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Assessment on the Maximum Water Level at the Confluence of The Ayeyarwady and Myitnge Rivers

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Abstract

The area near and around the confluence of the Ayeyarwady and Myitnge Rivers is experienced seasonal flood in each and every year. In some years, that area is also experienced severe flood situations. The area is periodically facing with the minor and major flood by heavy local rainfall and the maximum water level of the above two rivers. Heavy local rainfall can produce flash flood and high level of water can also produce normal flood. Generally, any type of flood can give two opposite opportunities: one for advantage and the other for disadvantage. The conditions of disadvantage were more worsen when it encountered severe flood situation. For that reason it is necessary to observe the probability of the flood years and local rainfall intensity that can give danger level. And also it is necessary to assess the probable highest point of maximum water level and the resultant its affected areas. The study shows that the International Airport of Tada-U and its nearby built up areas has been experienced the endanger situation of flood from the above two main rivers or some intermittent streams and other channels (i.e. Irrigation System). In this paper preliminary investigations are made for the above situations.

Key words: confluence, seasonal flood, flash flood, rainfall intensity,

danger level, maximum water level, built-up areas

Introduction

The study area is located in Central Dry Zone of Myanmar and Mandalay_Kyaukse Plain, Mandalay Division. It is also situated in the area that falls in the confluence of the two rivers; the Ayeyarwady River, the Myitnge River (Dokehtawady River). According to the Koppen's classification system, the area receives Bsh(Tropical Savanna) type of climate.

Probability of recurrence interval of maximum water level for these rivers is the same value of 42 (Wei Bull's Probability). In addition the most possible maximum water level for the above two rivers are observed at two river stages and the result shows that the Ayeyarwady(at Sagaing Station) will have a tendency to rise up to 1126.40 cm , the Myitnge (Dokehtawady River at Myitnge Station) will rise up to 917.99 cm in 2008. In practice, seasonal water logged in this study area are not related to the annual floods of these rivers and these situations are more related to physical constraints and the unusual

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amount of the local rainfall. So this paper is preliminary attempt to make a differentiation between local rain effect and the annual flood of the above two rivers (Ayeyarwady and Myitnge) for the study area especially Tada U township.

Aim

- To assess the recurrence interval of flood in the area of around the confluence of Ayeyarwady and Myitnge (Dokehtawady River) Rivers
- To make; an investigation about the yearly maximum water level from which assessment can be made for the year 2008
- To analyze the annual flood volume and static period of annual flood in the Tada U Township especially the area of International Airport and its surroundings
- To find out whether the final result that flood recurrence interval and occurrences of the maximum water level may be serious or not for flashy flood of Tada U Township

Objectives

To fulfill the above aims three major objectives are adopted as follow:

- To study the patterns of the annual floods of three rivers
- To observe the recorded rainfall of the study area and its environs
- To analyze the most possible probability for the severe flood whether it was due to the annual floods of the rivers or not
- To analyze the most possible probability for the severe flood whether it was due to the recorded rainfall of the local area or not

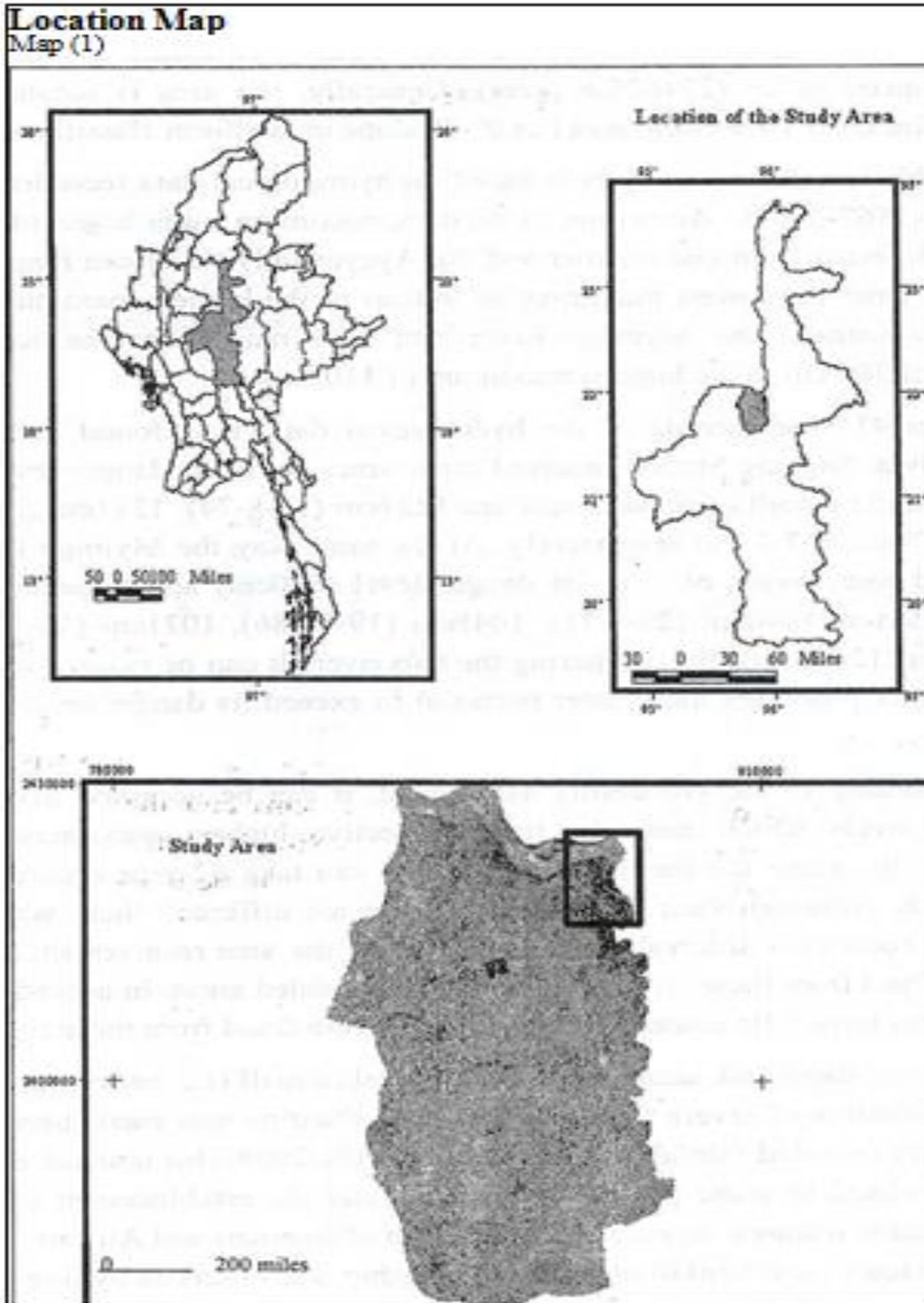
Methodology

This paper is based on the analysis of data and information from field survey and from Hydrological data. By using descriptive quantitative method, it is presented in explanatory type.

For the record of water level of the study area, the author selected the nearest two river stages at Sagaing and Myitnge. Data were especially selected for maximum water level of those rivers. Probability of recurrence interval for annual flood of the study area is presented by using the Wei Bull's Probability Method. By using the Least Square Method, trend line of water level fluctuation for the period from 1967 to 2007 and the expected maximum water level

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are calculated. Trend of total rainfall fluctuation is shown through the method of five-year running means. For the map presentation, Arc View Software is used by GIS.



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The study area lies between North latitudes $21^{\circ} 28' 36''$ and $21^{\circ} 54' 52''$ between East longitudes $95^{\circ} 44' 25''$ and $96^{\circ} 02' 04''$. It is also situated in Tada-U Township. The township, has an elevation between 150' - 1500' or (45.72 meters - 457.2 meters) above sea level. Tada-U Township has an area of 366.6 square miles (234655.6 acres). Generally, the area is located in alluvial plain. Over 70% of the area has 0° - 2° slope in landform classification.

In this assessment analysis is based on hydrological data recorded for 41 periods (1967-2007). According to the data, maximum water levels of two rivers are different from one another and the Ayeyarwady River can range its water level from the lowest maximum of 900cm to the highest maximum of 1300cm. In Contrast, the Myitnge River can also rang from the lowest maximum of 700 cm to the highest maximum of 1100 cm.

Over 41 year records of the hydrological data, it is found that the Ayeyarwady at Sagaing Station received three times above its danger level of 1150cm and the record of these events are 1227cm (13-8-74), 1221cm (30-8- 76) and 1274cm (27-7-04) respectively. At the same way the Myitnge River experienced four events of over its danger level (870cm) and these events were recorded as 1040cm (20-8-71), 1048cm (19-10-86), 1021cm (16-9-04) and 1048cm (12-10-06). By comparing the two rivers it can be noted that the Myitnge River possesses-the greater potential to exceed its danger level than the other.

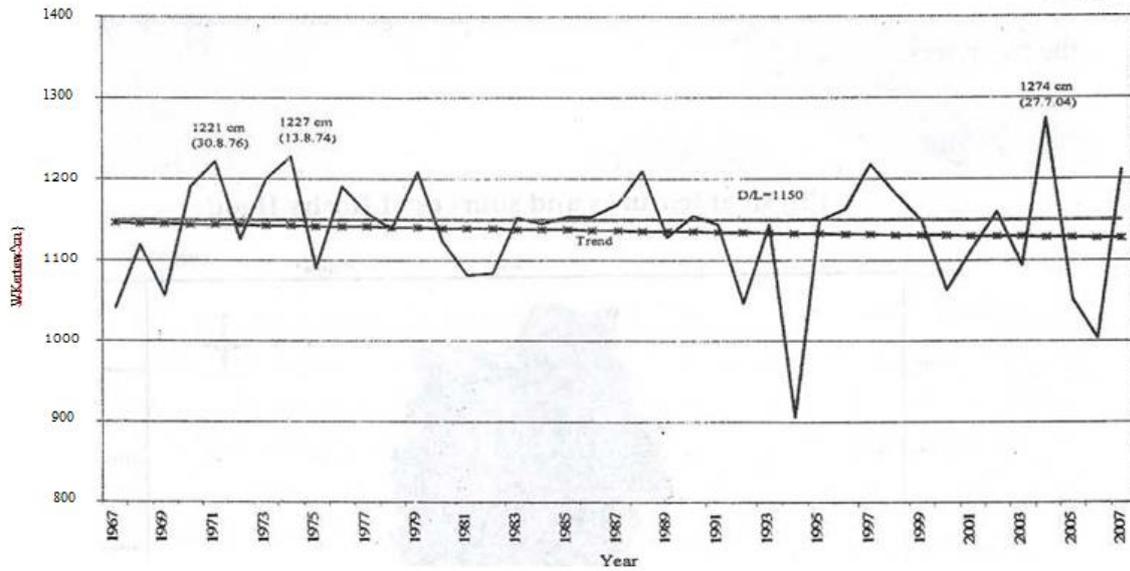
According to the probability assessment, it can be accepted that the recurrence levels which can take their respective highest maximum are accidentally the same for these rivers and they can take 42-year recurrence interval each. Although their fluctuation patterns are different, there was no different in recurrence interval. As a consequence, the area receives situation of normal flood from these rivers in the normal inundated areas. In accordance with the areas have little tendencies to meet the severe flood from these rivers.

On the other hand, unusual amount of local rainfall (i.e. heavy rainfall) can take a situation of severe flash flood and this situation was encountered in this area with recorded rainfall of 4.72 inches in July 2008. This unusual event is directly related to some physical constraints and the establishment of the large man-made features especially construction of International Airport. As a supporting factor local rainfall of Tada U Township was observed by five-year running means and the result shows that the amount of total rainfall was markedly

increased between mid-year of 1999 and that of 2007. However, smaller fluctuations are seen before this period. The increase in the amount of total rainfall can be considered as a major contributing factor for the events of flash flood created by local recorded rainfall.

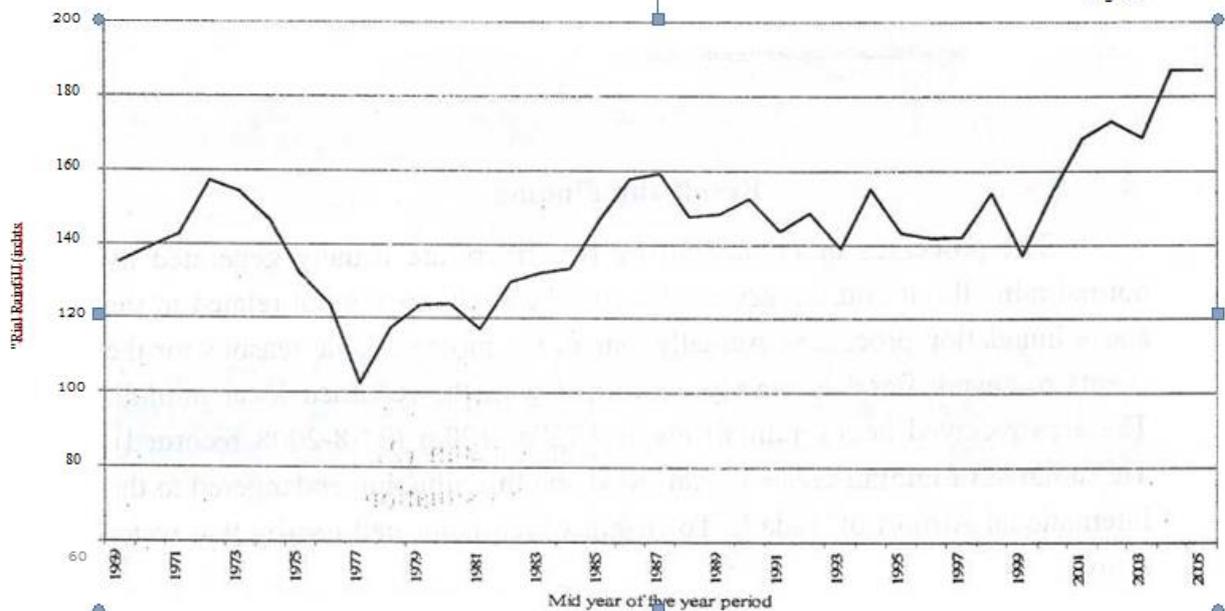
Yearly Maximum Water Level of Ayeyarwady River at Saging Station (1967-2007)

Figure 1



Graph of five year running beams for rainfall at Tada U, 1967-2007

Figure 3

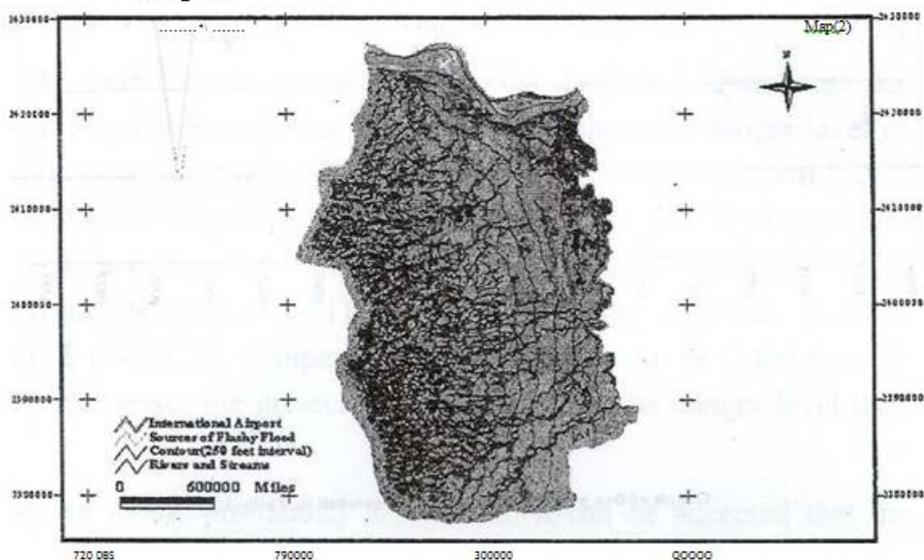


In addition, an important man-made feature of irrigation ditch can take a greater role in the changes of local drainage system. In general, most of streams in this area flow from west to east and west to north directions. However, the patterns of irrigation ditches run north-south direction and it may be the major cause of inundation and the resultant canal destruction. (See map-2)

In a brief sense, it can be assumed that the construction of various man-made features including irrigation ditches is more effective in the processes of unusual flash flood than the natural drainage system backed up by the two rivers.

Physical features and sources of flashy flood

Map-2



Result and Finding

The processes of inundation by two rivers are usually generated by normal rainfall but unusual severe flood of the study area is not related to the above inundation processes. Actually, one of the most possible reasons for the events of severe flood is mainly concerned with the recorded local rainfall. The area received heavy rainfall about 4.72" or 120mm (27-8-2008 recorded). This amount of rainfall created local flood and this situation endangered the International Airport of Tada U Township which is located nearby that water source.

Source of flashy flood



The above photo shows the entrance of water that cannot fully collect for drain water from heavy rain.

The most possible reason for flashy flood of the inundated situation may be related to the overflow of the left main canal connected to the Kinda Dam which is located in Kyaukse Township, eastern part of Tada U Township and local small streams. This condition will be wide spread to the lower part of the township especially in Eastern Part including International Airport. We must find out to prevent the flashy flood in Tada U Township. We might think "How to solve this problem of local flood in Tada U Township" so far in regional or national scale.

Source of flashy flood



It shows the overflow of left main canal of Kinda Dam in Tada U Township when the area may receive heavy rainfall.

Discussion

According to the assessment on maximum water level of around the confluence of Ayeyarwady and Myitnge (Dokehtawady River) Rivers, it is found that the source of flashy flood is not related to the annual flood of these two rivers. If the area has heavy rainfall, there will be accumulated water existed in most parts of Tada U Township. Instead of this, it is more increasingly concerned with the amount of some local record rainfall. If the climate is markedly changed, the study area will have the greater opportunities to face with severe flash flood. To make the effective preventive measures for this situation, it is necessary to re-manage the whole man-made irrigation system of the study area and to construct the over run system which can feet directly to the Panglong River.

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