



Understanding The Human Health Consequences of Water Pollution and The Call for Action

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ABSTRACT

Water, the elixir of life, is one of the most fundamental and essential substances on our planet. It is a clear, tasteless, and odourless liquid that covers about 71% of Earth's surface. The effects of human activities cause water quality levels to deteriorate daily, impacting human health. A recent Focused Group Discussion (FGD) held at the National Institute of Health, Setia Alam, Selangor, aimed to address water quality issues. Key points discussed include: 1. the identification of sources and causes of water pollution in Sepang, Selangor, 2. assessment of the effects of consuming contaminated water on human health, 3. emphasis on collaboration between Federal and State Governments for effective water safety management, 4. evaluation of the effectiveness of laws and regulations in regulating water safety and 5. the recognition of the need for public education to prevent water pollution. The objective is to ensure citizens receive clean potable water, mitigating long-term health effects. Authorities must enforce the prevention of surface water pollution as the basis for guaranteeing water quality which aligns with health standards.

Keywords: effluent, industrialization, human health

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INTRODUCTION

Water is a precious gift that must be preserved in all situations. Public health and the natural environment are both significantly influenced by the quality of the water (Xu et al., 2019). Water is the most basic need for living things such as humans and other creatures. Humans may live comfortably for days without electricity, computers, internet, and anything else but not without water. Water supply, transportation, sewage discharge, waterlogging drainage, and urban defence are some of the roles

that rivers play in the process of urban development. These roles assure the stability of the city, encourage population agglomeration, and foster the growth of industry and trade (Yin et al., 2022). Water can be used to carry out various life activities as a very beneficial resource. Chemically, water comprises two hydrogen atoms bonded to a single oxygen atom, giving it the molecular formula H₂O. This simple yet powerful structure is the basis for many remarkable properties, such as its high heat capacity, surface tension, and solvent abilities (Chen et al., 2019).

These characteristics enable water to sustain life, shape our landscapes, and influence weather patterns.

In recent times, there have been many human activities that can cause an impact on raw water resources that are the cause of human daily use. Achieving long-term and intricate global water quality safety targets greatly depends on quantifying the effects of climate change and human activity on water quality (Mishra et al., 2021). There are a few examples of the many human activities that can affect water quality. Deforestation is an activity in which the removal of trees can increase soil erosion and sedimentation, negatively impacting water quality. Razali et al. (2018) focused their research on the river system network in Malaysia's Cameron Highlands and examined case studies of land use change in highland areas and its effects on river water quality.

Another example is industrial activities. Many industrial processes generate wastewater containing various chemicals, including heavy metals, solvents, and other pollutants. One factor influencing the sources of water quality changes due to urbanisation. Growing urban areas have been identified as one of the main causes of the global rise in pollution in freshwater environments (Mello et al., 2018). This is because they generate more wastewater, which can contain a variety of pollutants such as oil, grease, and human waste. Agricultural practices make runoff from agricultural fields that can contain fertiliser, pesticides, and other chemicals, which can pollute nearby waterways. One of the main causes of high levels of phosphorus and nitrogen is the overuse of fertilisers on agricultural land (Pérez-Gutiérrez et al., 2017). The quality of raw water supplies is impacted by all these activities, which result in changes. To preserve the health of our rivers and the species that depend on them, it is imperative to reduce these effects by appropriate behaviour and legislation.

Changes in water quality sources can also be caused by weather changes that occur throughout the year. Malaysia is one of the countries that experience weather changes throughout the year, namely heat and rain. Weather change refers to variations in a region's regular or average weather conditions over time. Natural phenomena like variations in solar radiation, volcanic activity, and shifts in the Earth's orbit could be the source of these changes or human actions like the combustion of fossil fuels, deforestation, and industrial processes.

2. METHODOLOGY

This program is in the form of a Focus Group Discussion (FGD) to open space to discuss urban health issues that are increasingly becoming a concern and parallel to the urbanization process which is also an important aspect of environmental health. The program's goal is to bring together parties with expertise and experience in identifying environmental health issues that can impact the health of urban communities and propose strategies to deal with them. To discuss the issues several agencies from various backgrounds and expertise were invited to give their input and views related to water issues in Selangor. The topic presented this time is related to water issues in Selangor. During the Focus Group Discussion, participants exchanged views, ideas and methods that should be implemented in dealing with the issues that arise. In addition, there is also information obtained from the mass media that aims to further strengthen the arguments brought during the discussion. Each idea and finding from the discussions that have

been conducted are presented during the final session of the FGD.

3. ISSUES RELATED TO WATER POLLUTION IN SELANGOR

Several issues were discussed during the FGD. Among the issues highlighted are the causes and sources of contamination of the Sepang District's water sources, the impact on human health because of drinking from contaminated water sources, the importance of cooperation between the central and state governments in dealing with issues related to pollution, the implementation of laws and the role of the community in assisting the government in dealing with issues related to water source pollution.

3.1 The sources and causes of water pollution in Sepang, Selangor

During the FGD, a representative from the Sepang district health office explained some of the issues faced regarding the causes of water pollution. According to Geraldine (June 19, 2023), a representative from the Drinking Water Quality Control Unit, Sepang District Health Office, one issue that comes up is the existence of errant factories that discharge their waste into the river directly. This pollutes river water, which is where treated water comes from. Excess phosphorus in the environment substantially negatively impacts aquatic ecosystems with subsequent dangers to the health of people and the economy (Ofori et al., 2021). Apart from the existence of these illegal factories, the problem of livestock farms also often arises in the area around Sepang District. Pig farms are among livestock farms that often become a nuisance to water sources. Livestock farms that exist and are cultivated traditionally are one of the causes of pollution here. In addition to causing problems for the pig farm's raw water source, it also causes odour problems that disrupt the daily activities of the surrounding residents.

Recently, the consequences of heavy metal pollution caused by human activities on mangroves, rivers, estuaries, and coastal wetlands in the Sepang region have drawn more attention. Thus, in 2022, an ecological risk assessment of heavy metal pollution in the mangrove sediments of the Sepang Besar River, West Coast Peninsular Malaysia, was carried out. The presence of heavy metals in the surface sediments of the mangrove Sepang Besar River was investigated in this study. Inductively coupled plasma mass spectrometry (ICP-MS) was used to measure the sand concentrations of arsenic (As), molybdenum (Mo), lead (Pb), chromium (Cr), cobalt (Co), cadmium (Cd), nitrate (Ni), and mercury (Hg). According to research utilising the enrichment factor and geo-accumulation index, the study determined that Arsenic is the predominant heavy metal contaminant in surface sediments of the Sepang Besar River mangrove sediments. Certain stations within the river require specific focus due to elevated pollution levels. The amounts of the metals analysed in the sediments were found to be lower than both the average shale values and the standards set by the USEPA. This indicates that adverse impacts are not always present. To mitigate potential pollution issues, it is imperative to monitor the levels of As, Mo, and Pb in the future, as indicated by the results of the enrichment factor and the geo-accumulation index (Krishnan et al., 2022).

3.2 The effects of consuming contaminated water on human health

Many past studies have published the results of their studies related to the effects of drinking water from contaminated sources. The effect on the health of the human body can be categorised into two conditions. The first effect is acute, while the other is a long-term effect. The burden of disease associated with water includes non-communicable diseases brought on by exposure to chemically contaminated water as well as communicable diseases (waterborne, water-washed, water-based, and vector-borne diseases related to water) (Boelee et al., 2019). In addition, there are also effects on human health due to excessive heavy metal content in treated water. Heavy metals are present in the Earth's crust naturally and remain as environmental pollutants due to their inability to be degraded or eliminated (Malviya et al., 2023).

Exposure to some metals, such as Hg and Pb, can also lead to the onset of autoimmunity, a condition in which an individual's immune system mistakenly targets its cells. Alzheimer's disease may arise from Pb and Cd levels in the body that enter the brain (Jyothi, 2020). The Lancet Commission on Pollution and Health has calculated that there are around 1.8 million deaths globally that can be attributed to water pollution, primarily caused by microbiological contamination. Additionally, there are approximately 0.5 million deaths that can be linked to soil pollution, heavy metals, and chemicals (Boelee et al., 2019). Multiple studies have demonstrated a correlation between prolonged exposure to lead and the development of different types of cancer, kidney damage, adverse effects on the central nervous system, and cardiovascular disease in people. Additional consequences of Pb exposure include enzyme dysfunctions, anaemia, cognitive impairments, heightened activity levels in children, low body weight and premature births, as well as elevated blood pressure in adults (Zaheer et al., 2023; Farias et al., 2020). Pb gradually builds up in our bones over a period of around 20-30 years, leading to a chronic condition (Charkiewicz & Backstrand, 2020).

A study was carried out to investigate the seasonal differences in household water quality in Hancheng City, China, which is situated on the Guanzhong Plain. The Hancheng Centre for Disease Control and Prevention's water quality monitoring data was used to analyse the health concerns. It was discovered that during the dry season as opposed to the rainy season, there are more non-carcinogenic health risks for both adults and children. The degree to which the overall non-carcinogenic risk varies with the rainy and dry seasons is determined by the risk assessment's evaluation of water quality indicators. Compared to the wet season, when people drink tap water until it runs out, people are more likely to get cancer if they drink chlorinated water during the dry season. Compared to adults, children have nearly twice the risk of developing cancer. Although the endemic sickness has been eliminated because of improved water quality, cancer is still a risk that needs to be taken into account (Ji et al., 2020).

3.3 The importance of collaboration between Federal and State Governments in managing water safety and quality control

To deal with this issue related to water, all parties need to work together to ensure that it can be implemented effectively.

In general, each state's government has authority in water management in their state. This means that all activities involving raw water sources and water treatment operations up to distribution are managed by a company appointed by the state government. At the same time, they also monitor the quality of the water they produce.

Mohd Suffian (personal communication, June 19, 2023) said that apart from water supply companies, another agency under the Malaysian Ministry of Health also carries out monitoring and surveillance of treated water through routine water collection activities. This sampling involves monitoring the water quality involving the presence of microbiology, organic chemistry, heavy metals, and pesticides. The results of the monitoring carried out are reported to the water supply company for corrective action so that the water supplied to the residents is always in good condition and according to the specifications that have been set.

3.4 The effectiveness of implementing laws and regulations to regulate water safety and quality control

Based on a daily news report dated August 14, 2019, titled "Create a special body to monitor, regulate agencies to protect water resources", SPAN chairman Charles Santiago at the time thought there were too many agencies managing water (Noor, 2021).

"The problem at the moment is that we have too many related agencies and departments when there is river pollution or water supply. However, all parties will point fingers if there is pollution."

In Selangor itself, there are several agencies related to water management. Mohd Suffian (personal communication, June 19, 2023) said water-related laws have been in place for a long time, but enforcement measures have yet to be implemented. This may be because some several bodies or agencies enforce laws related to water in our country. He thinks that a special body related to the implementation of laws related to water should be established so that legal action can be taken against water supply companies that fail to treat water according to established standards. The diverse water applications are typically overseen by distinct subsectors in a fragmented manner, exhibiting variable levels of consideration for water quality. In addition to the obvious connections that exist between infectious diseases and the management of water resources (Boelee et al., 2019).

3.5 The need for public education in preventing water pollution

Many awareness campaigns have been carried out before, whether on television, in newspapers, or electronic media and have been used to educate people about the importance of caring for the river. This awareness campaign has also extended to the school level when taught in the school syllabus. This shows how important and serious the government will ensure that raw water sources need to be protected as best as possible so that they remain for future generations. Ruhaizie (personal communication, June 19, 2023) believes the awareness campaign needs to be changed to something more attractive to attract the community's interest to follow it. Using the latest materials and methods, such as *TikTok*, can attract the community's interest to

implement it. This kind of measure is seen as more suitable for the present time since most people use the application in their daily lives. In addition, it is also suitable for use as awareness campaign material because it is watched by various layers of society.

4. CONCLUSION

Various efforts and proactive measures have been made and carried out to ensure that the people receive the best water quality. It is crucial to ensure that human health is always maintained and guaranteed. To ensure that water quality is always in good condition, various measures and continuous efforts have been made by the government. Many government agencies are involved in water management in this country, whether at the federal or state level. All these agencies play their respective roles according to the responsibilities that have been entrusted. The large number of agencies is insufficient if they do not carry out their responsibilities effectively, even more so if there is a duplication of duties and responsibilities involving the state and federal governments. Therefore, a body needs to be appointed to ensure that the quality of water in this country can be adjusted so that every citizen in this country obtains water of the same quality and comparable to the standards set by the government. The reorganisation is an excellent step to ensure that there is a government agency responsible for water quality in the country so that it can be coordinated in each state.

CONTRIBUTION STATEMENT

The MAEH Urban Health Forum was held at National Institute of Health Setia Alam from 19-20 June 2023. MRH, MNNI, MDA, ERR, MNAA and FAS conceived the forum, applied for and obtained the funding from Malaysian Association of Environmental Health and Universiti Teknologi MARA and also drafted the first version of the article. MRR, MSMS, GNHH and MNAR analysed the issue. All participants at the forum contributed to the focus group discussion that produced the article and all approved the final version.

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