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Influence factors to flood disaster and search and rescue capacity in Thua Thien Hue delta

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Abstract. Thua Thien Hue delta is one of the strongest areas affected by natural disasters, especially disasters related to water disasters such as floods, landslides coast. To have a scientific basis for the proposed measures to prevent and respond to mitigate the damage and assist in search&rescue in the event of floods need to study the factors that affect stroke floods and search&rescue capacity.

This paper has identified the natural and man-made factors affecting flood disasters and search&rescue activities when disasters occur flood on Thua Thien Hue delta. In particular, major role as geographical location, the study area is located in the transition zone between the Northern climate and Southern climate, the place where the dispute between the different air pressure, with morphological characteristics of terrain, extreme weather, resulting in Thua Thien Hue delta is often effected by various types of natural disasters related to water disasters, especially floods.

The result analysis of the factors causing floods will be the scientific basis for early warning, prevention and response, efficient support for search&rescue activities to reduce the loss of life and property when flood disasters occur in Thua Thien Hue delta.

1. Context

Flooding is a natural hazard phenomenon, the result of the concentration of water large amounts and overflowing into low terrain area making wide flooding, causing damage not only to people and property that also a long-term negative impact on the environment such as water pollution, disease ...

Thua Thien Hue delta is one of the strongest areas affected by natural disasters, especially disasters related to water disasters such as floods, landslides coast. In flood history (XI/1999) with flood peaks exceeded the alarming III level, Thua Thien Hue has made plain immersed in water, destroyed several residential areas, killing hundreds of people, damages estimated trillion. It is the direct physical damage, and the damage to the ecological environment can not fully assess.

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To have a scientific basis for the proposed measures to prevent and respond to mitigate the damage and assist in search&rescue activities in the event of floods need to study the factors that affect stroke flooding and the ability to search and rescue. This is the research content of this paper.

2. The factors that affect flood hazard and the ability to search and rescue when disasters occur on Thua Thien Hue delta

The cause of the flood disaster is derived from two basic factors, natural factors and man-made factors. These factors are affected both directly and indirectly to the flooding. Common factors independent nature, but in many cases a combination of both nature and man-made.

Natural factors: of endogenous and exogenous origin.

Endogenous factors has a very important role, it indirectly affect flood on the earth's surface. Endogenous factors, tectonic activity and new tectonic new in the process of formation of the surface and hydrological network and the formation of the delta is a very important role. Endogenous process usually takes very long geological cycles at a slower rate but there is a very decided, create the geological foundation of a large basin.

Exogenous factors include landscape factors and the local landscape. They have both direct and indirect impact to flood through the role of vegetation and nature of seasonal hydrological regime of rivers and oceanographic regimes rain - flood the continent, waves, tides, ocean circulation, sea-level rise.

Natural factors interact with each other in the system consists of two major sub-systems to generate flood or flooding phenomenon in general. The first sub-system reflects the state of atmospheric precipitation (rain, a combination of factors monsoon with atmospheric disturbance factors) and abnormal changes of sea level for the coastal areas, such as water level, water is drawn and unusually high tides. The second sub-system consists of the factors reflecting the present state of terrain buffer on two main aspects, which is the condition of water to cause flooding or high flood level, or even generate flash floods, flood debris. This is determined primarily by the topography type is clearly on the digital elevation model (DEM): the presence of the surface form small absolute height, the low range relative to around, etc, the second characteristic of the terrain buffer is the permeability or water impedir is defined by the characteristics of the vegetation, the physical properties of the mantle and crust of the soil, the surface layer of the lithosphere, the characteristics of the parent rock, etc. Both aspects of the terrain buffer are reflected in the characteristics of the source, or geomorphological characteristics of the terrain of the area. So, could be attributed to the analysis of the interaction of natural factors on fertility and flood inundation of the analysis consists of three components: state of the atmosphere - the physical terrain characteristics - arising terrain (geomorphological). In this interaction, if the process of water volume win, will generate flooding in varying levels, depending on the water volume on the low terrain; contrary, when the process of water drainage win, extreme water levels will not appear. By that logic, for Thua Thien Hue delta, we can see the sensitivity flooding as follows:

- The area is flooded just normal due to the rainy season, the most sensitive;

- The area flooded by rain in storm situations single season, second kind of sensitivity;

- The area flooded by rain in storm situations seasons combined with tropical convergence circulation, third-sensitive type;

- The area is flooded by rain in hurricanes husband situations combined with tropical convergence circulation and NE monsoon circulation, the fourth category sensitive;

Easy to understand the depth of flooding, duration of flooding and the level of cause hazard also increased in the order mentioned above [1].

Man-made factors: a very important decision factor to regulate the natural flow from upstream is the rapid fluctuations of watershed vegetation due to deforestation, mining and economic purposes obtain land for farming, cattle breeding. The rapid decline of vegetation, especially in the current watershed protection forests have lost the ability to slow down the flood, the flow of surface water, and this is actually one of the main causes of the the flood disaster. In addition, the construction of many works to regulate water reservoirs, dams, dams regulate water, recounts line, whether they shore spillway, salty dam, dredging... has changed the natural hydrological regime of the river, and the traffic system, housing... also impede drainage causing flooding. On the other hand, planning in the distribution of population, the civil, social and economic decision likely hurt their different and therefore also the dominant direction of search and rescue activities.

Due to the topography and geomorphology of Thua Thien Hue delta has characteristics than even the nearby coastal delta of the central coast (as the Thu Bon River Delta) and the dialectical relationship between they are for floods *(flood left their mark on the terrain, and then record the impact of the flood through various changes it has gone through)*, so the study of the geomorphology traces and weather patterns causing floods will contribute to clarify the scale, causes and potential flood damage.

2.1. Natural factors

Geographical location: situated in the climatic transition zone between Northern and Southern climate that ranges Bach Ma is the natural climatic boundary between the two regions, and is located in the boundaries of the typical tropical areas with limited the 16 degrees latitude, the place where the dispute between the air flow comes from the different air pressure center: from the North came down, from the West pass, from the encroaching on the East and from the South move up, usually the combination of extreme weather phenomena. and so located downstream of low and medium mountain ridges get wind, rain welcome in Western Thua Thien Hue, a center of heavy rain most of Vietnam; boundary between typical tropical equatorial region should usually have many strong weather disturbances; located in the middle part of the shoreline segments from Thanh Hoa to the extreme South central perpendicular to the dominant wind direction NorthEast coast often blocked by the estuarine sand trip and the sand bar extends parallel to the shore. These characteristics of the geographical location is one of the main causes for here regularly suffered the ravages of storms and flooding. As a result, there are often many types of natural disasters related to water disasters, especially floods. This set for the search and rescue activities with specific objectives is to focus

energy and material resources to respond mainly to the flood disaster in the region.

Topography: if Southwest mountains with very steep terrain beneath the coastal delta is both low and not slope. That makes conditions for the flood took place so quickly in the study area.

A terrain quite common in Thua Thien Hue delta is in the Northeast of the dunes running parallel to the coast with a height of 5-30m, the two asymmetric ribs, ribs fairly large Western slope 25°-30°, the Eastern slopes laid over 10°-15°. These dunes make this delta having low trip after dune, estuarine is narrow, difficult to escape the water and the sand pressed into the estuary shore, forced to flow in the stream leads not slope, parallel to the coast, so that rapid flooding when there is heavy rain, water from the West down.

Geology: the structure has decided to form the topography of the delta by the parallel orientation of the bar, the val-shore and estuarine sand trip extends in NW-SE direction, the same direction as the sand bar and modern shore. It is also a very notable feature of the Thua Thien Hue delta, because they make a "grabens" valley and closed [2].

Climate: the interaction between the monsoon circulation and the topography of South Truong Son mountain did appear a special variable type the rain is heavy rain during the autumn and winter and less rain in the spring-summer period. range pearling in the West form a wall of rain took almost the entire amount due to weather disturbances caused when winds from the east or in the winter monsoon blows from the Northeast. The weather is rainy situation even more powerful combination of interference with operation of the tropical convergence zone. and main characteristics of rain, storms and temperature, the characteristics of the atmospheric circulation and its interaction with the terrain did appear in this area disaster situations dangerous as flood floods, river bank erosion, coastal ...[3].

Hydrographic network: in general, due to rain seasons, the rivers are short and steep, vegetation cover was badly damaged, so the extreme fluctuations in a flow: the rainy season they are rivers full of water, the water can repeatedly hit causing major floods bring disaster, while in the dry season, the valley floor are usually shallow, revealing the vast golden sand, his masterpiece receiver narrow. by rainfall concentrated on the narrow and steep, so the rivers are large flood peak flow is usually very high. Besides the ancient river system, there is no recommended flood, so the flood waters, they reactivate and form the large flow of flood. Along with the rapid transition from steep mountains to the lower thus accrue delta will very quickly, because there is flow not directly into the sea which was congestion in the lagoon due to the floating sand dikes high flood events here can happen very quickly.

Oceanographic regime: sea salt contribute to speed up the process of the typical brackish coastal lagoon on the Tam Giang-Cau Hai, affect the structure of the existing species, promote agricultural implement more thorough and salinity solutions, especially solutions works and therefore also affect the ability to flood the region's natural migratory species groups. Rising sea levels also change the process variable terrain coastal and wetland expansion on the Tam Giang-Cau Hai lagoon and the coastal plain, increasing the impact of floods on Thua Thien Hue delta and the Huong river Basin [3].

Soil characteristics: barren hills mainly in the mountainous areas with steep slopes, the source of the river, so the rainy season increases the risk of disaster phenomena such as floods, flash floods and mud rocks, erosion, landslides occur very serious.

Vegetation cover and lakes: Forest area accounts for a large proportion of natural land, but over the years the forest has been devastated, the coverage decreased significantly, from the ability to regulate flood basin fell, poor water holding capacity, combined with slope increase flood flow coefficient. The lagoon area lakes in the province accounts for nearly 5% of the territory, but mainly near the sea so little to regulate.

Geomorphological characteristics: with geomorphologic characteristics with the characteristics of the central region, may have noticed, we determine the structure of these four countries, the direction of flow, the process of accretion and erosion direct reflection of the operation of the flood, inundation. Research and evaluate the role of geomorphology of the delta and its inherent characteristics related to floods, really very useful and effective for the proposed solutions to cope later. Applying the achievements of GIS will help, assist in analysis, calculation of spatial data and associated remote sensing data, digital elevation models, especially when combined with expert knowledge analysis in geomorphology and flood characteristics can make more accurate judgments flood sensitive areas, the relationship - this reflects that zoning areas at risk, build scripts prevention and search and rescue plan in case of flooding [2].

2.2. The man-made factor

It is an important factor in promoting or reducing the risk of flood disasters. If the development and improvement activities have calculated the risk of complications, the level of risk is down, even if development does not take into account the influence of the level of flood risk due to accidents, the result is incalculable. Exploitation and improvement of the natural terrain for social life so growing human factor in increasing flood caused.

Due to pressure of increasing coastal population and, of course, is the economic development needs requires more area under cultivation and housing, has led to the exploitation of the territory of a lack of management, serious encroachment coastal flood corridor. The uneven distribution of population concentrated mainly in the plain, on both sides of the river downstream. Along with economic activities such as sightseeing tourism, industry, agriculture, aquaculture fishing... have very strong improvement of virgin terrain. Residential areas located along the high ridge along the river espécially Hue City including many unique ancient architecture is built on alluvial of Huong river along with high walls and drainage systems narrow, the water overflows the banks will cause huge damage.

Despite dense irrigation network, including rivers, canals dug in Huong Thuy, Phu Vang district, but by digging a long time, should not be dredged regularly now heavily sediment, making flood drainage capacity greatly reduced. No large-scale reservoirs, with a capacity of about 55 million m^3 of flood control level is not high. Existing irrigation in the plain key role to provide irrigation water, rather than drainage. Therefore, in some places this apparent drawback system like the roads to slow the drainage flood plain when surface runoff.

Roads often have higher than the natural terrain of about 0.5m to 2m and main traffic

routes also play an important role in the process causing floods. 1A National Road with a height of 1.5-2m runs parallel to the sea, narrow drainage aperture formed dams prevent flood large parts of the western plains units flooding in rainy season this is clear in the historic floods of 1999: in many roads, flood who breached them to make escape routes flood erosion principle backwards for geophysics online form located perpendicular to the direction of spread transmission of the flood.

In addition to the above factors affecting areas downstream is influenced by tides, storm surges. When flood to meet surges, or surges will reduce downstream flood water surface slope, the ability to drain the sea slowed down, leading to rising flood water levels than normal. At low tide, the water surface slope as well as the flood flow rate increases, the moment the amount of flood water to drain faster, and the destructive power of the flood flow is also more dangerous - large flow rate will be washed away many houses, projects, river bank erosion, etc. All of these features need to be included in the flood and disaster prevention plans, rescue scenario locally.

3. Conclusion

1. Research area, Thua Thien Hue delta is always potential risk of flooding due to the natural geographical conditions with specific characteristics of the region, especially the morphological characteristics of the topography associated with the arising in the process (ie the form directly and objectively reflect the operation of flood and waterlogging).

2. The weather that caused flooding, storm, tropical depression, tropical convergence zone (single operation or in combination with cold air masses). That is the reason for the Thua Thien Hue delta annual rainfall depending on the type of the highest in the country, but unevenly distributed, mainly in the rainy months, so flooding was born very intense. The distribution of rainfall in space and time flood are very complex, creating floods have massive changes in the nature and in each section of the river and its tributaries. Flood flow with great speed, while the plain is a narrow, low-lying areas, close to the foothills of the mountain, it is blocked from the sea by a typical lagoon system, the focusing speed is very rapidly from a network of short rivers and streams, the average slope derived from the mountains and foothills to the West. In this context, the flow rate is usually very large, when rolled down've created large and rapidly rising water, causing serious flooding.

3. We can not completely allelopathic natural disasters in general and flood disasters in the region in particular, but can be active in the work of early warning (ie warns practical areas will be flooded with time and depth of flooding vary according to geographical location and the weather is rainy different flood), prevention and response, efficient support for search and rescue work to reduce low most damage to people and the flood disaster occurred.

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