The relationship between water-related disasters and poverty in Yangon city, Myanmar

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1. Introduction

Myanmar is a nation having the possibility of various natural disasters. The hazard profile of Myanmar[1], which was published in 2009, classified the disasters in Myanmar to the cyclone, droughts, earthquakes, fires, floods, forest fire, landslides, high tide, and tsunamis. In addition, there is high frequency of disaster, and local people in Myanmar suffer from disasters every year. According to the Germanwatch Global Climate Risk Index[2], Myanmar was the country most affected by disasters between 1996 and 2015.

While there are various types of disasters, the water related disasters, including flood and cyclone, have a big impact in Myanmar. For example, in cyclone Nargis, which occurred in 2008, the number of dead and missing exceeded 140,000 people. In addition, floods become the problem due to less capacity of drainage and rapid urbanization in Yangon city. Therefore, it is quite important to take countermeasures and to consider local people's action plan against water related disasters.

Furthermore, Myanmar has some social issues to accelerate disaster damage. For example, there are some problems related to rapid urbanization, old and fragile infrastructure, and poverty, including economic disparity and the social gap. Especially, it is said that poverty in Myanmar is a big problem, and will expand more rapidly in the future. Therefore, it is important to take poverty problem into disaster countermeasures.

Considering these conditions in Myanmar, this study focused on water-related disaster and poverty problem. The objective of this study was to clarify the damage of water-related disaster and response and awareness of local people, while examining the effect of poverty. This study will be able to contribute to SDGs (Sustainable Development Goals) in Myanmar, especially the elements of "no poverty", "reduced inequalities" and "sustainable cities and communities".

2. Survey methodology and sample characteristic

(1) Household Interview Survey (HIS)

In order to clarify the relationship between water-related disaster and poverty, we used the data of Household Interview Survey (HIS) in Yangon city, conducted by Japan International Cooperation Agency (JICA) in "Strategic Urban Development Plan of Greater Yangon" in 2012[3]. The detail of HIS is summarized in Table 1. This survey was conducted to obtain the basic data necessary for formulating a comprehensive urban development program. In this survey, 10,069 households answered, which is equal to 1.0~1.2% of the population of Yangon city in 2012. As for survey items, this study utilized the data of household socioeconomic conditions, water-related disaster experience and damage, and disaster response and awareness (Table 2).

(2) Sample characteristic and definition of poverty

To analyze the influence of poverty to disaster damage and response and awareness, this study selected the data of household income level and education level as indicators of poverty. As for income level, each household was classified to the four groups while referring to the final report 1[3] of the project for the strategic urban development plan of the greater Yangon by JICA, which summarized the HIS survey results and information of living environment of local people in Yangon. As for education level, it was classified as shown in Table 4. This study defined the highest education level in the household as the household education level, because it is expected that the person who has the highest education level supports the life of household.

Among 10,690 households of data, 9,906 data was

Table 1 Summary of questionnaire

Method	Interview Survey
Term	22 Sep 2012 - 16 Nov 2012
Target	Household in Yangon city
Number of Sample	10,069 Household

Table 2 Survey Items

Category	Questionnaire contents
1 Household socioeconomic conditions	Household income per month
	Education level
2 Water-related disaster experience and damage	Experience of Disaster Damage
	Property damage by cyclone
	Duration of the flood
3 Disaster response	Experience of evacuation
4 Disaster awareness	Preparation for disasters

valid answer and 163 data was not valid answer because of the lack of the income and education information. Therefore, this study analyzed 9,906 household data.

3. Results and cross tabulation analysis

(1) Water-related disaster experience and damage

(a) Disaster experience

As for the result of income group, chi-square value (X^2) is 82.606, degree of freedom (F) is 6, significant probability (p) is under .01 (p<.01), Cramer's V=0.091. In Figure 1, although the proportion of household who experienced disaster increases in lower income group, there is weak relevance between income level and experience of disaster, judging from Cramer's V.

As for the result of education group, X^2=151.033, F=3, p<.01, Cramer's V = 0.123. As with the result of income, there is weak relevance.

(b) Property damage of cyclone

In Figure 2, for the results of income group, (X^2, F, p, Cramer's V) is (135.712, 9, <.01, 0.084). In the result of education group, (X2, F, p, Cramer's V) is (207.669, 9, <.01, 0.104). Both of the result can be seen that the property damage becomes bigger as income and education level is low. In group of low income and below primary school level, the answerer who gets serious or very serious damage exceeds 50%. But judging from Cramer's V, there is weak relevance between income and education level and property damage. 38% of high income and 36% of above university level households also gets serious or very serious damage.

(c) Flood duration

In Figure 3, for the results of income group, (X^2, F, p, Cramer's V) is (80.020, 9, <.01, 0.077). In the result of education group, (X^2, F, p, Cramer's V) is (179.279, 9, <.01, 0.116). Although the income and education level influence flood duration of each household, the degree of influence is small. In particular, in the results of income group, there was not much difference.

(2)Disaster response

In Figure 4, for the results of income group, (X^2, F, p, Cramer's V) is (110.937, 3, <.01, 0.106). In the result of education group, (X^2, F, p, Cramer's V) is (279.293, 3, <.01, 0.168). Regardless of income and education level, about 90% household of each group don't have experience of evacuation.

(3) Disaster awareness

In Figure 5, in the results of income group, (X^2, F, p, Cramer's V) is (1.324, 3, >.01, -). In the result of education group, (X^2, F, p, Cramer's V) is (0.479, 3, >.01, 0.007). Only around 13% of household in each group takes disaster preparation, regardless of income and education level.

Table 3 Classification by household income level

Classification	Number	Valid %
Low income (0~100,000 chat/month)	1784	18.0
Lower middle income (100,001~150,000chat/month)	2091	21.1
Upper middle income (150,001~200,000chat/month)	1908	19.3
High income (200,000~ chat/month)	4123	41.6
Valid answer	9906	100.0

Table 4 Classification by household education level

Classification	Number	Valid %
Under primary School level	1552	15.7
Middle school level	2534	25.6
High school level	1441	14.5
Above university level	4379	44.2
Valid answer	9906	100.0

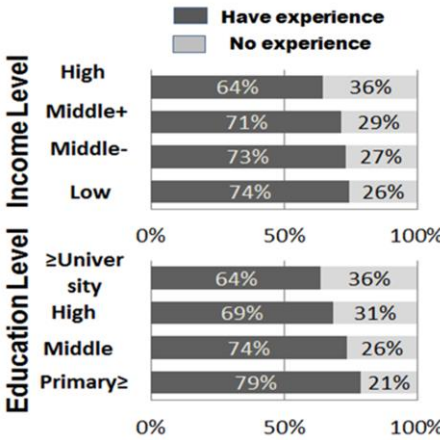

Figure 1 Disaster experience

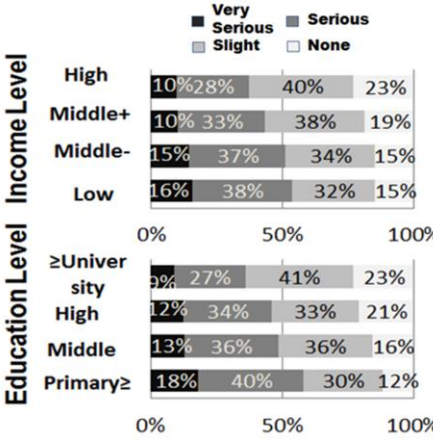

Figure 2 Property damage (Cyclone)

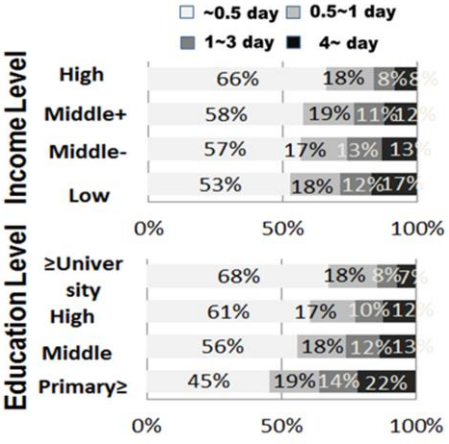

Figure 3 Flood duration

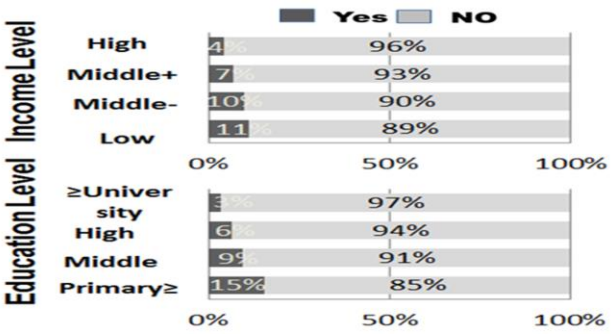

Figure 5 Experience of evacuation

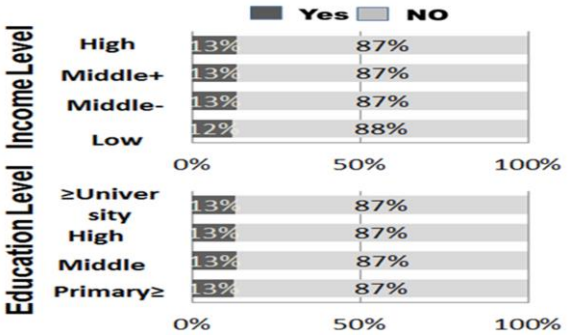

Figure 6 Disaster preparation

4. Discussion

(1) The relationship between water-related disaster and poverty

From the result, it is revealed that there are correlations between the water-related disaster damage and income and education level. However, the influence of income and education level was relatively small, and the households of high income and high education level were also damaged. Considering these results, it seems that poor and non-poor households have relatively the same risk of disasters. This is because the possibility of floods by river water is very low in the center of Yangon, owing to high altitude of the land, and there are many small floods inside the levee. Generally, when a river collapses, the disaster damage is prolonged and get serious, like the Thai flood 2011 and the Bago-river in Myanmar. In addition, the effect of poverty to the disaster damage gets bigger. But the proportion that the flood settles down within a day in Yangon is 71% in low income group (Figure 3), and there is less danger of the floods by river floods in Yangon city. Therefore, the big effect of poverty was not seen in this result.

However, the Yangon city is developing, and there are much lands of high risk of floods. So in the future, it will be necessary to develop city and use lands so as not to make poor people living in the dangerous area.

(2) Disaster response and awareness

Even though a lot of households were damaged by disasters, the rate of evacuation and preparation for disasters is quite low in all income and education level. As well as the previous research[4)], it is pointed out that the rate of the households who should evacuate at time of disaster is around 10% and quite low. This is because the duration of floods in Yangon is short and the local peoples don't recognize floods as big problem.

However, as for the disaster of cyclone, above 50% of households in low income and below primary school level got very serious or serious damages. Therefore, they should prepare for disaster and protect their safety and property. Also, it will be necessary for government to take action for raising people's awareness of disaster prevention.

5. Conclusion

This study clarified the relationship between water-related disasters and poverty in Yangon city by examining the effect of income and education level on disaster experience, damage, and disaster response and awareness. In the future, based on this result, it is necessary to suggest some strategy to improve disaster countermeasures, which includes the influence of socio economic conditions, especially poverty. In recent years, government of Myanmar is making efforts to mitigate the effect of disasters. However, at the household level, there is quite low disaster response and awareness. Therefore, it is important to suggest disaster countermeasures to raise awareness and not to expand the poverty by disaster.

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