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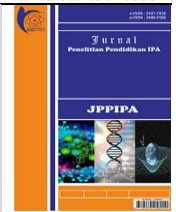
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Environmental Health Literacy and The Hope Tree Metaphor: Reflective Studies in Peatlands Communities

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Abstract: This research aim to develop the concept of EHL by reflecting the wish tree metaphor in supporting interactions between government, communities, companies, and agencies to achieve the vision of environmental health. This research used a qualitative methodology with a phenomenological perspective. The community, the penghulu, the village secretary, the village midwife, as well as businesses, professionals, and peatlands specialists served as the study's informants. The peatlands where the study is being conducted is in Indonesia's Riau Province's Rokan Hilir Regency. As a result of this research, it is hoped that stakeholders will become more knowledgeable about the detrimental effects of peatlands management and that they will be able to lessen the negative effects of poor community sanitation on peatlands, protecting the environment and lowering health risks. This metaphor of the wishing tree is said to be upbeat and holding on to improvements in the quality of life in the future. This research is a reflection study that results in a wish tree metaphor that expresses the desire that stakeholders would adopt EHL successfully.

Keywords: Communities; Environmental; Health Literacy; Peatlands; Tree Metaphor

Introduction

With a total size of 22.5 million hectares, Indonesia is one of the nations with the largest peatlands in the world. One of the key elements of the global carbon cycle is the peatlands (Wicaksono & Zainal, 2022; Widyatmanti et al., 2022). As much as 13 times their weight in water may be stored by peatlands (Nugrahany, 2022; Sitinjak et al., 2022). For the preservation of biodiversity and the comfort of the environment, peatlands are also necessary (Elia et al., 2021). However, in 2015, forest fires burned 2.6 million hectares of land, and in 2016, they burned 49.2 million hectares of land, the majority of which were peatlands in the province of Riau. The growth of oil palm plantations on peatlands is to blame for this. Compared to mineral fields, peatlands are substantially more affected by fires (Purnomo et al., 2017).

Peatlands fires result in significant damage and raise public health concerns, including high prevalence

of environmental illnesses such acute respiratory infection (ARI). In order to address environmental health issues in peatlands areas, the government, communities, businesses, and relevant agencies must work together (Febria et al., 2021). Although the government has made sincere attempts to create laws that are in accordance with customary law, trees have not yet been saved by these efforts (Mizuno et al., 2021). Understanding the link between environmental exposure and health is the first step in developing environmental health literacy (EHL). By merging core ideas and operational components from environmental health sciences (EHS), communication research, health literacy, risk communication, and safety culture, the development of EHL has taken a turn for the better (Finn & O'Fallon, 2017).

As a foundation for contemporary discoveries, the developmental path of EHL has been identified in a number of earlier research, including (Biocca, 2004; Chinn, 2011; Edwards et al., 2013; Hui et al., 2020). A

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summary of the development of EHL was also carried out by Gray (2018); Gray (2018) by grouping them into 3 categories, namely the individual level related to environmental exposure and health (Barrett et al., 2014; Bogar et al., 2017; Chan et al., 2015; Che et al., 2014; Cohen et al., 2016; Schure et al., 2013; White et al., 2014) at the second level at the individual and community levels where the development of an environmental health literacy measurement tool (Brenner et al., 2015; Dixon et al., 2009; Ferguson et al., 2014; LePrevost et al., 2014; Miller et al., 2016; Ramos et al., 2012; Ratnapradipa et al., 2015; Rosas et al., 2014) and at the third level is the community level by forming a community of action (Adams et al., 2011; Brown et al., 2012; Butterfield et al., 2011; Derrick et al., 2008; Emmett et al., 2009; Haynes et al., 2016; Korfmacher & Kuholski, 2008; Madrigal et al., 2016; Mankikar et al., 2016; Paul et al., 2015; Quandt et al., 2013; Ramirez-Andreotta et al., 2016; Zierold et al., 2016). Each of these subjects has contributed distinctive frameworks and viewpoints to the creation of EHL as independent subfields, and they all are expected to continue to influence EHL's growth.

Environmental health literacy is required to implement the environmental health paradigm and to understand and analyze information related to environmental health, particularly for people living on peatlands, in order to improve quality of life and protect the environment on peatlands. The preservation and enhancement of the wellbeing of human life derived from the environment is one of the tenets of environmental health (Febria et al., 2020). Environmental problems are global concerns, yet there are considerably fewer people than there are people who defend personal interests. As a result, environmental health literacy is necessary.

According to the growing body of literature on the subject, environmental health literacy is not just a stage in the educational process; rather, it is a philosophical viewpoint that includes a public health literacy policy and a number of educational tactics for teaching people and communities how to prevent environmental harm that compromises their health (Estacio, 2013). People's behavior in addressing environmental and health issues may be changed with the help of environmental health literacy. It will lead to improved health outcomes for people and communities, a better awareness of particular dangers, and less exposure (Finn & O'Fallon, 2017).

By developing self-competence, knowledge, social awareness, and caring action behavior for preventive actions from environmental exposures that threaten human health, an individual can improve their quality of life and protect the environment (Febria et al., 2020). The creation of EHL definitions, literature, guidelines,

and measurement methods shows how important EHL is to environmental health in the pursuit of a thriving society. The populations that reside on peatlands, which are the planet's lungs and must be prevented from being destroyed, are the subject of this study. Therefore, much hope is placed in efforts to raise awareness among all parties engaged in using peatlands for economic advantage. The purposes of this study is to examine the state of environmental health in peatlands communities and the development of the idea of EHL by reflecting on interactions between the government, communities, businesses, and agencies in order to realize the purpose of environmental health.

Method

The study was carried out in the Rokan Hilir Regency's Penghuluan Bagan Sinembah Timur, in the Bagan Sinembah Raya District. The community, headmasters, village secretaries, village midwives, businesses, peatland practitioners, and specialists were the informants employed in this research. Researchers employ a qualitative, phenomenological approach in their study. The phenomenological approach, in accordance with Creswell, is a research methodology that identifies the character of human experience with regard to a certain topic. The data analysis method employed here is a modification of Van Kaam's phenomenological analysis method and it involves grouping the initial data, reduction or elimination, grouping the data by theme, initial data validation, and construction.

The creative vision Bassett & Deveaux (2014) and environmental health research framework Pettibone et al. (2018) were modified to create the new vision by Febria et al. (2021). The goal of the new environmental health vision is to promote public health through interacting with the environment, society, and economy.

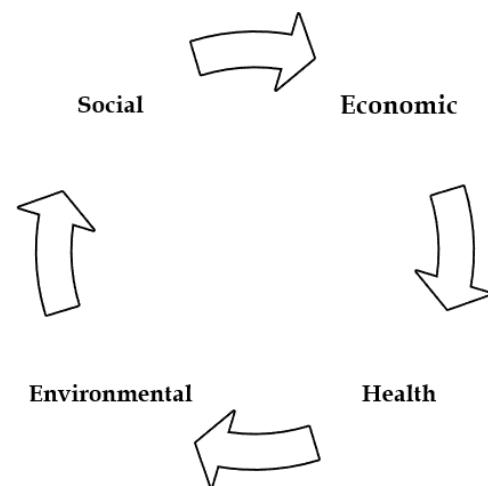


Figure 1. Health and Environment cycle

Environmental health is an interdisciplinary discipline that examines the interactions between people, communities, and organizations in connection to environmental changes that have an impact on people's quality of life (Febria et al., 2020). According to environmental health, a community's quality of life is influenced by how actively people, organizations, and communities respond to environmental changes. This adheres to the environmental health paradigm, a theory of healthy living. Environmental health literacy is required to comprehend and evaluate information linked to environmental health in order to adopt the environmental health paradigm (Febria et al., 2021).

Result and Discussion

Peatlands' environmental health conditions

Peatlands must be maintained responsibly to prevent harm and ensure that future generations can benefit from them. This implies that the management and usage of peatlands must take into account the effects on the environment and the general people. Handcock et al. (2004) underline that environmental harm and toxic effects are among the factors that enhance the dangers to the public's health. These factors may be addressed not only by using an icon to convey a message, but also by engaging the public in educational activities. Information technology is required to increase public health literacy. Persons with strong health literacy boost people's ability to maintain and enhance their health.

Environmental health literacy, also known as community skills and competences to comprehend, assess, seek for, and apply environmental health information, is necessary for enhancing people's quality of life and safeguarding the environment, claim Finn & O'Fallon (2017). People's knowledge of environmental exposures that are harmful to health is where environmental health literacy begins. According to the data collected, ARI, diarrhea, and skin disorders are the three environmental diseases present in Penghuluan Bagan Sinembah Timur. The following table shows the number of environmental illnesses in Penghuluan Bagan Sinembah Timur.

Table 1. Number of diseases caused by the environment in Kepenghuluan Bagan Sinembah Timur

Disease	Amount / Years	
	2019	2020
Inspection of the upper respiratory tract (ARI) ISPA	47	42
Diarrhea	26	32
Skin disease	7	4

The researchers discovered that ARI in Kepenghuluan Bagan Sinembah was high during peatland fires based on the data they had collected. This is in accordance with study by Sukana & Bisara (2015), which claims that the occurrence of ARI is brought on by smoke from peatland fires and negatively affects the health of the general population, particularly young children and the elderly. ISPA may be impacted by variations in temperature, humidity, rainfall, and environmental pollutants such as car exhaust and indoor air pollution.

Environmental illnesses pose a serious danger to the general public's health and are a leading cause of mortality. Pathological conditions, such as morphological and organ function abnormalities brought on by human interactions with the environment that have the potential to produce illness, can contribute to environmental-based disorders. According to Wijayanti & Widyastari (2018), in order to prevent environmental-based illnesses, the community must be aware of the need to maintain hygiene and good health. The state of affairs right now demonstrates that there is still a lack of public knowledge, which causes illnesses to spread and manifest swiftly. According to Emmett et al. (2009), an effective communication strategy generates solutions that may be used in society to raise people's knowledge and behavior.

Polluted environs in Penghuluan Bagan Sinembah Timur are the root cause of environmental ailments as ISPA, diarrhea, and skin conditions. Environmental diseases that consistently rank among the top 10 illnesses seen in medical facilities in Indonesia. There must be changes made to how peatlands are used and managed, which produces a lot of smoke. Severe fires have been burning in Indonesia's peatlands since 2015, commencing in Sumatra, Kalimantan, and Papua.

In addition to the effects of land fires, ISPA is also impacted by climate change, particularly in terms of temperature, humidity, rainfall, and indoor air pollution. To measure the humidity in people's homes or rooms on peatlands, the researchers utilized a hygrometer. Below are the findings of the humidity test.

2. Results of a room or home humidity check

Parameters						Result	Standards
	Units	House 1	House 2	House 3	House 4	House 5	
Humadity	%	66	69	73	66	86	45 - 65
Temperature							
Indoor	oC	31.6	32.3	31.2	32.3	28.7	29 - 32
Outdoor	oC	30.4	30.7	30.7	30.7	27.8	28 - 31

Table 2 demonstrates that the humidity of the five evaluated homes is more than 65%, indicating that the peatland community's living space is humid. Air humidity exceeding 65% encourages the rapid development of bacteria, fungus, mites, viruses, and mildew that may cause asthma attacks or shortness of breath. Conversely, if the humidity falls below 45%, the body will become more prone to illness as the mucous membranes, airways, and skin will become dry and itchy. The temperature test findings for the room (the living room) revealed a temperature of 29 OC -32.3 OC, although the outdoor temperature was 28 OC -30.7 OC, indicating that the peatlands' residents were living in pleasant, warm to hot circumstances.

Aside from shutting off access to roads, drowning people's homes, and harming local agricultural goods, improper management of peatlands may also result in catastrophic floods during the rainy season. Communities had resilience or strategies to be able to coexist with peatlands or make use of peatlands before large-scale land clearing for oil palm plantations. For instance, before clearing land by burning (maximum 2 Ha), small ditches that have been made in the vicinity of the field or land to be processed is known as Galang API. If the fire erupts from the ditch, the neighborhood will put it out with leaves that coexist or cooperate. Cooperation is essential for clearing land, as well as manageable portions (1-2 ha), so that land fires may be predicted accordingly.

The population continued to dig and cover trenches behind their homes and indiscriminately defecate beneath oil palm trees, according to the researchers, who discovered that the latrines used by individuals who lived on peatlands did not fulfill health requirements. Many ailments will be brought on by such practice. Inadequate toilet conditions will result in dirt contaminating the land and water during the rainy season, as well as animal excrement that has to be properly handled. Healthy latrines do not pollute the soil surface, groundwater, or surface water, are not less than 10 meters away from clean water sources, have a sturdy construction, do not serve as vector breeding grounds, and have closed final disposal channels.

The study's findings Ramirez-Andreotta et al. (2016) demonstrate that open defecation is a risky and unhealthy practice that makes it easier for illness to spread via flies, air, and water. People in the Kepenghuluan Bagan Sinembah Timur peatlands utilize peat water in ditches or canals close to communities as a source of clean water for bathing and washing in addition to open defecation. The table below shows the findings of evaluating the cleanliness of local clean water sources located on peatlands.

The clean water quality utilized by the community in peatlands is shown in Table 3. The water has a pH of 4, is brown, and cannot be used for bathing, cleaning, or cooking. According to the findings of the interviews, the peak period for diarrhea in Kepenghuluan Bagan Sinembah Timur occurs during the flood season. This is a result of untreated human and animal excrement contaminating the soil, which attracts a lot of flies. During floods, in addition to diarrhea, individuals frequently get skin ailments. This is due to the pure water they use for sanitation being contaminated by human and animal waste. People are used to believing that skin conditions and diarrhea would go away on their own without visiting a physician.

The researchers came to the conclusion that under these circumstances, community awareness, comprehension, and knowledge of the detrimental effects of peatland management may lessen the effects of inadequate sanitation. Therefore, in order to inform or educate people who live on peatlands so that they may preserve the environment and lower health risks, it needs the efforts of all parties, including health professionals, health educators, educators, and the administration of the Penghuluan Bagan Sinembah Timur. According to Ramirez-Andreotta et al. (2016), in order for individuals to grasp and assess environmental health information and raise each individual's knowledge of the danger of exposure, tackling the habit and practice of open defecation needs education. People with poor levels of education will have an impact on how the public understands health literacy, according to (Palumbo, 2016).

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Table 3. Findings from the Quality Check of Clean Water Sources

Sampling Place	Water Source for Sanitation	Maximum Used 6.5 – 9.0 (pH), Colorless and Odorless		
		pH	Colorless	Odorless
House 1	Dug wells are not protected	4	Brown	no
House 2	Protected dug wells	6	Clear	no
House 3	Protected dug wells	6	Yellow	no
House 4	Ditches/canals	4	Brown	no
House 5	Drilled well with electric pump	7	Clear	no

EHL reflections

Based on the aforementioned conclusions, the researcher develops a metaphorical symbol to represent the emerging new view of environmental (Febria et al., 2021). In order to depict actual reality using abstract notions, one uses metaphors, which are terms that strengthen certain parts of language, images or paintings, or caricatures that include analogies or similarities of anything, a notion communicated by a metaphor is special and has a code that is captured when the researcher observes the subject of their study and a related item.

The "Wishing Tree" metaphor is the one used by the researcher. The metaphorical "Tree of Hope" refers to a hope that researchers cling to in order to enhance the standard of living for those who live on peatlands. Long tree roots, dark trunks and branches, green leaves, and black scales that harm the Hope tree make up this "Hope Tree" parody. In order to deliver the message they wish to, researchers also employ color media as a messenger. Color is a nonverbal communication tool with a deep significance. Darkness and the lack of light are represented by the color black.

Black is often connected with negative traits. Thus, the dark hue of the roots, stems, and twigs symbolizes nature, which includes both the good and bad twists and turns of life, as well as the desire for a change in the quality of life in the direction of a better one. The resilience of peatland ecosystems, wealthy and thriving communities, and thriving settlements are also shown by the roots, stems, and branches of trees. Black beetles on plant roots symbolize the destruction of life's joints, pointing to poverty, disease epidemics, slum settlements, and harm to peatland ecosystems in the community.

The researcher offers four options for individuals to choose from that will result in a higher quality of life in the future based on the image above. The community continues to have little awareness and shows no change in behavior toward a better one, which is shown by the worst option, which is an image of a hope tree on the tree's root side and in black (less healthy). Black beetles and tree roots serve as an analogy for people's bad health and the environmental harm caused by floods and fires on peatlands, poor society, and squalid housing. The

failure of environmental health efforts is summed up in these four areas.



Figure 2. Hope Tree for Environmental Health Literacy

It is essential to raise public awareness and alter behavior if individuals desire to make changes for a better life. The leaves of the wishing tree in this image are described as being light green, dark green, dark blue, and turquoise. This expresses optimism and hope for improvements in living quality in the future. In the example, the community is predicted to experience improvements such as improved health, a sustainable peatland environment, prosperity, and healthy settlements (environmental, economics, social and health). The effectiveness of environmental health initiatives is summed up in these four factors. Four of them represent an actual EHL in some way stated as healthy society, sustainable peatlands, welfare society, and healthy settlement.

Conclusion

Stakeholders are required to be aware of the detrimental effects of peatland management, understand them, and be knowledgeable about how to reduce these effects. To safeguard the ecosystem and lower health hazards, all parties must inform or educate

the public about peatlands. It is essential to raise public awareness and alter behavior if individuals desire to make changes for a better life. The wishing tree in this image is shown as a symbol of optimism and hope for future improvements in life's quality. A high level of health, a sustainable peatland environment, a wealthy community, and healthy settlements are the changes that may be anticipated in the area. The effectiveness of an environmental health program, which is an example of EHL, is determined by these four factors.

Author Contributions

This paper was prepared by five authors, namely D.F, M.H, R.A, Y, dan D.U.S.A. This article was prepared jointly at each stage.

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Conflicts of Interest

The authors declare no conflict of interest.

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