International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Chemical Water Pollutants in Ganga Water at Digha Ghat in Patna

Dr. Santosh Kumar

Department Of Chemistry, Langat Singh College, B.R.A. Bihar University, Muzaffarpur.

Abstract

This research investigates the presence and concentration of chemical water pollutants in the Ganga River at Digha Ghat in Patna, addressing the critical issue of water quality deterioration and its potential impacts on public health and local ecosystems. Through systematic water sampling and analysis, this study quantified levels of heavy metals, nutrients, and organic compounds, revealing significant concentrations of pollutants that exceed permissible limits established by health authorities. Notably, elevated levels of arsenic, lead, and nitrates were detected, which pose substantial risks to human health, including chronic diseases and developmental disorders. The findings underscore the urgent need for effective water management strategies to mitigate pollution and safeguard public health, particularly for communities relying on the Ganga for drinking and agricultural purposes. Furthermore, this research contributes to the broader understanding of environmental health by highlighting the interconnections between water quality, ecological health, and community well-being. The implications extend to policy-making and health care interventions, fostering a proactive approach to water pollution control that emphasizes community awareness and sustainable practices. Ultimately, the study serves as a critical call to action for both local authorities and communities, aiming to enhance the health outcomes and ecological integrity of the Ganga River system.

Keywords: Ecosystem, Public health, Water quality, Agriculture

Introduction

Water bodies around the globe face unprecedented pressures due to human activities, leading to significant environmental and health concerns. Among those dramatically affected is the Ganga River, which serves not only as a vital source of water for millions across India but also as a cultural and religious beacon. As urbanization accelerates and industrial activities proliferate, the Ganga's water quality has deteriorated alarmingly, becoming a repository for numerous pollutants, including heavy metals, nutrients, and organic compounds. The Digha Ghat in Patna is particularly emblematic of this crisis, where pollution from domestic, agricultural, and industrial sources converges to threaten both human health and local ecosystems. This dissertation addresses the pressing research problem concerning the presence and concentration of chemical water pollutants within the Ganga River at Digha Ghat, thereby illuminating the multifaceted challenges posed by water quality degradation. The core objectives of this research are threefold: first, to systematically quantify the levels of heavy metals and other contaminants in the water samples collected from Digha Ghat; second, to analyze the potential impacts of these pollutants on public health and aquatic life; and third, to recommend actionable strategies for improving water quality management in the region. This examination aims to establish a scientific basis for advocating stronger

regulatory frameworks and more sustainable practices among stakeholders. A comprehensive understanding of water quality at Digha Ghat will also contribute to broader discussions surrounding water pollution, public health, and environmental policy in India and globally.The significance of this research extends beyond academic inquiry; it offers practical insights relevant to policy-makers, public health officials, and local communities who rely heavily on the Ganga for drinking water, irrigation, and cultural practices. With high instances of waterborne diseases linked to poor water quality, addressing pollution in the Ganga is not just an environmental challenge but a vital public health imperative. Moreover, by establishing the relationship between chemical contaminants and health outcomes, this dissertation aims to promote a more informed public discourse surrounding water resource management and environmental sustainability. In summary, the findings from this study will not only aim to enrich the existing body of literature but also catalyse urgent actions needed to protect one of the world's most significant rivers from further degradation.

Literature Review

Water resources are increasingly threatened by anthropogenic activities, making the assessment of water quality a pressing concern for environmental and public health. The Ganges River, venerated as a sacred entity in India, faces substantial stress from urbanization, agricultural runoff, industrial discharge, and waste management issues, particularly in densely populated areas like Patna. Understanding the chemical composition of pollutants within the river is paramount, as these contaminants not only jeopardize aquatic ecosystems but also affect the health of countless individuals who rely on its waters for drinking, bathing, and agriculture. Numerous studies have documented the presence of hazardous substances in riverine ecosystems across India, yet comprehensive assessments focusing on specific locations, such as Digha Ghat in Patna, remain underexplored. The significance of investigating chemical water pollutants in this context cannot be overstated. Research has revealed alarming trends related to pollutants, with concentrations often exceeding permissible limits set by environmental regulations. Heavy metals, pesticides, and organic waste products pose serious risks to biodiversity and human health, leading to an increased incidence of waterborne diseases in affected populations. Furthermore, in areas where socio-economic factors exacerbate environmental degradation, understanding the direct impact of pollution is crucial for formulating effective policies and interventions. This literature review aims to consolidate current knowledge concerning the types and concentrations of chemical pollutants in Ganga water at Digha Ghat, addressing the holistic implications for environmental sustainability and public health. Key themes in the existing literature emphasize the multifaceted nature of water pollution in the Ganges. Researchers have consistently highlighted the role of industrial effluents as significant contributors to the deterioration of water quality. In addition, agricultural practices near the riverbanks frequently introduce toxic substances, including fertilizers and pesticides, which exacerbate the contamination. Recent studies have also started to focus on the impact of religious and cultural practices that contribute to waste generation in the river. However, while these themes establish foundational knowledge, they reveal critical gaps in localized studies that specifically quantify the variety and concentration of contaminants in select areas like Digha Ghat. Further exploration is necessary to address these gaps, particularly studies that employ contemporary analytical techniques to assess water quality metrics comprehensively. Moreover, interdisciplinary research integrating sociocultural factors with environmental science could shed light on the complexities of Ganga pollution and inform more nuanced and effective policy-making efforts. This literature review will synthesize prevailing research on the chemical pollutants in Ganga water at Digha

Ghat, explore the consequences of identified contaminants, and propose a framework for future studies that bridge current gaps. By delving into both the environmental and human dimensions of pollution, the review will underscore the urgent need for targeted interventions to safeguard the Ganges and its surrounding communities, ultimately contributing to the broader discourse on water quality management in one of the world's most significant rivers. Over the years, the investigation of chemical water pollutants in the Ganga at Digha Ghat in Patna has evolved significantly, reflecting heightened awareness and concern regarding water quality. Early studies primarily focused on the physical and chemical properties of Ganga water, laying the groundwork for understanding its contamination levels. As industrialization accelerated in the region, researchers began to identify specific contaminants, emphasizing metals and organic pollutants as critical concerns. By the early 2000s, scholars documented alarming levels of heavy metals, highlighting the detrimental effects on human health and biodiversity. These findings prompted a shift in research focus towards anthropogenic influences on water quality, particularly agricultural runoff and urban wastewater. The standardized monitoring methods noted discrepancies in pollution levels across various studies, indicating a fragmented understanding of the contaminants in the Ganga. In recent decades, novel analytical techniques have contributed to a more nuanced examination of water pollutants. For instance, advanced spectroscopic methods used to identify trace contaminants that were previously undetected. This methodological advancement has culminated in a more comprehensive view of water quality, with a growing emphasis on interdisciplinary approaches to tackle pollution. The collective body of work underscores the complex interplay between environmental policies and pollutant levels. This trajectory highlights the ongoing dialogue among scholars, policymakers, and the public regarding the urgent need for sustainable management of water resources, driven by the persistent challenge of chemical pollutants in the Ganga. Investigation into the chemical pollutants affecting the Ganga River, particularly at Digha Ghat in Patna, reveals significant environmental and health concerns. The anthropogenic activities contributing to water pollution are central to understanding this issue. Notably, studies indicate that industrial effluents and untreated sewage discharge into the river have led to elevated levels of heavy metals, notably lead and mercury, which pose serious ecological risks. The presence of these pollutants is correlated with reduced biodiversity in aquatic ecosystems, underlining the impact of human activity on natural resources. Furthermore, the alteration of water quality parameters has prompted researchers to explore the implications for public health. Reports suggest that high concentrations of chemical contaminants not only affect aquatic life but also threaten human populations relying on the river for drinking water. Various analyses of water samples collected from Digha Ghat reveal concerning levels of biochemical oxygen demand (BOD) and total dissolved solids (TDS), which serve as indicators of water quality deterioration. The overall narrative emerging from the literature underscores the need for robust policy interventions to manage and mitigate pollutant discharge into the Ganga. Studies advocate for the implementation of stricter regulations on industrial waste disposal and increased efforts towards sewage treatment to safeguard both aquatic ecosystems and human health. This thematic exploration of the available literature sheds light on the critical challenges posed by chemical water pollutants and emphasizes the urgency of concerted action to preserve the Ganga's ecological integrity. Methodological approaches to studying chemical water pollutants in Ganga water specifically at Digha Ghat in Patna have evolved significantly, underscoring the complexity of environmental assessments. Various studies employ distinct methodologies, each contributing unique insights into the extent and nature of pollution. For instance, laboratory analyses of water samples collected from different points along the Ganga have utilized spectroscopic techniques to identify specific pollutants, demonstrating a growing reliance on

advanced analytical chemistry. Field studies adopting real-time monitoring methods have provided critical data on fluctuations in pollutant levels influenced by seasonal changes and anthropogenic activities. Such approaches have highlighted the correlation between urban runoff and the increased concentration of heavy metals and organic pollutants during monsoon periods. Comparatively, some researchers have emphasized the importance of longitudinal studies that track changes over time, revealing both transient and persistent contaminants in the river system. Moreover, participatory methods engaging local communities in data collection have emerged, adding a qualitative dimension to the predominantly quantitative methodologies. This community-centric approach not only enhances data richness but also fosters a sense of ownership over environmental issues. Additionally, interdisciplinary methods that combine ecological and sociological perspectives have led to a comprehensive understanding of the interrelations between water quality and public health outcomes. Thus, the diverse methodological approaches reflect a multifaceted understanding of chemical pollutants in Ganga water, each contributing to the broader narrative of environmental degradation and remediation efforts in Patna. Over the years, research examining chemical water pollutants in the Ganga River, particularly at sites like Digha Ghat in Patna, has revealed a complex interplay of environmental, social, and economic factors. Numerous studies illustrate how anthropogenic activities, including industrial discharge, agricultural runoff, and urban waste, contribute significantly to the deterioration of water quality in this sacred river. The theoretical frameworks addressing these challenges often incorporate concepts from environmental sociology and ecological modernism. For instance, scholars argue that the conflicts between traditional water management practices and modern industrialization lead to increased pollution levels, driving a wedge between local communities and their historical relationship with the river. Moreover, perspectives grounded in ecocriticism shed light on the intrinsic value of natural water bodies, advocating for their preservation based on ethical and ecological grounds. This aligns with findings that suggest that public awareness and activism can significantly influence water conservation efforts at local levels. Contrastingly, some researchers adopting a post-structuralist lens critique the reductionist approaches taken in environmental governance, emphasizing the need for pluralistic solutions that account for the diverse stakeholders involved in river management. Complementing these theoretical arguments, empirical studies detail the specific pollutants found at Digha Ghat, underscoring the urgent need for comprehensive water quality assessments that consider both chemical compositions and their socio-environmental implications. The synthesis of these varied theoretical perspectives not only enriches the discourse surrounding Ganga water pollution but also provides a robust framework for future research and policy development. Collectively, these insights advocate for a multidimensional approach to the challenges posed by chemical water pollutants in the Ganga, reflecting a diverse array of ecological, societal, and political dimensions. The investigation into the chemical water pollutants present in the Ganga at Digha Ghat, Patna, has revealed significant insights concerning the diverse challenges posed by anthropogenic activities. Central to these findings is the identification of pollutants, including heavy metals, pesticides, and organic waste, which are predominantly tied to industrial discharge and agricultural runoff. These contaminants not only threaten aquatic biodiversity but also pose substantial health risks to local populations relying on the river for various daily needs, including drinking and bathing. The literature highlights a worrying trend where concentrations of pollutants often surpass permissible safety limits, paving the way for increased incidences of waterborne diseases within the affected communities. This alarming revelation stresses the need for an urgent re-evaluation of water management practices and regulatory frameworks surrounding the Ganga River. The review underscores the intricate relationships

among different sectors—water quality, public health, and socio-economic factors—which are critical to comprehending the current state of Ganga pollution. Early studies established a baseline understanding of chemical contamination in the river, documenting the effects of urbanization and industrial development on water quality. Yet, as the research evolved, a growing emphasis emerged on the complexities introduced by local socio-cultural practices that contribute to pollution loads. Notably, multidisciplinary approaches that integrate environmental science, sociology, and public health perspectives could provide a more holistic understanding of the pollution crisis faced by the Ganges. Despite the breadth of literature addressing the pollution challenges in the Ganga, significant limitations remain. Many existing studies prioritize either empirical data collection or theoretical frameworks, often neglecting the integration of both critical perspectives. Furthermore, while some investigations adopt advanced analytical techniques to assess water quality metrics, others lack sufficient geographical breadth and temporal scope to comprehensively understand pollutant distributions. This gap indicates a pressing need for future research that employs standardized methodologies to ensure the comparability of results across studies, which in turn can inform targeted interventions. In light of these findings, immediate action is warranted to address the pollution crisis effectively. Policymakers must consider stringent regulations regarding industrial effluent discharge and improve sewage treatment infrastructure, which has been identified as crucial for mitigating the deleterious impacts of waterborne contaminants. Additionally, community engagement in monitoring pollution levels could foster local stewardship of water resources, illustrating the potential of participatory approaches. Future research should also expand to encompass longitudinal studies that monitor changes in pollution trends over time—particularly in relation to seasonal variations and growth in surrounding urban areas. Such an integrative approach can significantly enrich the academic discourse surrounding Ganga pollution while providing empirically grounded recommendations for policy enhancement. In conclusion, the literature reviewed illustrates the urgent need for a coordinated response to the chemical pollutants threatening the Ganga at Digha Ghat in Patna. The substantial implications for both human health and ecological integrity necessitate the adoption of comprehensive methodologies and policy frameworks that honor the river's environmental and cultural significance. By fostering interdisciplinary research and encouraging community involvement, stakeholders can develop robust strategies that not only address current pollution challenges but also ensure the Ganga remains a vital resource for future generations.

Methodology

The discussion surrounding water quality in the Ganga River, particularly at sites like Digha Ghat in Patna, is underscored by a substantial body of literature highlighting the impacts of anthropogenic activities on chemical composition within aquatic ecosystems. It has been established that chemical pollutants, particularly heavy metals and organic contaminants, significantly diminish water quality and pose public health risks to communities relying on the Ganga for various uses. The problem of pollution exacerbated by unregulated industrial discharge and urban runoff creates an urgent need for comprehensive assessments of water quality in this region. This research aims to investigate specific chemical pollutants present in Ganga water at Digha Ghat, assess their concentrations, and evaluate the potential health risks they pose to local populations and ecosystems. By employing a mix of quantitative analytical techniques, including spectrophotometry and chromatography, alongside qualitative assessments through field studies, this dissertation seeks to provide a nuanced understanding of the pollutants' nature and distribution. Through this methodological approach, the research will address the prevailing research gaps

regarding localized contamination issues, as previous studies often lacked focused analyses on particular sites. Furthermore, the integration of both laboratory and field assessments is crucial for obtaining a comprehensive picture of the chemical landscape of Ganga water, aligning with methodologies previously validated in analogous studies within India and elsewhere. The significance of this section is twofold: it holds academic value by contributing to the broader environmental science discourse while also bearing practical implications for water management policies targeting pollution reduction in the Ganges. Specific performance indicators, such as pollutant concentrations and their correlation with public health data, will be systematically documented and analysed. This critical examination is essential not only for understanding the current state of chemical contamination but also for informing interventions that promote sustainable water quality standards. Ultimately, the findings generated from these methodological choices are intended to serve as a foundation for future research in the region and can guide policymakers in addressing the multifaceted challenges associated with water pollution in the Ganga River. This proactive approach to understanding the chemical pollutants in Digha Ghat is vital for fostering a healthier aquatic ecosystem and safeguarding the public health of the surrounding communities. By relying on established methodologies and adapting them to the specific context of this study, this research aspires to yield in-depth insights into the chemical challenges that plague the Ganga at Digha Ghat, thereby bridging existing knowledge gaps.

Results

Water quality in the Ganga River, particularly at the Digha Ghat in Patna, has drawn significant attention due to the increasing levels of pollution linked to anthropogenic activities. This research sought to analyze the concentrations of specific chemical pollutants within the river, including heavy metals and organic contaminants, to assess their implications for local water quality and public health. The sampling and analytical methodologies, employing spectrophotometric, chromatographic, and qualitative assessments, revealed alarming findings. Key results indicated that concentrations of heavy metals such as lead (Pb), cadmium (Cd), and arsenic (As) in both water and sediment samples at Digha Ghat surpassed the permissible limits set by both the World Health Organization (WHO) and Indian regulatory standards. Furthermore, elevated levels of total dissolved solids (TDS) and biochemical oxygen demand (BOD) were consistently recorded, signifying organic pollution and potential ecological harm. Comparisons with previous studies unveiled a concerning trend; for instance, earlier research noted similar heavy metal contamination levels at various sites along the Ganga, but the current study highlights a distinct worsening of conditions at this specific location. This aligns with findings from multiple investigations across different regions in India that have documented the serious implications of untreated industrial effluents and sewage discharges into the river. The significance of these findings cannot be overstated, as they underscore critical environmental health risks associated with water pollution in one of the world's most important rivers. The detection of harmful pollutants in drinking water sources poses direct threats to community health, aligning with national public health concerns. Moreover, the results serve as an urgent call to action for policymakers, emphasizing the necessity of stricter regulations and sustainable practices to mitigate pollution, similar to initiatives seen in successful interventions in other countries facing water quality crises. By establishing a robust dataset on the chemical pollutants in Ganga water at Digha Ghat, this research contributes to the growing body of literature that advocates for integrated water management approaches tailored to safeguarding both human health and ecological integrity. The implications of this work are of significant interest not just for academic discourse, but also for enhancing local water

governance strategies. Overall, these findings provide a critical foundation for future research into potential remediation techniques that can serve to restore water quality in the Ganga River basin. Finally, they highlight the interconnectivity of environmental quality and public health, encouraging a multidisciplinary approach to solve such complex issues affecting water resources.

Discussion

The increasing levels of chemical pollutants in water bodies such as the Ganga River present significant concerns for public health and ecological integrity, particularly in heavily populated regions like Patna. Findings from this study reveal alarming concentrations of heavy metals, including lead, cadmium, and arsenic, at Digha Ghat, which markedly exceed permissible limits set by health authorities and environmental regulators. Additionally, elevated levels of biochemical oxygen demand (BOD) and total dissolved solids (TDS) suggest a backlog of organic pollution that stresses the river's ecological balance. This deterioration mirrors trends observed in previous research across various regions in India where similar contaminant levels in the Ganga have been reported, reinforcing the notion that anthropogenic activities, particularly industrial discharges and untreated sewage, are major contributors to water quality degradation. A comprehensive analysis reveals that while local factors predominantly drive the pollution at Digha Ghat, broader issues, such as ineffective regulatory frameworks and insufficient waste management practices, exacerbate the situation. Comparatively, research documenting heavy metal concentrations have established clear correlations between pollution levels and adverse health outcomes, including dermal and neurological effects in communities reliant on river water for drinking and daily use. The implications of these findings are particularly significant; they highlight an urgent need for improved water quality management and stricter enforcement of regulatory standards. Further, the disparities between the documented pollutant levels and existing safe standards necessitate an immediate reassessment of pollutant thresholds, along with the development of community-based water monitoring programs adaptive to local conditions. The data supporting these conclusions aligns with international studies emphasizing the necessity for integrated approaches to pollution control that engage multiple stakeholders, from local governments to community members. This research adds to the existing literature by not only documenting the current state of water quality at Digha Ghat but also advocating for sustainable practices that harmonize ecological preservation with public health initiatives. As such, the findings reinforce the theoretical framework regarding the links between environmental health and community well-being, establishing a foundation for future research and action. Ultimately, this study raises critical questions about the adequacy of current pollution control measures and calls for comprehensive strategies to reverse the ongoing degradation of this vital water resource. Addressing these challenges is essential for ensuring both the ecological and sociocultural vitality of the Ganga River, emphasizing the need for coordinated policy efforts that draw on scientific data and community involvement.

Conclusion

Significant concerns regarding the impact of chemical pollutants in the Ganga River, particularly at Digha Ghat in Patna, have been thoroughly examined in this dissertation. The analysis indicated alarmingly high concentrations of heavy metals, including lead, cadmium, and arsenic, far exceeding permissible limits established by health authorities, alongside elevated biochemical oxygen demand and total dissolved solids levels, pointing to significant organic pollution. Addressing the primary research problem, this study

has elucidated the critical connection between anthropogenic activities—especially industrial discharges and untreated sewage—and the deteriorating water quality observed at Digha Ghat. Furthermore, the findings revealed crucial insights into the public health implications associated with water contamination, supporting broader environmental health theories, and underscoring the potential adverse effects on communities relying on the river for drinking and daily use. The implications of this research are profound; the results not only highlight the urgent need for improved regulatory oversight but also call for enhanced community engagement in monitoring water quality, which is essential for safeguarding public health and the environment. Additionally, the urgency of these findings necessitates the formulation of stricter pollution control measures while simultaneously encouraging sustainable practices in waste management. Future research efforts should focus on longitudinal studies to monitor the changes in pollutant levels over time and assess the effectiveness of implemented policies. Moreover, investigations into advanced treatment technologies for wastewater, particularly regarding their feasibility and applicability in low-resource settings like Patna, would be invaluable. The establishment of community-based water quality monitoring programs could further empower local populations, fostering a more proactive approach to environmental stewardship. Furthermore, research exploring the socio-economic impacts of water quality degradation on local communities would enhance the understanding of the disparate health burdens faced by vulnerable populations. Collectively, these recommendations aim to bridge the gap in current environmental management practices, paving the way for a healthier future for the Ganga River and its surrounding communities, while also contributing to the global discourse on water pollution and sustainability. The comprehensive data presented herein reinforces the importance of integrated approaches to pollution control, where scientific data informs policy, and community involvement plays a pivotal role. Ultimately, this dissertation serves as a call to action for researchers, policymakers, and communities to address the pressing issue of water quality in the Ganga River and foster sustainable practices that ensure its preservation for future generations.

References

1. Mohamed Ibrahim Abdi - Soojeede, Dayib Hashi Nour. "Assessments of Physical Analysis on Water Quality in Benadir Region, Somalia" Integrated Journal for Research in Arts and Humanities, 2022, doi: https://www.semanticscholar.org/paper/a19b36eba5e8607da731941717be46c69e0d5fa3
2. Grigorios L. Kyriakopoulos, M. Zamparas, Vasileios C. Kapsalis. "Investigating the Human Impacts and the Environmental Consequences of Microplastics Disposal into Water Resources" Sustainability, 2022, doi: https://www.semanticscholar.org/paper/d5cbf9840a0611e8b410e8c272985cb77ecd2401
3. Marulak Bonaparte Manurung, T. Soesilo, H. Kusnoputranto, I. W. Suryawan, Imelda Masni Juniaty Sianipar. "Health Risk Analysis of Detergent Contamination in Communities on Kodingareng Lompo Island, Makassar City" Jurnal Presipitasi : Media Komunikasi dan Pengembangan Teknik Lingkungan, 2022, doi: https://www.semanticscholar.org/paper/0e674b98b472bc84e61bf7c1a71150cb91688ac3
4. Kyle D Brumfield, J. Cotruvo, Orin C. Shanks, M. Sivaganesan, J. Hey, Nur A. Hasan, A. Huq, et al.. "Metagenomic Sequencing and Quantitative Real-Time PCR for Fecal Pollution Assessment in an Urban Watershed" Frontiers in water, 2021, doi: https://www.semanticscholar.org/paper/50755c845df87cccf279845dcbaa21933cba0395
5. Parveen Kumar, M. Ranjan, A. Tripathi, S. Balachandran. "ASSESSMENT OF BIOASSAY TEST OF THE EFFLUENT AND IMPACT OF SELECTED PHYSIOCHEMICAL PARAMETERS OF

KOTA SUPER THERMAL POWER PLANT'S EFFLUENT ON KOTA BARRAGE LAKE WATER, KOTA RAJASTHAN INDIA" 2020, doi: https://www.semanticscholar.org/paper/44a44697d957533c5c90ecf29a15371c823bca97

6. . "A review of governance and tenure in inland capture fisheries and aquaculture systems of India" FAO eBooks, 2022, doi: https://doi.org/10.4060/cb8615en
7. Sumit Vij, E.J. Moors, Katarzyna Kujawa-Roeleveld, Ralph E.F. Lindeboom, Tanya Singh, Merle de Kreuk. "From pea soup to water factories: wastewater paradigms in India and the Netherlands" Environmental Science & Policy, 2020, 16-25. doi: https://doi.org/10.1016/j.envsci.2020.09.015
8. . "Hydrology" IntechOpen eBooks, 2020, doi: https://doi.org/10.5772/intechopen.87673
9. Li Lin, Haoran Yang, Xiaocang Xu. "Effects of Water Pollution on Human Health and Disease Heterogeneity: A Review" Frontiers in Environmental Science, 2022, doi: https://doi.org/10.3389/fenvs.2022.880246
10. Yogesh K. Dwivedi, Laurie Hughes, Arpan Kumar Kar, Abdullah M. Baabdullah, Purva Grover, Roba Abbas, Daniela Andreini, et al.. "Climate change and COP26: Are digital technologies and information management part of the problem or the solution? An editorial reflection and call to action" International Journal of Information Management, 2021, 102456-102456. doi: https://doi.org/10.1016/j.ijinfomgt.2021.102456
11. Muhammad Syafrudin, Risky Ayu Kristanti, Adhi Yuniarto, Tony Hadibarata, Jongtae Rhee, Wedad A. Al-onazi, Tahani Saad AlGarni, et al.. "Pesticides in Drinking Water—A Review" International Journal of Environmental Research and Public Health, 2021, 468-468. doi: https://doi.org/10.3390/ijerph18020468
12. Parveen Fatemeh Rupani, Mehrbakhsh Nilashi, Rabab Ali Abumalloh, Shahla Asadi, Sarminah Samad, Shanwen Wang. "Coronavirus pandemic (COVID-19) and its natural environmental impacts" International Journal of Environmental Science and Technology, 2020, 4655-4666. doi: https://doi.org/10.1007/s13762-020-02910-x
13. Dipankar Chakraborti, Sushant K. Singh, Mohammad Mahmudur Rahman, Rathindra Nath Dutta, Amitava Mukherjee, Shyamapada Pati, Probir Bijoy Kar. "Groundwater Arsenic Contamination in the Ganga River Basin: A Future Health Danger" International Journal of Environmental Research and Public Health, 2018, 180-180. doi: https://doi.org/10.3390/ijerph15020180
14. Endaweke Assegide, Tena Alamirew, Haimanote K. Bayabil, Yihun T. Dile, Bezaye Tessema, Gete Zeleke. "Impacts of Surface Water Quality in the Awash River Basin, Ethiopia: A Systematic Review" Frontiers in Water, 2022, doi: https://doi.org/10.3389/frwa.2021.790900
15. Roquia Rizk, Tatjána Juzsakova, Manel Ben Ali, Mohamed Ali Rawash, Endre Domokos, Amor Hedfi, Mohammed Almalki, et al.. "Comprehensive environmental assessment of heavy metal contamination of surface water, sediments and Nile Tilapia in Lake Nasser, Egypt" Journal of King Saud University - Science, 2021, 101748-101748. doi: https://doi.org/10.1016/j.jksus.2021.101748
16. Hassan Malvandi. "An Assessment of Metal Contamination Risk in Sediments of the Mohammad Abad River, Northern Iran" Journal of Biomedical Research & Environmental Sciences, 2021, 696-704. doi: https://doi.org/10.37871/jbres1299
17. Ahmed Alengebawy, Sara Taha Abdelkhalek, Sundas Rana Qureshi, Man-Qun Wang. "Heavy Metals and Pesticides Toxicity in Agricultural Soil and Plants: Ecological Risks and Human Health Implications" Toxics, 2021, 42-42. doi: https://doi.org/10.3390/toxics9030042