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The Impact of COVID-19 Prevention Measures on Water Quality: An Indonesian Perspective

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COVID-19 (coronavirus disease 2019), caused by the SARS-CoV-2 virus, has infected many countries worldwide, including Indonesia and has been declared a pandemic. To prevent the spread of the disease, several measures are implemented, most notably physical distancing, wearing masks, and hand hygiene. These measures have shown their efficacy in preventing the disease. On the other hand, several impacts of these measures, both positive and negative, also prevail.

Physical distancing is the act of maintaining a recommended distance (guide varies between 1–2 m) in contact with other people. In some countries, physical distancing is enforced by lockdown and travel restrictions. The closure of industrial activities during lockdown has reduced pollution load, significantly improves river water quality in several developing countries. A preliminary study reported a decrease in the amount of chlorophyll-a in several water bodies in Jakarta during a period of large-scale social distancing (Adwibowo 2020). Chlorophyll-a is an indicator of phytoplankton in waters, whose presence is closely related to water quality and abundance of nitrogen and phosphorus compounds.

The use of masks has been shown to reduce SARS-CoV-2 spread from droplets significantly. However, the sheer volume of used masks creates disposal problems. There are reports of used masks littering public places and enter rivers and oceans. Aside from the aesthetic, mask litters potentially increase microplastic problems in the aquatic environment (Fadare and Okoffo 2020).

Hand hygiene is implemented via handwashing with soap and the use of hand sanitizer. There are challenges in implementing the former in Indonesia, most notably the availability of clean water and familiarization with handwashing habits (Purnama and Susanna 2020). The increased handwashing practice consequently increases the need for clean water and add pressure in regions where water is scarce. In addition, it also increases the generation of domestic wastewater (greywater). Unlike industrial wastewater which is more regulated, domestic wastewater treatment is loosely implemented. Only several cities have centralized wastewater treatment plants, e.g. Jakarta, Bandung, and Surabaya. Even when treated, domestic wastewater contains organic compounds that may be persistent, including drugs, hormones, and compounds derived from sanitary and personal care products such as fragrances, stabilizers, biocides, etc. It becomes worse when some personal care products possible to bind on plastic particle in aquatic environment (Wilkinson et al. 2017). These can affect aquatic organisms directly, or through bioaccumulation, therefore, an increased amount of domestic wastewater is of concern.

To measure the impact of COVID-19 prevention measures on water quality, an analysis of water and material balances is required. The impact of reduced industrial activities would be countered by additional "new" pollutant sources from increased handwashing practices (Sivakumar 2020). Pollutant concentration in domestic wastewater

would be determined by water volume, product volume, and product type. The impact depends not only on the extent of measures but also on policies in place (Awoke et al. 2016). When regulations of industrial wastewater treatment and discharge are strictly implemented, the impact of increased domestic wastewater volume and persistent organic pollutants may outweigh the lower pollutant load from industries.

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