal zones
Meadows	Wetlands	Salt marshes
Rocks	Rivers	
Rural habitats	Streams	
Cultivation Field	Waterfalls	
Abandoned Slopes	Canals	

To find out the proper strategy for reducing the negative environmental impacts over the biodiversity sites.

III. MATERIALS AND METHODS

Different processes are present in the biodiversity measures commonly conducted by the companies. These are known as Canopy Fogging, Quadrat Sampling, Transect Sampling, as well as Netting [11]. Canopy Fogging is used for finding out the biodiversity of insects. A little amount of insecticide is sprayed at the top of a tree, and the dead insects are collected on a large screen for analysing their features. Quadrat Sampling is the process of sampling number of different species and their density by creating a plastic sheet. In this plastic square, or plastic stakes and strings, an area of 1 square meter by 20 square meters is made and the total number of different species within that space is analysed.

Transect sampling is the process of dividing the total area by rope or string at an equal interval and evaluating the biodiversity within the range. Netting is the process of creating fine mesh for catching the bats and birds in the case of the terrestrial ecosystem and fishes for the aquatic ecosystem [8]. After the catching is done, the species are analyzed for biodiversity evaluation. This process mainly includes the DNA culture, genetic analysis, Blood type culture, and other tools are used.

Every research has its philosophy, design, and approach that makes it unique as well as defines the way of progressing with the work. This research follows the philosophy of Positivism because, in the positivism philosophy of research conduction, the critical and analytical survey of quantitative information is done [2]. Furthermore, this research undergoes the inductive approach, where it creates a research question and uses different kinds of theoretical frameworks, and analysed Data for the achievement of the research objectives. On the other hand, the research is a descriptive one that mainly focuses on detailed data analysis and pattern evaluation.

In this particular research, the primary Data Collection is conducted through different survey methods. The primary Data Collection is conducted by going at 7 different sites across Jharkhand and Odisha. The habitats have been divided into three different areas, operational area, rehabilitation area, as well as Natural Habitats [7]. The operational area of this research is defined as those places, where the company has stopped working more than two years ago, and new species can be found. The Rehabilitation Areas are those portions where the extraction of neutrality due to the company activities have been ceased more than five years ago, and a huge amount of biodiversity can be found in those areas. The natural Habitat section has been divided into three different subparts. These three subparts are known as Terrestrial Habitats, Freshwater Habitats, and Coastal Habitats.

BIRS includes three main sub-processes within it, like Delineation of Habitat, Habitat Assessment, and Site Condition Class Evaluation. In this research, the habitats are delineated with the help of two types of maps, like Used Land map, as well as Covered Land Map, known as LU/LC map.

The survey points are selected in the next stage with the two types of area discrimination. Up to 5 to 6 points in the map are selected that have a large area within the habitats, and at least two areas are selected with smaller habitats [3].

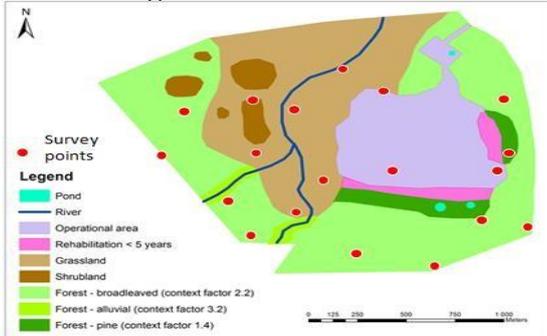


Fig. 1: Different ecosystem types [3]

Third stage included site visiting and survey conduction with the help of the above-mentioned processes like Canopy

Fogging, Netting, and so on. In the next step, the BIRS habitat Questionnaire is used for assessing the habitats. The Questionnaire includes different simplified queries needed for delineation of the habitats. After the proper conduction questionnaire session, the excel sheet is made with the help of Habitat Condition Class creation through scaling it based on 10. The last step is evaluating the Biodiversity Index by entering the Land Use/ Land Cover Mapping.

IV. RESULTS AND DISCUSSIONS

From this research, a clear picture of the current situation of the biodiversity in the chooses 7 sites of Jharkhand and Odisha states has been found. The first process that is done is isolating different types of areas based on their features and finding out their periphery in the units of square meters [9]. In the next table, a brief discussion about the different types of Habitats is discussed.

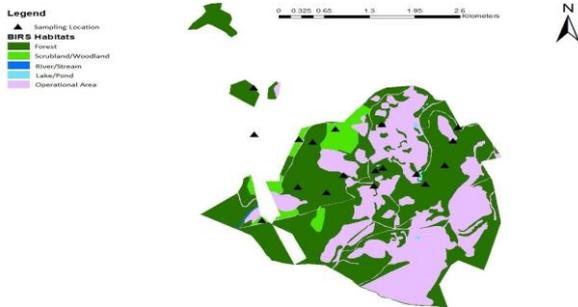
Table 2: The habitat distinction based on area and features [9]

Land Type	Distinguishing Feature	Area (Hectare Acres)
Cultivated Land	This Land type is used at ploughing fields, irrespective of the owners.	94
Forest Land	This land type has at least 75% canopy cover and is mandatory for BIRS assessment	111
Wood land or Shrub Land	This land type has less than 75% canopy cover and is used in BIRS analysis.	398
Grass Land	This land type includes parks and gardens. Most grasses are found in this type of land. A little number of huge trees are found.	10
River	It includes all streams, canals, and drainage systems present within the survey area.	10
Pond	It includes every kind of man-made water reservoir present within the area.	32
Rehabilitation Area		
Rehabilitation Observatory Dump type 1	This area includes those portions that have not undergone any extraction within the last five years.	11
Rehabilitation Observatory Dump Type 2	This area includes those portions that have not undergone any extraction within the last two to five years.	12
Rehabilitation Observatory Dump Type 3	This area includes those parts that have not undergone any extraction within the last one or more years.	10
Operational Area	This area is the portion within the area of the survey that is excluded from the research work.	1065

Totally 102 sites are surveyed for the conduction of this

finding out the biodiversity. The Noamundi site has almost 20 biodiversity sites that have characteristics of different types of lands.

Fig. 2: BIRS Habitats with location of Sampling Points in the map of Noamundi, West, Jharkhand



On the other hand, the Sukinda area was searched for finding out the 9 biodiversity sites present within the area. Moreover, the Tata steel Ltd is one of the greatest domestic steel industries present within India and has its wings at West Bokaro and Jharia [6]. From these two places, almost 38 biodiversity sites have been found. In the next table, the found data from different biodiversity sites within these places are discussed.

Table 3: Biodiversity Index of Locations at Odisha

Habitat	Joda, Keonjhar, Odisha	Deojhar, Keonjhar, Odisha	Sukind, Jajapur, Odisha	Barbil, Keonjhar, Odisha
Forest	3	4	3	2
Woodland	4	5	5	3
Grassland	-	1	4	-
Cultivated Land	2	-	-	-
River/Stream	-	2	-	3
Lake/Pond	-	-	-	-
Operational Area	-	-	-	-

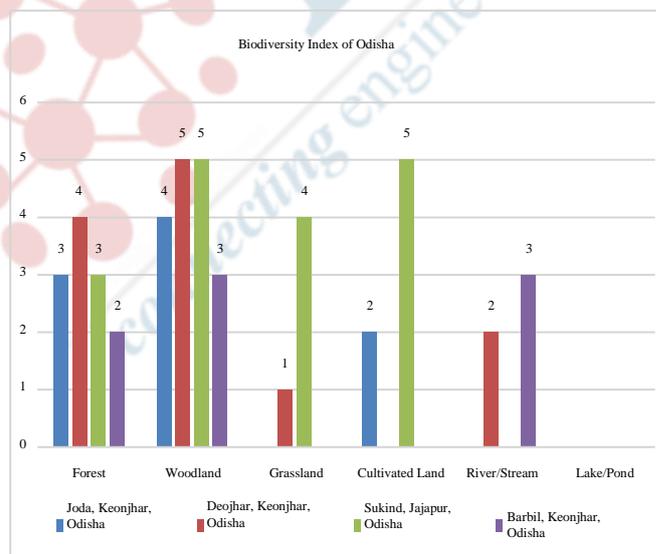




Fig. 3- Biodiversity Index of the Locations in Odisha

Deojhar, Keonjhar, Odisha (Biodiversity Score-6) Sukind, Jajapur, Odisha (Biodiversity Score-3)
Comparative Analysis of Forest Presence in Odisha at sites with Highest and Lowest Biodiversity Index score (Source- Google Earth Engine)

Table 4: Biodiversity Index of Locations at Jharkhand

Habitat	Noamundi, West, Jharkhand	Ghatotand, Mandu Ramgarh, Jharkhand	Jharia, Jharkhand
Forest	3	1	3
Woodland	4	4	4
Grassland	-	4	6
Cultivated Land	-	3	2
River/Stream	3	4	2
Lake/Pond	4	2	-
Site Biodiversity Index	5.5	3.5	3

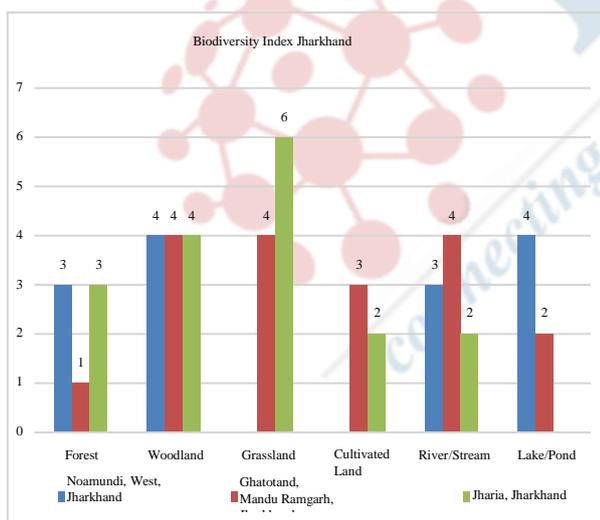


Fig. 4- Biodiversity Index of the Locations in Jharkhand

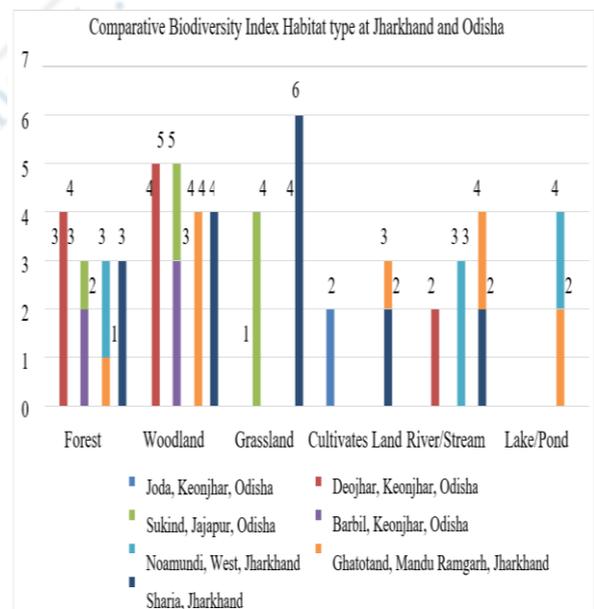


Figure 5- Comparative Analysis of Biodiversity Index Habitat type

Table 4: Average Biodiversity Index Score of Odisha

	Joda, Keonjhar Odisha	Deojhar, Keonjhar, Odisha	Sukind, Jajapur disha	Barbil, Keonjhar, Odisha	AVERAGE SCORE
Site Biodiversity Index Score	4.5	6	3	5	4.625

Table5: Average Biodiversity Index Score of Jharkhand

	Noamundi, West, Jharkhand	Ghatotand, Mandu Ramgarh, Jharkhand	Jharia, Jharkhand	AVERAGE SCORE
Site Biodiversity Index Score	5.5	3.5	3	4

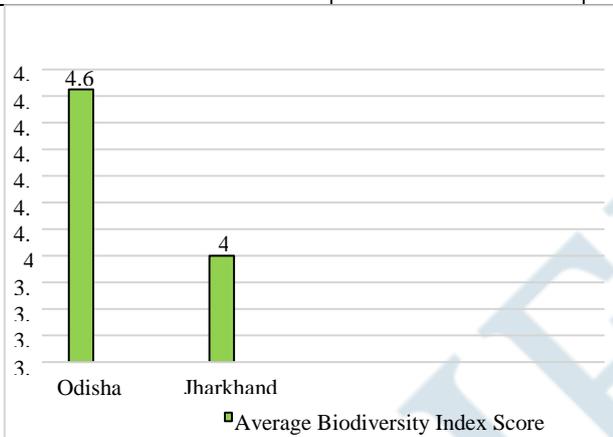


Fig. 6- Comparative Analysis of Average Biodiversity Index Score

It can be inferred from the above comparative analysis graph that sites present in state of Odisha has overall better biodiversity index score as compared to sites present in the state of Jharkhand. From the above table, the Biodiversity Index of different sites present with the area selected is found. The most significant Biodiversity has been found in the Noamundi iron ore mine area, where a total of 1200 Hectare land is present within the territories [5]. The found 19 sample sites have provided a huge biodiversity index, almost 5.5 to 6. On the other hand, the highest Biodiversity index has been seen from the Deojhar area. The other sites have shown medium or micro biodiversity. Despite these, it is found that almost all sites have biodiversity greater than 1, indicating a high level of biodiversity. Except Sukind, Jajapur site, all other Sites locates in Odisha have a very good biodiversity index score.

V. CONCLUSION

Most of the companies wanted to know how they are affecting the habitats and ecosystems for which they are responsible under new regulatory framework and international conventions like post 2020 declaration of Convention of Biological Diversity. To get further approvals it is important to have understanding about their mitigation

and habitat rehabilitation measures. Important question is How to measure our Biodiversity Management performance. Till date in India, area under plantation is used to indicate the biodiversity performance. With help of BIRS annual calculation of biodiversity condition index (expressed as Biodiversity class condition) which is on a scale of 1-10 is measured to relative progress or degradation which help in analyse the threats/ disturbances in each habitat.

The research has been a very significant initiative for measuring the biodiversity indexes present within the biodiversity sites of the Chota-Nagpur Plateau area, especially different regions present. The most important feature of the study is that it has not compromised the life of any living plants or animals. Another important outcome of the research is that the Tata Steel Ltd has very little negative footprint over biodiversity sites present within the company lands. The Biodiversity Index value over 1 is the proof of this positive approach of the company. The research has opened the scope of conducting a critical analysis regarding the species present within the habitats. Furthermore, future studies can focus upon the generation of new strategies for conserving the different species living within the places.

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