VULNERABILITY ANALYSIS TO CLIMATE CHANGE IN LEMBEH ISLAND, NORTH SULAWESI

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INTRODUCTION

- The local community in Lembeh Island, North Sulawesi depend on natural resources that is affected by climate change, such as fisheries and farming, and therefore their vulnerability to climate change needed to be assessed. A vulnerability survey was done in three villages in Lembeh Island, which are Kareko, Pintu Kota, and Pasir Panjang.

- Currently climate change give significant impact to fisheries and these sectors need to adapt to the risk of climate change. Coastal community is potentially affected by the ecological disaster related to climate change. These will really affect the livelihood of the coastal community in Lembeh Island.

- Vulnerability is typically defined as a combination of the extrinsic exposure of groups or individuals or ecological systems to a hazard, such as climate change, their intrinsic sensitivity to the hazard, and their lack of capacity to modify exposure, absorb, and recover from losses stemming from the hazard, and to exploit new opportunities that arise in the process of adaptation (Adger et al. 2005).
- Variability in weather and climate across spatial and temporal scales has a range of human and ecological impact, climate and weather have profound effect on economies, and the food security and livelihood of community. The survey locations were choosen because these villages are located in the coastal area of North Sulawesi considered to be prone to the impact of climate change ecological disaster on fisheries and farming sectors.

OBJECTIVES

- (1) Vulnerability assessment to climate change in the coastal community at the household level to figure out the social & economic impacts to the community.
- The coastal community are prone to the risk of climate change ecological disaster, such as extreme weather, high wave, and strong current that can increase the risk to their livelihoods. Therefore, Yayasan TERANGI (Terumbu Karang Indonesia Foundation) strive to increase the resilience of the coastal community of Lembeh Island with the proper adaptation and mitigation strategies to cope with and adapt to the climate change ecological disaster.
- (2) Provide input for disaster management in Lembeh Island.
- This studies also addressed the policy makers of the government and other related institutions that urgently require information and analysis to guide investments and initiatives in climate change mitigation and adaptation.

METHODOLOGY

- Lembeh Island is located in Bitung, North Sulawesi
- Survey location is 3 villages: Kareko, Pintu Kota, and Pasir Panjang
- Vulnerability assessment of climate change to the coastal community in Lembeh Island was done in quantitative & qualitative assessment in the form of quisionnaire interview and indepth interview to local community on disaster occurences in the last 5 years

METHODOLOGY

- Vulnerability to climate change depends upon three key elements: exposure (E) to physical effect of climate change, the degree of intrinsic sensitivity (S) of the natural resource system or dependence of the economy upon social and economic returns from that sector, and the extent to which adaptive capacity (AC) enables these potential impact to be offset (Adger 2000).
- As this study specifically addressed the variables of these three elements to assesst the vulnerability of the community in coastal area, so we identified indicators that were included to these three elements of vulnerability assessment as derived below:

- Exposure (E)

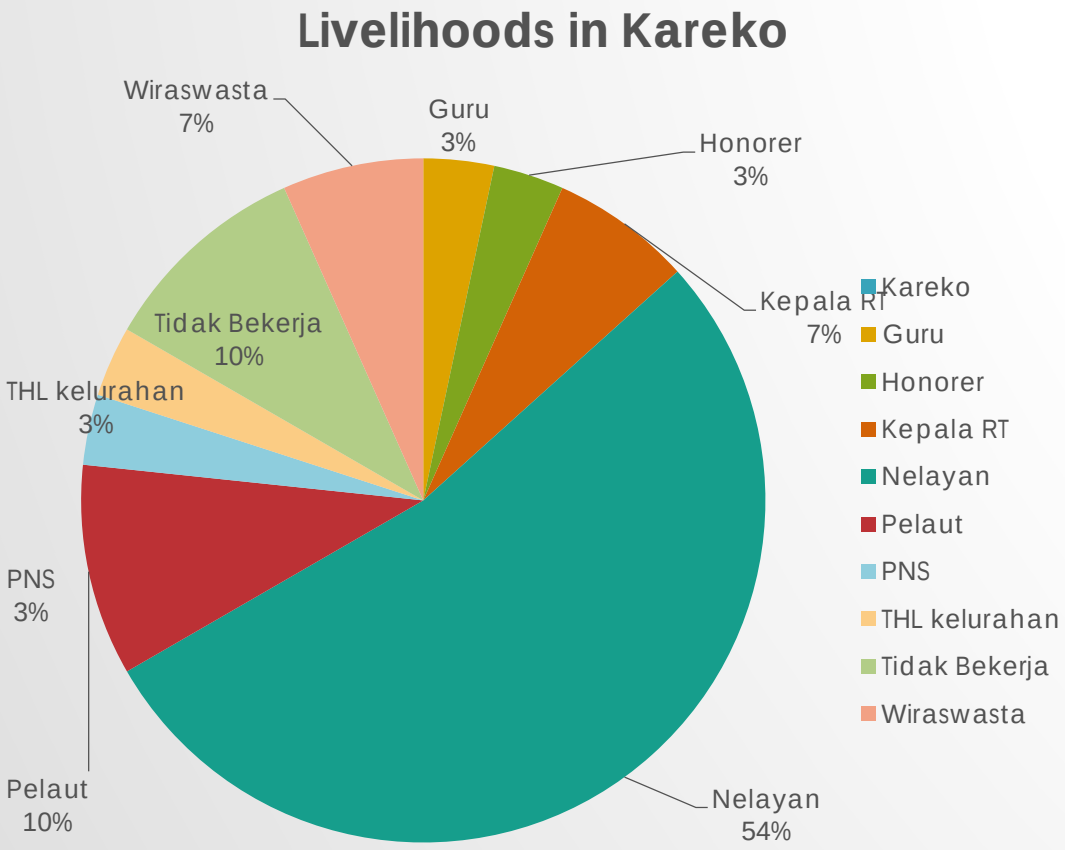
We analyse how far the impacts of the climate change to the decline of the fish catchs. We focused on how far the community that live in the coastal area were affected by the impact of climate change ecological disaster. Based on the questionnaire form, there were indicators that we used to analyse the exposure index such as the effect of the disaster to family members of the household, how long the disaster happened, and how far the scope area of the disaster.

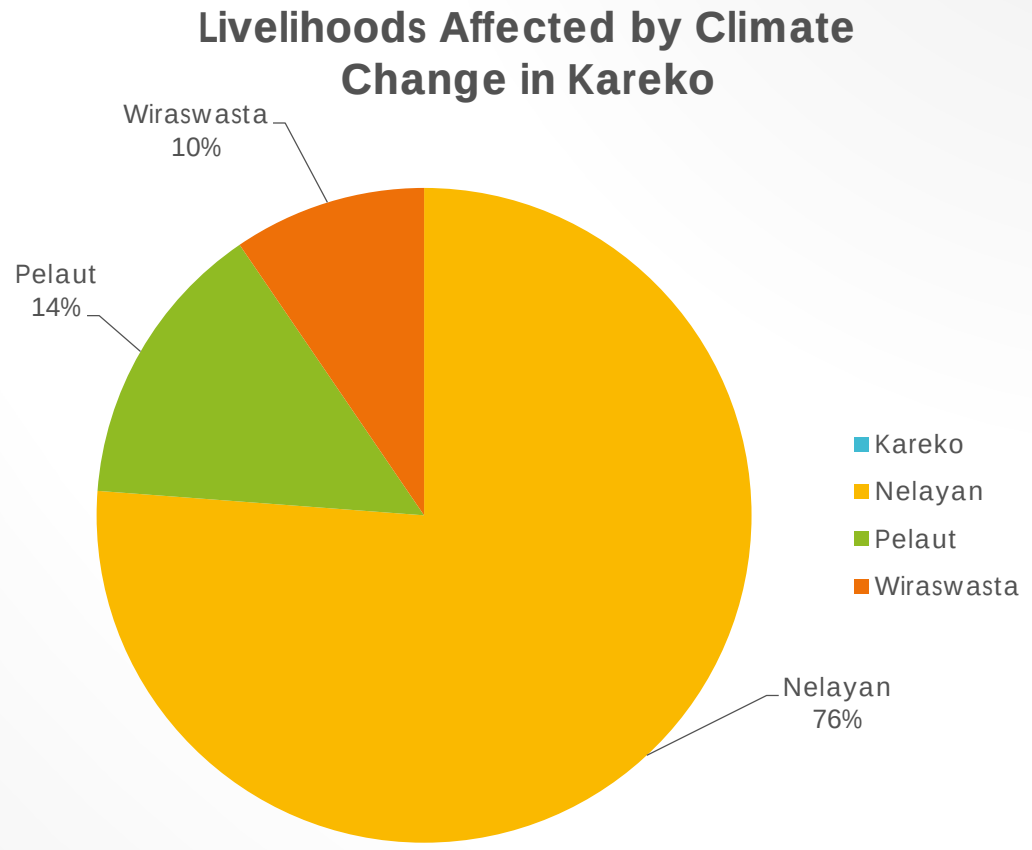
- Sensitivity (S)

Sensitivity is usually defined as the intrinsic degree to which biophysical, social and economic conditions are likely to be influenced by extrinsic stresses or hazards (IPCC, 2001a). Representation of the fisheries employment as the economic aspect, we focused on how the disaster affected the livelihood and the food security of the household, whether it affected the amount of income of the family or affected the kind of the livelihood in the household.

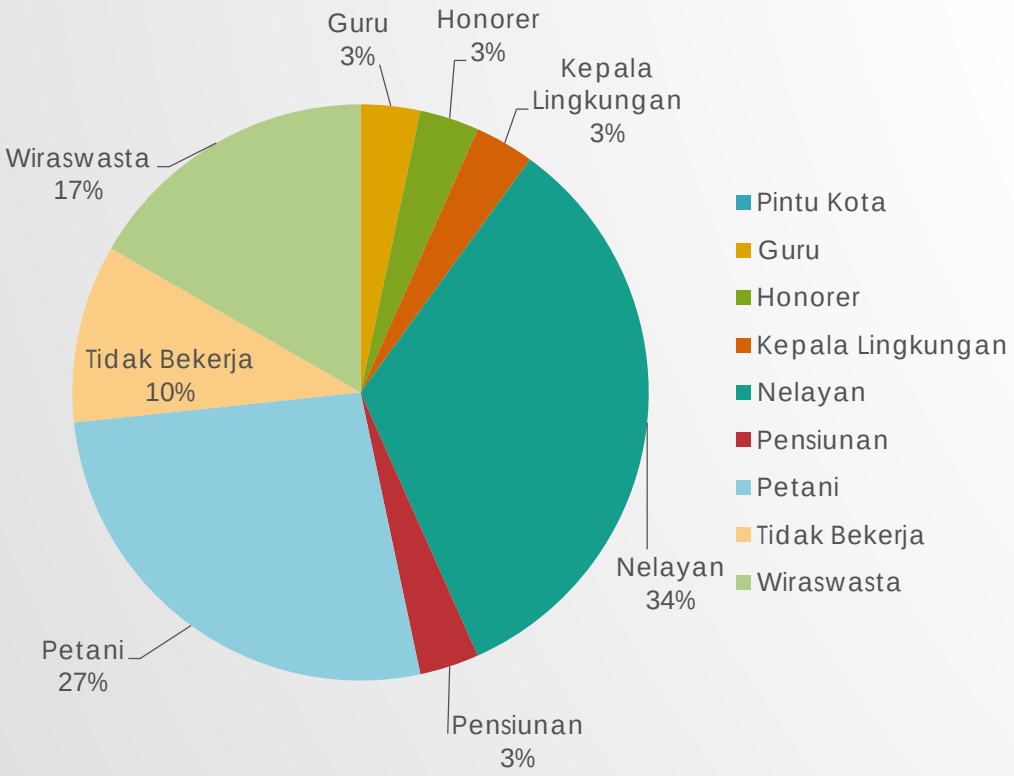
- Adaptive capacity comprises elements such as levels of social capital, human capital and the appropriateness and effectiveness of governance structures (Haddad et al. 2005).
- The indicators that were anaylised such as the ability of the respondent to cope with the climate change phenomenon, how they manage their knowledge and skills to get along with the hazards effectively so that they can survive. At the level of social capital there are indicators we analysed such as the physical buildings that support and help the community to cope with the climate change, for example the availability of evacuation route and shelter area.

RESULTS

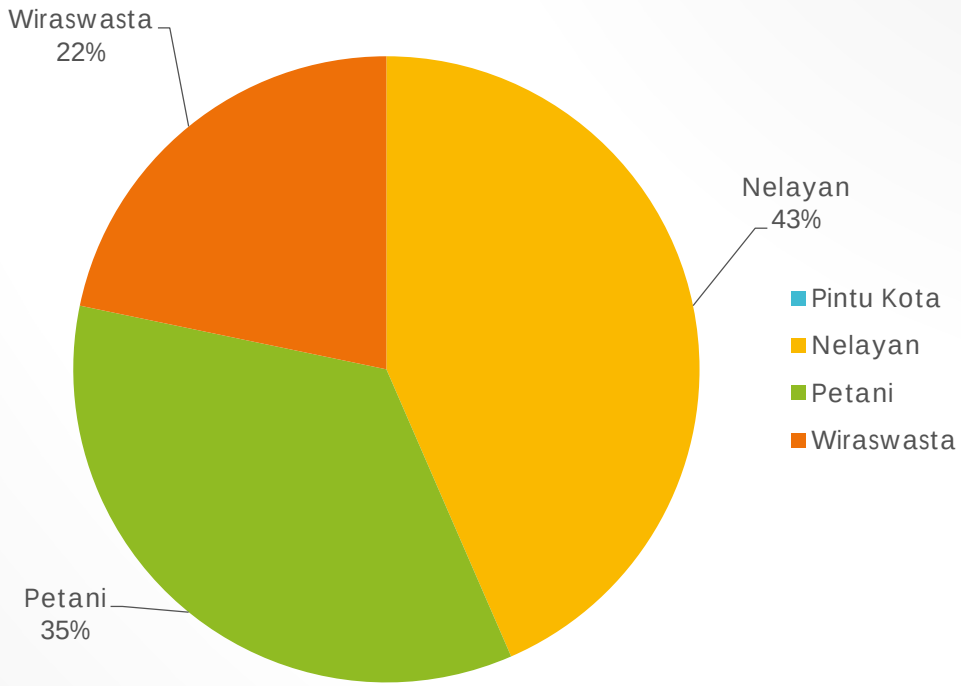

Livelihoods in Kareko
Wiraswasta 7%
Guru 3%
Honorer 3%
Kepala RT 7%
Tidak Bekerja 10%
THL kelurahan 3%
PNS 3%
Pelaut 10%
Nelayan 54%
Kareko
Guru
Honorer
Kepala RT
Nelayan
Pelaut
PNS
THL kelurahan
Tidak Bekerja
Wiraswasta


Livelihoods Affected by Climate Change in Kareko
Wiraswasta 10%
Pelaut 14%
Nelayan 76%
Kareko
Nelayan
Pelaut
Wiraswasta

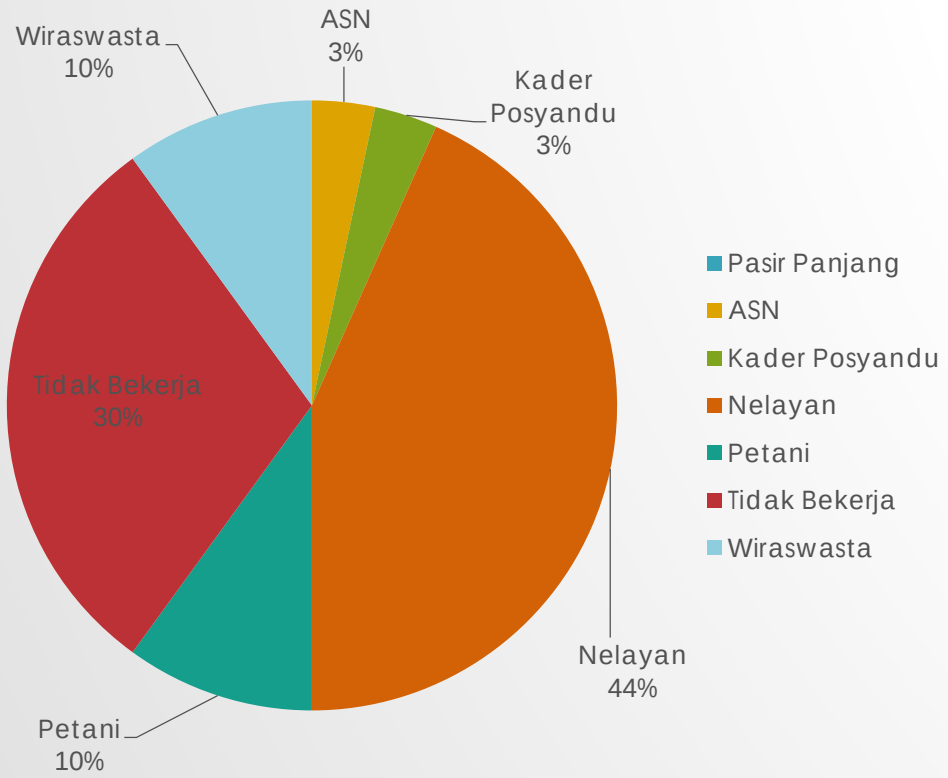
Livelihoods in Pintu Kota



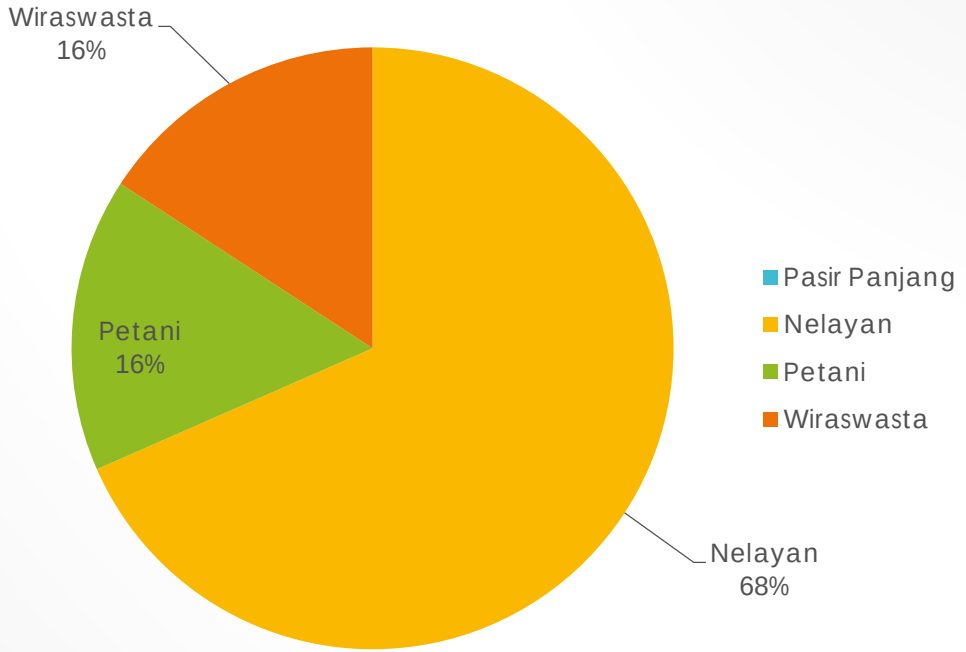
Livelihoods Affected by Climate Change in Pintu Kota



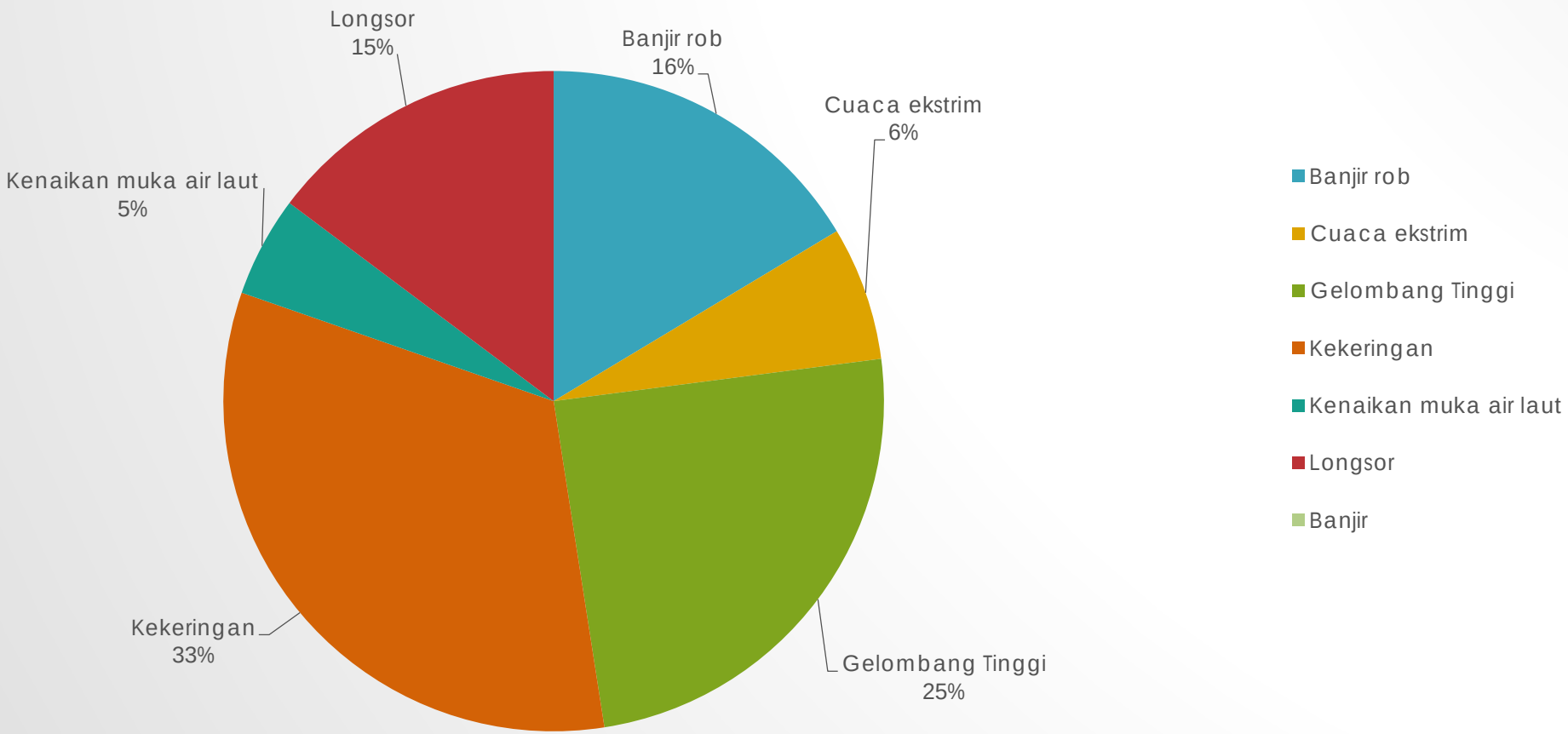
Livelihoods in Pasir Panjang



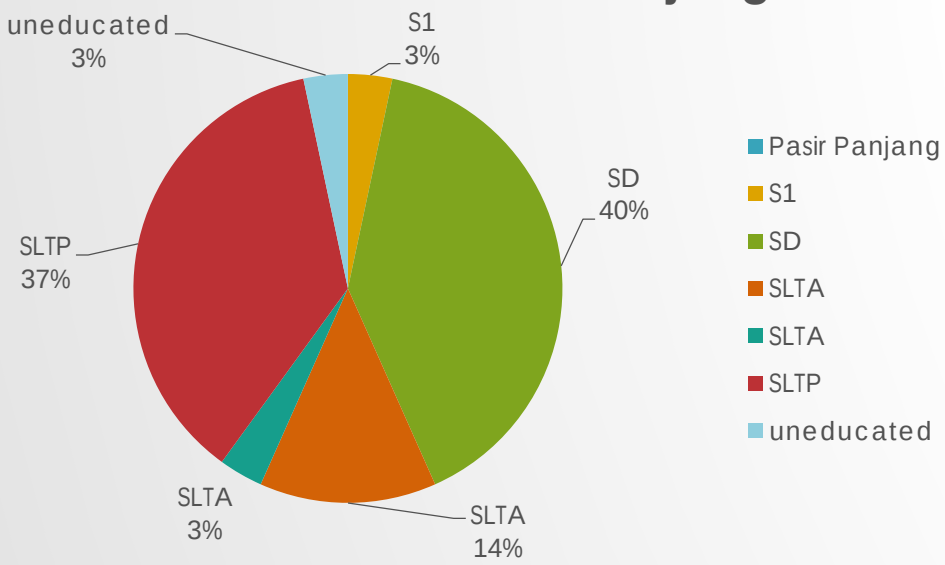
Livelihoods Affected by Climate Change in Pasir Panjang



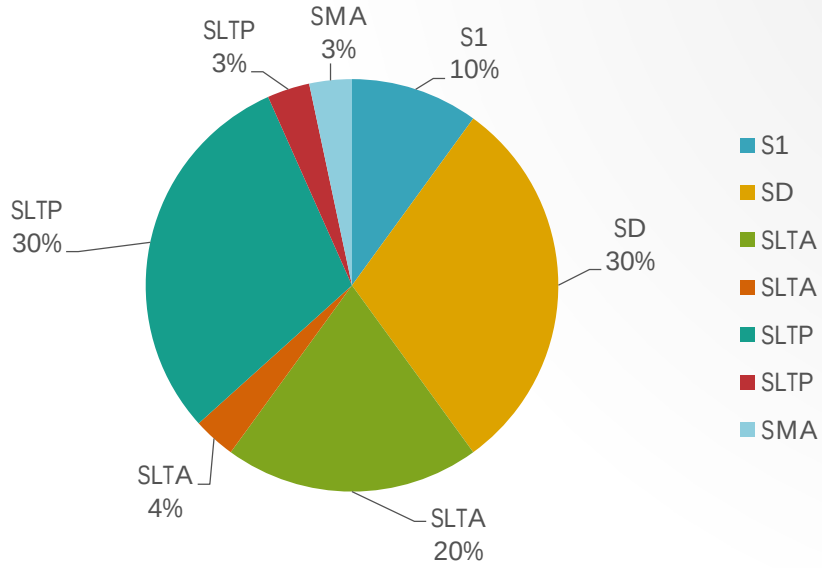
Climate Change Ecological Disaster in 3 Villages



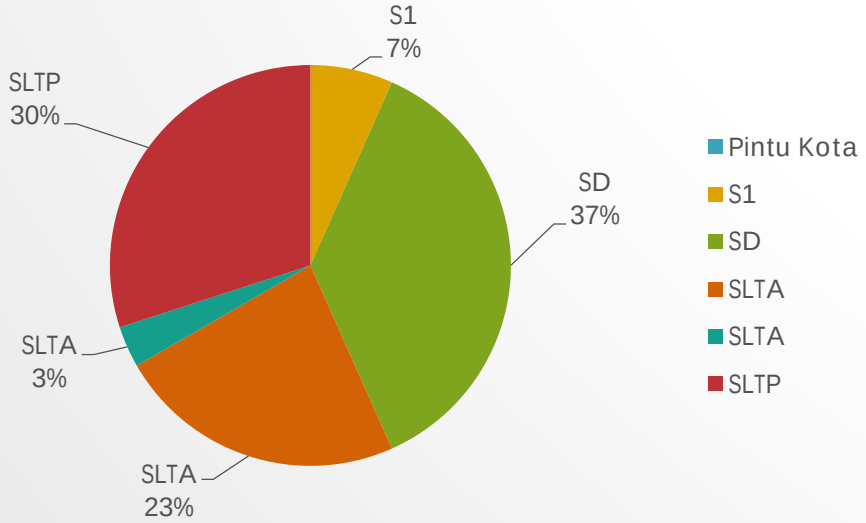
Education in Pasir Panjang



Education in Kareko



Education in Pintu Kota



DISCUSSIONS

- Construction of The Vulnerability Index

The calculation of vulnerability index (Vi) may be seen as a relational function of exposure (Ei) or sensitivity (Si), which may be modified by adaptive capacity (ACi), such that Vi = (Ei + Si) - ACi.

Implicit in this framework is that any vulnerability score is weighted one per amount of indicators included to adaptive capacity and one per amount of indicators included to exposure and sensitivity.

The weighting of index for each element we used is ranged from 0 – 1 with the minimum index score is 0 (zero) and the maximum index score is 1 (one). With assumption, the smaller the index score means it is less vulnerable, and the bigger the index score means it is more vulnerable.

- Based on the formula construction, so the result of the vulnerability index calculating showed that the index of Kareko is 0.271 ; Pintu Kota 0.301 and Pasir Panjang is 0.365.
- The villages in Lembeh Island had the similar characteristic of terrain that some villages situated near the waters while some villages situated near the cliffs that are prone to the land slide. It is showed that Pasir Panjang is the most vulnerable village this is due to the countour of the terrain that laid along the coastal area. Even some respondent told us in an indepth interview, from the Tsunami happened in 2007 that hit Japan, also affected this village, the high wave swept away many buildings near the coastal area. While in Kareko, have the least vulnerable due to the village relatively protected from the coastal area, but uniquely the study found that Kareko is prone to the landslide because mostly all areas of this village situated near the cliffs.

- Respondent with higher level of formal education had the ability to adapt better to the hazardous situation than the respondent with lower education. They also had skill and knowlegde that was given by the formal or informal sources such as training of mitigation from the government & related institutions or from the group in the community itself that was driven by the figure of the key person who they trusted had the proper knowledge and skill on how to cope with such kind of situation.
- On the other side, the disaster affected the fisheries employment that led to the decreasing of the income for the household or even losing source of income. In the 3 villages we surveyed, it is known that the respondent had various alternatives of income source to compensate with the impact of the climate change and the disaster affected their livelihood. In some cases they managed to have foods stock such as seafoods stored in the ice box to survive for more days while they were striving to gain money from other source.

- From the data of the education level of the respondent showed that mostly they had basic formal educations and only few of them had higher formal education such as senior high schools or colleges. The higher the education, the respondent had tendency to work not in the fisheries and farming sectors because based on their opinion from indepth interview, they gain better education for a better livelihood in the upland that is safer than in the oceans and they believed it can give them more incomes. On the other side, the respondent with lower education had tendency to keep working on the fisheries and farming sectors because whether they have no other better option of livelihoods or because they manage to continue their working on this sector with the members of the family in the household.

CONCLUSSION

- Based on the analysis of the the 3 elements of vulnerability index with its indicators, this study can be concluded that the coastal community in these 3 villages in Lembeh Island were relatively less vulnerable to the impact of climate change ecological disaster based on the scale of index ranged from 0 - 1. This is due the community in these vilages had various sources of income to support their livelihood while the crisis situation. Regardless this reason, the community were still had less proper knowledge and skill in the context of the standard techniques of mitigation & adaptation to cope with the climate change. The behaviour they had was based on their common sense to survive while the crisis situation.

THANK YOU
&
terima kasih

Kementerian PPN/ Bappenas

ICCTF
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