

BIOREMEDIATION: AN ANALYSIS

by

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ABSTRACT

The paper covers the meaning of the word 'Bioremediation'. This paper also covers some of the main headings like-What is the relevance of this process in India, Indian laws and environment, what are major decisions of Indian Courts in which environmental issues dealt with by the court along with if any guidelines released by the Court. This paper tries to define all the major headings with suitable case laws and also schemes of government which is framed mainly to protect the environment from some activities which directly affect them and to protect the environment, not for only the present generation but also protect the environment for future generation as well.

Introduction-

The environment is the more important part of a living being, without it there will be no existence of a human being or an animal. The environment since time immemorial considered religious and treated from a religious' view like animals, trees are considered a form of God. With time many rulers considered the environment as an important part and started giving their input towards it but in the present scenario, there is awareness of the environment but it is restricted to a particular area or region.

E.g.; Rural people or tribal people are more conscious of the environment and its beauty and wisely use the natural resources they also depend on forests as it is their source of livelihood but on the other hand Urban population is trapped in the urbanization which creates distance from natural resources and problems related to their scarcity.

In one of the cases, **Fatehsang Gimba Vasava Vs the State of Gujrat**, in this case, tribal people who were dependent on forests were deprived of their rights. The Hon'ble court in this

case held that allowed tribal people in the forest area as they are dependent on bamboo for their livelihood¹.

With this many of the cases were recorded before the Hon'ble Supreme Court which directly indicates that the environment is also most important to our existence. But, with development, it can be observed that it directly affects the environment, the development of factories brings livelihood to workers but somehow it directly or indirectly in both ways it affects the environment. In one of the leading cases, the Hon'ble Supreme Court held that it is required to maintain harmony between development and the environment.²

The question emphasises that with the improvement in economic conditions, is it fine to directly affect the environment, and is the considered an important part of a living organism? Well, the answer for this, is the food the water whatever has at present time for survival for a living being is the part of the environment, it is the surrounding in which a human being can survive and perform its best. So just having the economic benefit and affecting deeply the environment will not be considered a wise decision.

It's important to realize that 'Earth is important not just by saying itself or on papers but with the celebration of every year with an agenda to protect certain natural resources of the environment who are there at the verge of extinct. Environment day was celebrated worldwide on 5 June 1974, it started in the year 1974 in Spokane, Washington³. On this day for the first-time people of all other countries realized that there is a need for awareness towards the environment and to protect it for future generations, they focused on the concept of sustainability to preserve and to provide the next generation with the slogan of 'only one Earth'.

But somehow, this slogan of 'save the earth' or 'only one earth' are directly affected in various ways and due to which environment also giving reactions for our actions like landslides which is the effect of factories or development in the prohibited areas, pollution, soil erosion, deforestation, flood, droughts, illegal mining are easy terms but it affects deeply mankind.

In the case of **Tarun Bharat Sangh Alwar Vs Union of India**⁴, in this case, Court observed that the Government of Rajasthan allowed illegal mining in the Sariska National Park which is a violation of the Forest Conservation Act 1980, due to which it affects ecology directly and

¹ Fatehsang Gimba Vasava V State of Gujrat AIR1987 GUJ9.

² Vellore Citizens Forum v UOI, AIR1996, SC2715:(1996) 5 SCC 647.

³ WORLD ENVIRONMENT DAY - June 5, 2023 - National Today

⁴ 1998 SUPP(3) SCC115.

the verge of diminishing it. The Court, in this case, held that under Section 3 of the Environment Protection Act 1986, the court ensure to enforce of the law and prevent the devastation of the environment and ecology in the particular area and also prohibited this area from mining and also decided to take remedial measures to protect the particular area.

But again, in its protection, there are certain organisms in the environment which perform their cycles to reduce the effects of these activities and protect the earth. E.g. - bacteria, fungi, algae, and aerobic and anaerobic organisms can perform their cycle even in presence of oxygen or not. These organisms somehow can be considered key organisms to protect the earth. They perform many processes like bioremediation, incineration, and phytoremediation all these processes can be used to reduce the effects of contamination in the surroundings.

Bioremediation: what & why this?

Pollution is directly affecting us, and also aware of the term and its types, it can be air, water, noise, soil and more. But do not take this as an important issue of concern, as it was highlighted through recent studies that pollution is not in a specific area but it affects at large. through reports World Health Organization, IHME's Global Burden of Disease Study highlighted that through estimated it was observed that 7 million deaths were reported due to air pollution⁵.

This data itself highlights that air pollution is affecting such a large population. This pollution causes so many diseases in an individual whether it can be a respiratory disorder, hearing disorders, cardiovascular disorders and so on.

As per reports of deaths related to air pollution, it is considered the fourth factor which led to an increase in the death rate after tobacco, and poor diet. It was highlighted that due poor air quality; can be one of the reasons for early deaths in the country.

As per the estimation, 1.67 million deaths occurred in India due to air pollution which signifies an increase in this figure from 2.5% in the last two decades which means in the year 1990 the deaths were reported around 2,79,500 and in the year 2019 the deaths were reported due to air pollution is 9,79,900, due to outdoor pollution⁶. The deaths which are reported in indoor pollution from 1990 around 10,41,000 and in the year 2019 it is 6,06,900⁷.

⁵ Data Review: How many people die from air pollution? - Our World in Data

⁶ India pollution: Deaths linked to PM2.5 pollution in India increased by 2.5 times in 2 decades: Report - The Economic Times (indiatimes.com), 1 March 2022, 04:19 IST.

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In the case of **Consumer Education & Research Forum Vs Union of India**⁸, in this case, the Hon'ble Supreme Court itself held that the right to health is considered an integral part of an individual and it is enshrined under Article 21 of the Constitution Of India. But even in the present scenario due to bad air quality, such a high death rate was observed within the country.

In the case of **M.C.Mehta Vs Union Of India**⁹, this case is considered the river pollution case, where the petition highlighted the pollution in the Ganga river due to effluents of factories in the waterbodies which directly affect the natural resource.

The Court, in this case, held that it was found that a certain amount of iron, and manganese found in the waterbodies directly affects the waterbodies and is considered a harmful substance.

The Court also directed tanneries that -

- they must introduce primary treatment for effluents which reduces their harmful effects and also direct the local authority to avoid disposing of harmful effluents in the water bodies,
- treatments of effluents in the tanneries, introducing treatment plants in the laboratories and also
- prohibited introducing dead bodies, ashes or half-burnt bodies in the river.

But these pollutants affect the environment very deeply even though the court has taken certain remedial measures but there will be a certain number of harmful substances remaining in the water. In such cases, the techniques like bioremediation can be used to reduce its effects of it. E.g.- soil pollution is because of an increase of toxic substances in the soil which causes contamination in the soil it can be through fertilizers, pesticides or other harmful substances in the soil which directly or indirectly affect the vegetation and its consumption affects the human cycle and it can be considered as the reason of soil erosion and soil reduces its holding capacity.

In such a situation, the process of Bioremediation plays a major role it will reduce the contamination of soil simply by introducing certain microbes like bacteria, fungi, and algae which reduces the contamination to a certain level, this can also be considered a waste management technique where they utilize the pollutants. As per a recent report, in 2019 Indore is the city which used the bioremediation process to treat 15 lakh tonnes of historic waste which

⁸ 1995 AIR 922, 1995 SCC(3) 42.

⁹ (1997), 2 SCC 353.

is landfills of waste and become the first city to clear the waste with the Bioremediation process¹⁰.

Bioremediation is the technique which includes some other techniques as well like-

1. In-situ Bioremediation- this is the bioremediation process where the naturally occurring microbes are used to treat the contaminated site and the product will be transferred to the laboratory for further examination.¹¹
2. Engineered bioremediation – when there is no proper growth of the microbes in the particular site in such case some elements are introduced that help to increase the growth of microbes in the particular site for the treatment of contaminants at the particular site.¹²
3. Ex-situ Bioremediation- collecting the waste and treating it with microbes at a particular site and collecting that degraded product from that particular site.¹³

Limitations-

- a. In-situ Bioremediation process- The most important limitation considered is it time-consuming and depends on certain biological and non-biological factors.¹⁴
- b. Ex-Situ Bioremediation process- The limitation for this is that is costly as it involves further steps in the process which itself is time-consuming as well.¹⁵

Factors which are considered to be important in this bioremediation are as follows-

- Biological factor- it involves all those factors which occur naturally like it can be enhanced by catalytic reaction or through enzymatic activities but it usually does not

¹⁰ Pushkara S.V., 24 February 2021, Why bioremediation is not a magic pill for India's overflowing landfills - Citizen Matters

¹¹ Shilpa k. Bioremediation: Principle, Need, Advantages and Limitations | Environment (environmental pollution. in)

¹² Shilpa k. Bioremediation: Principle, Need, Advantages and Limitations | Environment (environmental pollution. in)

¹³ Shilpa k. Bioremediation: Principle, Need, Advantages and Limitations | Environment (environmental pollution. in)

¹⁴ Shilpa k. Bioremediation: Principle, Need, Advantages and Limitations | Environment (environmental pollution. in)

¹⁵ Shilpa k. Bioremediation: Principle, Need, Advantages and Limitations | Environment (environmental pollution. in)

require them. Factors like biomass production, mutation, and gene population are some of the biological factors which play a major role in this bioremediation process.

- Other factors- those factors which also somehow play a major role like concentration, pH, moisture content, and solubility are the factors which are directly under the control and this can affect the bioremediation process.

Schemes related to Environment-

The government announced certain schemes related to the environment and wants to create awareness among the citizen of the country-

1. Paryavaran Vahini Scheme- This scheme was launched in the year 1992 with the main objective to create awareness among the people related to the environment, wildlife, forests, and natural resources, reduction in pollution and also protection extinct species also reduce illegal activities. It includes 184 districts and also as per this scheme feedback is also taken regarding the afforestation and monitoring pollution.¹⁶
2. National Environmental Policy 2006¹⁷, this policy is the response to Articles 48A and 51A(g) of the Indian Constitution, which is a mandate to provide a healthy environment to every citizen and it's a hand-in-hand action of the state and its citizens.

Objectives of this scheme-

- a. To protect and conserve the critical ecological system and resources for economic growth, and livelihood- Conservation of critical environmental resources.
- b. To protect resources and also enable those communities who are likely to depend on natural resources for their livelihood.
- c. Judicious use of natural resources to satisfy the needs of the present generation and also protect them for the future generation.
- d. To integrate environmental concerns into policies and programs, regulations and projects for development.

¹⁶ Paryavaran Vahini Scheme by Ministry of Environment and Forests| National Portal of India

¹⁷ The final text from MOEF 12-4-06.cdr (indiaenvironmentportal.org.in)

- e. Efficiently use environmental resources to reduce the impacts and challenges.
 - f. Principles of good governance applied which focused on time management, cost-efficient management and regulation related to the use of environmental resources.
 - g. Enhancement of resources for environmental conservation- under this objective it is a mutual partnership between the local community, public agencies and investors to protect the environment and resources required related to its conservation.
3. National forest policy¹⁸- this policy was introduced in the year of 1988-

The objectives of the policy are as-

Maintenance of environment stability, protection of ecological balance, conservation of soil heritage and checking of soil degradation, increasing the productivity of forests to meet the need and also utilization of forest produce.

These policies just highlight that government is there who take initiative to protect the environment and all the available resources like natural nature.

Suggestion-

As bioremediation is a process which helps to decompose pollutants and which also reduces the effects of pollution, this process helps to get rid of the major problem to the environment. As the government introduced certain schemes and policies related to the environment in the same way government may encourage young scientists and youths to find out cost-effective solutions to reduce pollution like Bioremediation to protect the environment. They must bring the 'award & reward' concept, which brings a large number of participants and it also helps to find out the solutions to already existing problems along with new problems and their solutions. In this way, I believe that it can be one of the ways to protect the environment from those activities which directly affected the environment at every level.

Conclusion-

This paper itself focused on that environment is so important not for a state but an individual as well and its protection is not only dependent upon the state only, but it is a hand-in-hand process between the state and individuals. With

¹⁸ Review of National Forest Policy, 1988 (drishtias.com)

development, the environment gets affected on a small or large scale, many activities taking place which directly affects the environment like mining, deforestation, grazing, construction in the ecological restricted area, and its impacts observed like the extinction of certain species of animals, plants and so on. This paper highlighted certain issues in which not only the state or individual initiate but the judiciary also play a vital role in providing justice to individuals whose rights are directly violated under Article 21 of the Indian Constitution like the right to livelihood. In many cases, the Hon'ble courts highlighted the main point which is important for the protection of the environment as well as rights given to an individual as well, Hon'ble court also emphasized the environment is also as much as important as a comparison to development. Likewise, the government also introduced certain schemes focused on the environment and issues related to it. With this, it can be concluded that it is a mutual effort between all authorities of the country as well as the individual for the protection of the environment at present and even for future generations as well.



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