Original Research Article
Public Response of Ipilo Village to the Flood Education Model in GorontaloCity

ABSTRACT
The purpose of this research is: 1) to provide educating to the public regarding the causes of flooding in Gorontalo City, 2) provide public understanding of the causes of flooding in their area, 3) to find out the extent of the public's response to the type of soil in their area which is one of the causes of flooding.
The research method is in the form of educating the public in the IpiloVillage which often experiences flooding in Gorontalo City. Counseling was arranged with the distribution of questionnaires. This questionnaire is to see the extent of people's understanding of the influence of soil conditions and groundwater levels as a cause of flooding and inundation.
Counselingontechnicalmapsofsoiltypesreceived a positiveresponsefromthepeopleofIpiloVillage. Thiscounselingprovidesanunderstandingtothepublicthattheclaysoilisdominatesthe Ipilovillageisdifficulttowaterinfiltrationandisoneofthecausesoffloodingandinundation.

***Keywords**: educational model, flooding,public response,puddle, soil type*

INTRODUCTION
In overcoming the problem of flooding in an area, public participation is very important. The government cannot be left alone in dealing with flood problems. Communities must be given knowledge (education) regarding the condition of the soil in their area. Disaster education at the public level must indeed be used as an initial lesson in disaster mitigation. This can increase people's knowledge about natural disasters, especially floods so that people remain alert to flood disasters and know what actions to take. In Law Number 24th of 2007 concerning Disaster Prevention and Management it is emphasized that disaster management is not only focused on the emergency period, but also covers the period before and after the disaster. The law also stipulates that everyone has the right to education, training and disaster management skills, both in a situation where a disaster does not occur or in a situation where a disaster occurs. The essence of disaster mitigation education is a movement to increase awareness, understanding and increase public participation to understand the possibility of disaster (flood), thereby increasing awareness of disaster risk reduction collective awareness, early detection, strategies and predictive actions for people living in disaster-prone areas. so that they are safe and do not become victims. Conventional flood prevention efforts such as making infiltration wells and biopores which have been encouraged by several groups, need to be reviewed whether they are suitable for the soil conditions in the City of Gorontalo. One of the efforts that can be made is by providing knowledge and understanding through counseling and socialization on an ongoing basis, it can reduce the risk of flooding in areas that have been vulnerable to flooding.

THEORETICAL BASIS
Flood
Flood is a natural event where an area or area is submerged in water. This can be caused by increased rainfall, overflow of river water, high tides or obstruction of water flow in drainage channels. Lowlands and basins are also areas prone to flooding.Very heavy rainfall occurs quickly in the catchment areas, bringing more and more water into the hydrologic system. Sedimentation of riverbeds due to damage to land in the upstream watershed can exacerbate flood events. High tides can flood coastal areas, or seas can be pushed inland by windstorms. The mechanism of damage due to flooding is inundation and water flow with mechanical pressure, the water flows quickly. Moving or turbulent currents can topple and wash away people and animals in relatively shallow water depths. Debris carried by the water also damages and injures. The main mitigation strategies against flooding are, regulating land use and site planning to prevent potential flood plains from becoming places of vulnerable elements.

Puddle

Puddle is a condition when water collects in a place in large quantities due to the absence of a drain that drains water out of that place, on the other hand water does not seep into the ground. So, inundation is closely related to infiltration and drainage channels.

Inundation is defined as a collection of water that stops flowing in places that are not bodies of water. Inundation is suspected by some urban and environmental observers as one of the results of conflicts of interest and needs between humans and water.

These conflicts include conflicts between built spaces and green open spaces, conflicts between building spatial planning and water spatial planning, and conflicts between spatial planning and water resources management. The conflict between built-up space and green open space is that increasing built-up space causes a reduction in green open space, which in turn increases runoff and reduces water seeping into the ground to become groundwater.

Soil

Hardiyatmo (2019), said soil is a collection of minerals, organic matter, and relatively loose deposits, which are located on bedrock. The relatively weak bonds between grains can be caused by carbonates, organic matter or oxides precipitating between the particles. The space between the particles can contain water, air, or both.

Soil is formed from the weathering of rocks or geological processes. The formation of soil from its parent rock can be a physical or chemical process. If the results of weathering are still in place, it is called residual soil and if it has moved, it is called transported soil.

Granular Soil

Many soil grains precipitate in a suspended solution individually, independent of the other grains, in the form of a single composition, for example: sand, gravel, or several mixtures of sand and silt. The weight of the grains causes the grains to settle in water. Granular soil compositions may be either compact (low void ratio or high density) or dense (low void ratio or high density). Pore number depends on the grain size distribution, arrangement, and grain density.

Clay soil

Clay soil is greatly affected by water because its specific area becomes larger. Variations in water content will affect soil plasticity. The grain size distribution of clay is generally not a factor influencing soil behavior. Clay soil conditions are very difficult to pass water (impermeable).

Groundwater

Hardiyatmo (2019), states that groundwater is water that is found under the earth's surface. This water comes from rainwater that seeps down through the spaces (pores) between the soil grains. Water is very influential on the technical properties of soil, especially fine-grained soils. There are 3 important zones in the soil layer close to the earth's surface, namely: water-saturated zone, capillary zone, partially saturated zone.

In the saturated zone, water fills all the voids in the soil so that the soil is completely saturated. The upper limit of the saturated zone is the groundwater level or friates surface. Therefore, the water in this zone is called phreatic groundwater. At the groundwater table, the hydrostatic pressure is zero.

The capillary zone is located above the saturation zone. The thickness of this zone depends on the type of soil. As a result of capillary pressure, water experiences suction or negative pressure. The thickness of the capillary zone is affected by the size of the soil grains, where the finer the granules, the thicker the capillary zone.

The partially saturated zone at the top is the zone near the soil surface, where water is affected by evaporation due to sunlight and plant roots. This zone has a thickness that varies, depending on the type of soil and vegetation on it.

Permeability

Hardiyatmo (2019), states that the soil pores are connected to one another, so that air can flow from points with high energy to points with lower energy. In soil, the nature of water flow may be laminar or turbulent. Resistance to flow depends on the type of soil, grain size, grain shape, mass density, and the geometry of the pore cavity. Temperature also greatly affects flow resistance (viscosity and surface tension). Although in theory, all types of soil have pore cavities, in practice the term permeable soil refers to soils that actually have air-permeable properties. On the other hand, soil is called impermeable, if the soil has very little ability to transmit water.

Educational Model

Education or also known as education is any effort that is planned to influence other people, whether individuals, groups, or society so that they do what is expected by educational actors (Notoadmojo, 2003 in Priyanto, et al, 2018). Education or knowledge about disasters should be given to the public, both the general public and educated people such as students and university students. Because disaster victims don't look at their age, whether they're children, teenagers, or the elderly.

An educational model that can be applied to community groups through:

a. Brochures, as written information material regarding a problem that is arranged in a systematic manner. It consists of several printed pages and is folded without binding. Brochures are also a means of information used to convey promotions, advertisements, and others. In general, brochures can be interpreted as paper leaflets that contain brief, concise and complete information about news, products, educational institutions, and others.
b. Edugame, in the form of games with content in the form of disaster education which is more suitable among children.
c. Website, containing video content on disasters and their mitigation. It can be accessed by all groups, both the general public and children.
d. Poster, contains visualization of disaster and its mitigation. It can be accessed by all groups, both the general public and school children.
e. Counseling, providing understanding and knowledge about disasters and their mitigation. This educational model can bring subject informants closer to the community so that the things conveyed are easier to understand.

METHODOLOGY

The research was conducted in Ipilo Village Kota Timur District Gorontalo City. The work program carried out in this research covers all stages of the research process starting from data collection both primary and secondary data to making maps. This map consists of the distribution of soil types and groundwater levels in the Ipilo Village. This soil type data is then analyzed and a map is made. Maps are analyzed using the Geographic Information System (GIS) application version 10.4.1 in 2015. This map contains information on the type of soil that causes flooding. Furthermore, the educational model is in the form of counseling in the form of posters and brochures to the public so that the community can participate in tackling floods in their respective areas.

The stages in research and development (R&D) consist of 5 stages, namely: (1) Preliminary Investigation; (2) Design; (3) Products; (4) Test, evaluation, and revision; and (5) Implementation.

RESULTS AND DISCUSSION

Result

The initial investigative phase was carried out by analyzing needs through collecting information on: soil type, ground water level, and regional geological conditions in 9 Villages in Gorontalo City. Data from the initial investigation results were obtained through literature studies, direct observation in the field.

Soil Type

Gorontalo City is dominantly located in the lake sediment formation which unconformity overlaps older rock formations in the Gorontalo area. In detail, the types of soil in each district are shown in Figure 1, Figure 2 and Table 1 below.

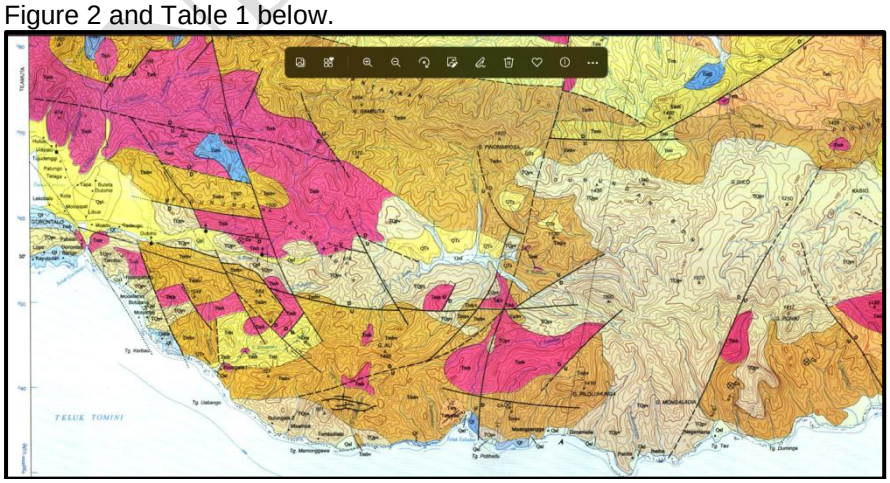

Figure1. Geological Map of the City of Gorontalo and its Surroundings

(Apandi and Bachri, 1997)

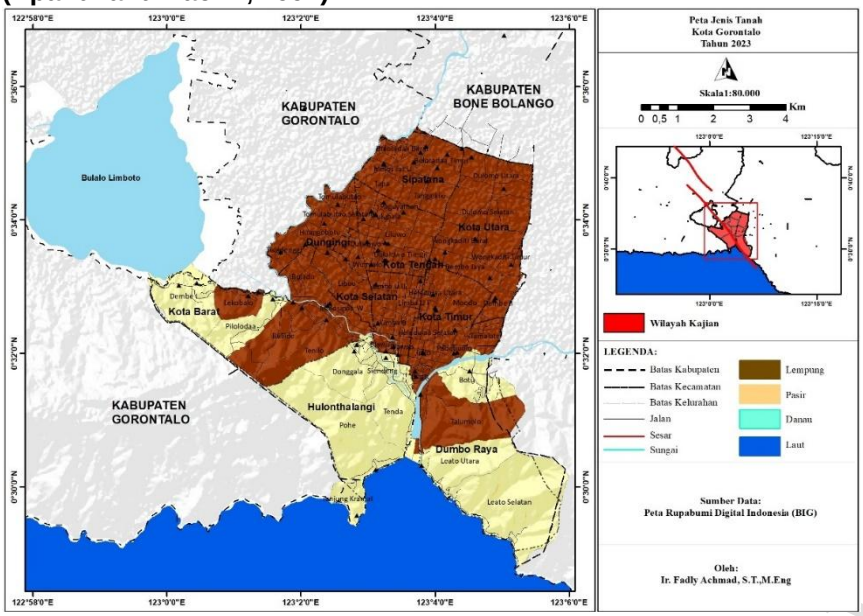

Figure 2. Soil Type Technical Map of Gorontalo City

Table 1. Soil Type in Gorontalo City

No.	District	Soil Type
	Kota Utara	Clay
	Kota Selatan	Clay
	Kota Tengah	Clay
	Kota Timur	Clay
	Kota Barat	Sandy, limestoneand partially clayey
	Sipatana	Clay
	Dumbo Raya	Sand, partially clayey
	Hulonthalangi	Sand
	Dungingi	Clay

Based on Figure 1 and Table 1, it can be seen that the dominant clay soil is spread over 6 Villages, namely Kota Selatan, Kota Tengah, Kota Utara, Kota Timur, Dungingi and Sipatana. Some of them are located in Kota Barat and Dumbo Raya Districts. Meanwhile, in Hulonthalangi District, it is more dominated by sandy soil. Soil in Gorontalo City is generally impermeable (watertight) so it is difficult for rainwater to impregnate. This is one of the causes of inundation in parts of Gorontalo City.

Educational model

Public counseling was conducted in Ipilo Village, Kota Timur District, Gorontalo City in the hall of the village head's office involving 16 respondents.This activity was attended directly by the Lurah, Babinsa, Bhabinkamtibmas, RT heads, RW heads, the public and village staff. After the counseling was carried out, the researchers circulated questionnaires with the aim of measuring the public's response to the material presented.

Public Response

The results of the analysis of the response of the Ipilo Village public to the technical map of soil types in the flood area are shown in Table 2 and Figure 3 below.

Table2. Public Responsein Ipilo Village

Num	Question	TS	KS	S	SS	Tot
		(%)				
1	We have benefited from the brochures and technical maps of the types of soil that cause flooding in Gorontalo City	0,00	6,25	12,50	81,25	100,00

2	Easy-to-understand brochures and technical maps of soil types that cause flooding in Gorontalo City	0,00	0,00	31,25	68,75	100,00
3	The brochure and technical map of the types of soil that cause flooding in Gorontalo City met our expectations	0,00	6,25	25,00	68,75	100,00
4	Brochures and technical maps of soil types that cause flooding in Gorontalo City have a clear database.	0,00	0,00	43,75	56,25	100,00
5	Brochures and technical maps of soil types that cause flooding in Gorontalo City are well organized	0,00	6,25	43,75	50,00	100,00
6	Brochures and technical maps of soil types that cause flooding in Gorontalo City can be accounted for	0,00	0,00	43,75	56,25	100,00
7	Brochures and technical maps of soil types that cause flooding in Gorontalo City have innovative value	0,00	6,25	6,25	87,50	100,00
Average		0,00	3,13	34,38	62,50	100,00

Information:
SS : Strongly agree
S : Agree
KS : Disagree
TS : Don't Agree

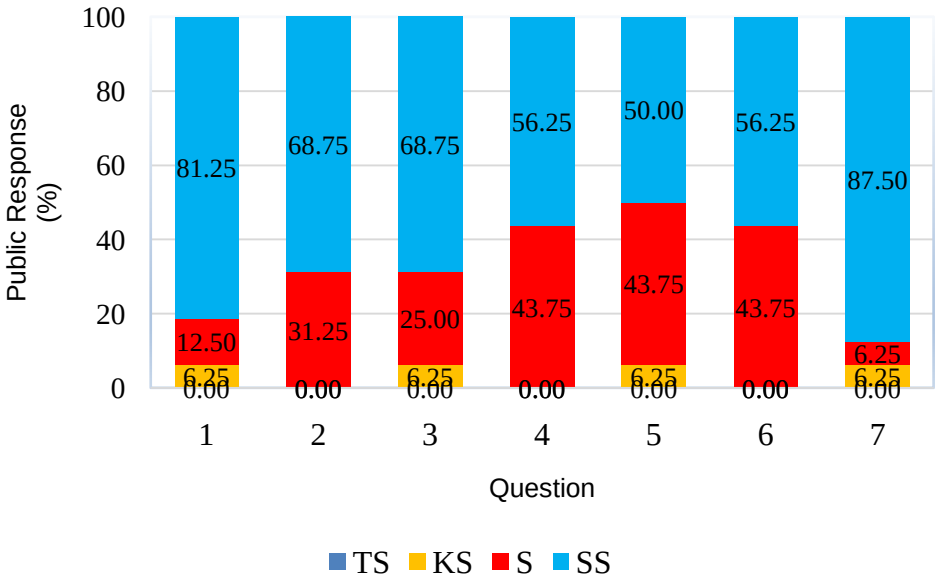

Figure 3.Public Responsein Ipilo Village

Based on Table 2 it is shown that:

a. As many as 93.75% of the people of Ipilo Village have benefited from brochures and technical maps of soil types that cause flooding in Gorontalo City.
b. As much as 100% of the people of Ipilo Village stated that the brochures and technical maps of the types of soil that cause flooding in Gorontalo City are easy to understand.
c. As much as 93.75% of the people of Ipilo Village stated that the brochures and technical maps of the types of soil that cause flooding in Gorontalo City met the expectations of the public.

d. As much as 100% of the people of Ipilo Village stated that the brochures and technical maps of soil types that cause flooding in Gorontalo City have a clear database.
e. As many as 93.75% of the people of Ipilo Village stated that the brochures and technical maps of soil types that cause flooding in Gorontalo City were well organized.
f. As much as 100% of the people of Ipilo Village stated that the brochures and technical maps of the types of soil that cause flooding in Gorontalo City can be accounted for.
g. As many as 93.75% of the people of Ipilo Village stated that brochures and technical maps of soil types that cause flooding in Gorontalo City have innovative value.

DISCUSSION

With the extension of the technical map of soil types, on average the participants realized that the City of Gorontalo is dominated by clay with a relatively shallow groundwater level and is one of the causes of flooding and inundation in their area. The application of the educational model can increase the activeness and participation of the public independently in solving problems that cause flooding and inundation in their respective areas. Public activities during the counseling took place were shown by the many questions asked about the condition of the soil and the causes of flooding. The public's response and response to the educational model was very positive.The public education model through technical mapping of soil types in flooded areas in Gorontalo City is an alternative extension model that can be applied in the public.

CONCLUSION

Counselingontechnicalmapsofsoiltypesreceived a positiveresponsefromthepeopleofIpiloVillage. Thiscounselingprovidesanunderstandingtothepublicthattheclaysoilisdominatestheipilovillageisdifficult towaterinfiltrationandisoneofthecausesoffloodingandinundation.

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