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Institutional Model of Community Participation in the City Flood Mitigation in Field

KEYWORDS: Mitigation , Flood , Participation , People , Settlements , Environment

M. Ali Musri. S
Graduate School of University of North Sumatera

Badaruddin
Lecture of University of North Sumatra

Sumono
Lecture of University of North Sumatra

Abdul Rauf
Lecture of University of North Sumatra

ABSTRACT *Cause of the widespread flooding in the city of Medan due to lack of space utilization harmony, between man and nature as well as between the economic interests of the preservation of the environment, which impacted on the delivery of increased flooding and increased flooding upstream core. Impacts occurring is environmental degradation and disruption of people's lives. Models are built in flood mitigation in Medan designated as Model - CUE Participation and Coordination (PK - CUE) showed the presence of a form of institutional coordination of all stakeholders, both government related agencies as well as by community participation. Participation and Coordination Model - CUE (PK - CUE) are very effective in mitigating floods in Medan, and can be used to aid the implementation of the policy in reducing flood risk through the institutional coordination and public participation in support of flood control in the city of Medan . Public participation was significantly affected mitigai flooding in Medan, as well as institutional coordination. A decrease in the risk of flooding impact on flood mitigation. The existence and use of land will facilitate flood control in the city of Medan. The model is able to support the Medan city flood free in ten years.*

INTRODUCTION

The phenomenon of floods that occurred in various areas in the city of Medan lately is a strong indication of harmony due to lack of space utilization , between man and nature as well as between economic interests with environmental preservation . Medan which traversed by Watershed and River Deli Babura are not able to accommodate the water debit so often experienced flooding due to the imbalance of land use and environmental management .

Medan is one of the low-lying and flat areas (flats) , with a height of 2.5 meters to 40 meters above sea level and the level of 0-4 % slope is lowland with gently sloping topography tends to the north and became the meeting place of two rivers namely River Deli and Babura River. As the downstream region through which the River Deli and Babura River, the city of Medan is one of the flood-prone areas. Flood condition almost always occurs in certain areas , especially during the rainy season, this condition is a problem that needs to be considered because it is very detrimental to society.

Flooding problem in the city of Medan itself mostly occur along the river Deli, originated from Bukit Barisan mountain range at an altitude of 1724 m above sea level to the Strait of Malacca to the length of 75.8 km flowing into the city of Medan is located in the lower reaches of the watershed Deli with height 0-40 m above sea level has an area of 481.62 km2 watershed Deli. This river is a main channel supporting Medan city drainage area they must cover approximately 51 % of the city of Medan. Poor drainage system in the city of Medan causing this metropolis is often flooded when the rains come. The impact is the disruption of economic activity and to the city of Medan , dangerous if crossed by residents, the traffic and commercial activity is inhibited.

Flooding caused by several factors, namely rain, destruction of the retention factor Watershed (DAS), the error factor of development planning of rivers, river siltation factor and factor system errors and areas of development infrastructure (Maryono, 2005). Some areas in the field of human population has increased because of the allure that can influence people to move from villages to cities. Actually lands for preservation and conservation areas to maintain the balance of the local environment, taken over for housing, factories, industries, and other (Kodoatie, 2002). Flood capacity that they observed BMKG meteorological station, the database contains data derived rainfall and extreme wind. Limits used in this database is the weather parameter values currently used by the Bureau of Meteorology, Climatology and Geophysics Agency in determining whether an extreme event, the rainfall > 50 mm / day (the so-called heavy rain by definition WMO) , wind speed > 25 knots (including the category of strong breeze and near gale on the Beaufort scale), temperature ^{3} 34 ° C, and high sea waves > 2 meters.

To reduce the losses caused by floods is necessary flood mitigation measures (flood damage mitigation), whether they are physical (structural measures) or corrective measures as ameliorative nature and actions of a non physical (non - structural measures) or preventive measures because it is disaster prevention / loss (Purbawijaya , 2011) .

Mitigation taken to minimize and mitigate the impact of disasters. Mitigation in principle to do for all kinds of disasters , both of which belong to the natural disasters (natural disaster) or disaster as a result of human activity (man - made disaster). (Referral Indonesian Urban Disaster Mitigation Policy, 2007).

One form of non-structural flood mitigation is community participation. Public participation is a technical process to provide opportunities and wider powers to the people collectively solve problems. This division of authority is based on the level of participation (level of involvement) community in these activities. Public participation aims to find better solutions to problems in a community with open more opportunities for people to participate in activities contributing to the implementation of more effective, efficient and sustainable .

Institutional forms in flood mitigation has been established by the government such as National Disaster Management Agency (BNPB), the National Search and Rescue Agency (Basarnas). Institutional forms of communities are members of Family Planning (RUK) and Planned Activity Group (RKK). Institutional form in the mitigation has not been coordinated

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with BNPB and SAR has been established by the government.

One effort to reduce the impact of flooding in addition to public participation and institutional coordination is the development of models Computable Urban Economic (CUE) was first discovered by Alonso (1964), which measures the economic value of public demand for urban settlements. Then developed by Akiyoshi Takagi and Taka Ueda (2006) study states that land use changes and able to mitigate the impact of flood risk from flooding.

Whereas PK - CUE models incorporate elements of public participation (P) and institutional coordination (K). Model PK - CUE is believed to have the advantage of the involvement of all elements in mitigating flooding, either from the government, the public, the private and the formation of the coordination of all of these elements are able to make maximum DAPT flood mitigation works so well. Participation and coordination models describe the shape of the role of government and the community in mitigating floods directly while indirect support flood risk management and land-use arrangement is expected to maximize the flood mitigation in Medan.

THEORETICAL STUDY

Environmental Settlement

Settlement (Settlement) is a process of reaching someone and settled in an area (Van der Zee, 1990), in which the usability of a settlement is not only to provide a facility for service, communication, education and recreation. In another sense (Parwata 2004) mentions the settlement is a place for living humans who have been carefully prepared and showed a clear purpose, thus providing comfort to the occupants.

The concept of environmentally sound settlement aims to achieve sustainable development by Research Triangle Institute, 1996 consists of aspects: 1. economic (welfare), 2. ecology (environment), 3. equity (equity), 4. engagement (participation), and 5. energy (Budihardjo, 1999), in an environmentally sound settlement there are four components that are used as indicators, namely: economic, social, environmental and cultural (Macrelan, 1996).

Regional Planning, Urban Spatial and Land Use

Planning is a process that is intended to make changes toward a better direction for the development of a community, the government, and the environment in a particular area, by using or utilizing a variety of existing resources, and should have an orientation that is comprehensive, complete, stick to the principle of priority (Riyadi and Bratakusumah, 2003).

The city is a residential neighborhood joint cells, or a place where people work together for the common good. Types of urban areas can be varied by varying the various activities carried out in urban areas such as trade, transport, procurement of goods and services , or a combination of all of these activities (Gallion and Eisner, 1992). A city is a relatively large settlements, solid and permanent, consists of a group of individuals who are heterogeneous in terms of social.

A land use plan is an expression of the will of the community on how land use patterns should be an environment in the future. Specified in the plan areas to be used for various types, density and intensity of use categories, such as the use for residential, commercial, industrial and public needs. Also determined the principles and standards that should be applied to the construction or preservation of the area. In a land-use plan is usually listed manuscript description and some maps. Descriptions contained in the policies, while the maps illustrate the application of the plan on the space available, both in general and specifically, by setting specific use for certain areas anyway. A land use plan is usually part of an overall plan. In other parts discussed the issue of transportation, public utilities, such as electricity, gas and water; wide range of community facilities and special problems as requiring attention, such as economic development and environmental preservation.

Flood, flood-prone areas as well as the impact

Many factors that cause floods include: (a) changes in the weather that causes local rainfall , water from upstream, tidal water and groundwater, (b) spatial irregular so ignore the ecological function, (c) drainage planning Comprehensive (just follow the road that does not flow into the disposal trenches), (d) Damage to the forest as a water catchment area (catchment area) so that the water that falls to the ground immediately washed downstream, (e) changes in riparian functions (flood plain) so narrow that the river catchment area will get smaller, (f) loss of water catchment areas due to changes in function, such as the valleys turned into a garbage dump, (g) the conversion of land in mountainous areas that were previously a rainwater catchment and space open (green belt) turned into land impervious (watertight) such as the construction of villas, hotels and settlements, (h) socio-cultural factors that lack of public awareness in protecting the environment, a comparison between the amount of open land with impervious area (basic building coefficient). Frequent flooding would cause a slum neighborhoods . According Khomarudin (1997) slum areas can be defined as follows : (a) densely inhabited environments (more than 500 persons per hectare), (b) low socioeconomic conditions, (c) the number of homes under very dense and size standards, (d) infrastructure does not exist or does not meet the technical requirements and health and (e) the dwelling was built on land owned by the state or other people and outside of the applicable legislation .

Flood mitigation

Mitigation (mitigation) is a systematic effort to reduce the risk of structural bencanabaik through the development of physical infrastructure and non strukutral through legislation and training institutions (Bastian, 2008). Basically disaster mitigation includes four aspects : preparedness (preparedness) is the effort made to anticipate disasters, through organizing, appropriate measures effectively and efficiently. Preparedness means to prevent and mitigate disasters, taking steps to reduce the impact caused by the disaster and make sure everyone is on alert if a disaster occurs. Emergency response : what happens during and after a disaster to save lives, reduce suffering and dealing with the impact of an immediate impact with the disaster. Recovery after a disaster, efforts to restore the situation to normal or may be better before the disaster by rebuilding the community in ways that are appropriate and estimate the risk of future disasters mendatang.Pembangunan sustainable communities is a long -term effort to grow and evolve in a way that right continues without result in disaster or new problems.

Public Participation levels in flood control

Community participation is necessary in flood mitigation. According Haghebaert (2007) disaster risk reduction program top-down often fail to address the special vulnerability to , the needs and demands of society at risk). The government's plan without involving the public in flood mitigation is very difficult to achieve , which is often government policy in flood mitigation is not wanted by the community. By Sherry Arnstein in a paper contained in the Journal of the American Institute of Planners with the title "A Ladder of Citizen Participation", (1999), there are eight levels of household participation rate is based on the power of the community in influencing the planning, as follows : 1. Manipulation (Manipulation). 2. Therapy (Therapy). 3. Provision of information (informing). 4. Consultation (Consultation) . 5. Penentraman (placation). 6. Partnership (Partnership). 7. Delegation of Powers (Delegated Power). 8. Community Supervision (Citizen Control).

Institutional Coordination in the Community Participatory Flood Mitigation

North Doglas a leading economic historian as defined insti-

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tutional boundaries are made to form a pattern of a harmonious interaction between the individuals in the conduct of political interaction, social and economic (North, 1990). In line with the North, Schmid (1972) defines institutions as a number of regulations in a society, group or community, that govern the rights, obligations, responsibilities, both as individuals and group. Meanwhile, according to Schotter (1981), an institutional regulation of human behavior which is agreed upon by all members of the community and is a stylist interactions in certain situational repetitive.

Computable Urban Economic Modelling (CUE)
CUE model is an integrated model that combines the model-puddle runoff and land use models. Explicit models can reduce the interdependence between flood risk and land use. At first, the model calculates the flow of runoff and flood inundation model to calculate the depth of inundation in case it is assumed that the rainfall in each country. Depth of inundation as a factor in the choice of location is inputted location equilibrium model, so that the number of households and land supplies and demands can be calculated for each region. Then the ratio of the area does not penetrate converted into city areas ratio is calculated by the number of households and household needs every land. That ratio is inputted in the model runoff again.

RESEARCH METHODOLOGY

The research was conducted in the city of Medan. Time study conducted in October 2012-March 2013. The study was conducted in Bappeda North Sumatra and North Sumatra BPS. In the context of applied, this study suggests a lot more and trying to give an explanation (description) of the phenomena associated with the study variables. The process of implementation will use a qualitative descriptive analysis techniques. Data were analyzed by descriptive approach is to provide an overview of the policy of the city of Medan in flood mitigation. Then quantitative analysis approach to Structural Equation Modelling (SEM).

RESULTS AND ANALYSIS

Geographically, the amount of the total area of the city of Medan reached 26,510 km2 with a population in 2011 of 2,950 million people with an average growth rate of 1.95 % per year and an average density of 11,127 inhabitants per Km. Poor population increased 9.92 % from 6.40% the previous year. Patterns of land use for the city of Medan is the largest settlement is 18126.8 hectares, 159.06 hectares for the company, industry and services amounted to 559.62 acres and the remaining 359.06 hectares earmarked for agriculture. Number consists of the river Belawan River, River Badera, Sikambing River, White River, Babura River, River Deli, River Sulang - Mutual, Monkey River and the River Tuntungan. Total population, population density, the number of poor, land-use patterns and the amount of the river as a major source of vulnerability that continues to threaten flooding in the future. The high degree of vulnerability (vulneribility) people living in flood-prone city of Medan face regular flooding. Vulnerability of people living in flood-prone city of Medan consists of physical vulnerability (percentage of area road network and woke up less spatial attention).

Social vulnerability of population (population density is increasing, people's understanding of the disaster is still lacking, and public attitudes towards flood prevention is still not participatory). Socio-economic vulnerability is still dominated by poverty. Environmental vulnerability is dominated by protected forest cover continues to be exploited by society. Vulnerability of the region's economy is dominated by business location / factory lot located near the river.

The existence of the low capacity of the communities and other stakeholders to reduce the impact of flood risk in flood-prone residential areas of Medan. Capacity is still low consist of a lack of community participation in addressing the government's policy on flood prevention such as littering, closed drainage in front of the house, do not build a water catchment area and the lack of socialization efforts in preventing floods in Medan. Low capacity physically identified also from flooding of the city rainfall less than half an hour already causing flooding city.

Any mitigation models in the upstream and downstream will be able to reduce the impact of flooding in flood-prone residential areas of Medan. Upstream mitigation models to respond quickly and minimize the high rainfall in the forest to reduce the risk of impact to the region is traversed. Downstream flood mitigation models as primary prevention models consisting of coordination between government, industry and society. Government strategies and policies set both short-term, medium-term or long-term flood mitigation. Prevention is supported across relevant agencies such as the departments of Public Works, City Planning Office, department of Education, Office of Residential Areas to jointly create a budget in support of flood mitigation and disseminate to the general public. Actors involved in the business or industrial businesses that are near flood prone areas in order to treat waste and making space for water catchment wide. For the active participation of the community is needed both structural and non-structural institutions.

Most forms of public participation affect flood town residents are saving water. Residents water savings will accommodate several cubic widespread rain water so as not to flood. Saving water is also called Environmental Drainage System. Currently drainage, not only serves to liberate urban areas from flooding attacks, but also served tanah. Alternatively for solving water pollution of the drainage system for the environmentally sound water management, better cope with floods and droughts is through infiltration wells. An effort to increase the infiltration wells rain water infiltration into the soil and reduce surface runoff as a cause of flooding. This effort will function when all citizens are aware and willing to implement it. Role of infiltration wells would not mean that if only a few citizens are applying. Imagine if every resident of the region who have a million buildings were able to apply the well resapan.manfaat of Environmental Drainage Systems include: Flood control, a lot of runoff that can be reduced through infiltration wells depending on the volume and the amount of infiltration wells. Groundwater conservation, water well recharge is very important given the land use changes in the earth's surface as a consequence of economic development and citizens community. The land use change will reduce the ability of the soil to absorb water. This is because more and more land is covered by walls, concrete, asphalt, and other building which would affect the rate of increase in surface runoff. Closure of the land surface by settlements and large public facilities impact on its part, meaning every time it rained 30 mm will be 225,000 m3 of rainwater that does not soak into the ground above sea level. This amount will gather with runoff from other areas on the lower land so can result in flooding. Reduce the rate of erosion, with a decrease in the rate of surface erosion flow would be decreased. If the surface flow decreases, soils eroded and carried away would be reduced. Impact, small rainwater runoff and erosion would be minor.

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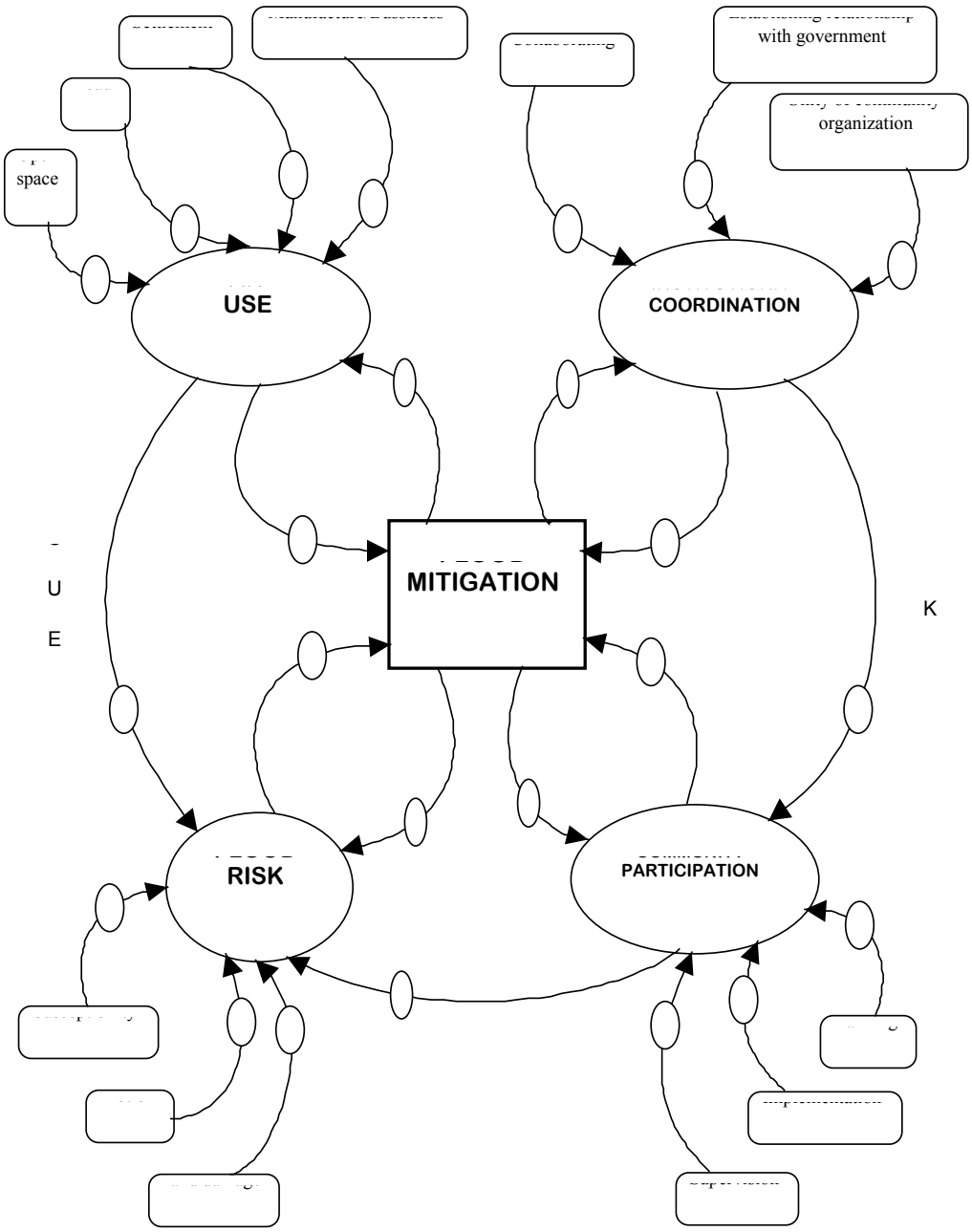

Picture 1. Causal Loop Diagram Of The Study

Based on the discussion of the results of the causal loop Structural Equation Modeling (SEM) is known to result variable is capable of supporting the coordination of institutional participation and understanding by the public of the risks of flooding. As for the variables referenced in flood mitigation is public participation, institutional coordination and the use of urban land. Community participation and understanding of the risk of flooding is able to support the implementation of an effective institutional coordination. Communities play an active role in the coordination of institutional structures on the grounds that the public know the risks encountered in flood mitigation. The role of community participation, institutional coordination and the use of land by the people of the city will support optimal flood mitigation in the city of Medan. The results of this study could form the model - CUE Participation and Coordination (PK - CUE) in flood mitigation in the city of Medan. Model PK - CUE is very effective and can be used to aid the implementation of the policy in reducing flood risk through the institutional coordination and public participation in support of flood control in the city of Medan.

CONCLUTION

Level of vulnerability (vulneribility) people living area in flood-prone city of Medan regular flood. Low capacity of the communities and other stakeholders to reduce the impact of flood risk in flood-prone residential areas of Medan. Model mitigation in upstream and downstream of the construction

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of forms of physical and non-physical means will be able to reduce the impact of flooding in flood-prone residential areas of Medan. Factors Conservation Buffer Areas Medan, factors Physical Infrastructure and Non-Physical factors in the Flood Mitigation, either directly or indirectly affect flood mitigation in the city of Medan.

Community participation and understanding of the risk of flooding is able to support the implementation of an effective institutional coordination. Communities play an active role in the coordination of institutional structures on the grounds that the public know the risks encountered in flood mitigation. The role of community participation, institutional coordination and the use of land by the people of the city will support optimal flood mitigation in the city of Medan. The results of this study could form the model - CUE Participation and Coordination (PK - CUE) in flood mitigation in the city of Medan. Model PK - CUE is very effective and can be used to aid the implementation of the policy in reducing flood risk through the institutional coordination and public participation in support of flood control in the city of Medan.

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