

## Impacts of Flooding on Local People's Livelihood in Laymyethna Township

Su Hlaing Thin<sup>1</sup>, Tin Tin Mar<sup>2</sup>, Wint Wah Htun<sup>3</sup>

### Abstract

Laymyethna Township encounters two types of flooding: overbank flooding and flash flooding. With the exception of 4 years, from 2000 to 2018, the water level of Ngawun River reached danger level (34 feet above sea level) and above danger level in study area. The township suffered the impact of floods almost every year. Flood causes negative impact on economic and social including paddy cultivation. Monsoon paddy cultivated area has damaged by flood especially overbank flooding. Primary data were collected from semi-structured interview. Pearson Moment correlation method was used to present the relationship between paddy production, highest water level of Ngawun River and duration of flooding period. The result shows the highest water level and duration of flood periods are related the paddy production.

**Keywords:** Flood, flood related problems, socio-economic, impact, paddy cultivated.

### Introduction

The devastation caused by severe river floods in different areas of the world have been brought to the people's attention since last many decades and "flooding" is simply a temporary covering by water of land not normally covered by water (European Commission, 2007). Flooding is a serious, common, and costly hazard that many countries face regularly (Karki & Pradhan, 2011). Munich Re, 2015, said floods remain the most devastating natural hazard globally. Flooding causes substantial harms to local people and economic activities in (Newton & Weichselgartner, 2014). Intergovernmental Panel on Climate Change (IPCC) stated heavy precipitation events will likely increase in frequency and intensity over many land areas due to climate changes (IPCC, 2013).

Moreover, the risk of fluvial flooding will increase in several regions (Hirabayashi et al., 2013; Winsemius et al., 2016). Floods can have a variety of societal impacts that span across space and time (Smith & Ward, 1998). Agriculture remains one of the most vulnerable sectors to climate change in Africa in terms of declines in agricultural production and uncertain climate that significantly affects food security (Cusker & Carr, 2016).

Myanmar's economy still depends heavily on agriculture. As Laymyethna Township is located in the northern part of the Ayeyarwady deltaic region, known as Myanmar Granary. The danger level of the Ngawun River at laymyethna is 10363.2 mm (34 feet). During the 19-year period from 2000 to 2018, the township witnessed flooding in 14 years in the rainy season.

The study area experiences flood related-problems such as social, economic and environmental problems. In the period from 2009 to 2019, the damaged area of monsoon paddy was 9,194.3 ha (23461 acres), replanted area 1,280.4 ha (3164 acres), harvested area 201,886.3 ha (498872 acres) and the production 36,998,595 baskets. Moreover, during flooding period, the schools are closed and it affects education of local children. During flooding period, local people encounter health problems and transportation problem.

---

<sup>1</sup> Tutor, Department of Geography, Hinthada University

<sup>2</sup> Professor, Dr., Department of Geography, Hinthada University

<sup>3</sup> Tutor, Department of Geography, Hinthada University

Therefore, Laymyethna Township was selected as study area and impacts of flooding on livelihood of local people are studied from the geographical point of view.

### Study Area

Laymyethna Township is one of the townships in Ayeyarwady Region. It is located in Hinthada District. Laymyethna Township has an area of 1033. 5sq.Kilometers. It is comprised 43 village tracts made up of 283 villages in the rural area and 5 wards in the urban area. The main river is Ngawun River which causes flooding almost every year. Main economic is agriculture, especially paddy and pulses.

The land is higher in the west and it lower gradually toward the east. The Ngawun River flows from north to south meandering across the eastern part. Other locally important creeks are Khattu, Paukyo, Ketky, Mazeli, Yinze, Lakhogyi, Kakhohay, Htawla, Minywin, Chin, Pawbyin, Myauk, Nigwin, Thinda and Gyat. The high meandering of the Ngawun River channel reduces the flow velocity, there by depositing large amount of sediments during flooding in the rainy season. The flow lying areas along the banks of Ngawun River are vulnerable to severe flooding.

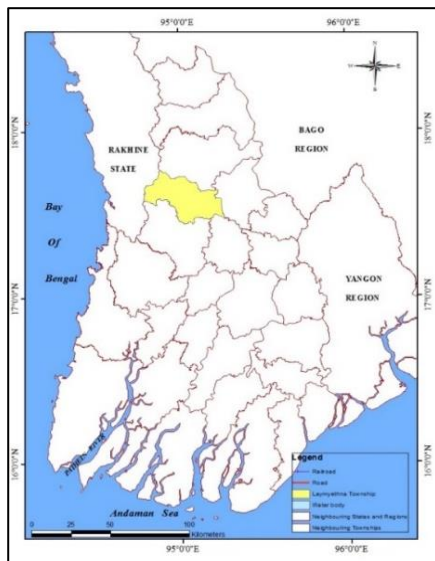


Figure 1. Location of Laymyethna Township in Ayeyarwady Region

Source: Myanmar Information Management Unit

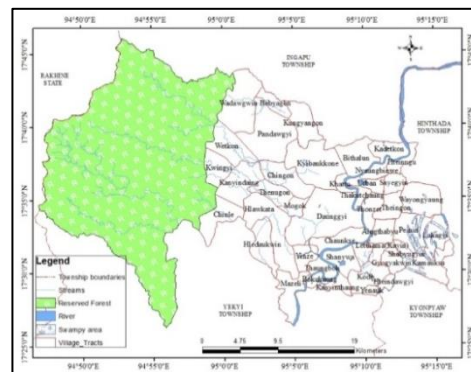


Figure 2. Location of Village Tracts in Laymyethna Township,

Source: Myanmar Information Management Unit

### Research questions

- Where are flood prone areas in Laymyethna Township?
- What are impacts of flooding in the study area?

### Aim

To present the impacts of flooding on local people in Laymyethna Township

### Objectives

- To investigate the flood prone areas in Laymyethna Township

- To find out impacts of flooding in the study area
- To examine problems and loss related to flooding in the study area.

### Source of Data and Methodology

Not only Primary data but also secondary data were used in presenting the paper. Primary data were collected by using field survey and interviews with local people especially flooded area. Secondary data were acquired from departments concerned. Spatial analysis, Statistical method and GIS tools were applied in presenting impacts of flooding and problems and loss related to flooding in Laymyethna Township.

## Findings and Suggestions

### Flooding in Laymyethna Township

Two types of flooding: overbank flooding and flash flooding are found in the area. Ngawun River is the main river in Laymyethna Township. It is a distributary of the Ayeyarwady River. The Ngawun River banks are covered with alluvium and the terrain is flat and wide. It has numerous tributaries. In the rainy season, the higher the discharge of Ngawun River cause overbank flooding. The large amount of heavy rain rush down along the slope of Rakhine Yoma causes flash flood over the area between the Yoma and the Ngawun River.

### Flooded Area

The area to the east of Ngawun River witnesses only occasional light flooding, the area is well protected with embankment. Usually the area between the western foothill and the western bank of Ngawun River are hardest hit by the Ngawun River flood. The village tracts often suffered by the destructive effect of flood include Bebyagon, Kungyangon, Pandawgyi, Chingon, Thenugon, Mogok, Hlawkata, Hledaukwin, Bithalun, Sayegyin, Thonezet, Thakhutchaung, Shabyugyin, Lahargyi, Nyaungpiwe, Dauggyi, Yinze, Mazeli, Kyibaukkone, Letthama (kayin), Pain-in, Chaukse, Wayoyaung, Theingon, and Katatkon.

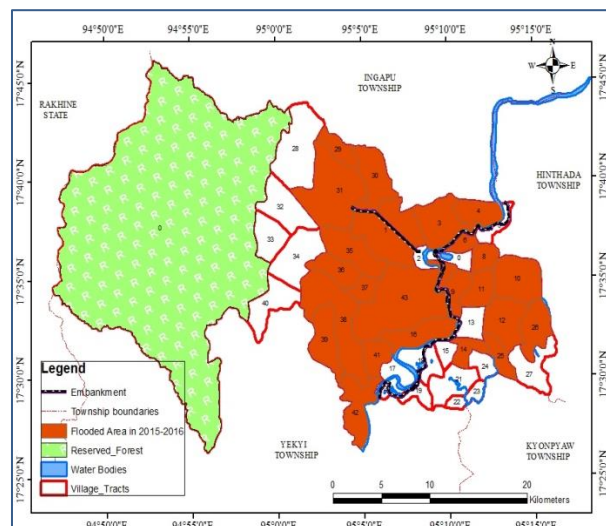


Figure 3. Flooded Village Tracts in Laymyethna Township  
Source: Department of Agricultural Land Management and Statistics, Laymyethna

### Impacts of Flooding

Flood impact on both individuals and communities, and have social, economic, and environmental consequences. The impacts of floods, both negative and positive, vary greatly depending on the location and extent of flooding.

During the 18- year period from 2000-2018 the Ngawun River overflowed its banks for 14 years, flooding the extensive low lying area. Because of flooding, the planted crops were destroyed and education, health, and transportation of the areas concerned were also adversely affected. Besides, some households had to leave their native places and temporarily relocated in other. Usually paddy cultivation, the main economic activity of Laymyethna Township was hardest hit.

The highest river water level during the study period was 36.4 feet and the lowest level 33.45 feet and The longest period of flooding was 48 days and the shortest period 2 days. The frequency of flooding was high with 4 times and low with once per year. Therefore, flooding severely affects on livelihoods of local people in Laymyethna Township.

### Impacts on Economy

Like other areas in Ayeyarwady Region, agriculture is major pillar on the economy of Laymyethna Township. Therefore, flooding affect agriculture especially paddy cultivation.

### Impacts on agriculture: Paddy Cultivation

Twelve type of crops: monsoon paddy, summer paddy, monsoon groundnut, winter groundnut, sesame, black gram, green gram, pigeon pea, soya bean, cow pea, chick pea, and bocate (cow pea are mainly grown) among 60 types of grown in Myanmar.

Table 1. Destruction of Monsoon Paddy Cultivated Area in Laymyethna Township from 2013 to 2023

Year	Monsoon Paddy Cultivated Area		
	Total Cultivated Area (Hectares)	Damage	
		Hectares	Percentage (%)
2013-2014	8643	0	0
2014-2015	8735	0	0
2015-2016	8578	3423	39.9
2016-2017	8589	3334	38.8
2017-2018	8589	1221	14.2
2018-2019	0	0	0
2019-2020	0	0	0
2020-2021	0	0	0
2021-2022	2247	498	22.2
2022-2023	1125	91	8.1

Source: Agriculture Land Management Statistics, Laymyethna Township

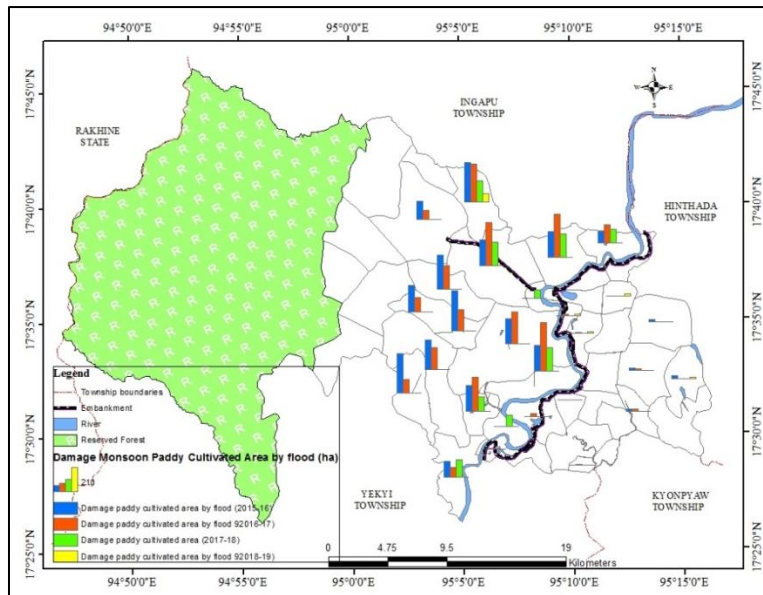


Figure 4. Damaged of Monsoon Paddy Cultivated Area by Flooding in Laymyethna Township

Monsoon paddy occupies 43.8 percent of the total sown area. When the planted monsoon paddy is affected by flood, it is needed to replant new paddy plants and use chemical fertilizer is less affected area to get normal growth. Some plants are weakened and less resistant to pestilence. Therefore, the farmers have to use pesticide to increase production.

The replanted paddy fields cannot bear fruits in normal time, delaying the time of harvest affecting second crops cultivation. According to the table, the study area suffered flooding 5 of 10-year period. The destruction percentage is highest with 39.9 percent in 2015-2016. In 2015-2016, 4565 hectares are submerged area, 4421 hectares rejuvenated, 4051 hectares partially destroyed, 3427 hectares of totally destroyed and 276 hectares of replanting.

Plates 1(a,b) show the regrowth of monsoon paddy caused by flash flooding. This show that the damaged by flash flood is less significant than the damaged by overbank flooding.

Overbank flooding causes more damage to the paddy crop than flesh flooding. In order to protect the overbank flooding, Ngawun embankment was established along the eastern bank of the river. After establishing Ngawun embankment, number of village tracts affected by flooding decreased. There were 25 village tracts that suffered damage of paddy in 2015-2016, 22 in 2016-2017, 19 in 2017-2018 and 5 village tracts in 2018-2019.



Plates 1. (a, b) Damaged of Monsoon Paddy caused by Flash Flooding  
Source: Field Observation, 9.8.2019

Table 2. Damaged of Paddy Cultivated Area and Crop Loss

Years	Cultivated Area		Damage Area		Replanted Area		Harvested Area		Production baskets
	Acre	ha	Acre	ha	Acre	ha	Acre	ha	
2013-2014	52775	21357.3	0	0	0	0	52775	21357	3889455
2014-2015	53337	21584.7	0	0	0	0	53337	21584.4	4027477
2015-2016	52379	21197	8459	3423.2	0	0	44955	18192.4	3313620
2016-2017	52451	21226.2	8235	3332.6	0	0	44216	17893.3	3095428
2017-2018	52451	21226.2	3018	1221.3	197	79.7	49630	20084.3	3475368
2018-2019	52459	21229.4	652	263.9	340	137.6	52147	21102.8	3688016
2019-2020	52645	21304.7	0	0	0	0	52645	21304.7	3609142
2020-2021	52632	21299.4	0	0	0	0	52632	21299.4	3750030
2021-2022	52632	21299.4	2247	498	0	0	50385	20390.1	3747783
2022-2023	52642	21303.5	1125	91	0	0	51517	20848.2	3773305
Total	526403	213028	23736	8830	537	217.3	504239	204057	36369624

Source: Agriculture Land Management Statistics, Laymyethna Township

Pearson Product Moment Correlation Coefficient Method is used to find correlation between following variables.

In finding, the correlation between the two variables: The damaged area of monsoon and the highest water level. The calculated 'r' value is to +0.644, revealing fairly positive correlation. This means that the higher the level of river water, the larger the damaged area.

Then, in calculation between paddy production and flood period, paddy production is taken as dependent variable and the flood period as independent variable. The 'r' value is -0.8, indicating high negative correlation. It indicates that the longer the flood period, the lower the production of monsoon paddy.

In calculation, between paddy production and Paddy production highest river water level, paddy production is used as dependent variable and the highest river water level as independent. The calculate value of 'r' is -0.69 (-0.7), indicating high negative correlation. It means that if the water level of river is higher, the paddy production will be lower in operate production.

Table 3. Damage of Monsoon paddy and Duration of Flood Period and High Water Level and Production

Year	Damaged area (ha)	Duration of Flood Period (Day)	Highest water level (ft)	Production (Basket)
2013-2014	0	29	35.65	3889455
2014-2015	0	15	35.65	4027477
2015-2016	8459	35	36.4	3313620
2016-2017	8235	29	36.05	3095428
2017-2018	3018	21	35.5	3475368
2018-2019	652	2	34.1	3688016
2019-2020	0	0	34	3609142
2020-2021	0	0	34	3750030
2021-2022	498	2	34	3747783
2022-2023	91	1	34	3773305

Source: Hydrology Department and Department of Agriculture Land Management Statistics, Laymyethna Township

## Impacts on Social Sector

Flooding also affect education sector. The township has 175 basic education schools. Of which, 51 schools have to be closed due to flooding for 1 to 7 days per once flooding period. Therefore, flooding affects education of the area.

The most common flood- related water-borne diseases are diarrhea, dysentery, snake-bite, skin disease, etc. As the dirty floodwater drains over the nearly all the surface wells and ponds, inhabitants of the flooded areas encounter purified water shortage problem for domestic uses and drinking. There are a few water purifying machines and tube wells dug by World Bank, but local people do not get sufficient purified water for daily consumption. In such occasion, the villages of Yaethoe, Kalayo and Yoegyí store the river water to become clean by keeping 3-4 days for sedimentation.



Plate 2.(a) Primary School in Innlok Village, Mogok Village Tract in Rainy Season  
Source: Field Observation



Plate2. (b) Primary School in Pazunseikchaung Village, Hledaukwin Village Tract in Rainy Season  
Source: Field Observation



Plate3. (a, b) Tube Well in Innlok Village Tract  
Source: Field Observation, 30.8.2019



Plates4. Transportation in flooding period  
Source: Field Observation

Floodwater also overflows the roads during flooded period and the roads become destroyed. In rainy season, road transportation is difficult to nearby villages and schools. Villagers use boat for transportation and every household possesses boat in every house.

### **Conclusion**

Laymyethna is the fourth largest among the township of Hinthada District. It occupies an area of 1033.5 Sq.km (255383.4acres). The Ngawun and a number small creek flows across the township of which the relatively important creek are Khattu, Paukyo, ketky, Mazeli, Yinze, Minywin, Thida and Kyat creeks.

The township witnessed the impact of floods every year in the rainy season. The water level of Ngawun River reached up to 36.4feet, above its danger level of 34 feet. Ngawun Embankment was constructed to protect the river flood. However, some year have witnessed the break-up of embankment. Hteinngu Dam broke in 1991, Kywetagone Dam in 1997 and Pyartagaw dam in 2007. The break-up of their dam flooded the lowlying area of the east protected by Ngawun Dam.

The chief economic activity of the township is agriculture. Flooding not only affects the monsoon paddy but also have adverse effects on education, health, transportation and settlement units. The replanting of crop costs more to farmers. Late replanting and late harvest of paddy result in the late growing of second crops when the soils are low in moisture content, decreasing the yield of second crops.

Floods affect socioeconomic condition of the local people such as income, education, health, etc that are important for regional development. The search illustrates the negative impacts of flood for the purpose of planning the priority works. It is needed to do collaborative works not only in time of emergency as well as in safe period to fulfil the needs on socioeconomic conditions of the local area. Moreover, it is needed to further research works concerning need analyses and flood managements.

### **Acknowledgement**

First and foremost, I would like to express my gratitude to Dr Theingi Shwe, Rector, Hinthada University, Dr. Yee Yee Than and Dr. Aye Lwin, Pro-rector, Hinthada University and Professor Khin Hnin Phyu, Head of the Department of Geography, Hinthada University, for her guidance and encouragement during the preparation of my research. Last, but not least, thanks are accorded to all the friends and my family members as well as the persons of Departments concerned who are ready to give helping and in compiling this research throughout.

### **References**

- Cusker, M.B.; Carr, E.R., (2006). The co-production of livelihoods and land use change: Case studies from South Africa and Ghana. *GeoForum*, 37, 790–804.
- European Commission: Directive, (2007). EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks(<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32007L0060:EN>)
- Hirabayashi, Y., Mahendran, R., Koirala, S., Konoshima, L., Yamazaki, D., Watanabe, S., Kim, H., & Kanae, S. (2013). Global flood risk under climate change. *nature climate change*, 3(9), 816–821
- IPCC., (2013). *Climate change 2013: the physical science basis. contribution of working group i to the fifth assessment report of the intergovernmental panel on climate change.* Cambridge, U.K.: Cambridge University Press.



- Karki, S., & Pradhan, A.M.S., (2011). Impact of Flooding on People's Livelihood: A Case Study from Kankai Watershed ( <https://www.researchgate.net/publication/273063073>)
- Munich Re., (2015). Topics geo. natural catastrophes 2015: analyses, assessments, positions. Munich: Munich Reinsurance.
- Newton, A., & Weichselgartner, J., (2014). Hotspots of coastal vulnerability: an analysis to find societal pathways and responses. *Estuarine, Coastal and Shelf Science*, 140, 123–133.
- Smith, K., & Ward, R., (1998). *Floods: physical processes and human impacts*. Chichester, U.K.: John Wiley & Sons
- Winsemius, H. C., Aerts, J. C. J. H., Van Beek, L. P., Bierkens, M. F., Bouwman, A., Jongman, B., & Van Vuuren, D. P., (2016). Global drivers of future river flood risk. *Nature climate change*, 6(4), 381–385.