Mitigation Disaster at Drainage Basin of Air Dingin Padang City

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Available Online undefined NaN.

Keywords

Mitigation, Rainfall, Morphometri, Evacuation

Abstract

DAS (Drainage Basin) Air Dingin located in Koto Tangah Padang City. DAS Air Dingin come from some small river in upstream. Meeting from some small river reside in the area of Lubuk Minturun. DAS Air Dingin own the height until 1.800 m above water sea level and have the rain pattern which high relative. Floods represent one of event which is often happened by the effect of farm closing upriver decrease, also the effect of sedimentation and topography. Floods that happened in the year 2007 resulting collaps embank in both sides of river of effect charge the water exceed the boundary accomodate river. From analysis morphometri wide of DAS 130,70 km2, long river 19.87 km. ramp 25 - 45% be at 96.05km2 (74% DAS). Daily rainfall 240 mm. From study morphometri result the DAS inclusive of floods and sedimentation. Effect of durability of bevel and rainfall happened by floods in area downstream that is area Bungo Pasang and Pasie Nan Tigo. Planned by four (4) location evakuasi in the map for the Bungo Pasang which be at the distance 100 - 200 m and also three (3) location evakuasi for the Pasie nan Tigo with the distance 100 m from DAS downstream

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Proceedings

International Conference on Maritime and Archipelago (ICoMA 2018)

Publication Date

undefined NaN

ISBN

978-94-6252-785-0

Cite this article

risenwbib

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TY  - CONF

AU  - Lusi, Utama

AU  - Amrizal Saidi

AU  - Isril Berd

AU  - Zuherna Mizwar

PY  - NaN/NaN

DA  - NaN/NaN

TI  - Mitigation Disaster at Drainage Basin of Air Dingin Padang City

BT  - International Conference on Maritime and Archipelago (ICoMA 2018)

PB  - Atlantis Press

UR  - https://www.atlantis-press.com/article/125917277

ID  - UtamaNaN/NaN

ER  -
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International Conference of Vocational Studies on Applied Research (ICoVAR)
as a Presenter
Soll Marina, 13-15 September 2018,
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Keywords: Mitigasi, Rainfall, Morphometri, Evakuasi

I. INTRODUCTION

Floods represent one of phenomenon which is always happened. With the accretion sum up the resident which fast to progressively bring the impact to make-up of requirement of farm and request of accomplishment of service requirement will town which can affect downhill it environmental quality like environmental degradasi and natural disaster.

Aprizon Putra (2012) expressing in its research at catchment Air Dingin that change of farm use from farm vegetasi to non vegetasi result the level of run off so that charge to become to mount especially at the rains.

Morphometri Air Dingin evaluated from topography with the big inclination from 40% in pate, upstream shares cause easy to is it happened by the floods. Is hence suggested that by resident of not to pass on new farm . Floods that happened at date of 26 March 2016, causing building Plunge by damage Koto Pulai totalize with the condition dance the downstream experience of the big enough building wing collapse, and bank of river like experience of slide.This floods is caused by a rainfall height. Effect of building failure plunged by DAS Air Dingin is often happened by the floods. The selecting of drainage basin cause this DAS represent the areal of protected forest used by resident as areal plantation, mining, and seen activity of illegal logging openly and also change of farm use which can menace the existence of function hidrologis needed by society. DAS area 130,70 km². and length of DAS 19,87 km.

The upper area at Bukit Tampurung Gadang at elevation + 1.811 m from face the sea and Bukit Lantik elevation 1.625 m at the Koto Tangah area, downstream Batu Gadang at elevation 120 m until Muara Penjalinan. Width river average 43 m.

1. Community Participation

Community participation is a technical process to provide wider opportunities and authority to the community, so that the community is able to solve various problems together. This division of authority is based on the level of community participation in these activities. Community participation (local wisdom), (Qiuling Yao, 2016) aims to find solutions to problems better in a community, by opening up more opportunities for the community to contribute so that the implementation of activities runs more effectively, efficiently and sustainably.

2. Breaking the flood with Physical approach

Physical breakdown can be in the form of: drainage channels (Pawitan, 2014), pumping stations, water reservoirs, construction of river embankments, and drainage. But physical development should consider: no

environmental damage and costs needed both during construction and maintenance of very large buildings.

3. Solving floods with a non physical approach

(Linsley, 1982), Non-physical / non-structural flood mitigation can be in the form of: spatial planning (land use regulation) due to land conversion into urban areas, intensive and continuous counseling involving the community, NGOs. Make flood plain zoning, which is a zoning-zoning arrangement of space use that is differentiated according to the level of vulnerability and threat level due to flooding. So flood plain zoning is a fairly effective instrument to avoid the occurrence of delays in areas that have not been built to halt the occurrence of land use changes according to Law No. 25/2007 on Spatial Planning and Law No.7 / 2004. concerning Water Resources

4. Characteristics of Latosol soil

Because most areas of the Air Dingin (Asdak, 2010), (Rahayu, 2009) consist of latosols, the properties of this land are: Latosol soil is also called inceptisol soil. This soil has a layer of soil solum that is thick to very thick, which is from 130 cm to 5 meters or more, while the boundary between the horizons is not very clear. The color of the land of latosol is red, brown to yellowish. The content of organic ingredients ranges from 3-9% but usually around 5%. Soil reactions range from, pH 4.5 to 6.5, from acid to mildly acidic. The texture of the entire soil solum is generally clay, while the structure is weak with consistency is loose. The color can be seen from the color, the more red is usually the poorer. In general, this nutrient content from low to moderate. It's easy to get a little difficult to seep water, so the infiltration and percolation from rather fast to rather slow, the water holding power is good enough and somewhat resistant to erosion. This resulted in easy flooding.

5. Remote Sensing

(Calder, 1999), Remote sensing technique is a way to obtain or collect information about objects on the basis of measurements carried out at a certain distance from the object or event without touching or making direct physical contact with the object being observed. Information obtained in the form of electromagnetic wave radiation that comes from an object on the surface of the earth, both emitted and reflected by the object which is then received by the sensor. This sensor can be a camera or other electronic equipment.

Image interpretation is the act of studying aerial photographs or images with the intention of identifying objects and assessing the importance of the object. Need to recognize objects that are reflected in the image. There are three sets of activities needed, namely detection, identification and analysis. Detection is the observation of the existence of an object, identification is an attempt to characterize an object that has been detected by using sufficient information, while the analysis is the stage of collecting more information.

Image interpretation can be done visually and digitally (Soemantri, 2009).

Visual interpretation is done on hardcopy images or those displayed on a computer monitor. Visual interpretation is a visual activity to examine the image of the face of the earth that is reflected in the image for the purpose of identifying objects and assessing their meaning. Elements in interpretation namely.

1. Form: is the configuration or framework of an object. This form of object characterizes so that its image can be identified directly based solely on these criteria.

2. Object size: considered in relation to the scale of aerial photography.

3. Pattern: Spatial relations of objects. Repetition of certain general forms or patterns of relationships is characteristic of many natural and building objects and will provide a pattern that facilitates the interpreter to identify the pattern.

4. Shadows: The shape or frame of the shadow can provide a profile picture of an object and object under the shadow can only reflect a little light and is difficult to observe in photos.

5.Rona: is the color or relative brightness of an object in a photo.

6. Text: The frequency of hue changes in photographic images.

7. Site: Location of an object in relation to another object. (Liliesand and Kiefer, 1997)

The interpretation of digital imagery is the activity of examining the image of the earth by using software to interpret satellite imagery such as Erdas Imagine or Quantum ArcGIS.

II. Materials and Method

Using a map image and map study of vulnerability to flooding along the Air Dingin, program ARGIS x. 1 and Watershed Modelling System (WMS) , is expected to come by the evacuation line and place the temporary shelter. A temporary shelter was planned in areas closer to the location of the floods, but have height, so that people can be evacuated.

III. Results and Discussions

. Efforts to Overcome Floods

To overcome the problem of flooding can be done by carrying out various physical activities, namely building flood control facilities and infrastructure and or modifying the natural conditions of the river to form a flood control system (in-stream). And the non-implementation activities are still limited. In some countries the structure of efforts has been combined with non-physical / non-structural (off-

stream) efforts so as to form a comprehensive and integrated handling system as shown in table 1 as follows:

Table 1. Flood Mitigation

Physical Activity	Non-physical activity
Normalization of rivers	1. Making dikes Management of floodplains
Make a reservoir	2. Spatial planning and engineering in the upstream watershed
Make drainage	3.Flood fighting to reduce the magnitude of the disaster and deal with it in an emergency
	4. Flood proofing carried out by yourself
	5. Community roles supported by law enforcement
	6. Determination of river boundaries
	7. Community education and education

From physical activity table 1 is expected as follows:
1. Construction of flood dikes to prevent flooding of flood water to a certain level / extent of flooding. With the embankment built a cross section of the river is formed to drain the planned flood discharge
2. Normalization, line, serves to lower the flood water level of the river.
3. Construction of reservoirs and or flood retention, which serves to minimize flood discharge.
4. Construction of a drainage system to reduce the area and height of inundation.

Each type of physical infrastructure mentioned above can stand alone or be combined with one another so as to form a unified flood control system. The conditions and problems in each river are always different or not the same, so the determination of the optimal flood control system in each river must go through a comprehensive study by comparing several alternatives. The system is designed based on the amount of certain flood discharge which is usually based on the return period of floods, for example for 5 annual floods, 10 years, 25 years, 50 years and 100 years according to the feasibility schedule, and not for the largest flood discharge.

From non-physical activities table 1 is expected as follows:
1. Management of floodplains in the form of spatial planning and engineering on floodplains that are regulated and adapted in such a way that the disasters that arise when flooded are as small as possible. Engineering in the form of buildings includes: stage houses, flats, flyovers, concrete pavement roads, home / multi buildings, and so on. The software required includes signs or warning boards installed on the floodplain
2. Spatial planning and engineering with consideration may be set as a cultivation area, so that land cultivation does not damage the watershed conditions.

B. Community Participation
Community cooperation with the government in an effort to reduce the risk of flooding is:
1. Adjust the slope of the river in the Air Dingin Watershed to facilitate the flow of river water (planned flow velocity of 1.50 m / sec)
2. Putting in place land use a minimum of 20% (Yuwono, S.B, 2011), of green land for infiltration can reduce flooding
3. Regulate the use of river borders by making rules that do not allow building in the border area of the river (banks), at least not allowing to build 100 meters from the river lip
4. Obtain evacuation routes and shelter shelters by using earth map Citra data which is analyzed using *quantum ARGIS X*

C.High of pond
R = rainfall = 250,8 mm Wide area catchment (A) = 130,70 km2 Inclination of River = S = 0,09
Speed of stream (V) = 6,46 km / hour Concentration time (t) = 3,07 hour Rain intensity (I) = 81,69 mm / hour. River Bar debit of Air Dingin by using rational formula: Q = 0,278 C I A
From analysis: debit of Air Dingin Q = 2077,72 m3 / second wide mean 43 m, Bar depth of water of Air Dingin = 2.2 m. Characteristic downstream in form of trapezium of A = (b + h) h x1/2
Angle inclination of river = 450. P = circle wetly = b + 2hV2 R = A / P
S = inclination of bar mean of Air Dingin = 0,05. For the debit of Q = 2077,72 m^3 / second, hence value of y = 1,60 metre, deepness of river mean = 2.20 metre, hence not happened floods middle area and Bar downstream of Air Dingin. But low effect of depth of water him, speed of water Bar of Air Dingin become to lower, so that happened sedimentation process.

D. Map of Evacuation
By using image Citra map scale 1:5.000, map of DEM and map tematik. processed with the Quantum ArgisX got by band evakuasi of at DAS Air Dingin DAS Water (scale 1:70.000):

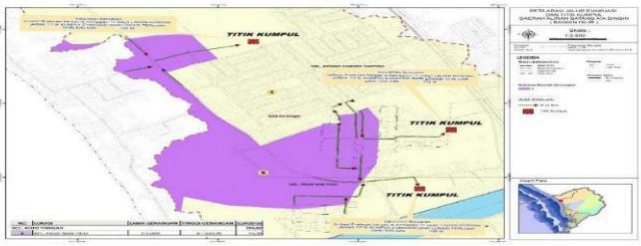

Figure 1: Map of Routes for Evacuation and Shelter Pasie Nan Tigo (down Stream)

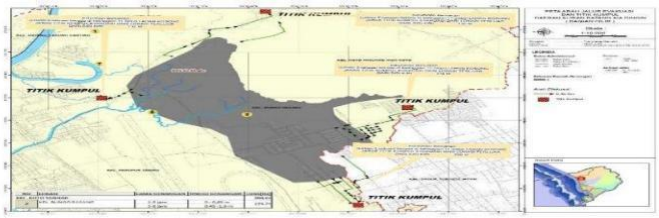

Figure 2: Map of Routes for Evacuation and Shelter Bungo Pasang (down Stream)

IV. CONCLUSION

There is a map/evacuation line for area flood, that is the area the Bungo Pasang and Pasie Nan Tigo. There is a temporary shelter for the community when flooded to the area of Bungo Pasang and Pasie Nan Tigo. There is a data and parameter morphometri for Batang Air Dingin.

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