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Model for Community Environmental Health Literacy in Peatlands: Research & Development Study

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ABSTRACT

Environmental health literacy as a combination of the concepts of environmental literacy and health literacy to develop the skills and competencies needed to understand, evaluate, and seek and use environmental health information, reduce health risks, improve quality of life and protect the environment. The development of a model of environmental health literacy in communities on peatlands using research and development methods. Kcomponents of the environmental health literacy modelin communities on peatlands: (1) c*ompetencies* in environmental health, (2) knowledge about environmental health, especially peatlands and environmentally based diseases, (3) s*ocial consciousness* and responsible behavior for environmental health, (4) m*apping for social behavior* environmental health, (5) preventive care action on health and the environment and (6) the context of environmental health literacy includes health and environmental issues that are related to physical, personal, social, economic, cultural, religious, educational, political and environmental conditions as well as aims to protect the environment and improve the quality of life of people on peatlands.

1. Introduction

Preliminary

Literacy is a stage of social behavior, namely the individual's ability to read, interpret, and analyze the information and knowledge obtained so that they can participate more in society, both economically and socially. Literacy also serves to improve people's ability to read, write, count and seek useful information (Kern, 2000 and Yosal 2009). Currently, the search for information that is needed by the community, one of which is information about environmental health. Environmental health is an environmental condition that is able to sustain a dynamic ecological balance between humans and the environment to support the achievement of a healthy and happy quality of human life (KMI, 2013).

World Health Organization (WHO) states that environmental health is an ecological balance that must be possessed between humans and the environment in order to ensure a healthy condition by making it easier for people to access, understand, assess and apply the information obtained (KMI, 2011). Imai et al (2017) stated that to increase health literacy which aims to ensure a healthy condition, information is needed that is able to explain the relationship between social and health conditions. The concept of health literacy is the degree of a person's ability to obtain, process and understand basic health information and services needed to make decisions (Baker, 2006; Nutbeam, 2000). Health literacy has an important role in health, so this is the responsibility of all stakeholders.

To support the balance of life between humans and the environment, the concept of environmental literacy is also needed. Environmental literacy is complete knowledge about environmental issues, has empathy, is responsible for the environment, so that society plays an active role in finding solutions to environmental problems (Cortese, 2003). Cortese (2003) states that citizens who have knowledge, behavior and a sustainable lifestyle about the environment are able to create a good environment, meaning that each component of environmental literacy can influence each other. The combination of health literacy and environmental literacy creates environmental health literacy.

One of the important environmental issues in Indonesia today is the destruction of peatlands. This problem arises due to human behavior that has an impact on human life. Purnomo et al (2017) found that forest fires in 2015 covered 2.6 million hectares and in 2016 covered 49.2 million hectares, most of which occurred in the provinces of Riau, South Sumatra, Jambi, Central Kalimantan, West Kalimantan and Papua and 30% The fire is located on peatland. This has a much higher impact than mineral soils due to the density of the fire.

Bellamy (1997), Pantau peat (2017) and Uda et al (2017) state that peatland damage has a profound impact on the environment as evidenced by flooding in the downstream watershed and peatland fires caused by individuals and companies. If this issue is not resolved immediately, it will have an impact on decreasing biodiversity and human well-being. Uda et al (2017; 2018) stated that the negative impact of peatland destruction on human health is marked by

symptoms of mild poisoning, acute and chronic headaches, and even fainting. or death after prolonged exposure to high CO and SO2 concentrations, and decreased well-being. Exposure to CO and sulfur dioxide (SO2) emitted from peat fires has an effect on pulmonary dysfunction and respiratory symptoms (Uda et al. 2017 and 2018).

2. Research Question

Based on the description above, this research was conducted to develop a literacy model for environmental health in communities living in peatlands.

3. Literature Review

Gray (2018) defines environmental health literacy as a relatively new framework for conceptualizing how people understand and use information about potentially hazardous environmental exposures and their effects on health. Griswold (2012) found that Carson was the first to explain to policy makers and the public about the risks of chemicals to the environment and health, thus giving birth to a community that cares about the environment. Ramirez (2016) defines environmental health literacy as a concept that bridges several theories including communication theory, environmental health science, behavioral science, evaluation, public health, and social science.

Basically, environmental health literacy has been described as the ability to make a connection between environmental exposure and human health (Finn and O'Fallon; 2017). Integration of the concepts of environmental literacy and health literacy to develop skills and competencies for seeking, understanding, evaluating, and using environmental health information to make informed choices, reduce health risks, improve quality of life and protect the environment (Finn, S .; O 'Fallon; 2017, Ramirez; 2016 and Gray; 2018).

Gray (2018) grouped 3 levels of research on environmental health literacy. The first level, environmental health literacy at the individual level is described as: (a) understanding the relationship between environmental exposure and health, (b) representation of knowledge content, such as scores on surveys of environmental health knowledge or gains in knowledge content indicated by pre / post assessments, and (c) changes in behavior reported in response to environmental exposure. This level includes exploratory studies of the relationships that respondents make between environmental exposure and their health, with a study sample that includes students, patient populations, and community residents. Research at this level has been carried out by several researchers, namely: Barret et al (2014), Bogar et al (2017), Chan et al (2015),

The second level, environmental health literacy between individual and community levels appears in biomonitoring studies that emphasize reporting of changes in individuals and communities across all respondents. Research at this level focuses on developing tools for measuring environmental health literacy and using these tools to establish a baseline for literacy. Research for this level has been conducted by several researchers, namely: Dixon et al (2009), Ratnapradipa et al (2015), Brenner et al (2015), Cohen (2012), Ferguson et al

(2014), LePrevost et al (2014) , Miller et al (2016), Ramos, He & Ramos (2012) and Rosas et al (2014).

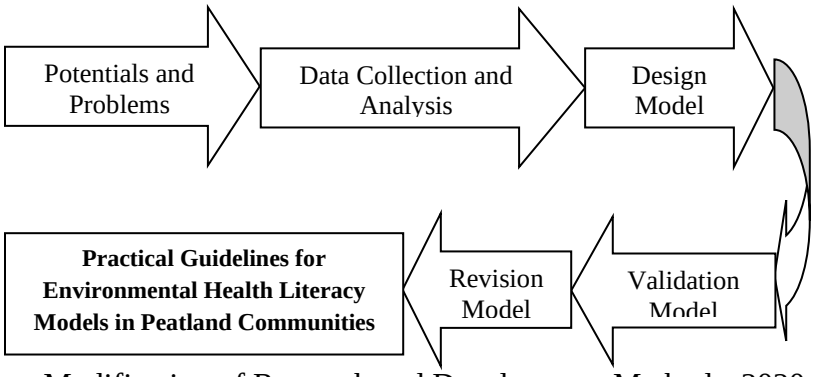
The third level, community level environmental health literacy is represented as community change or collective action reported in response to environmental exposure. This level includes research that focuses on changing individual behavior in response to environmental health education. Research for this level has been carried out by several researchers, namely: Butterfield et al (2011), Derrick, Miller & Andrews (2008), Korfmacher and Kuholski (2008), Mankikar, Campbell & Greenberg (2016), Paul et al (2015), Quandt et al (2013), Zierold, Sears & Brock (2016), Adams et al (2011), Brown et al (2012), Haynes et al (2016), Madrigal et al (2016), Ramirez et al (2015) and Ramirez et al (2016).

This research is a continuation of the model of Febria et al (2018) which focuses on environmental health literacy in sustainable peatland ecosystems. This modification was made to find a more comprehensive model of environmental health literacy in communities on peatlands.

4. Research Method

This study uses a qualitative method with a research and development approach. Borg and Gall argue that R&D is a process used to develop and validate educational products (Riadi and Retnawati, 2014).

Richey and Client (2007) also suggest that the R&D method is a systematic research, development and evaluation process with the aim of creating an empirical basis for creating products. Gay, Mills and Airasian (2009) say that the process of researching customer needs aims to develop products according to customer needs. The following is the research process using research and development, namely:



Source: Modification of Research and Development Methods, 2020

This research was conducted in Rokan Hilir Regency, namely the Bagan Sinembah Raya District area according to the criteria for the Peat Care Village and the Peat Restoration Agency. The object of this research is the community living in peatlands and stakeholders (Head of Sub-District, Village Head, Head of Community Health Center / Sanitarian, community / customary leaders). The selection of informants is based on considerations, namely having

knowledge or information, experience, expertise, positions in accordance with the field being studied and being in the location being studied.

5. Discussion

1. Community and Peatlands

The history of the Bagan Sinembah Timur community began in 1952 by the Malays who cleared forests to make villages. The clearing of the forest and the formation of the village was led by Mr. Syekh H. Abdul Wahid with his nickname students. The forest or land cleared is about 15 hectares. There is a belief that "this forest area can be opened for a settlement on the condition that it is not allowed to commit bad deeds and harm other people such as drunkenness, adultery, gambling and actions that violate Islamic law". If one of the community violates the terms agreed by Mr. Syeakh H. Abdul Wahid, then the forest guard (datuk tiger) will be angry as if he was pouncing on the community who violated these conditions. After the conditions were agreed upon, the forest was cut down and made into a village called "Kampung Baru" by Tuan Syeikh H. Abdul Wahid. After the formation of Kampung Baru, the community came to form the RT (Rukun Aboutga) which was under the Bagan Sinembah government of Kubu District, Bengkalis Regency in 1952.

Year	Change		
	Environment / landscape	Social and Cultural	Economy / livelihood
1952 - 1962	Forest forests, waterways (rivers), wild animals are still abundant and plants are still diverse	Land clearing, merkerabat / descendants, mutual cooperation / sabatan, entertaining (offerings, traditional prayers), nicknames (specifically for Islam) and rejecting Bala	Looking for fish, hunting, looking for rattan, houses made of bark and water sources from rivers
1962 - 1972	Forests, waterways (rivers) and wild animals are still abundant	Outsiders enter the village, buy and sell land to outsiders, work together and reject reinforcements	Looking for fish, breaking wages, hunting, looking for rattan, selling land and water sources from rivers
1972 - 1982	Planting oil palm, planting rubber, walking paths, less animals, less plants and less forests	Gotong royong, offerings, traditional prayers, nicknames and refuse reinforcements	Looking for fish, hunting, tapping rubber, manual labor in oil palm and rubber plantations and water sources from rivers and

Year	Change		
	Environment / landscape	**Social and Cultural**	**Economy / livelihood**
			dug wells
1982 - 1992	Planting oil palm and rubber, roads have been entered by cars, land forests are gone and animals and plants are reduced	Gotong royong, offerings, traditional prayers, nicknames, refuse reinforcements and outside communities increased	Looking for fish, hunting, tapping rubber, manual labor in oil palm and rubber plantations, water sources from rivers and dug wells, buying and selling of rubber and oil palm plantations and elementary school teachers have entered
1992 - 2002	The rubber plantation has been reduced to being replaced by oil palm plantations and Alan has entered a car but is still on a dirt road	Gotong royong, offerings, traditional prayers, nicknames, refuse reinforcements and immigrant communities increased	Looking for fish, hunting, manual labor in oil palm plantations, water sources from dug wells, buying and selling of palm oil and rubber, elementary school teachers have entered and are working on oil palm
2002 - 2012	The construction of canals for oil palm plantations, rubber plantations has been used up and the roads are still dirt and enter cars	Gotong royong, offerings, traditional prayers, refuse reinforcements and more and more immigrant communities	Looking for fish, hunting, manual labor in oil palm plantations, water sources from dug wells, buying and selling of oil palm, elementary school teachers and palm oil entrepreneurs
2012 - 2020	All palm oil, peatland management and roads are still dirt	Gotong royong, offerings, traditional prayers, refuse reinforcements and more and more immigrant communities	Looking for fish, hunting, manual labor in oil palm plantations, water sources from dug wells, buying and selling of oil palm, elementary school teachers and palm oil entrepreneurs, village officials and palawija farmers.

Source: Focus Group Discussion

Kepenghuluan Bagan Sinembah Timur is an area with a landscape of peat and scrub, the local people call it peat swamp forest and inland forest or jungle. The Kepenghuluan Bagan Sinembah Timur was previously dominated by rubber and forest timber plantations such as Kulim, Seminai, Rattan, and Mahang, but in the last twenty years it has shifted to being dominated by oil palm plantations. The community uses peatlands to become local community oil palm plantations as well as privately owned companies with extensive control. The construction of canals for oil palm planting is known as the 212 method, namely planting oil palms on peat land using the two rows of trees and 1 canal method and so on.

Peatland is land consisting of the remains of trees, grass, moss and dead animals, whether rotten or not. Peat soils in Kepenghuluan Bagan Sinembah Timur are generally used for oil palm plantations. However, part of the peatland area is still not managed (scrub) because the land conditions tend to be flooded during the rainy season. Peat soil in Kepenghuluan Bagan Sinembah Timur is immature peat soil (half ripe) which is characterized by the structure of the soil is still in the form of leaves and wood chips. The peat land area in Kepenghuluan Bagan Sinembah Timur is around 9,328.79 or about 89.92% of the area of the Kepenghuluan Bagan Sinembah Timur.

Peatlands in Kepenghuluan Bagan East Sinembah

Based on observations of peat soils in Kepenghuluan Bagan East Sinembah, the peat hemic maturity level is dark brown-black in color and a moderate or half-ripe level of weathering, some of the material has experienced weathering and partly in the form of fibers (Lynn et al, 1974). When squeezed by hand when it is wet, the peat passes through the fingers rather easily and the fiber content is left in the palms. The yield is between less than three-quarters and a quarter or more (≥ ¼ and <¾). In the figure, you can see that the peatlands are

experiencing weathering caused by oil palm plantations. Oil palm plantations always use poisonous pesticides, causing accelerated weathering of peatlands as evidenced by this artificial chemical process,

2. Development of an Environmental Health Literacy Model for Communities on Peatlands

Most of the peatlands have been used by the community or companies to become oil palm plantations. The nature of the oil palm tree is very damaging to the peatland ecosystem, as oil palm is a solitary tree and consumes a lot of water, which causes peatland destruction to accelerate. Information obtained from Informant A (Penghulu on Kepenghuluan Bagan East Sinembah) regarding the condition of peatlands is:

"For the area of peatland, the peatlands in Bagan Sinembah Timur are around 3000 ha. These peatlands belong to individual communities and companies, most of which have been planted with oil palm. Some of it has not been used or planted by the community ".

This information proves that peatlands have been used by communities and companies. This condition worsens the quality of peatlands as the lungs of the world, but communities and companies do not realize the damage they cause. Information obtained from informant B (Secretary of the Pengulu Kepenghuluan Bagan Sinembah Timur) regarding the community's unconsciousness on the condition of peatlands is:

"During the rainy season, floods are like the sea but when it is dry, it is dry like land. The condition of peatlands at this time there are still activities carried out by companies that damage the environment, especially peatlands, but the community does not question these activities, because on the one hand the community feels benefits without ever thinking about the impact of these activities in the future ".

This information proves that the community and companies are more concerned with economic benefits than preserving the peatlands. This happens because the community's knowledge of the benefits of peatlands is still very low. The low level of public awareness can be seen from information from informant C (Bagan Sinembah Timur community) as follows:

"We as a community keep planting oil palm because what we know is that oil palm is very promising. When there is peatland that has not been used, we turn it into oil palm plantations, because we don't know how to manage peatlands other than oil palm. The condition of the oil palm plantations is now flooded, but during the dry season, dry peatlands cause fire. We don't know that it has a bad effect on peatlands, but what can we do, palm oil is promising.

Apart from people's unconsciousness, another factor is the lack of knowledge of the community in utilizing peatlands without damaging them. These peatland fires often occur during the dry season and this has an impact on public health. The following is information obtained from informant D (Midwife Kepenghuluan Bagan Sinembah Timur) said:

"What causes the risk of contracting the disease here, bu, especially environmentally based diseases, is ARI, diarrhea caused by forest and land fires yesterday, for example, ma'am. The 2015 fires were very severe, almost the same as 2019, it seems that people who are exposed to this ISPA rarely go to the puskesmas or to me. Floods too, before this the flood was quite large as well, the effect of this flood, the people who were affected by the flood also experienced a lot of diarrhea and for those who were far from flooding, they could not go to their garden land.

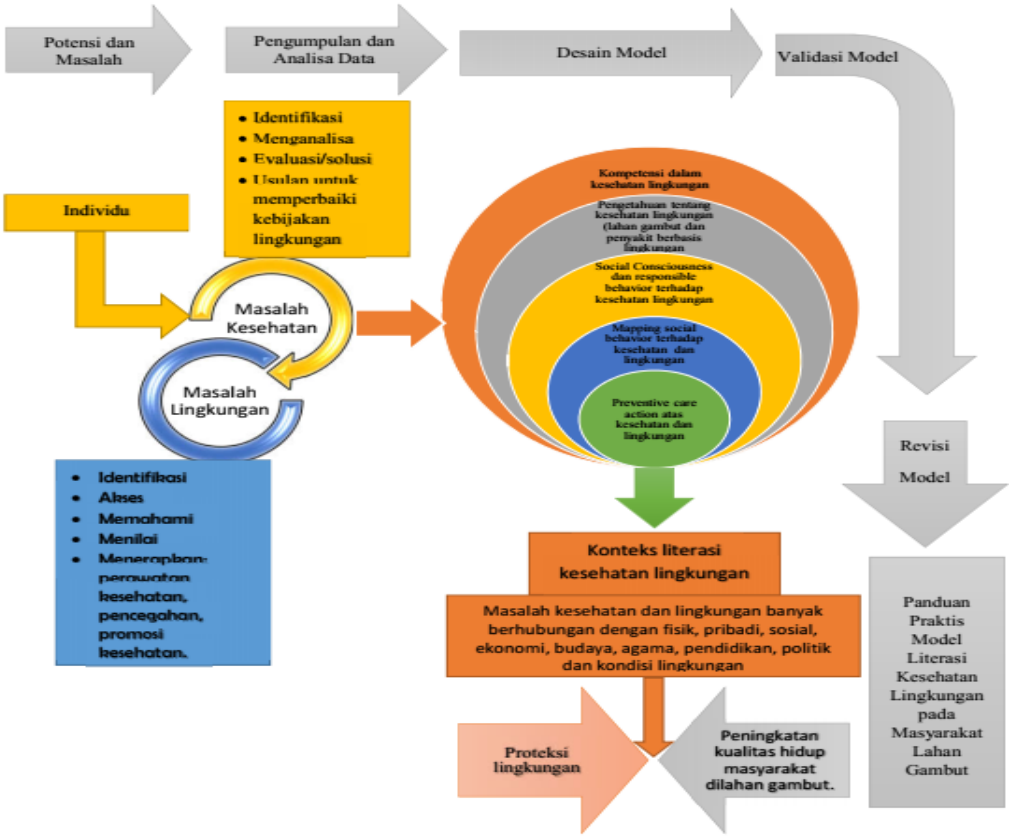
This condition has seriously worsened the health of residents, but community awareness has not yet appeared to coexist with peatlands. ARI as an environmentally-based disease is a disease that threatens residents every dry season. Lung dysfunction, acute headaches lead to fainting and death (Uda et al, 2017). From the above conditions, efforts are needed to increase public awareness and knowledge about the importance of peatlands and a high level of health. This is done through the development of an environmental health literacy model for communities on peatlands. The healthy behavior of the people on peatlands is also very bad. The following information was obtained from the residents (informant E):

We have been living here for more than 2 years and we have been using water on peatlands. Mother works here to help her husband's economy and lives here in this oil palm plantation. For bathing, we use this peat water, for defecating we use a hole for ourselves and then we fill it up. So every time we defecate, for cooking and drinking we buy gallons of water. This peat water is not itchy for mothers, only a small mother's child when it starts to itch and we are forced to take it to a general practitioner or a skin specialist until we take it to a dukun, maybe the mother's child is overslept

This condition is often found in communities around peatlands, but there is no socialization and education from related parties related to health. Environmental health has a PHBS program (clean and healthy lifestyle), this program is needed by this community. PHBS needed in this community is the use of latrines and bacteria that can neutralize feces produced by humans. To accelerate the destruction of human feces, several non-pathogenic microbial strains were used, including: Megatorium Sp., Azobacter Sp., Lactobacillus Sp., Nitrobacter, Yeast, Streptomyces, Actinomycetes, Subtillis sp, Micrococus Sp Ruminococus and Bacteroidessuccinogenes cellulose, sp. Other beneficial microorganisms in smaller numbers (Matsuura, 1998; Cho and Hahm, 2009; Hong et al, 2009, Hermadi and Warsito, 2020).

The development of an environmental health literacy model starts from determining the components that determine the success of a model. The following are components of the environmental health literacy model: (1) c*ompetencies* in environmental health includes (a) mhe identifies health and environmental issues in communities on peatlands, (b) mto analyze environmental health issues in communities on peatlands, (c) mevaluating environmental health issues in communities on peatlands, (d) mtake personal

and social decisions regarding environmental health issues in communities on peatlands and (e) mmake use of the knowledge and information obtained in resolving environmental health issues in communities on peatlands,(2) k*nowledge* concerning environmental health, especially peatlands and environmentally based diseases, include: (a) mhe knows the ecological system and the peatland ecosystem, the human health system, (b) mknow the social, economic, cultural, religious, educational and political systems of communities on peatlands, (c) mknow the environmental health issues in communities and peatlands, (d) mknow the preventive and protection measures for the environment and the quality of life of the community, (e) mhe knows the right solution in preventive and protection of the environment and the quality of life of the community, (f) ppublic participation and real action by researchers, government, companies, and the community in preventive and protection efforts for the environment and quality of life of the community, (3) s*ocial consciousness* and responsible behavior for health and the environment, (4) m*apping for social behavior* on health and the environment, (5) preventive care action (action of concern for preventive) for health and the environment and (6) the context of environmental health literacy includes health and environmental problems that are related to physical, personal, social, economic, cultural, religious, education, politics and environmental conditions and aims to protect the environment and improve the quality of life of people on peatlands.



Source: Environmental Health Literacy Model in Peatlands

Based on the above model, it can be concluded that environmental health literacy, especially peatlands and their communities, always develops dynamically and changes according to social and environmental changes. In its development, environmental health is classified as a multidisciplinary science that discusses the dynamics of interactive relationships between individuals, groups and communities with environmental changes that affect the quality of life of people (Hoover, 2020).

HL Blum's healthy living paradigm explains four factors that affect the health status of individuals or groups of people, namely behavioral or lifestyle factors, environmental factors (political, economic, social, cultural, physical, chemical, etc.), health service factors (type, coverage, completeness, quality, and so on), and genetic factors (heredity) (Ikhtiar; 2017). These factors all interact with each other dynamically affecting the health (well being) of individuals and communities. The most dominant factor is environment, followed by behavioral factors or life style. Environmental factors are considered to have a more dominant influence on public health than behavioral factors because these factors affect human health, for example in exploiting the environment (Ikhtiar; 2017). In line with environmental health, the interactive between individuals, groups and society with environmental changes affects the quality of people's lives and this is in accordance with the healthy living paradigm, so it can also be called the environmental health paradigm. To implement the environmental health paradigm, environmental health literacy is needed as a medium for understanding and analyzing information related to environmental health, especially communities on peatlands in order to achieve improved quality of life and environmental protection on peatlands.

6. Conclusion

The development of an environmental health literacy model starts from determining the components that determine the success of a model. The following components of the environmental health literacy model include c*ompetencies* in environmental health in communities on peatlands ,, *knowledge* regarding environmental health, especially peatlands and environmentally based diseases, *social consciousness* and responsible behavior for health and the environment ,, *mapping for social behavior*on health and the environment, preventive care actions on health and the environment and the context of environmental health literacy includes health and environmental issues that are related to physical, personal, social, economic, cultural, religious, educational, political and environmental conditions. and aims to protect the environment and improve the quality of life of people on peatlands.

In its development, environmental health is classified as a multidisciplinary science that discusses the dynamics of interactive relationships between individuals, groups and communities with environmental changes that affect the quality of people's lives. In line with environmental health, interactive between individuals, groups and communities with environmental changes affects the quality of people's lives and this is in accordance with the healthy living paradigm, so it can also be called the environmental health paradigm. To

implement the environmental health paradigm, environmental health literacy is needed as a medium for understanding and analyzing information related to environmental health, especially people living in peatlands in order to achieve improved quality of life and environmental protection on peatlands.

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