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Regulating sewage pollution of Malaysian rivers and its challenges

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Abstract

While sewage pollution is considered as an old problem which developed nations have already managed effectively, missing all too often in developing countries are the resources to come up with practical solution and the necessary political and legal infrastructure to support these solutions as well as the community awareness required to address the problem. Many Malaysian rivers continue to suffer from sewage pollution. This paper provided concise exposition the regulatory framework of sewage pollution control of inland surface waters under the country's existing primary federal environmental legislation. The paper then discussed regulators' perceptions on the main causes that lead to the recurring sewage pollution problem in Malaysian rivers. Semi-structured interviews were conducted face-to-face with key informants from several relevant government bodies. They highlighted a mixture of causes to the recurring problem of sewage pollution in our rivers including insufficiency of the law and its implementation, outdated technology as well as lack of public awareness. This research gathers essential views from different authorities that can be of use by policy-makers in the efforts of improving the existing situation of sewage pollution problem in the country.

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1. Introduction

For many developing nations, sewage pollution is a growing problem [1,2]. The United Nations reported that more than 80 percent of sewage in developing countries is discharged untreated, polluting rivers, lakes and coastal areas [3]. Many large cities in most low- and middle-income countries still have no treatment plants. As sewage generation usually increases with population and economic growth [4,5], existing plants in these countries are also quickly become undersized as urban population growth outpaces investments³. In Malaysia, despite existing legislation that protects water quality, some 72 percent of 473 rivers monitored by the Department of Environment Malaysia (“the DOE”) in 2013 were found polluted with 25 rivers classified as highly polluted⁶. Many of these rivers suffer from high Biochemical Oxygen Demand (BOD) and are polluted by ammoniacal nitrogen (NH₃-N) and suspended solids (SS). Sewage has been identified as the major source of these problems [6]. The origins of the polluting sewage include sewage treatment plants, discharge of raw sewage from squatters, sullage of households, wet markets and eateries. In 2013, Malaysia was reported to have more than 1.2 million sewage treatment systems. These sewage treatment systems formed about 86 percent of some 1.48 million water pollution sources identified throughout the Peninsular Malaysia [6]. Sewage pollution is a major concern because it poses risks to human health. Sewage may contain many types of disease-causing organisms including *E.coli* that can cause various health problem such diarrhea, severe abdominal pain, and vomiting. Sewage pollution also affects ecosystems. Sewage contains high levels of nutrients like phosphate and nitrates which can affect rivers, lakes and seas through eutrophication caused by nutrient enrichment [7]. In fact, sewage is one of the major forces driving deterioration of coral reefs worldwide [8]. For example, in Malaysia, sewage pollution has lead to the spread of algae on coral reefs of several islands [7]. Apart from that, according to the DOE Selangor Annual Report 2013, untreated or partially treated sewage has contributes to high level of ammoniacal nitrogen (AN) in river water and high level of *E.coli* in marine water along the beach in Selangor. Similar problem is also suffered by many beaches in other parts of Malaysia. This paper aims to investigate factors that have caused the continuous problem of sewage pollution in the Peninsular Malaysia. The paper looks at the problem from the perspective of the agencies that involve in the enforcement or monitoring of sewage pollution in the Peninsular Malaysia.

2. Federal regulatory control of sewage pollution in Malaysia

The primary federal legislative instrument governing efforts to improve and maintain water quality in Malaysia is the Environmental Quality Act 1974 (Act 127) (“the EQA”). The EQA is considered as the most comprehensive legislation that deals with environmental protection and pollution control in the country [9]. Section 25 of the EQA prohibits any person to discharge or deposit of any environmentally hazardous substances, pollutants or wastes in contravention of standards specified by the Minister responsible for the environment into Malaysian inland waters without a license. As to sewage, such standards are set in the Environmental Quality (Sewage) Regulations 2009 (“the 2009 Regulations”). The 2009 Regulations is applicable to any premises which discharge sewage into any inland waters or Malaysian waters, except for housing or commercial development with a population equivalent (PE) of less than 150. Any discharge of sewage into any inland waters or Malaysian waters requires prior written notification to the Director General of Environmental Quality (“the DG”). Sewage discharged should not contain substances in concentration greater than the limits set in the Second Schedule of the 2009 Regulations. Among the parameters included in the standards are temperature, pH value, BOD, COD, suspended solids, oil and grease as well as NH₃-N. The standards set different limit for new and old sewage treatment systems i.e. those systems which were approved before the date of the coming into operation of the 2009 Regulations. In general, the standards for the new sewage treatment systems are stricter in terms of concentration limit and number of parameters regulated. Furthermore, the standards for discharges into inland waters within catchment areas are more stringent compared to releases into any other inland waters or Malaysian waters. The Second Schedule practically sets the acceptable conditions of sewage discharge in Malaysia. Nevertheless, an owner or occupier of premises may apply for a license to contravene the acceptable conditions of sewage discharge. Such application, however, must be accompanied by a report on sewage characterization and a license fee. Information on point of discharge or any changes made subsequently must also so be notified to the DG. The 2009 Regulations also require premise owners or occupiers to monitor the concentration of certain specified parameters including BOD, SS, and NH₃-N. They must maintain a record of the sewage discharge, which should be submitted to the DG on monthly basis. In addition, they are also required to maintain records of the operation and to conduct maintenance and performance monitoring of the sewage

treatment system. All these records must be made available for inspection by any authorized officer appointed by the DG. The information gathered through this self-reporting mechanism can form a baseline data for the authority to conduct targeted enforcement activities like for inspection or monitoring. The 2009 Regulations also require the operation of sewage treatment system to be operated and maintained in accordance with sound engineering practice and ensure that all components of the sewage treatment system are in good working condition. Any operation of a sewage treatment system must also be supervised by a competent person, certified by the DG, at all time. Any person who contravenes any of the aforementioned requirements, can be liable to a maximum penalty of a fine up to RM100,000 and imprisonment up to 5 years and to a further fine not exceeding RM1000 a day for every day that the offence is continued after notification of such offence has been served upon him.

3. Materials and methods

The research design and approach for this project is qualitative-based where the primary data were gathered through interviews with nine key informants from pre-identified relevant agencies. As the focus of the study is on sewage pollution in Malaysian rivers, the key informants were selected from major regulatory authorities and service provider relevant to the issue. These include the DOE headquarter and several branches in Selangor, IWK, the Ministry of Natural Resources and the Environment and the Department of Drainage and Irrigation Malaysia. More agencies were approached initially for the interviews but no or late responses were given. The interviews were conducted through face-to-face using semi-structured questions to seek key informants views on the causes of continuing sewage pollution problem in Malaysia. After the interview results were transcribed, they were then analyzed using content analysis. In doing so, the steps suggested by Burnard et. al. [10] was followed. It started with identification of themes in the interview transcripts through both inductive and deductive approaches. The analysis was done manually using word processing programs. The researchers started with open coding whereby notes and headings were written in the transcribed data while reading them carefully to find themes or issues that recur in the data. Then collection of the words and phrases that form the themes were pasted onto a clean set of pages to create categories. Next, the researcher looked for and eliminated overlapping categories. Based on the categories, researcher analyzed and discussed the findings. Apart from that, secondary information from relevant policies, government departmental reports and environmental quality reports were also referred to provide further explanation on the issues raised by the key informants.

4. Results

Through the face-to-face interviews, several main causes of sewage pollution in Malaysian rivers were highlighted by the key informants and discussed below.

4.1 *Incomprehensive regulations*

All interviewees agreed that current regulatory standard on sewage discharge in Malaysia is sufficient if not better than some other developing countries. However, they pointed out that the law fails to take into account several things. First, the law ignores consideration of river loading capacity. River loading capacity refers to the greatest amount of pollutants that a river can assimilate without causing the water to get polluted. At present, whether or not a river has the capacity to receive the total load of sewage effluent from various individual regulated point sources as well as other sources is ignored by the law. Consequently, even if all sewage treatment plants comply with the regulatory standard in discharging their effluent to rivers, the accumulative impact of these discharges may cause sewage pollution if the rivers capacity to dilute them is overshoot. Second, the regulation only covers premises with more than 150 population equivalent (PE) that contribute to flow to the sewerage treatment system. So, there seems to be no control or monitoring of premises that has a capacity less than 150 PE. Third, sewage from non-point sources is also neglected by the EQA. The effect of non-point sources in pollution issue is just as severe as the point sources, and need to be addressed through federal legislation. Fourth, Regulation 8(1) of the 2009 Regulations allows premises to contravene the regulatory standard in discharging their sewage if a license to do so is granted. This so-called contravening clause has also been seen as a potential cause of continuing problem of sewage pollution in Malaysian rivers.

4.2 Ineffective implementation of the law

Implementation of the law is also stained with difficulties. Maintenance of plant, among others, is required by the law. However, effective monitoring of compliance is difficult due to the existence of thousands of plants under various single operators. This forces the authorities to stretch thin their manpower in order to do monitoring including performing routine or random inspection. Maintenance is essential to avoid sludge accumulation. Otherwise, overflowing of sewage into watercourses is bound to occur. Such overflowing also happens through overloading of sewage into the sewage treatment system more than its capacity due to high number of population in certain areas. Unless this problem is tackled, even the best available technology may not resolve sewage pollution in Malaysia. Several ambiguities in the law also hinder effective implementation. For instance sewage treatment plants are required to operate to the best of “sound engineering practice”. In practice, it is unclear what does the law means by the phrase “sound engineering practice”. Another issue is with private sewage treatment systems for premises like apartments or hotels. A few informants commented that operators of such places like to build their sewage treatment system at basement which makes detection of violation difficult.

4.3 Outdated technology

Another main cause for the continuing problem of sewage pollution in Malaysian rivers is that many public sewage treatment plants (STPs) still use old technology. According to Indah Water Konsortium [11], most of the STPs in the country have used primary treatment systems like septic tanks and imhoff tanks. Those which use secondary treatment are limited to low costs methods like oxidation ponds. This has led to failure of STPs to meet regulatory effluent standards. For example, parameters for standard A require the removal of some nutrient like nitrogen and phosphate. However, most of the existing STPs do not have the technology to remove nutrients which usually requires tertiary sewage treatment. Secondary treatment removes only a small portion of the nitrogen and phosphorus nutrients which can lead to ‘over-fertilization’ of water bodies [12]. On top of that, many urban areas still depend on individual septic tank which can only partially treat sewage.

4.4 Public awareness

According to the key informants, insufficient public awareness is also another major factor that causes the continuous problem of sewage pollution. This is reflected in their unwillingness to pay for sewerage service thinking it is not their concern. Many also do not aware that septic tank at home is now under individual responsibility. The decomposition of sewage in septic tank results in sludge deposit at the bottom of the tank. The sludge need to be cleaned, approximately once every two or three years [11], to avoid it from filling the septic tank and stop it from functioning properly. A few of the key informants also pointed that many people ignore maintenance of their septic tank until it is too late i.e. by the time they call for service, the sewage has overflowed into drain and so on. Likewise, maintenance of communal septic tank also faces similar problem whereby not all house owners in the area concerned want to pay for desludging.

5. Discussion

The study shows that in order to address sewage pollution in Malaysian rivers, several aspects of the EQA and its implementation need to be improved. However, this may require amendment of the EQA. For instance, before the regulators can consider river loading capacity in curbing sewage pollution, and perhaps all other pollutants, sewage from nonpoint sources pollution need to be regulated uniformly through the EQA. The law will also need to stipulate the method used to measure the accommodating capacity of a water source. Such a big legislative step will take time and need careful consideration, especially in the light of the lack of technology available for us to measure and monitor a loading capacity of different water sources. Nevertheless, a smaller step towards such risk-based approach could be done through inclusion of a voluntary provision in the EQA to direct states or relevant industries like agriculture to report and control nonpoint sources pollution of sewage. As for the contravention provision which allows premise to disregard the regulatory discharge standard through a license and with payment, its

implementation need to be monitored and the license should be given to genuine cases only like for maintenance or upgrading of sewage treatment. Otherwise, the polluter pays principle which the clause is premised upon will not be effective. In issuing such contravening license, the DOE must also follow the precautionary approach to protect the environment.

Since the 1980s, Malaysia requires housing developers to build sewerage systems for areas gathering more than 30 households of 150 PE. This has led to the diffusion of many small-scale sewage treatment facilities all over the country which makes maintenance works difficult. On top of that, it also causes accumulation of a wide range of low-cost technologies for sewage treatment system [13]. Besides that, the large number of STPs under various private operators also hampers enforcement. Despite enforcement powers being conferred to them, in the light of high number of sewage treatment systems developed, the authorities cannot ensure effective monitoring until their manpower is strengthened. This is especially crucial for DOE since they have to monitor not only water pollution or sewage effluent but also industrial effluent and almost all kinds of environmental pollution regulated by the EQA. Meanwhile, to overcome the lack of manpower, DOE has now encouraged self-reporting whereby premises need to analyses and report the quality of their discharged effluent periodically to the DOE. Premises are also required to conduct performance monitoring of its sewage system processes and report to DOE. While this self-reporting approach can enable the authority to do the monitoring regularly from 'a far' and planned targeted enforcement activities, its effectiveness remains to be seen.

With regard to the public awareness, it was reported that an increasing number of individuals showed unwillingness to pay desludging fee and only ask for service when their septic tanks had trouble [13]. Public criticism also has led to three-time charge reduction in sewerage service charge in the country, which has negative impacts on the finance of service providers. It seems that full cost recovery for sewage treatment is still a long way to be achieved in Malaysia. The public need to be educated about sewage pollution and how it affects the quality of clean water, human health and the ecosystems. With better knowledge, more people will be willing to pay higher tariffs for sewerage services in the future. This will not only help the country's abate sewage pollution problem but will also help ensuring more financial resources is available for better sewerage services.

6. Conclusion

To date much of the literature has talked about the impacts of sewage pollution on human health and the ecosystems but this study offers some insights on the factors that contribute to the continuous problem of sewage pollution in Malaysian rivers. While this study does not offer a conclusive answer to the question of how to overcome the sewage pollution problem, but it does establish that incomprehensive federal pollution control law, ineffective implementation of the law, the use of old technology in sewage treatment system and the lack of public awareness are the main factors that have been associated with the problem. These factors vary in scope and complexity. A further broader and in-depth research is necessary to study the nature of each factor that has been identified by the current study, as causing the recurring problem of sewage pollution, will be necessary before some useful solutions should be proposed.

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