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Analysis of community based industrial waste treatment to control river water pollution

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Abstract
Body parts Diverse minerals and chemical substances found in water play a crucial role in the survival and ecosystem-wide equilibrium of aquatic life. Modernization and development aimed at enhancing human quality of life have, however, had a negative impact on the natural state of waters due to an increase in the number and quality of compounds. There are various challenges currently facing waste management as part of environmental rehabilitation efforts. The population has developed a habit of disposing of waste into river streams, and their unwillingness to treat it also contributes to the main issue, as was the case in the Padang River Stream Area. Water that is contaminated In this case the method used in this study is to collect data on survey results localized to the procedure: an unstructured interview, (guideline study only includes the important questions problem to be dug out of the respondents), so it can produce primary data , which will be the subject of research, and Non-Participant observation (observation that the researcher did not participate directly in the activities that are being observed), which produces secondary data that will strengthen the primary data. In this situation, the study's findings are anticipated to offer the best method for reducing Padang River pollution.
Keywords: community based; river pollution; waste treatment

1. Introduction

Life on earth depends heavily on water for survival. Water can, however, be harmful if it is provided under unfavorable circumstances, both in terms of quantity and quality. In order to repair lakes and encourage the production of higher trophic levels, it is appropriate to increase habitat complexity and variability by include land-water transition regions in lake systems (Meerhoff & de los Ángeles González-Sagrario, 2022). Humans benefit much from clean water due to its use in daily activities, industrial processes, and sanitary practices (Buoli *et al.,* 2018). Where water quality is declining year after year, finding clean water sources is a difficulty. It can be challenging to find water that meets specific requirements of quality.

The factors for the declining availability of clean water on this planet are brought on by careless human behavior. To lessen the effects of water pollution, processing and quality management of the water must be handled right away (Meals *et al.,* 2010). Up to 14 out of 18 types of pollution may exist in water, according to calculations made by the Water Quality Index (WQI). In addition to the fact that well water is polluted, incorrect food and drink consumption is a problem as well (Collaborators & Ärnlöv, 2020). Quality can be compromised by beverage handling (Zhou *et al.,* 2017). The water problem is also impacted by hygiene practices, such as how we use and consume beverages (Khan *et al.,* 2022).

This attempts to stop adverse effects that are particularly harmful to people and the natural equilibrium in these waters. In poor nations, numerous diseases brought on by contaminated water affect about half of the population. The World Health Organization estimates that up to 2 billion individuals worldwide get rheumatism caused by contaminated water. Around 525,000 kids every year die from this illness, which is the leading cause of death in children under the age of five (Paul, 2020). Nearly 30% of the world's population did not use a well managed drinking water service in 2015, and 844 million people lacked a basic drinking water service, which is defined as a drinking water source protected from recontamination within a 30-minute roundtrip to collect water.

Complexity has been produced by rapid industrialisation and urbanization. serious global issue with water pollution. As a top priority for national environmental protection, the problem of water pollution poses a major danger to the natural environment, food safety, and sustainable economic development (Ponce Romero *et al.,* 2017). Only 27% of healthcare facilities in the least developed nations offered the fundamental waste management services, and 3 billion people lacked access to controlled waste disposal facilities (Bellizzi *et al.,* 2020; Sharma *et al.,* 2020).

In Indonesia, there are numerous urban and rural areas with polluted water, including Jakarta Bay, which costs fish producers money. The loss of numerous fish, shrimp, and milkfish is one way this loss expresses itself. The Jakarta Bay pollution caused by dangerous compounds is a major concern. As a result, uncontrollable growth of pollutant indicators such green mussels has occurred (Melinda *et al.,* 2021). Water pollution will also be caused by using pesticides excessively and for an extended length of time (Willey *et al.,* 2021). According to Al Idrus *et al.* (2018), this occurred in NTB when farmers sprayed pesticides near the Lingsar and Ranget springs.

Each tributary is susceptible to contamination, which may contaminate the receiving river. Assessing the condition of the examined tributaries will therefore shed more light on the spatial development of water quality in the urban rivers of Bukavu. metropolitan drainage networks and systems that manage stormwater runoffs cause increased fluxes of pollutants into aquatic habitats as metropolitan areas develop (Zou *et al., 2018*). According to D. M. Berendes *et al.* (2017), onsite sanitation is used by at least 66% of urban inhabitants worldwide and typically has to be emptied.

Water shortages are caused by pollution, household waste, industrial waste, and agricultural waste across practically all of Java and certain areas of Sumatra, particularly in large cities. In addition to pollution, erosion brought on by deforestation contributes to the water crisis Rulli *et al.* (2017). The water crisis that exists in different parts of Indonesia is also a result of lax government regulation and lax law enforcement, which makes the issue of water pollution a serious issue that will only get worse with time (Musthofa *et al.,* 2017). The compounds' Strategy for Sustainability (CSS) offers a progressive method of managing chemical risks by implementing upstream controls that forbid or limit the use of the most dangerous compounds and only permit their necessary use (European Commission, 2020b).

2. Methods

2.1. Research Materials

Water contamination is the subject of the study's material on environmental pollution. In the meantime, social elements can be noticed in people's behavior and quality of life. Based on social considerations, the study's findings were able to identify the essential and relevant variables for addressing environmental contamination. A 3-D model was made using the inverted RES2D and IP data files, GPS data, and other data sources to help calculate and measure the approximate contaminated volume of the waste materials. The data for each electrode position of the six profile lines that were dispersed over the site were compiled using the Oasis Montaj Software (Arifin *et al.,* 2020). For precise mapping and quantification of the distributions, the process is essential. Since the pollutant plumes have had negative effects on ecosystems, humans, and the environment and any sustained exposure to them can have substantial health risks, data collecting is crucial.

2.2. Groundwater Health Risk Assessment

The average daily dose (ADD), non-carcinogenic target hazard quotient (THQ), hazard index (HI), and life-time carcinogenic risk (LCR) coefficients can be calculated to assess the health risks of adults and children exposed to heavy metals in groundwater (Ahmad *et al.,* 2021; Boateng *et al.,* 2019).

Human exposure risk pathways to heavy metals contamination could occur through three main routes: direct ingestion, dermal absorption through skin exposure, and inhalation through the mouth and nose (Zheng *et al.,* 2010). Dermal absorption and ingestion are frequent methods of exposure to water. Ordinary Daily Dose (ADD). The literature has described exposure dosages for these two pathways to assess human health risk.

2.3. Collection Techniques

Both main and secondary data can be collected during the data collection process. In this case, the research method is to gather data from a localized survey using a procedure: unstructured interviews (the research guidelines only include important questions that will be asked from the respondents), in order to be able to produce primary data, which will be the focus of the research, and non-participant observation (observation that the researcher does not directly participate in the activity being observed), in order to produce secondary data. While literature studies from journals and articles that are appropriate for this research are used to acquire secondary data.

Ten locations in the Batang Arau estuary were chosen for sampling, with a 200 m distance between each site. Figure 1 depicts the water samples that were taken in the middle and upper portions of the Batang Arau river as a comparative sample. The gravimetric method was used to measure the TDS, and the subsequent steps were taken: The evaporation cup was cleaned, placed in the oven at 105 0C for an hour, allowed to cool, and then weighed right before use to determine the mass of the empty cup (B). The water sample is well mixed before filtering it via whatman filter paper number 41. Up to 100 ml of the filtered sample is obtained, and it is then placed in the evaporation cup.

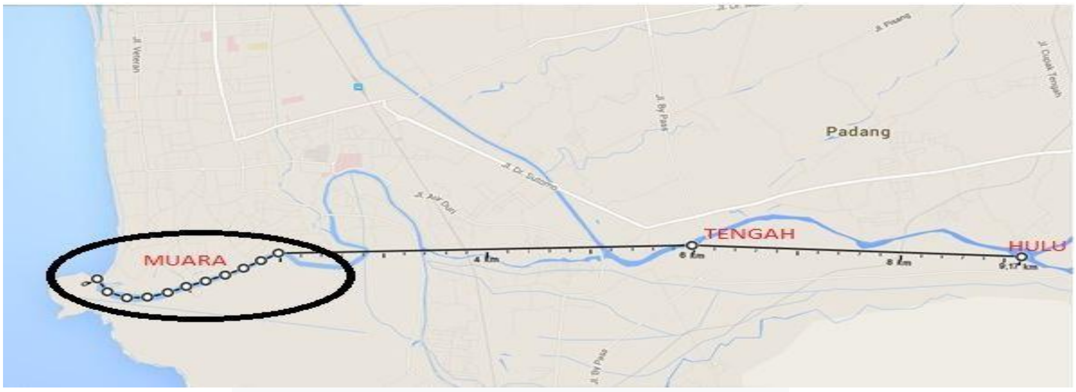


Figure 1. Sampling point in the Batang Arau river
(Indonesian Geospatial Information Agency, 2021)

3. Results and Discussion

Humans and other animals are negatively impacted by water pollution. Therefore, we require a method to manage water pollution. In the Yellow River Basin, Xu *et al.* (2022) conducted a study of a similar nature, however they came to two distinct results on the spatial differences in the AGWFs across the cities. (1) There are stark differences in the amount of GWF planted in prefecture-level cities. However, the variations did gradually vanish. (2) Positive spatial autocorrelation was visible throughout the whole area of the GWF for the planting sector, pointing to the existence of "H-H" or "L-L" agglomerations.

Because this study solely looked at the GWF of the planting industry, there are some differences between it and Xu *et al.* (2022) on specific uses of water.

Knowing the water source's quality is essential to ensuring that the water utilized for human activities does not harm people. In addition to being of high quality, water must also be available in adequate quantities to suit human needs. An example of a river pollution control effort is.

1) Industrial wastes need to be neutralized before being dumped into rivers to ensure they are free of contaminants.
2) Dispose of waste in designated areas; it is forbidden to toss trash into the river.
3) Using fewer insecticides to get rid of plant pests.
4) All oil companies are supposed to have machinery that can contain leaks of oil and vacuum it back up. Consequently, the oil spill won't be widespread.

Table 1. Samples' Leachate Pollution Index (LPI) Conc. stands for concentration, LPI for Leachate Pollution Index, wi for pollutant parameter weight, and pi for pollutant parameter sub-index score

Parameters	LI-Eneka				LII-Aluu				LIII-Iwofe			
	Conc.	w_i	p_i	w_ip_i	Conc.	w_i	p_i	w_ip_i	Conc.	w_i	p_i	w_ip_i
pH	7.43	0.055	6	0.33	7.28	0.055	5.5	0.30	5.56	0.055	6.5	0.36
EC	194	-	-	-	889	-	-		15,700	-		
TDS	0.08	0.05	28	1.4	2.32	0.05	24	1.2	2.67	0.05	23	1.15
Cl	2.14	0.048	30	1.44	145	0.048	25	1.2	1408	0.048	30	1.44
NO_3	117	0.053	100	5.3	1.08	0.053	100	5.3	0.04	0.053	98	5.19
PO_4	92.4	-	-	-	1.13	-	-	-	0.02	-		
SO_4	8.45	-	-	-	3.11	-	-	-	764	-		
Mg	9.93	-	-	-	3.75	-	-	-	103	-		
Na^+	4.80	-	-	-	82.4	-	-	-	678	-		
Ca	6.43	-	-	-	19.1	-	-	-	3464	-		
As	54.2	0.061	5.5	0.34	0.0010	0.061	10	0.61	0.0152	0.061	10	0.61
Cd	0.80	-	-	-	0.002	-	-	-	0.002	-		
Zn	7.43	0.056	5	0.28	0.02	0.056	5.5	0.31	0.87	0.056	6.5	0.36
Ba	194	-	-	-	0.03	-			0.03	-		
Mn	0.08	-	-	-	2.19	-			11.7	-		
Cu	2.14	0.05	7	0.35	0.02	0.05	6	0.3	0.17	0.05	7	0.35
Co	117	-	-	-	0.03	-			0.03	-		
Cr	92.4	0.064	6.5	0.42	0.006	0.064	6.5	0.42	0.006	0.064	6.5	0.42
Ni	8.45	0.052	8	0.42	0.06	0.052	5	0.26	0.06	0.052	8	0.42
Pb	9.93	0.063	9	0.57	0.008	0.063	8	0.50	0.008	0.063	8	0.50
Σwi		0.552										
Σwipi				10.85				10.4				10.8
LPI		19.66			18.84			19.57				

The results show low mineralization (Naminata *et al.,* 2018), and both anthropogenic activities and natural weathering can affect how much EC is present. Due to a lack of knowledge about the harmful effects of river water pollution, the community's role in preventing environmental contamination is equally crucial. However, part of the diversity in health outcomes might also be explained by factors at the community level. This study focuses on the correlation between women's empowerment, which is known to be a correlate of child health (Abreha & Zereyesus, 2021), and a particular community-level characteristic, the local level of ethnic diversity. Sumardjo (1999) lists the traits of empowered citizens, including:

1) Capable of understanding oneself and one's potential; Capable of planning (anticipating changing situations in the future).
2) Capable of taking charge.
3) Possess the ability to bargain.
4) Possess sufficient negotiating power.

An information graph was created from the EHRA (Environmental Health Risk Assessment) study or Environmental Health Risk Assessment research results based on sampling utilizing secondary data (EHRA, 2021). This quantitative study's descriptive research methodology use the EHRA method to assess the risks that environmental hazards pose to people's health.

The mean, minimum, and maximum values for the SO2 concentration data, age, activity pattern data, and anthropometric data are first calculated using frequency distribution analysis. The respondents' intake of SO2 is then calculated using a health risk analysis to estimate how much they received. To determine intake, each respondent's anthropometric data, exposure frequency, and exposure duration are used. The value of intake is then computed using the average value of all the factors. Researchers assessed SO2 in the morning and afternoon with assistance from the Palembang Environmental Health and Disease Control Engineering Center specialists. These actions are taken at four. According to Figure 1, 43.2% of residents of Tangerang City continue to use the open defecation method. 56.8% of the community had not practiced, making up the remainder.

The majority of the wastewater from the food sector may be easily handled by biological systems because the principal contaminants are organic materials, such as carbohydrates, lipids, proteins, and vitamins. Water pollution is a state brought on by the input of pollutant loads/discharges in the form of gases. These contaminants typically take the form of suspended or dissolved particles.

While some urban settlement areas have employed the system off-site, management of household wastewater in rural settlement areas uses the system on-site. The community can dispose of home wastewater in a number of ways, including the following.

1) Communities pouring household waste water into ice cubes, ponds, gardens, and rice fields
2) Localities that dump residential wastewater into rivers or drainage systems.
3) Localities that use straightforward septic tanks to dispose of domestic waste.
4) Local governments sending household wastewater to WWTP.
5) Communities using communal septic tanks to dispose of domestic waste.

Both dissolved and inhaled particles. According to Khatri and Tyagi (2015), pollutants can reach aquatic bodies through a variety of channels including the atmosphere, soil, runoff from agricultural land, domestic, urban, and industrial waste. Based on Figure 3 from the 2014 EHRA survey results, it is known that 90.9% of houses in Tangerang City have SPAL (sewerage system), with just 9.1% of households lacking SPAL. Nearly 8.3% of houses (out of the remaining 91.7% that do not experience inundation) suffer from flooding as a result of their lack of SPALs.

3.1. Water Quality Evaluation

3.1.1. Single Pollution Index

The average DO content was 3.1 1.4 mg/L, over the Class V standard level of 2 mg/L, with C1, F1, and G2 being below the standard. DO was a key measure for assessing water quality and determined the metabolism. The order of cation abundance is as follows: Na – Ca – Mg – K. It was discovered that the calcium concentration ranged from 11.12 mg/l to 1600 mg/l. Water can contain anything between 0 mg/l to 480 mg/l of magnesium. The range of the sodium concentration was 15 mg/l to 2500 mg/l. Potassium concentrations in water range from 2 mg/l to 400 mg/l. High temperatures (26 C) throughout the investigation period and DO were typically adversely connected with water temperature. High temperatures and enough sunlight may also.

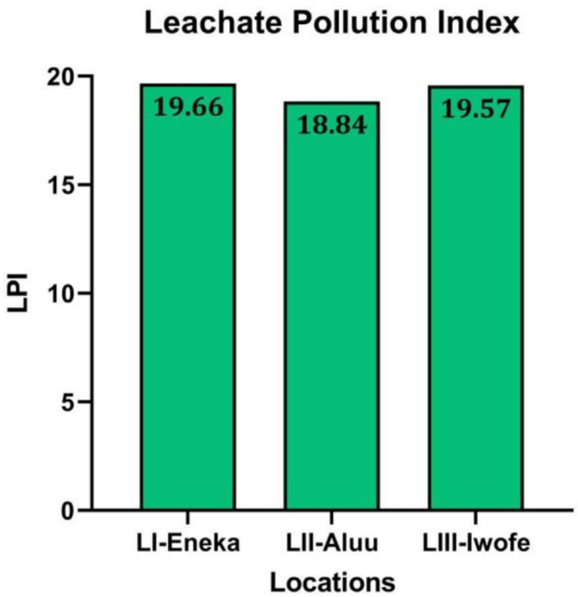


Figure 2. LPI of sampled landfills

There may be several levels of variation in the concentration. However, due to the quantitative instrument, the LPI inside demonstrated uniformity. The analysis determined that the LI-Eneka dumpsite had an LPI of 19.66, the LII-Alun dumpsite had an LPI of 18.84, and the LIII-Iwofe dumpsite had an LPI of 19.57. The higher value of LPI (>10) indicated a hazardous character of the dumpsite, indicating probable contamination of the local groundwater, according to Mishra et al. (2019).

The maximum values of DO in A2 and B2 were 4.1 and 3.1 times the minimum values, respectively; the maximum values of COD in B2, H1, and G2 were 3.4, 10 and 4.5 times the minimum values, respectively; the maximum value of TN in A1 was 5.0 times the minimum value; and the maximum values of TP in B1 and C1 were 11.7 and 3.2 times the minimum values, respectively. These spatial differences in water quality were evident in the majority of rivers. Anions usually appear in the following order: Cl comes before CO3, SO4, NO3, and HCO3. The surface water samples' Cl concentrations range from 20 mg/l to 8000 mg/l. The range of carbonate concentrations was 28 to 4000 mg/l. The range of sulphate concentrations is 11 mg/l to 1000 mg/l. The greatest sulfide concentration in C1 is 2.8 times the smallest concentration. There could be changes in water quality at various cross-sections due to the self-purification of water bodies and pollutant transport processes. This outcome was comparable to those mentioned in the literature. El-Sheikh et al. (2010) discovered the difference between the COD maximum and minimum levels.

3.2. Total Dissolved Solids Value

The graph of the relationship between the TDS value and the sampling location can be seen in Figure 2. The average TDS value at the study site was 782.5 mg/l with a value range of 705-873 mg/L. The TDS value of water samples in the Batang Arau estuary area fluctuated but tended to decrease the farther from the sea. The highest TDS value is found at location M4 and this is different when compared to other locations, then the high TDS value is also found at location M10. While the lowest TDS value is at the M5 location. The cause of the high TDS value at the M4 location is due to the large number of fishing and passenger shipping activities in that location, because fishing boats and passenger ships use oil as fuel, so that if fuel oil spills in these waters, these waters will be polluted. The biggest cause of water pollution in the downstream (estuary) areas is workshop activities and waste disposal from dock ships in the form of oil (Bapedalda Kota Padang, 2004).

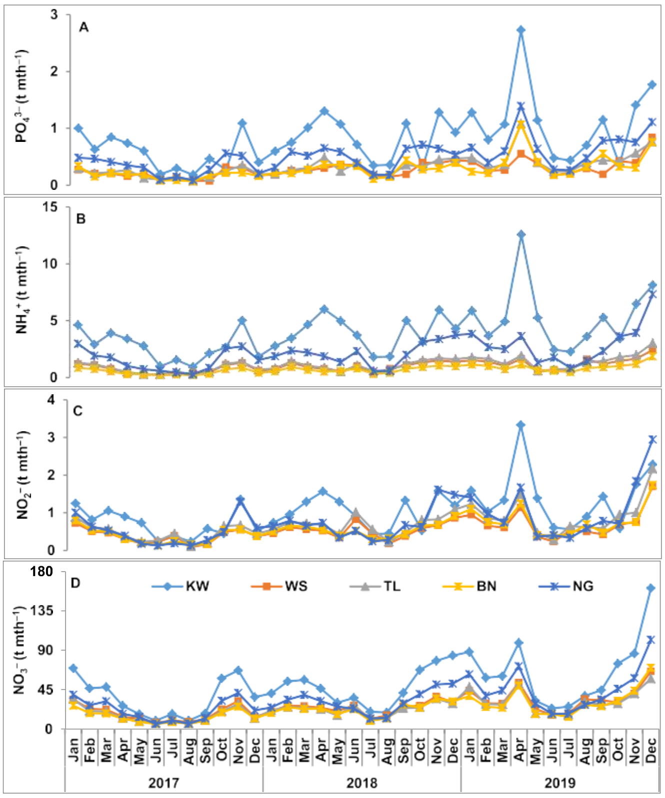


Figure 3. Monthly variations of (a) phosphate, (b) ammonium, (c) nitrite, and (d) nitrate load into Lake Kivu by Bukavu urban rivers measured at low- frequency between January 2017 and December 2019. KW: Kahuwa river; WS: Wesha river; TL: Tshula river; BN: Bwindi River; NG: Nyamuhinga river.

3.3. Analysis of Impact Mechanism

(1) Industrial structure

Firstly, the "10-Point Water Plan" may reduce industrial wastewater pollution by optimizing the urban industrial structure and promoting urban industrial upgrading. Traditional industries can reduce sewage discharge by changing their production mode and updating their technology. From a statistical standpoint, financial growth would give businesses additional financial support. The ability of a firm to acquire external financing is more important for OFDI engagement (Yan *et al., 2018*).

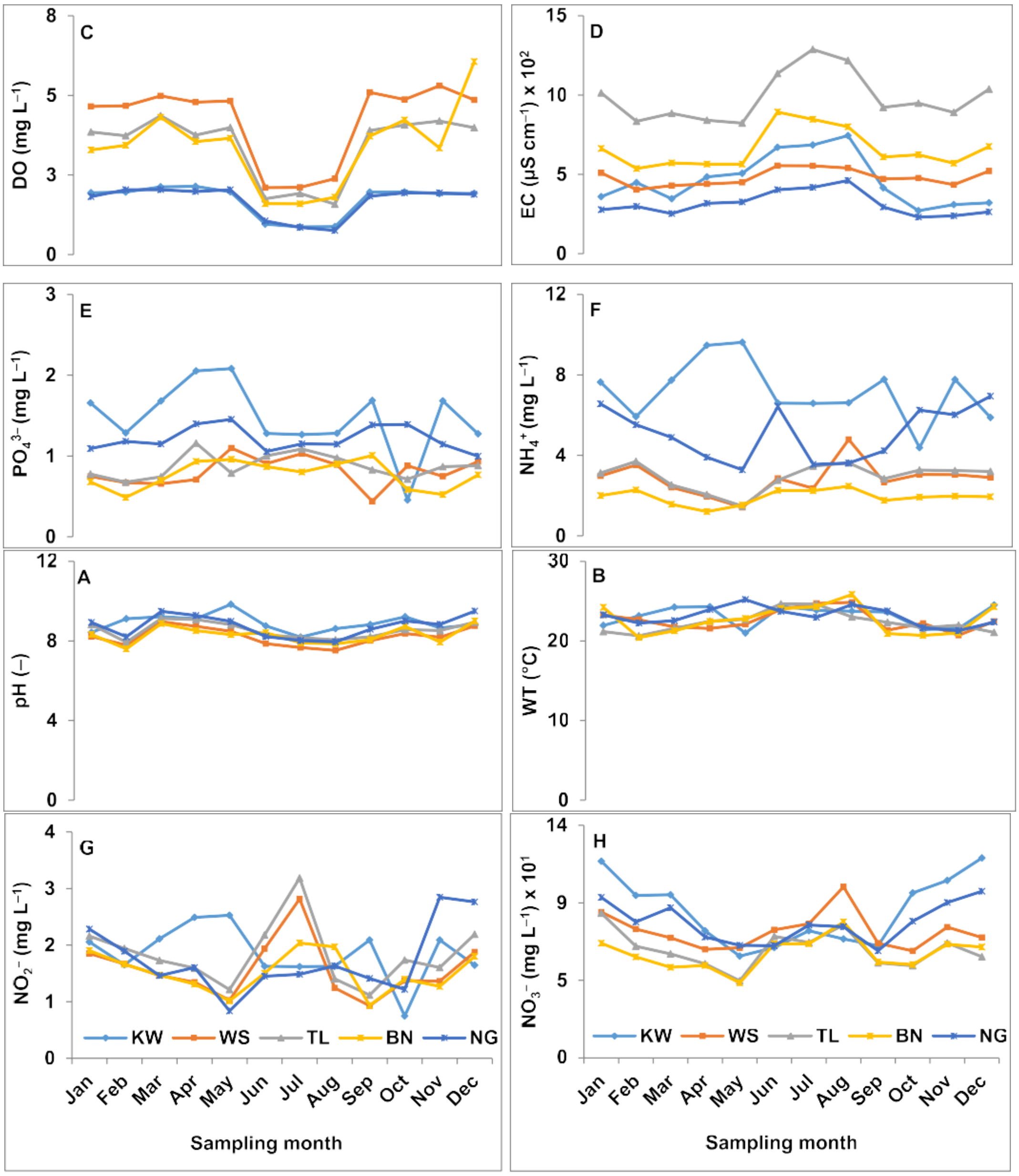
Other industries can develop low pollution and low energy consumption processes with the help of industrial structural upgrading, so as to promote the development of the entire industry toward the direction of green environmental protection and reduce industrial wastewater pollution.

The results of the Environmental Health Risk Assessment (EHRA) study conducted by the Tangerang District Health Office showed that 57% of households have private latrines, while the results of the 2014 EHRA study showed that in Tangerang City 90.9% of households have SPALs. This shows that this problem still requires serious attention and handling from the government and self-awareness from each community. Food industry wastewater is one of the sources of environmental pollution. The amount and characteristics of industrial liquid waste vary according to the type of industry. For example, the tapioca industry.

(2) Technological innovation effect

The "10-Point Water Plan" may reduce the intensity of water pollution by improving the sewage treatment rate through, e.g., technological innovation, improving sewage discharge standards, increasing investment in environmental protection, and strengthening the construction of the environmental protection infrastructure (Chakraborty & Chatterjee, 2017). The "10-Point Water Plan" states unequivocally that "Liu *et al.* (2018) proposed a framework that explicitly accounts for the variability in starting BMP efficiency to reduce the severity of runoff and pollutant concentrations due to local condition differences and installation practices; an intrinsic variability of operational performance due to watershed geophysical conditions, differential response to enterprises should play the main role of technological in the watershed management process.". Yi *et al.* (2020) pointed out that technological innovation can reduce energy consumption by improving production efficiency and energy efficiency to reduce environmental pollution.

The results of the mechanism analysis show that the "10-Point Water Plan" has significantly reduced the intensity of water pollution, improved the urban industrial structure, increased the proportion of the tertiary industries, and promoted the development of low energy con- Sumption and environmental protection industries; however, there is noevidence to show that the policy significantly reduces the proportion of industrial production in the short term. We do find that the "10-Point Water Plan" has reduced the intensity of water pollution by promoting industrial technological innovation, such as developing clean and emissions reduction technologies.



KW: Kahuwa river; WS: Wesha river; TL: Tshula river; BN: Bwindi river; NG: Nyamuhinga river.

Figure 4. The variations of (a) pH, (b) water temperature, (c) dissolved oxygen, (d) electrical conductivity, (e) phosphate, (f) ammonium, (g) nitrite, and (h) nitrate measured at low-frequency (bi-monthly measurements) in downstream setting of Bukavu urban rivers between January 2017 and December 2019. KW: Kahuwa river; WS: Wesha river; TL: Tshula river; BN: Bwindi River; NG: Nyamuhinga river

4. Conclusions

The impact of household waste that is disposed of carelessly will result in a decrease in water quality and can no longer be used. In this case the research results are expected to provide the most effective strategy in controlling river pollution around the city of Padang. There is a need for law enforcement against perpetrators of environmental pollution and imposing severe sanctions. Hopefully this article can be developed for further research.

The single pollution index method evaluation results showed that the Pearl River Delta typical river surge pollutants exceed the single pollution index order: TN > NH3-N > COD > Fe > TP > DO> Mn > sulfide; and water self-purification and pollutant transfer would lead to spatial differences in water quality at different cross-sections.

The average TDS value in the estuary is 782.5 mg/l. This value is still below the standard threshold for water quality, but already exceeds the level of contamination for drinking water, which is 500 mg/l. The National Sanitation Foundation's Weighted Arithmetic Water Quality Index Comprehensive Pollution Index, Foundation Water Quality Index, and Canadian Council of Ministers of the Environment Water Quality Index Examples of water quality indices that have been developed internationally to track river surface water quality (Mishra & Kumar, 2021).

The average value of electrical conductivity in the estuary is 172.5 μS/cm. This value is still below the standard threshold for water quality, but much higher than the value of the electrical conductivity of water in pure waters. The average pH value in the estuary is 6.7, which is classified as neutral water.

The concentration of heavy metal Fe 0.105 mg/l and Pb 0.005 mg/l. Both values are still below the water quality standard threshold. The average TDS value in the middle is 734 mg/l, while in the upstream it is 720 mg/l. The TDS value of the water samples from the three sampling locations is still below the water quality standard threshold. The highest TDS value of water samples is in the estuary area.

References

[Bapedalda] Badan Pengendalian Dampak Lingkungan Daerah Kota Padang. (2004). *Laporan Analisa Data Penelitian dan Pengujian Kualitas Air Permukaan (Sungai) di Kota Padang*. Padang.

Abreha, S. K., & Zereyesus, Y. A. (2021). Women's empowerment and infant and child health status in sub-saharan Africa: A systematic review. *Maternal and Child Health Journal, 25*(1), 95–106. https://doi.org/10.1007/s10995-020-03025-y.

Ahmad, W., Alharthy, R. D., Zubair, M., Ahmed, M., Hameed, A., & Rafique, S. (2021). Toxic and heavy metals contamination assessment in soil and water to evaluate human health risk. *Scientific Reports, 11*(1), 17006. https://doi.org/10.1038/s41598-021-94616-4.

Al Idrus, S. W. (2018). Analisis pencemaran air menggunakan metode sederhana pada Sungai Jangkuk, Kekalik dan Sekarbela Kota Mataram. *Paedagoria: Jurnal Kajian, Penelitian dan Pengembangan Kependidikan*, *5*(2), 8-14. https://doi.org/10.31764/paedagoria.v5i2.85.

Arifin, M. H., Kayode, J. S., Ismail, K. I., Abdullah, M., Embrandiri, A., Nazer, S. M., & Azmi, A. (2020). Data for the industrial and municipal environmental wastes hazard contaminants assessment with integration of RES2D techniques and Oasis Montaj software. *Data in brief, 33*, 106595. https://doi.org/10.1016/j.dib.2020.106595.

Bellizzi, S., Kamal, S. A., Newir, A. E., Pichierri, G., Salaris, P., Pinto, S., ... & Maher, O. A. (2020). Simple technology for COVID-19 medical solid waste treatment in low-resourced settings. *Journal of Global Health, 10*(2). https://doi.org/10.7189/jogh.10.020373.

Berendes, D., Kirby, A., Clennon, J. A., Raj, S., Yakubu, H., Leon, J., ... & Moe, C. (2017). The influence of household-and community-level sanitation and fecal sludge management on urban fecal contamination in households and drains and enteric infection in children. *The American Journal of Tropical Medicine and Hygiene, 96*(6), 1404. https://doi.org/10.4269/ajtmh.16-0170.

Boateng, T. K., Opoku, F., & Akoto, O. (2019). Heavy metal contamination assessment of groundwater quality: a case study of Oti landfill site, Kumasi. *Applied water science, 9*(2), 33. https://doi.org/10.1007/s13201-019-0915-y.

Buoli, M., Grassi, S., Caldiroli, A., Carnevali, G. S., Mucci, F., Iodice, S., ... & Bollati, V. (2018). Is there a link between air pollution and mental disorders?. *Environment international, 118*, 154-168. https://doi.org/10.1016/j.envint.2018.05.044.

Chakraborty, P., & Chatterjee, C. (2017). Does environmental regulation indirectly induce upstream innovation? New evidence from India. *Research Policy, 46*(5), 939-955. https://doi.org/10.2139/ssrn.2664131.

Collaborators, G. B. D., & Ärnlöv, J. (2020). Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet, 396*(10258), 1223-1249. https://www.diva-portal.org/smash/get/diva2:1503055/FULLTEXT01.pdf.

El-Sheikh, M. A., Saleh, H. I., El-Quosy, D. E., & Mahmoud, A. A. (2010). Improving water quality in polluted drains with free water surface constructed wetlands. *Ecological Engineering, 36*(10), 1478-1484. https://doi.org/10.1016/j.ecoleng.2010.06.030.

Enhealth. (2021). *Environmental Health Risk Assessment: Guidelines for Assessing Human Health Risks from Environmental Hazards*. Environmental Health Australia (EHA) Available: https://www.eh.org.au/.

European Commission. (2020b). *Chemicals strategy*. Available: https://environment.ec.europa.eu/select-language?destination=/node/114.

Khan, K., Qadir, A., Trakman, G., Aziz, T., Khattak, M. I., Nabi, G., ... & Shahzad, M. (2022). Sports and Energy Drink Consumption, Oral Health Problems and Performance Impact among Elite Athletes. *Nutrients, 14*(23), 5089. https://doi.org/10.3390/nu14235089.

Khatri, N., & Tyagi, S. (2015). Influences of natural and anthropogenic factors on surface and groundwater quality in rural and urban areas. *Frontiers in life science, 8(*1), 23-39. https://doi.org/10.1080/21553769.2014.933716.

Liu, Y., Engel, B. A., Flanagan, D. C., Gitau, M. W., McMillan, S. K., Chaubey, I., & Singh, S. (2018). Modelling framework for representing long-term effectiveness of best management practices in addressing hydrology and water quality problems: Framework development and demonstration using a Bayesian method. *Journal of hydrology, 560*, 530-545. https://doi.org/10.1016/j.jhydrol.2018.03.053.

Meals, D. W., Dressing, S. A., & Davenport, T. E. (2010). Lag time in water quality response to best management practices: A review. *Journal of environmental quality, 39*(1), 85-96. https://doi.org/10.2134/jeq2009.0108.

Meerhoff, M., & de los Ángeles González-Sagrario, M. (2022). Habitat complexity in shallow lakes and ponds: importance, threats, and potential for restoration. *Hydrobiologia, 849*(17-18), 3737-3760. https://doi.org/10.1007/s10750-021-04771-y.

Melinda, T., Samosir, A. M., & Simanjuntak, C. P. H. (2021, July). Bioaccumulation of lead (Pb) and mercury (Hg) in green mussel Perna viridis (Linnaeus, 1758) in Cengkok Coastal Waters, Banten Bay, Indonesia. In *IOP Conference Series: Earth and Environmental Science* (Vol. 800, No. 1, p. 012015). IOP Publishing. https://doi.org/10.1088/1755-1315/800/1/012015.

Mishra, S., & Kumar, A. (2021). Estimation of physicochemical characteristics and associated metal contamination risk in the Narmada River, India. *Environmental Engineering Research, 26*(1). https://doi.org/10.4491/eer.2019.521.

Mishra, S., Tiwary, D., Ohri, A., & Agnihotri, A. K. (2019). Impact of Municipal Solid Waste Landfill leachate on groundwater quality in Varanasi, India. *Groundwater for Sustainable Development, 9*, 100230. https://doi.org/10.1016/j.gsd.2019.100230.

Musthofa, Z. A., Husamah, H., Hudha, A. M., Muttaqin, T., Hasanah, I., & Setyawan, D. (2017). *Mengurai Sengkarut Bencana Lingkungan (Refleksi Jurnalisme Lingkungan dan Deep Ecology di Indonesia).* Umm Press Dan Pslk Umm. https://eprints.umm.ac.id/47255/.

Naminata, S., Kwa-Koffi, K. E., Marcel, K. A., & Marcellin, Y. K. (2018). Assessment and impact of leachate generated by the Landfill City in Abidjan on the quality of ground water and surface water (M'Badon Bay, Côte d'Ivoire). *Journal of Water Resource and Protection, 10*(01), 145. https://doi.org/10.4236/jwarp.2018.101009.

Paul, P. (2020). Socio-demographic and environmental factors associated with diarrhoeal disease among children under five in India. *BMC public health, 20(*1), 1-11. https://doi.org/10.1186/s12889-020-09981-y.

Ponce Romero, J. M., Hallett, S. H., & Jude, S. (2017). Leveraging big data tools and technologies: addressing the challenges of the water quality sector. *Sustainability, 9*(12), 2160. https://doi.org/10.3390/su9122160.

Rulli, M. C., Santini, M., Hayman, D. T., & D'Odorico, P. (2017). The nexus between forest fragmentation in Africa and Ebola virus disease outbreaks. *Scientific reports, 7*(1), 41613. https://doi.org/10.1038/srep41613.

Sharma, H. B., Vanapalli, K. R., Cheela, V. S., Ranjan, V. P., Jaglan, A. K., Dubey, B., ... & Bhattacharya, J. (2020). Challenges, opportunities, and innovations for effective solid waste management during and post COVID-19 pandemic. *Resources, conservation and recycling, 162*, 105052. https://doi.org/10.1016/j.resconrec.2020.105052.

Sumardjo. (1999). *Transformasi Model Penyuluhan Pertanian Menuju Pengembangan Kemandirian Petani (Kasus di Propinsi Jawa Barat)* (Dissertation). Institut Pertanian Bogor. https://repository.ipb.ac.id/handle/123456789/1746.

Willey, J. B., Pollock, T., Thomson, E. M., Liang, C. L., Maquiling, A., Walker, M., & St-Amand, A. (2021). Exposure Load: Using biomonitoring data to quantify multi-chemical exposure burden in a population. *International Journal of Hygiene and Environmental Health, 234*, 113704. https://doi.org/10.1016/j.ijheh.2021.113704.

World Health Organization. (2017). Progress on drinking water, sanitation and hygiene: 2017 update and SDG baselines. https://www.who.int/publications/i/item/9789241512893.

Xu, R., Shi, J., Hao, D., Ding, Y., & Gao, J. (2022). Research on Temporal and Spatial Differentiation and Impact Paths of Agricultural Grey Water Footprints in the Yellow River Basin. *Water, 14*(17), 2759. https://doi.org/10.3390/w14172759.

Yan, B., Zhang, Y., Shen, Y., & Han, J. (2018). Productivity, financial constraints and outward foreign direct investment: Firm-level evidence. *China Economic Review, 47*, 47-64. https://doi.org/10.1016/j.chieco.2017.12.006.

Yi, M., Wang, Y., Sheng, M., Sharp, B., & Zhang, Y. (2020). Effects of heterogeneous technological progress on haze pollution: Evidence from China. *Ecological Economics, 169*, 106533. https://doi.org/10.1016/j.ecolecon.2019.106533.

Zheng, N., Liu, J., Wang, Q., & Liang, Z. (2010). Health risk assessment of heavy metal exposure to street dust in the zinc smelting district, Northeast of China. *Science of the total environment, 408*(4), 726-733. https://doi.org/10.1016/j.scitotenv.2009.10.075.

Zhou, C., Zhan, Y., Chen, S., Xia, M., Ronda, C., Sun, M., ... & Shen, X. (2017). Combined effects of temperature and humidity on indoor VOCs pollution: Intercity comparison. *Building and Environment, 121*, 26-34. https://doi.org/10.1016/j.buildenv.2017.04.013.

Zou, L., Xia, J., & She, D. (2018). Analysis of impacts of climate change and human activities on hydrological drought: A case study in the Wei River Basin, China. *Water Resources Management, 32*, 1421-1438. https://doi.org/10.1007/s11269-017-1877-1.