

The Local Public Policy with Planetary Health using Executive Information System



Pichetwu Nillaor, Anirut Sriwichian, Jirapond Muangprathub

Abstract: Planetary health involves balancing the needs and sustaining the world in order to preserve the health and the well-being of humankind based on the environmental changes of the earth. To improve the foundation of human well-being, the local public policy was initiated for development. The developed process led to environmental improvements. Thus, providing the foundation for human well-being from local public policy to reduce environmental impacts. This paper proposed the decision for a support system and aims to study the local policies formulation process considering the planetary health at Makhantia Sub-District, Muang District, Suratthani Province, Thailand for local administrative organization chief executive decision making. This work leads to the tool, called PH-EIS system, of local planning support, decision making and management to achieve a balance between human needs and sustainable planetary health. The presented tool applies information technology with a web-based geographic information system to visualize data and to assist environmental monitoring before the real situation occurs by using the previous case learning. The implemented system was deployed in the policy formulation of local administrative organization. This work is tested by the developer and user groups and the result shows that the users are satisfied with the system and denotes the environmental impacts with high accuracy.

Keywords: Environmental, Information system, Monitoring, Public Policy

I. INTRODUCTION

Planetary health concept [1-4] is a new concept first presented by Rockefeller Foundation and The Lancet in 2015. It focuses on the interdependence between human health, animal health, and health of the environment. This concept tries to balance human needs and sustain the world in order to preserve the health and well-being of future generations [2,3]. To conduct planetary health we need to cooperate with sectors of all fields all over the world. To change minds and behaviors at every level from local to global to realize the importance of planetary health [4].

In Thailand, local administrative organization (LAOs) [5,6] is a public sector which is closest to the people and takes an important role in maintaining the quality of life and infrastructure development. In the past, the local development of LAOs still lacks awareness in environmental and health impacts. From the development projects of LAO [7], most projects do not study the environmental impact and health effects before policy decision making especially the development of the Sub-district Administrative Organization (SAO) which is the smallest LAO in Thailand and is spread over more than 5,000 locations [7]. It was found that most of the projects were conducted without environmental studies and health impacts assessment. These are major causes of the destruction of the environment and the ecology in local areas.

In the past 20 years, the development of the LAOs has influenced the changing landscape of the area extensively [6]. It is a turning point for local development. There are many development projects each year especially related to the development of infrastructures such as roads or buildings affected the change of the area and so on. The development of LAOs in the past has a direct and indirect impact on planetary health. Therefore, the people should be made aware of the knowledge and understanding about planetary health by those who have the authority to formulate policies of the local administrative organization. In order to make local developments in the future, environmental and health impact should be taken into account and consider planetary health mentioned in this research.

Makhantia Sub-district Administrative Organization (SAO), Thailand [8], does not conduct the environment and health impacts assessment the same way as the other LAOs across the country. The executive of the SAO does not have tools or systems to support decision-making. Especially, the decision about the environment and health impacts assessment. Although LAOs bring information technology applied to use in decision making of the executive of SAO in various dimensions, it is still limited to use in the large LAOs such as the Provincial Administrative Organization or municipalities [8]. To realize planetary health, the decision-making system for spatial development in Makhantia SAO does not seem to be concrete for the Executive of SAO. Thus, this paper applied information technology to visualize data and assist environmental monitoring before the real situation will happen by using the previous case learning. This paper contained the planetary health issues mentioned above and its importance of the health of the people and the sustainability of the resources and environment.

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Thus, the research team conducted research on Planetary Health-Executive Information System (PH-EIS system) for local administrative organization chief executive decision support by integrating social science and health science with information technology science to make the local development of the LAOs takes into account the planetary health and the quality of life of the people in the local area. This research is strongly related to the UN sustainable development goals or the SDGs and as a model for further development of another LAOs.

II. BACKGROUND

The planetary health [1-4] refers to the interconnections between the processes of environmental change and its impacts on human health, namely the activities involved in everyone's life. The planetary health is integrated with health impact assessment (HIA) [9] and environmental impact assessment (EIA) [10]. It focuses on the health of the world that affects the well-being of people while HIA address to the health of human from environment and EIA focuses on environmental care. The planetary health is different from the EIA and HIA in which both have clear rules with laws to support. If the health of the world is good, it affects the health of humans, EIA will be achieved as well. For this reason, many types of research attempt to integrate HIA and EIA to prevent negative impacts on the health of the world [11-14]. Moreover, many tools are developed to assist and facilitate the environmental impact that affects human health [14, 15]. Mostly, tools applicable to HIA and/or EIA are based on the paper process. Thus, it is limited to certain individuals. The information technology is one approach to assess environmental impact [16]. Practically, the geographic information system (GIS) was applied to visualize special data [17, 18]. Moreover, program computer was developed to assist HIA and EIA [19, 20]. Impact assessment is widely viewed such as province, city, and so on. Thus, this paper emphasizes to village level by using information technology. Web-based GIS is applied to assess environmental impact.

III. PH-EIS SYSTEM METHODOLOGY

The research methodology was divided into 3 phases i.e. background study, system development with the local public policy process, and system deployment in policy formulation of the local administrative organization (shown in Fig. 1). In the first phase, the researchers studied the background of special data such as community context, natural resources and environment, topography, and etc. This phase was studied as the base of the studied area in order to use the development tool in phase 2. Phase 2 was designed to apply information technology based on web and mobile application for local planning support, decision making and management to achieve a balance between human needs and sustainable planetary health. This phase considers and uses the process of local public policy as our PH-EIS system. Finally, phase 3 described the suitable local public policy and suggest to user from the PH-EIS system.

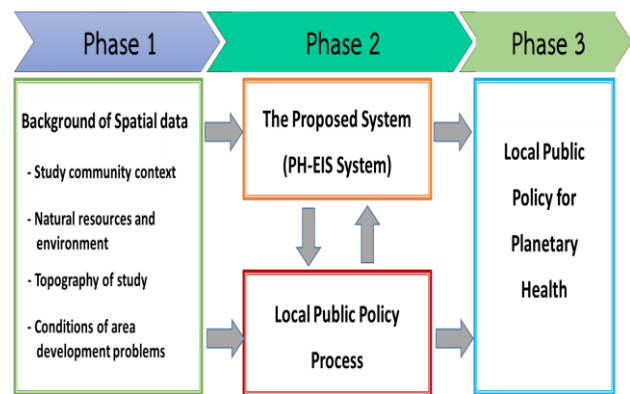


Fig. 1 The overview of PH-EIS system methodology

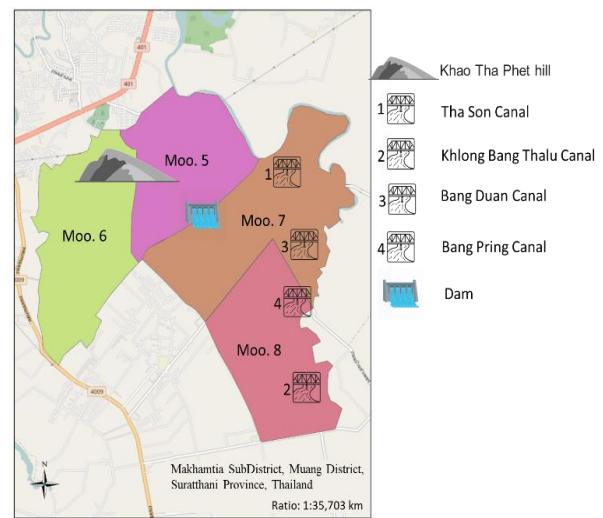


Fig. 2 The study area and its main natural environment on the map

Phase 1: The Background of Spatial Data

In the first phase, the researchers gained background of local structure, current situation, problems and obstacles of climate changes. The study area consisted of four villages (Moo 5, 6, 7, and 8) at Makhantia Sub District, Muang District, and Suratthani Province, Thailand shown in Fig. 2. This figure showed the study area and its main natural environment on the map. Moreover, this study collects the building data that may be affected by the natural environment led to the flooding problem. The data collection will be represented on the website to show an overview of the community context. This data was illustrated in Fig. 3, which consisted of the road, river, building, tax mapping, the boundary of the village, Google map view, and a satellite view.

From the background study of spatial data, it was found that the building infrastructure in the community has a part of environmental impact such as the road building effect on the resource and quality of life. From this study, the list of environmental impacts will be presented to the representative of the members of the community. The cooperation of the members of the community was the first phase to process our methodology.

The partnerships and stakeholders (eight local administrators' officer, seven local council members, and 40 local community representatives) brainstormed and discussed the problems and obstacles of climate change in the community. The groups focused on assessing environmental impact on their villages and what is required for a developed system mentioned next subsection. The summary of the discussion was made as to the system that supports planning, decision making and management of building infrastructure.

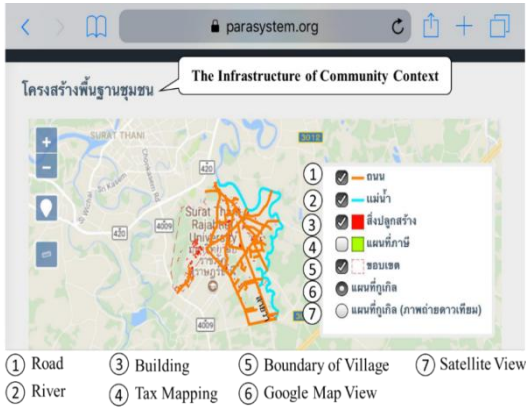


Fig. 3 The webpage for the infrastructure of the community context

Phase 2: PH-EIS system

The second phase was developed according to the software development life cycle from the requirements in phase 1. Web and mobile application is one of the best tools for information sharing and raising awareness about environmental changes. The information from the web and the internet can be easily accessible by everybody. This phase applied information technology with web-based GIS to support decision making. The system was designed for three user groups i.e. general users or people, local head officers, and administrators, which illustrated with interface structure design as Fig. 4

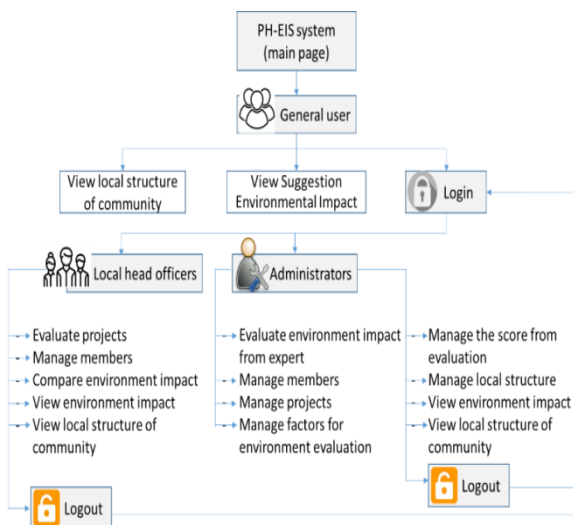


Fig. 4 The interface structure design for PH-EIS system

From Fig. 4, general users can view the local structure of the community that gives an overview of their village. Moreover, the user can get information about environmental impact when the new utility projects are created. They can

learn the results from creating infrastructure together. If the general users would like to get more details of the system in member status, they can require from local head officers or administrators. The member is the local administrators and local officers, local council members, and local people that are the representative person in the village to vote for new building infrastructure. Local head officers and member can join to assess the new utility projects whether the project has an impact on the environment or not. They evaluated the new project of building infrastructure and the system assessed the environmental impact. Thus, the local head officers compared the environmental impact of each project to make a decision through a web application or mobile application. They can add members and view to compare the results of the evaluation for the new project. The system will collect the evaluation results to suggest user for next time. The final user group is the administrators who prepared data management of infrastructure and environmental impact assessment. Administrators can add the environment impact information from the experts for the new utility project to use for the preliminary suggestion to local head officers and members. Moreover, the administrator can manage all information in the system.

Phase 3: Local Public Policy

The third phase developed the local public policy-making process that considers the planetary health. Fig. 5 shows the proposed model that address to planetary health for the local public policy-making process. The traditional process starts from the village community forum. The result is the requirements of the project for building infrastructure from each village. These projects will be discussed again in the next process to build because there are many projects but there is a limited budget for the building. Next step is the sub-district community forum. This step consists of the representatives of the people from each village who discuss their projects. Afterward, the selected projects will be added into the plan of year for sub-district community to make a local development next step. The plan of year for sub-district community will be considered again to permit for building in that year from voting of local council headers. The result is the policy implementation in new project form and then it is activated and monitoring in the final step. From the traditional process, it does not consider environmental impact. For example, road building is allowed without considering the impact. For this reason, the new model with planetary health is the key success to consider environmental impact in this research.

In the proposed model in Fig. 5, the traditional model is further improvised by using the PH-EIS system, which the processes are shown in block arrow. We start with data entry of community context from the village community forum into PH-EIS system. Next, the proposed system provides the data of environment impact assessment for community context in order to evaluate from an expert into the system through the website. The system will suggest to everyone in the sub-district community forum that can consider the projects together with the list of environmental impacts.

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The environmental impact will be reported from our system to the user.

Thus, the selected projects will be realized environment impact before they are added into a plan of year and building. Moreover, the system will illustrate an overview of all the effects of the proposed projects before making the decision to build infrastructure from each village. This is the first time for the local council to get the result of project impact assessment before decision-making. ssThese processes affect all local policymaker to consider with the planetary health and lead to the planetary health public policy.

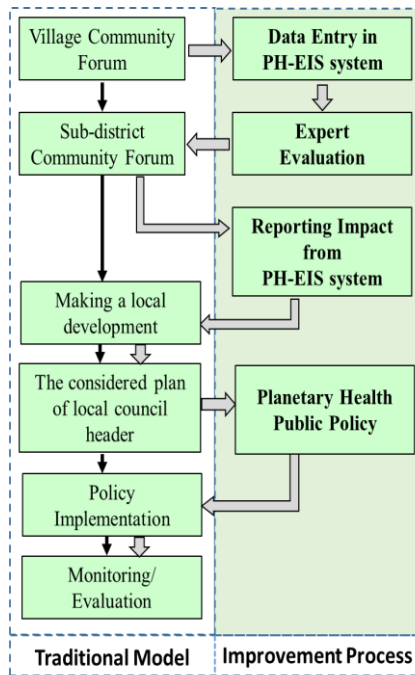
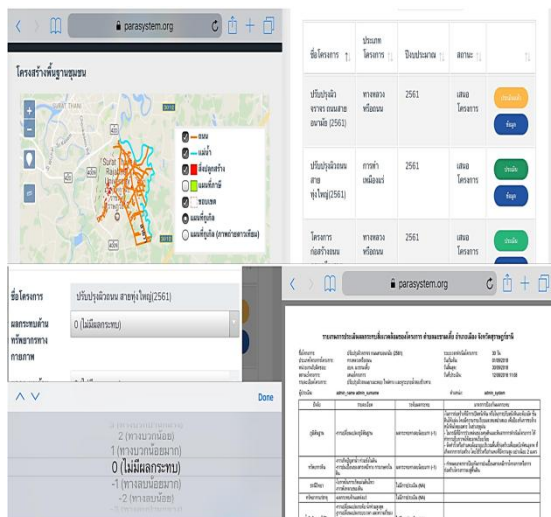


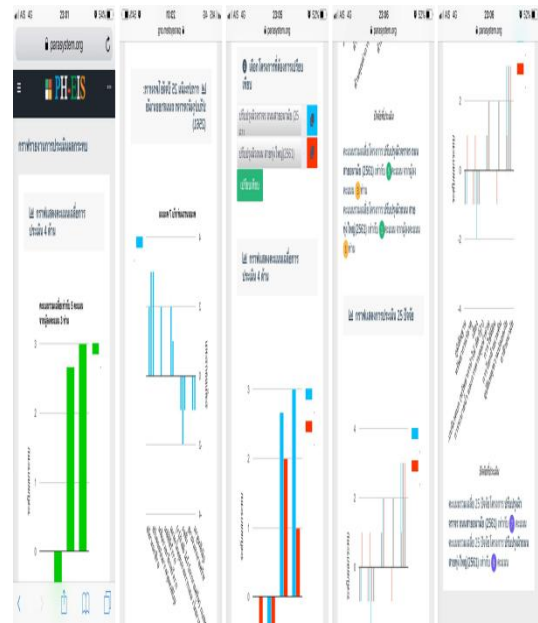
Fig. 5 The new model with planetary health for the local public policy-making process

IV. EXPERIMENT AND RESULTS

The proposed system was implemented as shown in Fig.6 (see for more details: <https://www.parasystem.org/PH-EIS/html/page/index.php>). This figure shows an example of a website and mobile application.



(a) Web-based application view



(b) Mobile-based application view

Fig. 6 An example website and mobile application of PH-EIS system

The developed system was implemented in four villages (Moo 5, 6, 7, and 8) in Makhantia Sub-District, Muang District, and Suratthani Province, Thailand. There are eight local administrative officers, seven local council members, and 40 local community representatives. The groups focused on assessing environmental impact on their villages and what requires a developed system. The experiment test by these user groups consists of two parts: the test by the developer and the test by the mentioned user. In the developer part, the result shows that the system can manipulate the local structure data, member data, project (new building) data, factors of environmental evaluation, and report in the score of evaluation for environmental impact. In user groups, this work uses the interview with focused group discussion. The result shows that they are satisfied and our system suggest the environmental impact on them with correctness. Moreover, this work uses a questionnaire to test the PH-EIS system. We found that the presented system is easy to use and presents information for environmental impact and local public policy. This research has transformed the people in the community to maintain planetary health policies of local administrative organization for the infrastructure development process and have a positive impact in the well-being of the local community.

V. CONCLUSIONS

The planetary health refers to the interconnections between the processes of environmental change and its impacts on human health especially the activities that is involved in everyone's life. To prevent environmental impact of human activities, cooperation among everybody is needed. The best way to prevent the impact is to monitor and join the community in creating something. Thus, this

research will present PH-EIS system generated from the cooperation of the members of the community.

This system applied information technology to assist environmental monitoring before the real situation occur by using the previous case learnings. The research methodology was divided into 3 phases i.e. study background, system development, and system deployment in policy formulation of local administrative organization. In the first phase, the researchers gained background of local structure, current situation, problems and obstacles of climate change. It was found that the building infrastructure in the community has a part of environmental impact such as the road building effect on the resource and quality of life. The second phase was developed according to the software development life cycle. This phase applied information technology with web-based GIS to support decision making. The system is designed for three user groups i.e. general users or people, local head officers, and administrators. The first group can see and search for the details of infrastructure and environmental impact assessment that occurred in their village. They can learn the results from creating infrastructure together. The second group is the local administrators and local officers, local council members, and local people that are the representative person in the village to vote for new building infrastructure. They evaluated the new project of building infrastructure and the system assessed the environmental impact. Thus, the local head officers compared the environmental impact of each project to make a decision through a web or mobile application. The final user group is the administrators who prepared data management of infrastructure and environmental impact assessment. The final phase is the system deployment in policy formulation of the local administrative organization by using the PH-EIS system. This work is tested by the developer and user groups. The result shows that the users are satisfied with the system that it can suggest the environmental impact on them with high accuracy.

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REFERENCES

1. Available at: https://en.wikipedia.org/wiki/Planetary_health#cite_note-Lancet2015-1
2. Nillaor P, Sriwichian A, Muangprathub J. (2018). PH-EIS System for Local Administrative Organization Chief Executive Decision Support. In Proceedings of the 4th ASIAEGAGE Regional Conference, 26-28 November, Chiang Mai, Thailand.
3. Horton R, Lo S. Planetary health: a new science for exceptional action. *The Lancet*. 2015 Nov 14;386(10007):1921-2.
4. Whitmee S, Haines A, Beyrer C, Boltz F, Capon AG, de Souza Dias BF, Ezech A, Frumkin H, Gong P, Head P, Horton R. Safeguarding human health in the Anthropogenic epoch: report of The Rockefeller Foundation–Lancet Commission on planetary health. *The Lancet*. 2015 Nov 14;386(10007):1973-2028.

5. Available at: https://en.wikipedia.org/wiki/Organization_of_the_government_of_Thailand
6. Kowitz P. Assessment of Local Administrative Organizations with Good Governance. *Social Science Asia*, Volume 3 Number 1, p : 30-40.
7. Available at: www.dla.go.th/en/index.jsp
8. Available at: <https://www.makhamtia.go.th/index.php>
9. Kemm J, Parry J, Palmer S, Palmer SR, editors. *Health impact assessment*. Oxford University Press; 2004.
10. Glasson J, Therivel R. *Introduction to environmental impact assessment*. Routledge; 2013 Sep 13.
11. Bhatia R, Wernham A. Integrating human health into environmental impact assessment: an unrealized opportunity for environmental health and justice. *Environmental Health Perspectives*. 2008 Apr 16;116(8):991-1000.
12. Noble BF, Bronson JE. Integrating human health into environmental impact assessment: case studies of Canada's northern mining resource sector. *The Arctic*. 2005 Dec 1:395-405.
13. [13] Briggs DJ. A framework for integrated environmental health impact assessment of systemic risks. *Environmental health*. 2008 Dec; 7(1):61.
14. Phayong T, Wattasit S, Sathirakorn P. Integrating Human Health into Environmental Impact Assessment: Review of Health Impact Assessment in Thailand. *Applied Environmental Research*. 2016 38(1) (2016): 61-73.
15. Hengpraprom S, Sithisarankul P. Developing tools for health impact assessment in environmental impact assessment in Thailand. *Acta Medica Okayama*. 2011 Apr 1;65(2):123-8.
16. Shrader-Frechette K. Science policy, ethics, and economic methodology: some problems of technology assessment and environmental impact analysis. *Springer Science & Business Media*; 2012 Dec 6.
17. Antunes P, Santos R, Jordao L. The application of Geographical Information Systems to determine environmental impact significance. *Environmental Impact Assessment Review*. 2001 Dec 1;21(6):511-35.
18. Maantay J. Mapping environmental injustices: pitfalls and potential of geographic information systems in assessing environmental health and equity. *Environmental health perspectives*. 2002 Apr;110(suppl 2):161-71.
19. Say NP, Yücel M, Yılmaz M. A computer-based system for environmental impact assessment (EIA) applications to energy power stations in Turkey: CEDINFO. *Energy Policy*. 2007 Dec 1;35(12):6395-401.
20. Hakansson A. An expert system for the environmental impact assessment method. *Institutionen för informations vetenskap*; 2004.