Social Science Journal for Advanced Research *Peer Reviewed and Refereed Journal*
ISSN (Online): 2583-0074
Volume-3 Issue-4 || July 2023 || PP. 6-11 DOI: 10.54741/ssjar.3.4.3

Research on the Impact of River Pollution on Water Quality

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Received: 30-06-2023 Revised: 17-07-2023 Accepted: 31-07-2023

ABSTRACT
Pesticides are a category of chemicals used worldwide as herbicides, insecticides, fungicides, rodenticides, molluscicides, nematicides, and plant growth regulators to control weeds, pests, and diseases in crops as well as for human and animal health. When pesticides are used, crop and food yields increase, and the spread of diseases by vectors is significantly reduced. They have, however, been used in an uncontrolled and indiscriminate manner, which has raised severe concerns for the environment in general as well as the health of people, birds, and other animals in particular. Despite widespread use bans, some of the least biodegradable and ecologically persistent pesticides, such as organochlorines, are nevertheless being used more often. Pesticides are extremely harmful to biological systems because of their fast lipid solubility and bioaccumulation in creatures other than their intended targets. Pesticides may have a variety of negative impacts, even at low concentrations, which may be seen in biochemical, molecular, or behavioural ways. Pesticide and residue water pollution is influenced by a number of factors, including drainage, rainfall, microbiological activity, soil temperature, treatment surface, application rate, solubility, mobility, and pesticide half-lives. The majority of pesticides used in India today, such as DDT and HCH, are organochlorine insecticides. There have been reports of the presence of pesticides in fresh water systems and samples of bottled mineral water from Delhi, Bhopal, and other cities, as well as some rural areas. Pesticide pollution's negative impacts on India's drinking water and riverine systems have been discussed in this review.

Keywords: *pesticides, chemical, water, pollution, human heath*

I. INTRODUCTION

Water is necessary for life. No living thing on Earth can survive without it. Marine water, which makes up the bulk of the water on Earth, must first be treated by people before it can be used. The only readily available source of fresh water that is suitable for human consumption is underground. The volume would have been adequate to meet the needs of the living things, though, if it had been of very high quality. Water quality is crucial to our survival because it's required to maintain every biological cell's physiological processes.

Any change in a body of water's natural characteristics caused by anthropogenic contaminants that renders it unfit for consuming by humans or providing food for biotic animals like fish is referred to as water pollution. The word "water pollution" describes the tainting of bodies of water, such as lakes, rivers, oceans, and groundwater, by human activities. Every sort of water pollution affects the animals and plants that live there, and almost always, this influence is bad for both the individual species and populations as well as the larger natural biological ecosystems. It occurs when toxins are directly or indirectly discharged into water bodies without being sufficiently treated to remove hazardous components.

Water contamination is a major cause of concern for the entire world as it triggers the development of various horrible diseases that kill more than 14,000 people every day. The predicament in emerging countries is more worrying than the problem facing industrialised countries. The biological health of water is significantly impacted by pesticides as well as other natural occurrences including earthquakes, algal blooms, hurricanes, and volcanoes. Water pollution is caused by a variety of sources. Toxins change the quality of water, potentially making it dangerous for some living forms rather than enabling them.

Numerous water pollutants reportedly behave like dangerous substances. Because the pesticides are designed to kill pests and insects in general, they do not target any particular species. When they apply the poisons, they make sure that they only harm the intended pests and miss the intended organisms. These pests are just animal species that share some characteristics with other animal species. One of these characteristics is being susceptible to particular substances. To put it another way, a material that is hazardous to one type of animal life might also be toxic to another. Even though some pesticides may need a higher dose to harm humans than pests like insects, many of them are nevertheless dangerous. Pesticide dosages

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have a variety of effects on humans, including reduced sex hormone function and reduced reproductive effectiveness. Because they imitate the actions of endogenous hormones or otherwise interfere with endocrine processes, pesticides are collectively referred to as "endocrine disruptors".

On undesired plants, a chemical referred to as a herbicide is used. Selective herbicides primarily spare the desired crop while killing specific targets. Many of these are synthetic "imitations" of plant hormones, some of which have the effect of inhibiting the growth of weeds. Herbicides are non-selective and completely obliterate all plant matter they come into touch with. They are used to clean industrial areas, railroads, and embankments around railroad tracks. Smaller amounts are used in forestry, grazing systems, and the management of areas designated as animal habitat. Numerous of the target plant pests are species-specific. The exceptions to this rule include broad-spectrum herbicides, which are designed to kill a wide variety of plants. A herbicide's specialisation for one or more plant species does not imply that it is safe for it to enter the water system.

Some of the dangers these drugs represent are still not well understood. Therefore, it is important to take precautions to stop these products from unintentionally entering the water supply. When items like pesticides are used in a safe, well-considered manner, the risk to people and other animals is quite low. These substances may end up affecting non-target species and putting the lives of non-target plants, people, and domestic animals at jeopardy if they wind up in the water system. In the same way that pesticides have the potential to harm water systems and ultimately people, so do many other compounds. The most sensible way to deal with the problem of water pollution might be to try to avoid purposefully introducing any dangerous substances into waterways because the result might be a drop in water quality. Not as bad as it seems, the situation is not actually. The threat to water systems and the mechanisms that produce water pollution are now well acknowledged, so we must take action to protect the quality of our water. The relevance of pesticide contamination in water systems and its effects on people, animals, and the environment have been taken into consideration when compiling and presenting the most recent information on this subject with an emphasis on India in the current review.

II. RESOURCES FOR WATER POLLUTION

The polluting of water bodies is known as "water pollution" (e.g., lakes, rivers, oceans, groundwater). This can be explained in terms of the unfavourable modifications to the chemical and physical characteristics of water that do not benefit all living beings that depend on it for survival. Water pollution can take one of two main forms: either changing the kinds and quantities of materials transported by water or changing the physical properties of a body of water. Water pollution comes from a variety of sources and takes many different forms. Water pollution from feedlots, pastures, and croplands may be caused by agriculture. Landfills, oil drilling, and mining might all be significant contributors to water pollution. The sanitary sewer system, storm sewers, business, and construction are additional human-related sources of water pollution.

The Environment Protection Agency (EPA) reported in 1990 that leaching and mixing of chemicals from agricultural operations account for more than 50% of the water contamination in streams and rivers. Municipal sources were in second place with around 12% of the total. Agricultural practises, storage tank leaks, industrial waste, sewer and septic system leaks, leaching from landfills, mining, and many other factors can all cause groundwater contamination (USGS Circular 1998). When a body of water is negatively impacted by the addition of significant volumes of materials to it, it is said to be polluted. Point sources and non-source points of contamination are two different types of sources of water pollution. When a contaminating substance is released directly into a river, it is referred to as a "point source of pollution." An illustration is a conduit that discharges hazardous chemicals into a river. When pollutants are conveyed into a river by surface runoff, such as when fertiliser and pesticides from a field are carried into a stream, this is referred to as a "nonpoint source." Chemical pollutants that do not naturally occur in aquatic ecosystems are referred to as "harmful substances." Herbicides, pesticides, and industrial chemicals are the biggest causes of harmful contamination.

Pesticides are those substances (insecticides, fungicides, herbicides, rodenticides, molluscicides, nematocides, plant growth regulators, etc.) that have been widely used around the world to boost crop yields and eliminate the insect pests that are responsible for spreading various diseases to people and animals. But many publications say that it has been proven that these compounds are bad for the environment and for living things' health.

Organochlorine (OC) insecticides, which were used to successfully control a number of diseases like malaria and typhus, have been prohibited or limited in the majority of technologically sophisticated nations. After 1960, many health management programmes as well as agricultural techniques began to use other synthetic insecticides such as organophosphate (OP), carbamates, and pyrethroidsogically sophisticated nations. After 1960, many health management programmes as well as agricultural techniques began to use other synthetic insecticides such as organophosphate (OP), carbamates, and pyrethroids.

After 1960, many health management programmes as well as agricultural techniques began to use other synthetic insecticides such as organophosphate (OP), carbamates, pyrethroids, herbicides, and fungicides. Figure 1 presents an illustration of the pesticide cycle.

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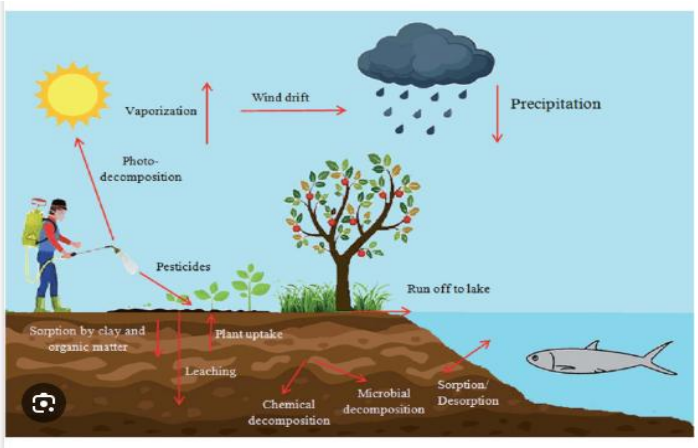

Figure 1: Showing the various stages of the pesticide cycle

Environment, more than half of pesticides are used in homes and gardens, in and near schools, businesses, hospitals, and other structures, by both urban and rural farmers alike.

A pesticide is a substance that should only kill the bugs it is intended to kill, not non-target living things like people and animals. However, the overuse of these substances has had a negative impact on the ecosystem's flora and fauna. The Indian Council of Agricultural Research (ICAR) formed a committee to recommend potential solutions to counteract the toxicity caused by the presence of pesticides and their residues in consumables after nearly 100 individuals in India died after consuming wheat flour tainted with parathion. By examining the toxicity of OC chemicals and their metabolites in birds, the US National Academy of Sciences studies supported the initial warning concerning the poisoning of biological systems by organochlorines (OC). It has been established that the pesticides manifest their effects by inducing xenotoxicity, changes in immune function, reproductive function, and other physiological processes in many organisms, leading to the development of several diseases, including cancer.

III. WATER POLLUTION IN RIVERS

According to reports, the majority of Indian rivers—including the Ganges, Yamuna, Godavari, Krishna, Sone, Cauvery Damodar, and Brahmaputra—and their tributaries are severely polluted as a result of untreated sewage disposal and industrial effluent discharge into the waterways. Numerous organic and inorganic contaminants, such as solvents, oils, grease, plastics, plasticizers, phenols, heavy metals, insecticides, and suspended particles, are frequently found in these wastes. Wastes containing the above-mentioned hazardous compounds may be carelessly dumped and released into rivers, causing environmental disturbance that may be a source of stress for the biotic population. For instance, during the course of its roughly 2525 km length, the River Ganges alone collects the industrial effluents of nearly 300 small, medium, and large industrial units in addition to the sewage from 29 Class I cities that are located on its banks. Similar to the Yamuna, another significant river in the Delhi and Ghaziabad regions has been endangered by pollution. The Yamuna River is said to receive daily sewage discharges of about 515,000 kg. Additionally, the Yamuna River receives significant daily amounts of untreated or only partially treated effluent from approximately 1,500 medium and small industrial facilities.

Similar surveys of numerous other rivers' contamination levels were conducted during the past 20 years. Agricultural regions, mines, and even cremations on the river banks continued to release surface runoff into the rivers in addition to home and industrial discharge. A source claims that in the year 1984, approximately 32,000 people were burned at the main burning ghats in Varanasi alone.

3.1 River pollution in the Ganga

Over 40% of India's population lives in the Ganga Basin, the largest river basin in the nation. Municipal sewage from 48 towns, 29 Class I cities (cities with a population over 100,000), 23 Class II cities (cities with a population between 50,000 and 100,000), and other polluting non-point sources is discharged into the Ganga River during its journey. This causes pollution in the river. According to the audit report and NRCD records, the estimated total amount of sewage produced in the towns along the Ganga and its tributaries is 5044 MLD (million litres per day). The entire amount of wastewater produced in the Ganga basin in 2001, as reported by the Central Pollution Control Board, was roughly 6440 MLD.

Many of the Ganges River's communities are heavily industrialised. The majority of enterprises release their waste into rivers since their effluent treatment facilities are insufficient. The problem has been made worse by Kanpur's dense

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population of tanneries. Kanpur also has 151 tanneries, which are concentrated at Jajmau along the southern bank of the Ganga and produce an estimated 5.8 to 8.8 million litres of waste water per day, in addition to various chemical and textile businesses.

In Jajmau, there are 151 tanneries, 62 of which only use the chrome tanning process, 50 of which only use vegetable tanning procedures, and 38 of which use both. The Ganga Action Plan (GAP) of the Indian government has numerous programmes in place to reduce Ganga pollution from tanneries. Tannery effluents are still found in the river, though there are violations of the pollution control procedures.

3.2 Yamuna River contamination

India's capital, Delhi, as well as other cities, towns, and villages in the bordering states of Uttar Pradesh, Uttaranchal, and Haryana, rely on the Yamuna as their main source of drinking water. But the decline in its water quality over the past few decades has raised severe concerns. Large amounts of partially treated and untreated effluent have been discharged into the river along its course, particularly between Wazirabad and Okhla in Delhi's National Capital Territory (NCT). The garbage from the cities that are located along the river's bank contributes to the pollution that flows into the river. Yamuna, once Delhi's lifeblood, is now the nation's most contaminated water source. Now it appears to be a sewer. Due to untreated water, everyone from large factories and industries to residents of large colonies, slums, and rural areas pollutes rivers with impurities.

Environmentalists are concerned about the Yamuna's increasing pollution, which has now spread to other countries.

IV. THE IMPACT OF PESTICIDES ON HUMAN HEALTH

Perhaps the most notable local example of pesticide contamination and human health is the area around the Aral Sea. Pesticides contributed to oncological (cancer), pulmonary, and haematological morbidity, as well as inborn defects and immune system deficiencies, according to UNEP (1993).Using pesticides can harm human health in three main ways: three ways: 1) skin contact (using pesticide products), 2) inhalation (breathing in dust or spray), and 3) ingestion (eating pesticides as a contaminant on, in, or in water). Farm workers are particularly at danger from inhalation and skin contact when preparing and applying insecticides to crops. However, consuming food that has been contaminated with pesticides is a primary source for the great majority of people. The deterioration of water quality caused by pesticide runoff has two main implications on human health. The first is consuming fish and shellfish contaminated with pesticides, which can be especially dangerous for subsistence fishermen located downstream of large agricultural zones. Drinking water that has been directly contaminated by pesticides is the second. The WHO (1993) issued drinking water guidelines for 33 pesticides. "Acceptable daily intake" (ADI) levels are the maximum amounts of pesticides that can be eaten daily over the course of a person's lifetime without creating a major risk to the individual. These values have been established by several health and environmental protection authorities.

When Wang and Lin (1995) investigated substituted phenols, they found that Tetrachlorohydroquinone, a dangerous metabolite of the biocide Pentachlorophenol, produces considerable and dose-dependent DNA damage.Pesticides harm organisms by causing death, cancer, tumours, and lesions in fish and animals, as well as inhibition or failure of reproduction, immune system suppression, and disturbance of the endocrine (hormonal) system. An excessive amount of slime on fish scales and gills, a low red-to-white blood cell ratio, and other symptoms of sick fish health include: 6) cellular and DNA damage; 7) teratogenic effects (physical defects such as hooked beaks in birds); 8) 9) intergenerational effects (effects do not manifest until the organism is passed down through subsequent generations); and 10) extra physiological effects, such as eggshell thinness.

Instead of being entirely related to exposure to pesticides or other organic contaminants, these impacts may be connected to a combination of environmental stresses, such as eutrophication and diseases.

Pesticides are frequently present in water. According to reports, 39 pesticides and their metabolites have been discovered in the groundwater of different US and Canadian provinces. The calculation of the allowable pesticide level in water is based on the exposure of children and adults because children are four times more susceptible to the toxicity of pesticides than adults. The water sources also contained significant levels of pesticide residues that have been "severely banned" because of their harmful effects on human health. Pesticide residues enter the water system and begin to negatively impact human health when they drain from soil into the groundwater.

V. POLLUTION CONTROL

The development of policy tools to tackle industrial pollution in developing countries is not only challenging but also extremely complex. Theoretically, the regulator is equipped with a vast array of physical, ethical, financial, and other tools. But because there are so many small-scale industries (SSIs), which cause pollution, it is impossible for any tool to function and ultimately fails. Because they lack the money, know-how, technology, and experience required to remediate their effluent, SSIs are a substantial source of pollution. The failure of industrial pollution management is also attributable to rigid command-and-control regulatory tactics. Regulators' ability to take action is restricted by a lack of resources, a lack of authority, and political

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interference. Informational imbalances make these problems worse. For all these reasons, multiple studies in India have discovered that implementation of environmental control is quite weak despite a strong legal framework and the existence of a big bureaucracy to oversee it. The inability of formal legislation to control pollution has highlighted the significance of informal regulation for attaining environmental goals. Recent times have seen a lot of interest in "information disclosure" and "rating" as potential tools for lowering industrial pollution. This approach, which is also known as the "third wave" of environmental policy, accepts the difficulties in oversight and enforcement as well as the fact that there are many more channels for influence than just official legislation or sanctions. Businesses worry about factors like their reputation and potential expenses in the future caused by mishaps or liabilities, for example. The development of this new regulatory paradigm is also related to advancements in our comprehension of asymmetric information. Goldar and Banerjee carried out their assessment to ascertain how informal pollution controls affected the water quality of the Indian River. This was accomplished by conducting a five-year econometric analysis of the variables influencing the water quality in Indian rivers between 1995 and 1999 utilising data from 106 monitoring locations along 10 important rivers. Results showed that informal pollution regulation had a considerable positive impact on the water quality of Indian rivers.

Data from river basin studies and the National Water Monitoring Programme show that the water quality of riverine segments and other water bodies has deteriorated since 1980. Streams of rivers and other bodies of water that fall below the acceptable water quality requirements are considered polluted. In response to the Ganga River's data deviating from the desired water quality parameters for that river, the Ganga Action Plan (GAP) was developed. Ten river lengths that didn't satisfy the required requirements were discovered in the years 1988-1989. 37 contaminated lengths, including all the major river basins, were present in 1992. The Central Pollution Control Boards (CPCB) and State Pollution Control Boards (SPCBs) undertook detailed assessments of the polluted river lengths to identify the sources of pollution, such as urban areas and industrial facilities. A total of 86 polluting water bodies (71 rivers and 15 lakes, ponds, and creeks) that did not meet the required requirements were found in 2002 as a result of the development of the monitoring network and the inclusion of more rivers in the routine monitoring. The amount of polluted river and lake stretches is broken down by state in Table 1.

The Yamuna is a good indicator of what is happening in practically all of India's rivers. In India, there are more than 700 million people without access to adequate sanitation. The United Nations estimates that each year, 2.1 million children under the age of five pass away due to a lack of access to safe water. India has also received a warning from the World Bank that it is about to enter a time of extreme water scarcity. The Yamuna serves perhaps the best illustration of this. The greatest water source in the capital is used by the government to extract 1.1 billion litres of water each day. By the time the river exits Delhi, it is estimated to have carried 3.5 billion litres of sewage per day, turning it into a gigantic drain. Its oil-black waters are incapable of supporting fish or plant life. Residents may smell methane bubbling from its surface all across the city. The government has invested 20 billion rupees (£240 million) in river cleaning projects since 1992, but results have yet to materialise. Pollution levels have increased and less than half of the river's waste is being cleaned up.

Table 1: State-by-state breakdown of the polluted portions of Indian rivers and lakes

Name of State	No. of Water	River	Lake/Tank/ Drain etc
Gujarat	10	9	1
Punjab	3	3	-
Himachal Pradesh	2	1	1
Karnataka	6	4	2
Madhya Pradesh	5	4	1
Assam	2	2	-
Delhi	1	1	-
Jharkhand	1	1	-
Tamil Nadu	7	7	-
Sikkim	1	1	-
Uttar Pradesh	8	8	-
West Bengal	1	1	-
Maharashtra	15	15	-
Meghalaya	5	1	4
Orissa	5	5	-
Haryana	3	2	1
Rajasthan	3	3	-
TOTAL: -	**86**	**71**	**15**

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VI. WATER POLLUTION'S IMPACTS

There are many different repercussions for this issue. The water's purity deteriorates as the bodies of water get progressively shallower. Algae use up the bulk of the oxygen that is available, increasing the BOD (Biological Oxygen Demand) and decreasing the DO (Dissolved Oxygen) level. Additionally, photosynthesis is happening less frequently, which kills a lot of aquatic plants. Soil erosion increases the amount of silt in bodies of water, lowering the quality of the water. When cow dung is allowed to decompose along water bodies' edges, the water becomes more loaded with harmful substances. Water contamination is the root cause of cholera, typhoid, diarrhoea, hepatitis, jaundice, dysentery, and other water-borne disorders.

Due to a variety of undesired plants and effluents, they smell bad and look like marshes. Water contamination can render it useless for industrial or agricultural uses, in addition to making it dangerous for drinking. Encroachments that have formed on the water bodies have significantly reduced the overall area. An example of this is the Indian lake Anchar, which has turned into a marsh. The River Jhelum has become a drain as a result of the introduction of solid waste and effluents. There is an infection in the fish population. Kashmir's Dal Lake is frequently referred to as "a dirty pond."

VII. CONCLUSION

Pesticides are generally thought of as a quick, easy, and cost-effective answer when it comes to getting rid of weeds and insect pests in urban environments. Nevertheless, employing pesticides comes at a high cost. Nearly every part of our ecosystem has been affected by pesticides as a result of the widespread discovery of pesticide residues in soil, air, surface, and groundwater, as well as from urban pesticide use. Pesticide pollution poses a serious threat to the ecosystem and non-target creatures, including beneficial soil bacteria, insects, plants, fish, and birds. Despite what many people think, even herbicides can harm the ecosystem. Weed killers in particular can be an issue because they are used in rather high volumes. The most effective way for everyone of us to help lower pesticide contamination (and the harm it causes) in our environment is to employ safer, non-chemical pest control methods, including weed control. To avoid water pollution from other substances like sewage or industrial waste, the effluents shouldn't be discharged into water reservoirs without sufficient preparation. The water must be regularly monitored and analysed by the proper agencies in order to further prevent any form of contamination.

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