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Restoration of Indian River

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***Abstract* - As India heads towards an ever-deepening water crisis, we seek to create efficient solutions for managing water resources. These include various initiatives to promote water conservation on the one hand, and on the other, to improve water use efficiency in industrial, domestic and agriculture section. To achieve our goal of ensuring long term sustainability of water resources, we focus changing the environment through river and conserving the rivers increase the availability of water and stable environment for future. This report discusses issues related to Restoration of Rivers.**

Key Words: River Restoration, Water Recharged System, Polluted, Dry River, Semi Dry River,

1. INTRODUCTION

River is the life line and blood line of India. The origin and distribution of the main streams and their tributaries is known as “Drainage System or River System”. India is one of such country in the world which is bestowed with good number of rivers and tributaries, which are helpful not only in the field of agricultural but also in inland transport system of the country. Rivers also form the basis for domestic and industrial water supply, generation of hydro- electricity, inland fishing, are responsible for deposition of fertile soil in the plains as well as formation of deltas. Some river basins are also responsible for trapping of oil and natural gas which also contribute to the list of usefulness of these rivers. Most of the rivers in India either flow into the Arabian Sea or the Bay of Bengal, which is determined by the water shed and the physical features of the country. *(Balasubramanian, 2017)*

CHAPTER 1 : POLLUTION OF RIVER

The spiritual reverence for rivers remains intact. But the physical well-being of the rivers shows that we have totally failed in keeping our reverence for rivers. Rapid growth in industrialization to support the country’s growing population and economy has polluted our rivers like never before. Studies show that domestic and industrial sewage, agricultural wastes have polluted almost all of Indian rivers. Most of these rivers have turned into sewage carrying drains.

This poses a serious health problem as millions of people continue to depend on this polluted water from the rivers. Water-borne diseases are a common cause of illness in India today. The bad effects of river pollution are not limited to human population only. Pollution of river has affected animals, fish, and bird ’s population, sometimes threatening their very existence. Polluted water seriously affects the reproductive ability of animal and fish species in rivers thus making them extinct in future. *(Bharati, 2014)*

1.1 Causes of Pollution of River

There is no sign of river pollution being stopped. It is increasing day by day. There are several sources of water pollution, which work together to reduce overall river water quality. Industries discharge their liquid waste products into rivers. Our agriculture practice that uses chemical fertilizer and pesticides also contribute to river pollution as rainwater drains these chemicals into the rivers. Domestic wastes that we throw into rivers add to pollution levels. As population grows, the size of towns and cities also grows. With that the amount of domestic wastes that we throw into river increases. In most of the towns and cities, the municipal drains carry our wastes to rivers. There are examples of rivers catching fire because of high pollution levels. This shows how seriously polluted our rivers are. In our everyday life we can easily see symptoms of river pollution. The floating dead fishes in our river, any coloured water in the river, or a bad smell from the river point towards river pollution *(Katakwar, 2016)*

1.2 How River Pollution Effect Our Lives

- **The case of Jaibheem Nagar**

Jaibheem Nagar, a slum locality in Meerut city is located on the bank of Kali River (East) near the medical college. The water quality of the river is so bad that it has even let to the contamination of underlying ground water. As a result of which, women and children especially young girls have to cover a tiresome journey of 2-2.5 kms every day to fetch clean drinking water for their families. Preliminary analysis of drinking water samples by Janhit Foundation revealed excessive contamination of the river water. The test found heavy metals like mercury, chromium, cadmium and lead in water samples. These metals can cause many serious health problems. Due to this contamination in drinking water the residents of the slum suffer from epidermal, gastrointestinal, neurological disorders and cardiac ailments. Pregnant women and children are the worst affected. The residents have abandoned a number of hand pumps since the water coming out of them is severely contaminate *(Hudda)*

International Journal of Engineering Research & Technology (IJERT)
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Vol. 10 Issue 03, March-2021

1.3 Control River Pollution

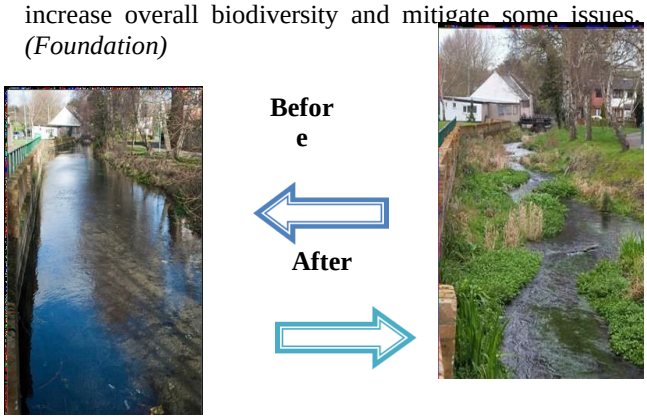
Controlling river pollution is in our own interest. As citizens of India we have constitutional duty to protect our environment. Similarly, the government also has a duty to protect the environment for the welfare of its citizens. There are many ways we can protect the river from pollution.

Some immediate ways to control pollution are:

- Industries should install machineries to remove contaminants from their effluents and wastewater. One way to do so is installation of Effluent Treatment Plant (ETP).This way we can control pollution at the source itself.
- The towns and cities should also have facilities to clean the sewage effluent. All towns and cities must have Sewage Treatment Plants (STPs) that clean up the sewage.
- Farmers should give up chemicals and pesticides in farming and should instead adopt organic methods of farming thus reducing chemical pollution of rivers.
- We should stop our religious practices that pollute river water.
- Proper drainage and sewage systems should be adopted that will not allow the polluted water to mix with river water.
- Ban on Dhobi Ghats alongside the river *(HUDDA)*

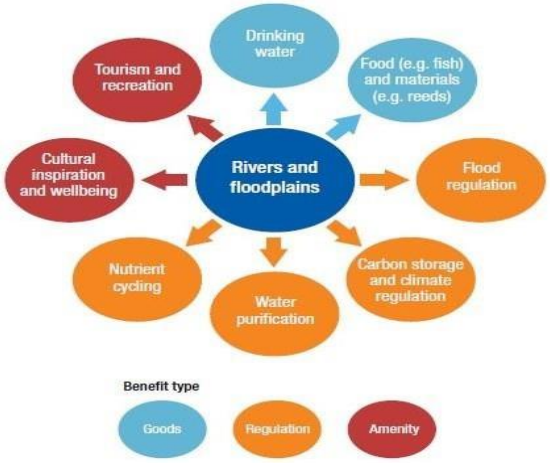
CHAPTER 2 RIVER RESTORATION SYSTEM

River restoration is the process of managing rivers to reinstate natural processes to restore biodiversity, providing benefits to both people and wildlife. Reintroducing natural processes can reshape rivers to provide the diversity of habitats required for a healthy river ecosystem and ensure their long-term recovery by addressing the root cause of the issue Some rivers have been extensively modified to accommodate societal needs for food production, flood protection and economic activity so it is not always possible or desirable to restore to a pristine condition. In this case, improvement of river structure and habitats within the adjacent constraints can increase overall biodiversity and mitigate some issues. *(Foundation)*



2.1 Importance of River Restoration

The fact that most towns and cities developed near rivers illustrates their importance to humans. Naturally functioning rivers and floodplains provide ample benefits to society including flood regulation, freshwater supply, tourism/recreation, water purification, carbon storage and improved human health. Many of these benefits, along with biodiversity and habitat, are compromised if rivers are modified. River restoration projects encourage local communities to engage in their local environment, raising awareness of environmental issues. To ensure local communities benefit as much as possible from river restoration projects, it is important to involve all interested organisations and individuals from the outset(*Foundation)*



2.2 Methodology River Restoration

2.1 Managing catchments

Ideally, to deliver multiple benefits to society and wildlife. River restoration should be considered at catchment scale and prioritized as part of wider catchment plans. The Catchment- Based Approach is a community-led approach that engages individuals and organizations from across society to improve freshwater environments. Catchment management groups are the best place to identify issues and agree restoration priorities. This approach will produce the most beneficial results as the river system can be viewed as a whole - focusing on a specific reach, without a wider catchment understanding, can lead to detrimental effects elsewhere. *(Foundation*

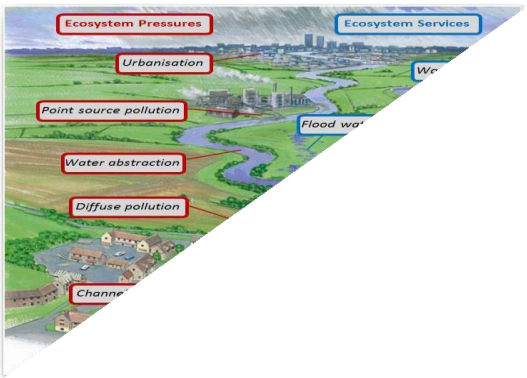


Figure *1 Ecosystem services and pressures within a river catchment (Image from RRC)*

International Journal of Engineering Research & Technology (IJERT)
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Vol. 10 Issue 03, March-2021

2.2 Restoring a more natural river course

River straightening, diverting and over-deepening has been common practice in the past, to create space for land development, enhance river navigation, improve land drainage and reduce flooding. Straightened channels generally lack flow and habitat diversity as their profile has been extensively modified and their features have been removed. Straightening can increase the risk of flooding downstream as water moves faster through the modified section and increases discharge downstream. Remaindering reinstates a more natural course and riverprofile with the aim of improving habitat diversity and biodiversity. Flow can be returned to the former river course or an entirely new course can be constructed if the old channel cannot be identified or is not accessible *(Foundation)*

2.3 Floodplain reconnection and wetland creation

Floodplains are an important aspect of a river in environment, providing flood storage, fish refuge and habitat diversity but often they have been disconnected and drained to protect housing from flooding and create land for agriculture or development. This disconnection and reduction in storage may cause a greater flood risk downstream as water moves through a catchment quicker. To restore connectivity, flood banks can be breached or set back in carefully chosen locations, allowing water to spill out onto the floodplain again. Benefits of reconnecting the floodplain include an increase in flood storage area, recreation of wetland habitat (Figure 4), reintroduction of wetland species and creating refuge for fish during high flows. *(Foundation)*

2.4 In-stream enhancement

If floodplains have been reclaimed and developed, which is the case in most urban areas; it is often not feasible to make space for large-scale river restoration. If the river has concrete banks or bed, which is again often the case in urban areas, reinstating some natural processes within the river channel can be the next best option. There are many novel in-stream enhancement techniques to consider but most involve introducing some form of roughness in-channel, such as woody material, reworking gravels or creating berms to create flow diversity, new habitats and areas of refuge. This form of restoration can provide a great opportunity to get local communities involved, as it usually requires a hands-on approach *(Foundation)*

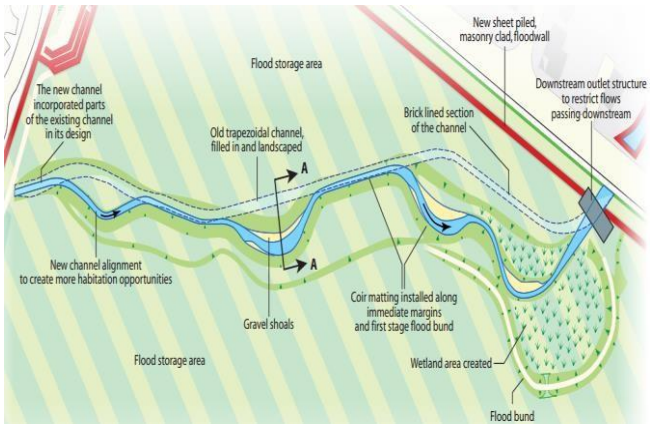

Figure 2: *Diagram showing a remaindered channel through Inch Park in Edinburgh - parks offer a good opportunity to remeander as space is less restricted than in residential/urban areas (image from RRC Manual of Techniques)*

Figure 3 *Diagram illustrating the creation of floodplain along the River Thames on Pink hill Meadow in Oxford shire (image from RRC Manual of Techniques)*

Figure 4 Pictures of berm creation during construction and one year after showing vegetation colonization on the River Somer in Midsomer Norton in Somerset

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2.4 Removing or passing barriers

Barriers such as weirs and dams are common features of the river in landscape. Barriers can restrict the passage of wildlife along a river, and alter river habitats by creating deeper and slower flows directly upstream. They also prevent transportation of sediment, which may lead to downstream erosion problems and increased maintenance costs. Where a barrier is no longer used for its initial purpose, there is a case for complete removal which would restore upstream and downstream connectivity. Where complete removal is not possible, other measures can provide some benefits, such as lowering weirs or creating bypass channels with fish passes *(Foundation)*

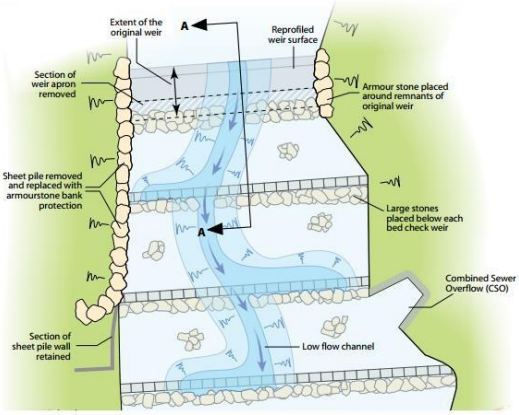
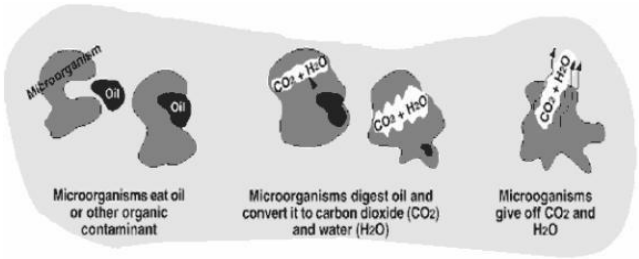


Figure 5 : Diagram illustrating the creation of bed check weirs with a low flow channel for fish passage on the River Calder (image from RRC Manual of Techniques)

2.6 How The Polluted River Restored

- **Bioremediation**

The term of bioremediation has been made of two parts: "bios" means life and Refers to living organisms and "to remediate" that means to solve problem. "bio remediate" means to use biological organisms to solve an environmental Problem such as contaminated soil or groundwater. Bioremediation is the use of living microorganisms to degrade environmental pollutants or to prevent pollution. In other words, it is a technology for



removing pollutants from the environment thus Restoring the original natural surroundings and preventing further pollution *(Ebhrahim Mohammadi, 2013)*

Bioremediation is a natural process and is therefore perceived by the Public as an acceptable waste treatment process for contaminated material such as Soil. Microbes able to degrade the contaminant increase in numbers when the Contaminant is present; when the contaminant is degraded, the biodegradactive Population declines. The residues for the treatment are usually harmless products and include carbon dioxide, water, and cell biomass *(Ebhrahim Mohammadi, 2013)*

- **Types of Bioremediation**

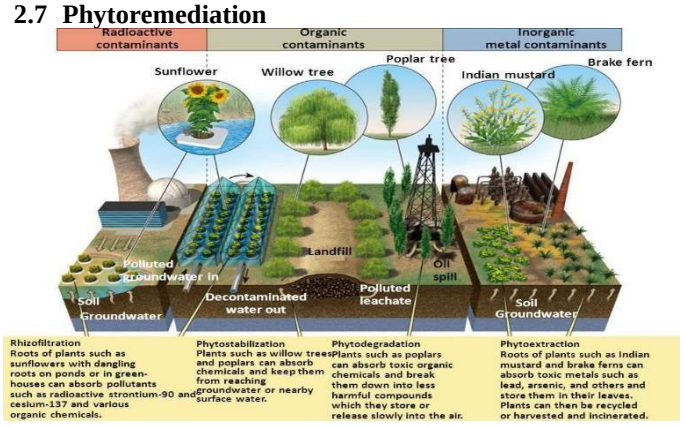
In Situ Bioremediation

Most often, in situ bioremediation is applied to eliminate the pollutants in contaminated soils and groundwater. It is a superior method for the cleaning of contaminated environments because it saves transportation costs and uses harmless Microorganisms to eliminate the chemical contaminations. These microorganisms are better to be of positive chemotactic affinity toward contaminants. This feature *(Ebhrahim Mohammadi, 2013)*

Ex Situ Bioremediation

The process of bioremediation here takes place somewhere out from contamination site, and therefore requires transportation of contaminated soil or pumping of groundwater to the site of bioremediation. This technique has more disadvantages than advantages. *(Ebhrahim Mohammadi, 2013)*

2.7 Phytoremediation



Phytoremediation is the direct use of living green plants for in situ, or in place, removal, degradation, or containment of contaminants in soils, sludge's, sediments, surface water and groundwater.
Phytoremediation is:

- ✓ A low cost, solar energy driven cleanup technique.
- ✓ Most useful at sites with shallow, low levels of contamination.
- ✓ Useful for treating a wide variety of environmental contaminants.
- ✓ Effective with, or in some cases, in place of mechanical cleanup methods.

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(Journal Of Pollution , 2014)

E.g.: Cabbage plantation growing close to a zinc smelter in Silesia, Poland. As a result of a smelt activities lead concentration was highly increased in the soil and then picked up by a number of crops in the surrounding areas

2.8 Houtan Landscape

Houtan demonstrates a living system where ecological infrastructure can provide multiple services for society and nature and new ecological water treatment and flood control methods. The postindustrial design demonstrates a unique productive landscape evoking the memories of the past and the future of the ecological civilization, paying homage to a new aesthetics based on low maintenance and high performance landscapes

3.PRINCIPLES OF RIVER RESTORATION

The six key principles to guide effective river restoration are:

1. Improve overall ecosystem integrity and biodiversity, rather than focusing on the status of single species, by using process-based techniques such as floodplains reconnection.

2. Engage with the interests and motivations of different stakeholder groups as early as possible. Discuss objectives, and identify opportunities and barriers, before planning activities.

3. Understand the connections between natural processes upstream and downstream: work beyond the scale of individual reaches to consider riparian areas, floodplains and the wider catchment.

4 Target measures at the root causes of degradation – not the symptoms – and at the scale at which the pressures exist.

5 Use minimal intervention wherever possible to reinstate natural processes so that rivers can recover by themselves.

6 Evaluate restoration projects using robust monitoring techniques over long timescales (>5 years) to determine outcomes and inform future restoration. *(Stephen Addy, 2016)*

3.1 Creates Policies for River Restoration

1. Ensure long-term (i.e. 5–30 years) provision of government funded resources to facilitate planning, implementation and evaluation of river restoration projects.

2. Streamline regulations and permission processes to aid implementation of small-scale, low risk restoration projects

3. Consider innovative approaches to compensating landowners, such as land purchase, land swapping, conservation covenants and easements, and payments for alternative land use
(Stephen Addy, 2016)

4. THE FUTURE OF RIVER RESTORATION

1. Improved resilience to climate change impacts of increased hydrological extremes of drought and flood risk by improving water storage and attenuating peak flows;

2. Reduced river maintenance costs by reinstating natural processes and physical habitats

3. Improved human well-being through improved opportunities for amenity, tourism and leisure

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 03, March-2021

4. A renewed sense of stewardship by communities towards their local river environment. (*Stephen Addy, 2016)*

5. CONCLUSIONS

After focusing the major problems in the environment, we take small step for preserving the environment. By Implementing, this Process We can bring various solutions for the environment & society. After this process or system the water table will be raised and stable the environment. Developing more green areas or other natural sources that can bring changes in our environment. Restoration of river can bring the huge changes to the environment

6. REFERENCES

[1] Ground Water: H.M.Ragunath(New Age International limited, Publishers.)
[2] Water Management: Dr.A.S.Patel, Dr.D.L. Shah (New Age International limited, Publishers.) Environment Science :Tyler Miller
[3] www.iucn-uk.org
[4] www.crew.ac.uk
[5] River Restoration and Biodiversity Nature- Based Solutions for Restoring the Rivers of the UK and Republic of Ireland Stephen Addy, Susan Cooksley, Nikki Dodd, Kerry Waylen, Jenni Stockan, Anja Byg and Kirsty Holstead (Report) (Journal Of Pollution , 2014)
[6] (Ebhrahim Mohammadi, 2013) Fungi as Bioremediator Journal Research Paper Reference Topic : River Restoration
[7] Author : Ellen Wohl,1 Paul L. Angermeier,2 Brian Bledsoe,3 G. Mathias Kondolf,4 Larry MacDonnell,5 David M. Merritt,6 Margaret A. Palmer,7 N. LeRoy Poff,8 and David Tarboton