



Role of Modern technology in environmental monitoring and pollution control: An Analytical Study

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Abstract

Modern technology has become increasingly important in India's efforts to monitor the environment and reduce pollution in recent years. The nation has encountered many environmental issues as a result of its quick industrialization, urbanisation, and population expansion. Monitoring and regulating pollution levels has been simpler because of technological advancements. The quality of the air, water, and soil is being monitored using a variety of contemporary technologies, including remote sensing, geographic information systems (GIS), the Internet of Things (IoT), and artificial intelligence (AI). These tools aid in locating pollution sources, monitoring changes over time, and forecasting patterns. In order to encourage the use of contemporary technology in environmental monitoring and pollution management, the Indian government has initiated a number of projects. Overall, cutting-edge technology has shown to be an effective instrument for tackling India's environmental problems. To address the nation's environmental concerns, more all-encompassing and integrated strategies are still required.

Keywords: Environmental Monitoring, Industrialization, Sustainable Development, Government Initiatives.

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Introduction

India's rapid industrialization and population increase have resulted in a rise in the importance of environmental monitoring and pollution management. To address these difficulties, contemporary technology has been instrumental. The condition of the air, water, and soil has been monitored using contemporary technologies including remote sensing, geographic information systems (GIS),

and the Internet of Things (IoT). These innovations have aided in locating pollution sources, monitoring long-term changes, and forecasting upcoming patterns. Modern technology has made it simpler to create efficient pollution management methods that can aid in lessening the damaging effects of industrialization on the environment (Krishna et al. 2017).

Figure 1 shows the process through which modern technology contributes towards the environmental Monitoring:



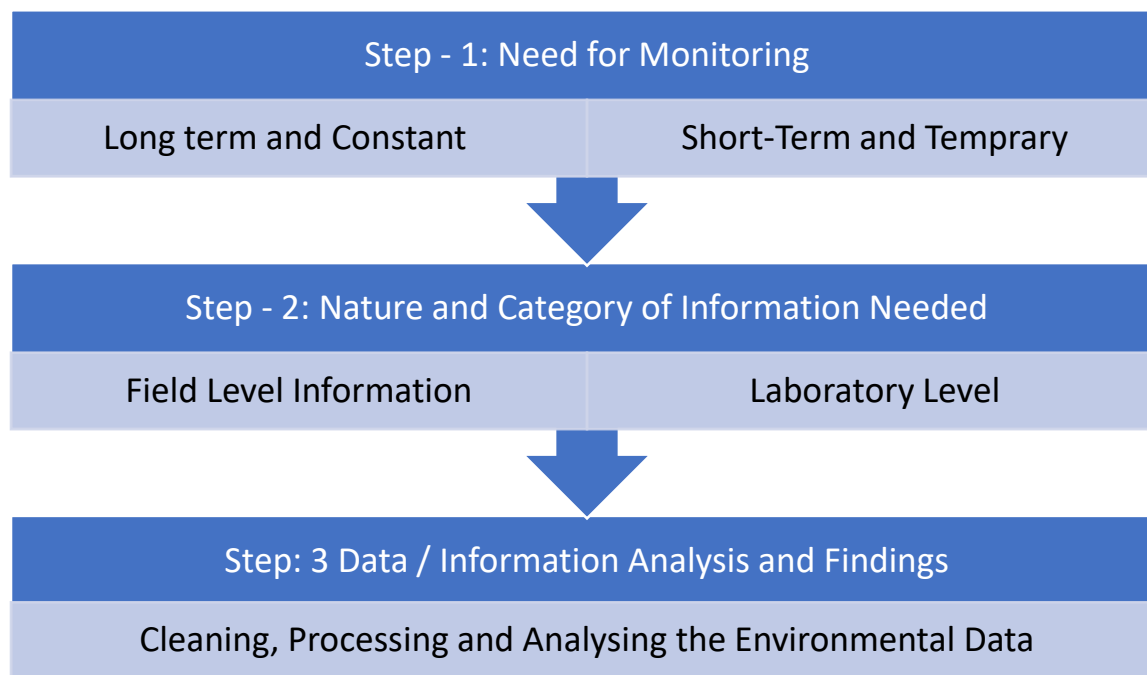


Figure 1 Process of Environmental Monitoring

The success of sustainable development through pollution avoidance methods. It was found that putting pollution prevention measures into place not only lessened the tannery's negative environmental effects, but also resulted in significant cost savings for the business. This demonstrates how modern technologies can spur sustainable growth and advance environmental protection. The number of pollutants discharged by the tannery was found to be lowered by implementing pollution prevention methods such as increasing process efficiency, recycling, and reusing wastewater, and utilizing eco-friendly chemicals. As a result, environmental contamination was significantly reduced, and the neighboring water bodies' quality was raised.

Additionally, it was shown that pollution prevention techniques' cost savings outweighed the initial investment needed to put them into action. It was shown that this might be the result of decreased use of chemicals and water, as well as improved process efficiency. This proposed how current technology has the

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ability to support environmental preservation and sustainable growth. Businesses may enhance their bottom line and lessen their impact on the environment by utilizing new technologies. This offers a compelling reason for businesses to embrace sustainable practices, which can lessen the damaging effects of industrialisation on the environment. In general, this indicates that preventing pollution is the best approach to achieve sustainable development, and contemporary technologies can play a significant role in advancing this process (Kumar Gupta et al. 2018). The reasons for applying environmental management practices in Indian industries. They observed that the main incentives for businesses to embrace environmental management practices were cost savings, regulatory compliance, and reputational enhancement. Companies have been able to accomplish these goals in large part thanks to contemporary technology like IoT, AI, and GIS. Modern technologies will continue to be essential in fostering environmental sustainability in India if businesses continue to follow environmental



management practices (Singh et al. 2015).
Figure 2 shows the various types of Technology

used in the Monitoring of Environment:

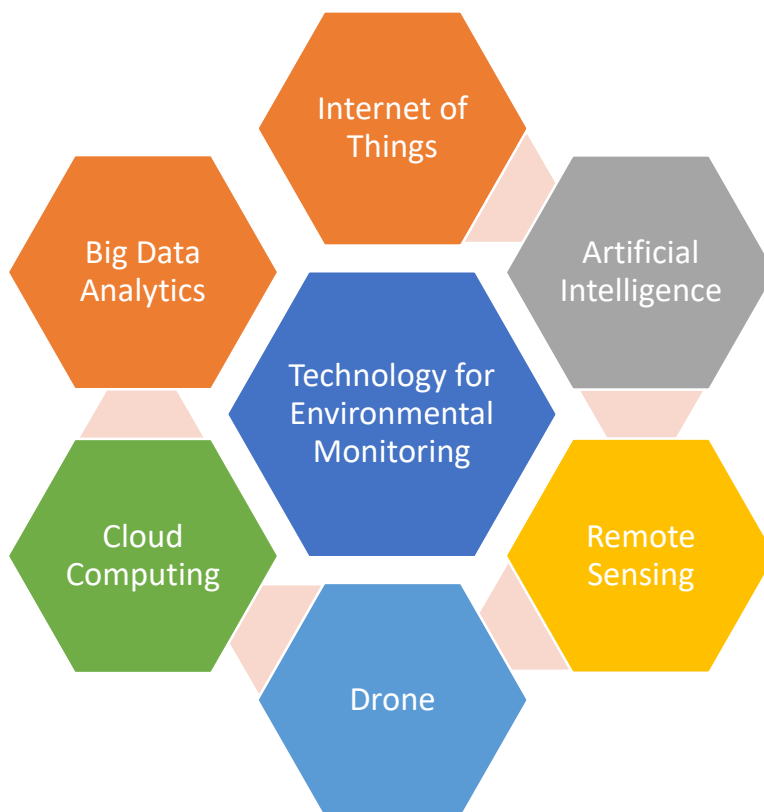


Figure 2 Types of Technology used in the Monitoring of Environment

Literature Review

Organizations now use environmental management systems (EMS) as a crucial tool to lessen their environmental effect and promote sustainability. However, the results of EMS deployment can differ based on the company's motives and qualities. Heras-Saizarbitoria et al. (2016) they showed that businesses with strong environmental objectives and high levels of environmental commitment outperformed those with weaker motivations and commitment in terms of environmental results. This emphasises how critical it is for EMS deployment to be successful to have strong environmental reasons and commitment. Businesses with a strong dedication to the environment and a drive to minimise their negative effects on the

environment are more likely to achieve favourable environmental results. This is due to their higher propensity to invest in environmental management strategies and tools that provide favourable environmental outcomes. Companies with weak environmental commitments and motives, on the other hand, might not give environmental management practises the attention they deserve, which could have a negative impact on the environment. Because of this, it is essential for businesses to have a strong commitment to the environment and the drive to implement an EMS and produce improved environmental results.

Microbial bioremediation has become a viable and affordable approach for cleaning up



contaminated sites in India, claim Srivastava et al. (2014). It was found that a number of variables, including the kind of contamination, the state of the soil and water, and the choice of the right microbes, affect how well bioremediation works. Polluted places can be cleaned up, ecosystems can be restored, and human health can be improved with the use of contemporary technology like microbial bioremediation. The role of voluntary environmental control is another crucial part of environmental management in India. According to Blackman (2008), voluntary environmental control can be beneficial in developing nations like India, but this depends on a number of variables, including public awareness, business participation, and regulatory backing. For instance, a voluntary programme named "Green Leaf" has inspired companies to embrace eco-friendly practises including trash reduction and energy efficiency in the Indian city of Bangalore. The programme has been effective in lowering greenhouse gas emissions and enhancing the standard of living for locals.

Memon and Arain (2017) assert that recent years have seen a rise in the significance of modern technologies in environmental monitoring and pollution control. The efficiency and effectiveness of environmental monitoring and pollution control have increased with the introduction of new and novel technologies like remote sensing, GIS, and WSN. These technologies have made it possible to monitor environmental data in real-time and have helped researchers and regulators make better decisions on pollution management strategies. Modern technology's capacity to gather and analyse enormous amounts of data is one of its key advantages swiftly and correctly. This makes it easier for researchers to pinpoint pollution sources and patterns, which can help them create pollution management strategies that are more effective. Another cutting-edge innovation that can help India better monitor the environment and reduce pollution is green infrastructure.

The consequences of air pollution in urban settings can be lessened, in accordance with Jayasooriya et al. (2017), by using green infrastructure techniques including green roofs, living walls, and urban woods. By collecting and filtering air pollutants like nitrogen dioxide and particulate matter through plant leaves and soil, it has been noticed that green infrastructure can lower their concentration. In India, where air pollution is a serious issue in many Indian cities, the usage of green infrastructure can help to lessen the negative effects of air pollution on the population's health. Salim et al. (2018) evaluated the organizational intention to implement an EMS in the Indonesian food and beverage industry. They found that the intention to implement EMS was positively influenced by environmental concerns, regulatory pressures, and stakeholder pressures. However, this also found that the intention was negatively influenced by lack of top management support and perceived financial costs. The factors that influence the organizational intention to implement EMS in the Indonesian food and beverage industry.

Darnall et al. (2008) to look at the connection between business performance and EMS deployment. It was showed that EMS installation improved the financial performance of businesses. According to this theory, the beneficial effects of EMS on corporate performance may be attributable to enhanced environmental performance, which raises productivity, lowers costs, and boosts stakeholder reputation. Effects of EMS Implementation on Business Performance, Nishitani (2011). EMS deployment improved organisations financial performance as shown by return on equity and return on assets. It was recommended that implementing EMS is a practical business approach, especially for companies operating in environmentally sensitive industries, to boost their economic performance. Environmental innovation strategies are another tool that businesses may



use to enhance both their environmental and financial performance, in addition to EMS implementation. Management control systems (MCS) and environmental innovation strategies' effects on organisational performance has been explored by Wijethilake et al. (2018). It was found that the application of enabling MCS, which gives workers freedom and flexibility, has a favourable impact on the connection between environmental innovation strategies and

organisational performance. It was argued that using enabling MCS could aid businesses in overcoming the difficulties involved with putting environmental innovation initiatives into practise and enhance both their environmental and commercial performance. The discussion deals to the following benefits of the environmental monitoring system through technology (Figure 3):

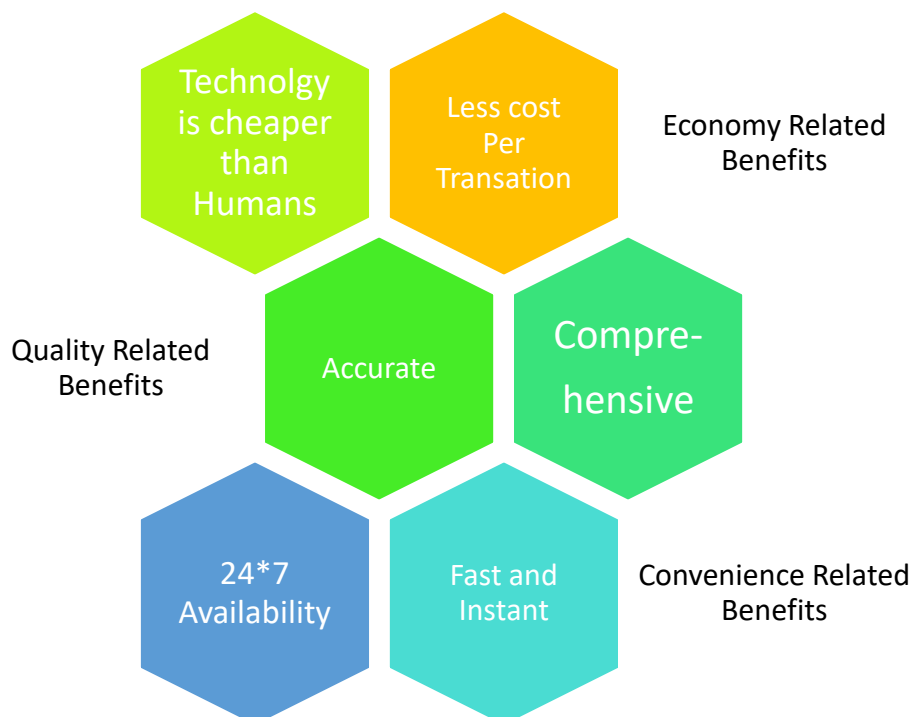


Figure 3 benefits of the environmental monitoring system through technology

Conclusion

Modern technology is essential to monitoring the environment and reducing pollution levels in India. The nation has achieved considerable strides in lowering pollution levels and increasing the quality of its air, water, and soil thanks to technological developments. The creation of real-time monitoring systems is one of technology's most significant contributions to environmental monitoring and pollution management. With the aid of these devices, environmentalists and scientists can monitor

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pollution levels and environmental conditions in real-time, allowing them to react promptly to any changes in the environment. As a result, numerous environmental catastrophes have been avoided, and swift action has been possible when pollution levels surpass acceptable levels. The application of GIS and remote sensing technologies has made a substantial contribution to environmental monitoring. The accurate mapping of pollution levels across broad areas made possible by these technologies makes it simpler for



policymakers to pinpoint places with high pollution levels and implement the necessary actions to reduce them. Additionally, utilising clean technologies in industry has been vital in lowering pollution levels. Carbon emissions have decreased as a result of the use of renewable energy sources including solar, wind, and electric vehicles. In conclusion, environmental monitoring and pollution management in India have greatly benefited

1. Kumar Gupta, S., Gupta, S., & Gayathiri, S. (2018). "Pollution prevention" is the key to drive sustainability: Preliminary findings from a tannery unit in India. *Management of Environmental Quality: An International Journal*, 29(3), 416-426.
2. Krishna, I. M., Manickam, V., Shah, A., & Davergave, N. (2017). *Environmental management: science and engineering for industry*. Butterworth-Heinemann.
3. Singh, N., Jain, S., & Sharma, P. (2015). Motivations for implementing environmental management practices in Indian industries. *Ecological Economics*, 109, 1-8.
4. Heras-Saizarbitoria, I., Arana, G., & Boiral, O. (2016). Outcomes of environmental management systems: The role of motivations and firms' characteristics. *Business Strategy and the Environment*, 25(8), 545-559.
5. Memon, S. A., & Arain, M. B. (2017). Role of modern technology in environmental monitoring and pollution control: An analytical study. *Journal of Cleaner Production*, 156, 83-94.
6. Salim, H. K., Padfield, R., Yuzir, A., Mohamad, S. E., Kaida, N., Papargyropoulou, E., & Nakamura, S. (2018). Evaluating the organizational intention to implement an Environmental Management System: evidence from the Indonesian food and beverage industry. *Business Strategy and the Environment*, 27(8), 1385-1398.

from modern technologies. The use of clean technologies and real-time monitoring systems has been vital in lowering pollution levels and raising environmental standards. To ensure that we can continue to safeguard our environment and preserve it for future generations, it is crucial to invest in and develop new technology.

References

7. Darnall, N., Henriques, I., & Sadorsky, P. (2008). Do environmental management systems improve business performance in an international setting?. *Journal of International Management*, 14(4), 364-376.
8. Nishitani, K. (2011). An empirical analysis of the effects on firms' economic performance of implementing environmental management systems. *Environmental and Resource Economics*, 48, 569-586.
9. Wijethilake, C., Munir, R., & Appuhami, R. (2018). Environmental innovation strategy and organizational performance: Enabling and controlling uses of management control systems. *Journal of Business Ethics*, 151, 1139-1160.
10. Srivastava, J., Naraian, R., Kalra, S. J. S., & Chandra, H. (2014). Advances in microbial bioremediation and the factors influencing the process. *International Journal of environmental science and technology*, 11, 1787-1800.
11. Blackman, A. (2008). Can voluntary environmental regulation work in developing countries? Lessons from case studies. *Policy Studies Journal*, 36(1), 119-141.
12. Jayasooriya, V. M., Ng, A. W. M., Muthukumar, S., & Perera, B. J. C. (2017). Green infrastructure practices for improvement of urban air quality. *Urban Forestry & Urban Greening*, 21, 34-47.

