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RESEARCH ARTICLE

Environmental Health Risk Assessment on Small Islands Groups in the Province of South and Southeast Sulawesi Republic of Indonesia

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Abstract

This study analyzes environmental health data to assess the variability of environmental health risks for the two groups of small islands in Indonesia. Five sets of criteria were designed to assist the process by having levels that were relevant to the issues being assessed. Each of the sets has five ordinal levels of impact ranging from insignificant (score 1) to catastrophic (score 5). The qualitative likelihood analysis also has five ordinal levels ranging from rare (score 1) to almost certain (score 5). Most of the environmental health risk values in Selayar district are categorized as high and extreme risk. On the other hand, Wakatobi district health values fall into low and medium risk. The water shortages risk is valued at extreme level in both districts; possibly a result of the combination of low or very low coverage of households with access to freshwater and the significant effects resulting from such a condition. The risk variability between these two groups of islands may be caused by a dissimilarity of coverage of environmental health indicators.

INTRODUCTION

Indonesia, which is made up of over 17,000 large and small islands with 1.9 million miles square is a massive archipelago country. It is a big challenge for the government to manage such a huge area. Due to strategic and political reasons, the government prioritizes services to the outer islands of Indonesia that are in the boundary zones to other countries (The Republika, 2010). Health issues such as poor sanitation and unhealthy behavior are one of the priorities for the government and through the Ministry of Health (MoH) make programs for health service delivery for the outer islands a priority (MoH, 2013). Of the 17,504 islands in Indonesia, only 7,870 (45%) are named, and of the 92 outermost islands that have been identified, only 43 (47%) islands are inhabited (Ministry of Home Affairs, 2004).

Most of the inner small islands are populated and are characterized by remoteness and isolated and are vulnerable to natural disaster. Furthermore, the local specific characteristics of each island based on geological and morphological of each islands such as volcanic and/or rocks-formed islands for thousands years ago, determine the endemicity of a disease in any one island. Schistosomiasis, for instance, is a characteristic disease in Province of Central Sulawesi due to the habitat of reservoir animal ecosystem (Achmadi, 2005).

Material and Methods

The qualitative risk assessment method was designed for this study using the risk rating matrix. The risk analysis methods developed were based on the Australian and New Zealand Standard Risk Analysis (Standards Australia, 2000, 2004a, b) to present information of two groups of small Islands in Indonesia, and this assessment focus on the environmental health risks of group of Selayar Islands in South Sulawesi province and group of Wakatobi Islands in Southeast Sulawesi province.
The five sets of criteria were designed to assist the process by having levels that were relevant to the issues being assessed. Each of the sets has five ordinal levels of impact ranging from insignificant, which is virtually no impact with a score of 1 to catastrophic, which means irreversible with a score of 5. Moderate level is scored as 3 and being defined as the highest acceptable level of consequence. The qualitative likelihood table also has five ordinal levels ranging from rare, which is defined as event that may occur only in very rare circumstances, but not impossible; with a score of 1 to almost certain means expected to occur in most circumstances with a score of 5.

Result and Discussion

Based on the evidence provided from data that had been collected, the next step in risk analysis after the assessment of likelihood and consequence is characterising the risk. In this step, issues were assigned to an appropriate combination of consequence and likelihood levels. This combination produces an estimated level of comparative risk by using qualitative risk analysis matrix, which can then be used to determine the extent of the risk whether it is extreme (E), high (H), moderate (M) or low (L).

The environmental health risk value in Selayar district that produced from the combination of likelihood and consequence assessment at the previous stage. Most of the risk value in this district are categorised as high and extreme risk. The only one categorised as low is air pollution. And the environmental health risk value, in Wakatobi district, ranges from low to extreme risk. The water shortages risk is valued at extreme level that may be caused as a result of the combination very low coverage of households with access to freshwater and the significant effect that may be resulted from lack of access to freshwater. It is different from the District of Selayar, most of risks in Wakatobi District are fall into low and medium risk.

Small islands communities are faced with a wide range of problems caused by their location and environment. Sanitation is a predominant concern. The discussion regarding sanitation in this paper refers to the safe disposal of human waste (excreta). Sanitation problems are more complex in high-density urban squatter settlements occupying the low-lying areas such as riverbanks, coastal areas and marshlands than those communities with low-density in rural areas (Navarro, 1994).

Poor sanitation, particularly in heavily populated areas, means exposure to an unpleasant environment and the risk of the spread of infectious diseases through: contact with water, entry into the food chain and breeding grounds for insects. Lack of sanitation can also threaten the ecological balance of the environment when other species come into contact with contaminated water (UNESCO, 2008).

Atolls and small island nations have unique needs in terms of sanitation. Some of the specific problems are related to small land area, fragile ground water systems, increasing population density, and lack of income to pay for improvements. Small islands up to 2000 km^2 may be of low elevation, with shallow ground water and population densities varying from very low to very high. Where the population is small there may be no need for any upgrading of sanitary arrangements. Traditional defecation practices such as using identified areas of bush or beach may be sufficient to ensure reasonable protection of health from communicable diseases. But populations are generally increasing in the Pacific and with this increase, the risk to health from inadequate sanitation is also increasing. This is particularly noticeable in the small atoll nations where urban drift has led to high population concentrations in such places as Funafuti in Tuvalu, South Tarawa in Kiribati, and Majuro and Ebeye in the Marshall Islands (Depledge, 1997).

Where the groundwater table is shallow, bacteriological and chemical quality quickly deteriorates as a result of poor excreta disposal in areas of population concentration such as villages. Lifuka in the Ha'apai Group of Tonga is an example of this contamination of ground water resources (Furness,1996).

In small ecologically sensitive islands, sanitation and safe waste disposal are inextricably linked with the question of water supply. As populations increase, so do problems of water supply and sewage disposal, if the limited freshwater supply, especially below coral islands, is not to be contaminated (Navarro, 1994). This type of contamination was the cause of cholera outbreak in urban Kiribati, a small island in the South Pacific, in 1977, and prompted the construction of toilets discharging into the open ocean (Marjoram, 1983).

The lack of sanitary means of disposing of human wastes, results in a high probability that inhabitants of coastal communities are prone to fecal-oral infections transmitted by the consumption of contaminated food and drink. The microorganisms that cause these infections are found in the excreta of infected people or animals from defecation in the open by livestock and by people who have no toilet (Sandy, 1990). This contaminated surface water can infect people through the contamination of their hands, their utensils, or their drinking water supply. Children are particularly exposed to infection when playing or bathing in the water (Navarro, 1994).

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