

## Livelihood Adjustments to Climate Changes and Foreign Migrant Worker

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## Abstract

*This paper explores the impact of climate change on livelihood options that affect migrant workers in Indramayu District, Indonesia. In this paper, migration is considered as an adaptation measure used by affected community members facing the challenges of climate change. The challenge emerges due to the interaction of several factors including the vulnerability of the region, government policies, demands of migrant workers, and social networks among migrant workers that contribute and encourage high temporary migration. A case study drawn from Indramayu District, Indonesia, the second poorest district in the province, demonstrates high remittances from migrant workers as a livelihood option. The research considers the experiences of ex-migrant workers (TKI) who are either ex-farmers/fishermen or close families of farmers/fishermen. Applied qualitative surveys explore environmental changes affected by climate change on livelihoods such as drought, floods, tidal wave, and sea level rise, and their impact on their reasons to become migrant workers. The paper concludes that the opportunity of being migrant workers abroad provides an alternative livelihood option for residents which have been highly affected by climate change impacts. It is therefore, important for national and local government to understand this climate change adaptation measure and to develop policy to support migrant workers affected by climate change. This paper also illustrates the ability of Indramayu residents to take the opportunity from the external condition that opens the possibility to work abroad and to gain some advantages.*

**Keywords:** *adaptation, climate change, livelihood, migrant workers, Indramayu, Indonesia*

## 1. Introduction

Climate change poses a significant challenge for small island countries and countries that have many islands and long coastlines. As an archipelagic country, Indonesia consists of 17,480 islands with total coastline of 95,181 km (Bappenas, 2010b). A recent study *Indonesia Climate Change Sectoral Roadmap* (ICCSR) by Ministry of National Development Planning (Bappenas, 2010b) predicts a large number of Indonesian coastal zones will be inundated with water around 63,768.36 km<sup>2</sup> ha in the year of 2030. While it is true that a large proportion of the Indonesian population resides in urban areas, there are many impacts in rural areas that deserve particular attention. The impacts of climate change to agricultural sectors in rural areas could potentially harm food supply in the country where many primary producers of foods are from the rural areas, whether from agriculture or fishery sectors. In the year 2050, the size of paddy plantation potentially affected by sea level rise will be around 182.556 Ha, which might reduce the rice production as much as 2.7 million ton (Bappenas, 2010a).

The Intergovernmental Panel on Climate Change (IPCC) noted that the greatest single impact of climate change could be on human migration—with millions of people displaced by shoreline erosion, coastal flooding and agricultural disruption (IPCC, 2007). Some scholars

have argued that there is a relationship between climate change and environmental changes to migration (Brown, 2007, Adger et al., 2002, Massey et al., 2010, Oliver-smith et al., 2009). While some scholars have argued that environmental changes cannot be the only factor for migration (Oliver-smith et al., 2009, Massey et al., 2010, Brown, 2007), developing countries will be the ones affected by climate change the most, numerically and geographically, as South and East Asia are particularly vulnerable to large scale forced migration, especially in poor countries (Brown, 2007, Drabo and Mbaye, 2011, IOM, 2009). Sea-level rise will have a disproportionate effect on their large populations living in low-lying areas (Brown, 2007), and economic factors play a decisive role in response to natural disasters, where developing countries are most vulnerable due to lack of resources to prevent, respond and cope with their effects (IOM, 2009, Drabo and Mbaye, 2011).

Previous studies have examined migration as a form of adaptation. Migration has been seen as one of the solutions for people living in the South Pacific in the face of climate risk from sea level rise. Other adaptation strategies include the provision of sea walls and making dyke or polder system to deal with flooding in coastal areas. Study of displacement or permanent migration has been discussed by several authors (Agrawala et al., 2003, Abrar and Azad, 2004, Oliver-smith et al., 2009, Stern et al., 2006). Furthermore, among available studies on climate change and migration, there are few studies that address the relationships between environmental changes, migrant workers and climate change adaptation. Many of these studies focus on the adaptation of households in dealing with sea level rise and tidal wave problem. Other types of adaptation by farmers and fishermen tend to be limited. Nevertheless, impacts of climate change will be experienced by villagers in rural areas and contribute to migration and/or displacement. Lonergan (1998) studied in a disaster risk context, communities' relocation to safe areas and remained there until conditions were safe to return. It is difficult to suggest that a single factor, such as environmental change, could contribute to migration or temporary migration. Other factors such as economic, social, accessibility and political factors together play important roles. Several research studies have discussed migration as a solution to climate change impacts (Castles, 2002, Hugo, 1996). Mortreux and Barnett (2009) observed in the South Pacific that the role of remittances is particularly important in household decisions about migration.

Adaptation is made up of actions throughout society, by individuals, groups and governments. It can be manifested in a myriad of ways; through market exchanges (Smith et al., 2000), through social networks (Adger, 2003), or through individual actions or organizations to meet their individual or collective goals. It can be undertaken by an individual for their own benefit or it can be made up of actions by governments and public bodies to protect their citizens. Social resilience can be understood as a community's ability to cope and to adapt with the environmental and social changes through the community's own mechanism or through external sources using social capital (Adger, 2000). External sources can be through extended family that is away temporarily or permanently. An example of permanent extended family is the help of the Minangkabau Community during the recovery of the West Sumatra Earthquake in 2009. Temporarily extended family helped family members by providing in kind support when they faced challenges or experienced a disaster (Vanhoebrouck and Sagala, 2010).

Migration is an attempt of a community to increase their social resilience through increase in source of income which is invested through human and physical capital. Several points that indicate a low level of vulnerability is the absence of land-ownership, unemployment,

homelessness, marginalization, lack of food and loss of access to social capital and the community function. Thus, when there is an external force coming in, these types of communities will be in fragile and at risk. Oliver-smith et al. (2009) argue that the relationship between environmental change and migration is not linear. It is more complex than an environmental change that caused migration. The complexity is influenced by socio-economic factors that take place where the communities are located.

Mayer (2011) suggests migration is not forced, but voluntary; it is not reactive, but preventive; it is not precipitated, but anticipated; it is not “inflicted” on public authorities, but decided and organized by them or, at least, with them, with the aim of reaching a mutually beneficial program. Like other adaptation strategies, migration may be a way for a community to cope with a change in environmental conditions. This may even be the only realistic strategy under certain circumstances.

As environmental changes increase, migration pressures related to these changes may also grow (IPCC, 2007). For many areas in the world, more erratic weather, rising sea levels and other climate change impacts will motivate resettlement, forced migration, or other forms of human mobility (Bogardi and Warner, 2008). Migration has yet to be discussed systematically within the context of adaptation strategies to environmental and climate change. Some characterize migration as a failure of adaptation, rather than as a form of adaptation. Yet studies have found that migration is often a proactive risk diversification strategy for households facing environmental stressors amidst a range of other risks that must be managed at the same time (Berkas, 2003, Hussein and Nelson, 1998).

This paper aims to examine the influence of climate change on livelihood options and sources in a rural setting in the Indramayu district as a case study to discuss the trends of migrant workers in Indonesia and the situation of migrant workers affected by climate change. Policy implications and recommendations are provided to further understand climate change adaptation options by affected communities.

## **2. Research Methodology**

To understand the trend of migrant workers and impact of the climate change in Indramayu, the authors carried out primary and secondary data surveys. The main source of information was obtained from interviews with ex-migrant workers, farmers, fishermen, and their family members. Interviews were also carried out with members of the Agriculture Agency, Fishery and Marine Agency, Labour Force and Transmigration Agency, Public Work Agency and Planning and Development Agency. Each interview took approximately 1-1.5 hours. To understand the climate change impact trend in the area, data were obtained from a literature review of the following sources: Intergovernmental Panel on Climate Change (IPCC), Indonesian Climate Change Sectoral Roadmap (IPCC) issued by Bappenas; International Organization for Migration (IOM) “Indonesian Migrant Workers”; Final Report of the Department of Agriculture Indramayu District; Report of the Department of Fisheries and Marine Indonesia "Disaster Mitigation and Adaptation Strategies of Coastal and Small Islands Due to Climate Change"; Report of the Bogor Institute of agriculture, the Ministry of Agriculture, BMKG, and local government Indramayu "Climate Information Use in Climate Risk Management"; and online national and local newspapers on climate change related disasters in the study area. The data analysis included a triangulation approach to understand the research findings.

**Table 1 In-depth Interview Informants**

<b>Informant</b>	<b>Information</b>	<b>Number</b>
Agriculture Agency; Fishery and Marine Agency; Labour Force and Transmigration Agency; Public Work Agency and Planning and Development Agency; Head of Village	General review of climate change's impacts in Indramayu	<b>6</b>
Ex-migrant workers (TKI) and their families	Reasons of migration	<b>23</b>
Farmers/farmers' family and Ex-migrant workers (TKI)	Climate change's impact to livelihood	<b>10</b>
Farmers/farmers' family		<b>9</b>
Fishermen/fishermen's family and Ex-migrant workers (TKI)		<b>11</b>
Fishermen/fishermen's family		<b>8</b>

The key-informants are from two villages and two sub-districts with different settings (see Table 1). The first village is Eretan Wetan, Kandanghaur Sub-District. This village represents an area that is mostly households that rely on the fishery sector as an income source. Fishermen who work in Eretan Wetan are traditional fishermen who own small and low quality accommodation, thus making them vulnerable to severe coastal weather. The village is largely affected by tidal waves and flooding. The second village, Singaraja Village, Indramayu Sub-District, is a village with both farmers and fishermen who face droughts and tidal waves. Farms in Singaraja Village are all rain-fed farms, which mean that they are dependent to rain water because of a lack of irrigation channels.

The ex-migrant workers (TKI) were selected through a snowball sampling research approach. The research team visited the head of each village to discuss the location and situation of potential informants. Most of the farmers work in paddy fields while the fishermen go out to sea to catch fish. The interview questions were qualitative, open-ended, and directly related to main research topic to avoid biases. The researchers developed an initial analysis framework based on 4 basic questions: 1) Farmers and fishermen were asked questions about whether they have seen environmental changes taking place in the last 30 years and how these have affected their livelihood sources; 2) How climate change affected farmers and fishermen's livelihood; 3) What are specifically the reasons why villagers chose to work as TKI; 4) Why do people not choose to work in Indramayu. As for the interview questions to the governmental agencies with respect to policies in relation to adapting to climate change in Indramayu, they were specifically asked.

The in-depth interview and focus group discussion results were systematically arranged in transcripts for data analysis. A grounded methods approach was used to inform a coding structure that emerged from the data. The results from the interviews and focus groups were compared and contrasted with the secondary data sources in order to enhance or reconsider the gathered information. The final goal was to combine information patterns into wider and more objective analysis patterns.

The authors visited the research areas four different times, from March to July 2011. The initial survey and government agency interviews were conducted during the period of 15-18 of March 2011 in order to gain a better understanding of the conditions in each study area. Field observations in Eretan Wetan Village were carried out from the 15 to 19 of June 2011 and resumed on 30 June to 2 July 2011. Field observations were also carried out in Singaraja Village from the 10 to 15 July 2011.



### 3. Indramayu Profile

Indramayu is located in West Java Province, North Coast of Java Island (see Figure 1). Indramayu district is prone to environmental disaster since it is located in the north coast of Java, with plane topography. This district frequently faces tidal waves, floods and droughts. As multi-hazards occur, the impacts have been felt by many livelihood sources in the district, specifically agriculture and fisheries.

In 2008, 262.984 Ha of paddy fields in Indonesia were inundated by flood waters. Fifty percent of the total inundated area was located in West Java Province (132.129 Ha) (General Directorate of Water Management Resources, 2008). On the other hand, the total area of the paddy fields that suffered from drought in Indonesia was 262.592 Ha, where 47% of the area was located in West Java province (123. 527 Ha). Nonetheless, West Java had the role of the nation's main supplier of rice, with a total area of paddy fields approximately 700.000 Ha., BNPB (2011) defined Indramayu, a coastal area in West Java, as one of areas in Indonesia which is likely to be affected highly by floods and drought.



**Figure 1 Study Location Map**

The total population of Indramayu District in 2010 was 1.7 million with the average increase rate around 1.2% per year (BPS Kabupaten Indramayu, 2011). The main livelihood in Indramayu is the agricultural sector with 45.23% working as farmers or laborers. Nevertheless, Indramayu is the poorest district in West Java. In 2010, poverty in Indramayu reached 319.630 people or 19% of the total population. Indramayu also has a low Human Development Index and low GDI. The Human Development Index of Indramayu is positioned at 303 and the GDI is 325 out of 340 Regencies in Indonesia. At least 71% of people in the district have not completed elementary school. On the other word, only 1.8% of the population holds a bachelor degree. With the low level of human development and environmental changes that threaten the district, people are limited with respect to acquiring a decent job in Indramayu. Thus, it is important to study how these communities address the lack of availability of decent jobs in exacerbated conditions.

Due to the limited job opportunities, many people in Indramayu have left temporarily, changed their jobs or found jobs somewhere else. An increase in migrant workers could be

seen as a response to the uncertainty induced by climate and environmental changes. While the population is only 4.1% of that in West Java, Indramayu is known as a district that supplies TKI. The percentage of TKI in West Java is approximately 50%. In 2009, close to 70% of TKI from West Java came from the Indramayu District.

The number of TKI in Indramayu started to increase significantly in 1996-1999. However, after the financial crisis in 1998, the number steadily increased from 2000-2010. The majority of migrant workers are female, which is known as 'feminization of migration'. This related to the demand for migrant workers in a number of countries, such as the Middle East that requires them to work as domestic workers. The age range of the majority of TKI age is from 16-25 years old who they are mostly graduates of primary school education. The destination country of Indonesian Migrant Workers is classified into three phases:

- 1985-1989: Priority Countries are Middle East, especially Saudi Arabia.
- 1989-1995: Priority Countries are Middle East; some other countries include Malaysia and Singapore.
- Since 2000 until now, Priority Countries are Middle East, Malaysia, Singapore and some East Asian Countries: Hong Kong, Taiwan, Korea, and Japan.

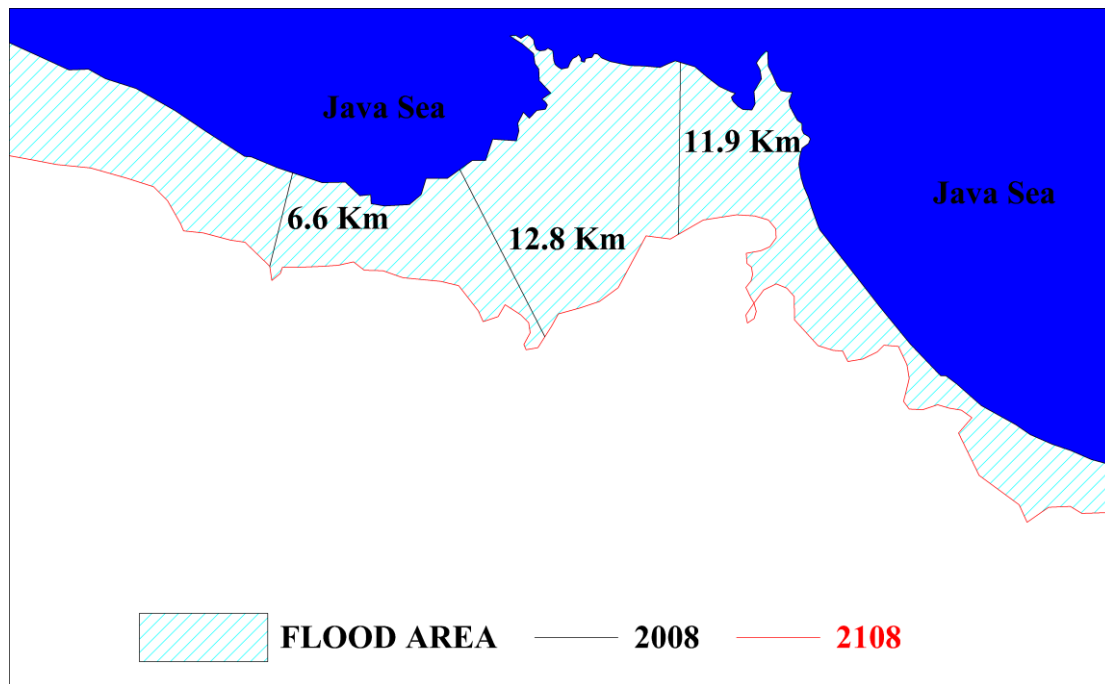
The increase in the number of TKI may be observed from the high rate of remittance. Despite its poor conditions, the amount of remittances received in the district of Indramayu is among the highest in the province (Kompas, 2010). *Western Union* Indramayu suggested that at least IDR 1-billion were received daily in Indramayu (Kompas, 2010). From the authors' previous research, it is known that remittances are used by people in Indamayu to increase their low household income. The remittances are also used to meet daily necessities such as house building and future investments.

The current research takes place in two districts of Indramayu Regency. The districts chosen for the study are those with the highest rate of poverty in Indramayu Regency, which are Indramayu and Kandanghaur District. In both districts, interviews were conducted in two villages. The village of Eretan Wetan in the Kandanghaur District suffers from floods and tidal waves, while the Singaraja Village in the Indramayu District grapples with droughts and tidal waves. Both of these villages have had an increase in the number of TKI. The main objective of this paper is to illustrate how climate change impacts are interrelated with migrant workers and livelihoods, and how migrant workers can reduce vulnerabilities.

#### **4. Discussion**

Environmental changes in Indramayu are characterized by changes in the average temperature, rainfall intensity, wind pattern, and coast lines. Regional temperature change in north coast of Java shows a range between 0.004-0.04° C/ year (Ministry of Fisheries Affairs, 2008). In October 2009, the maximum temperature reached up to 36°C. The temperature reached its maximum peak in 2008 at 38°C.

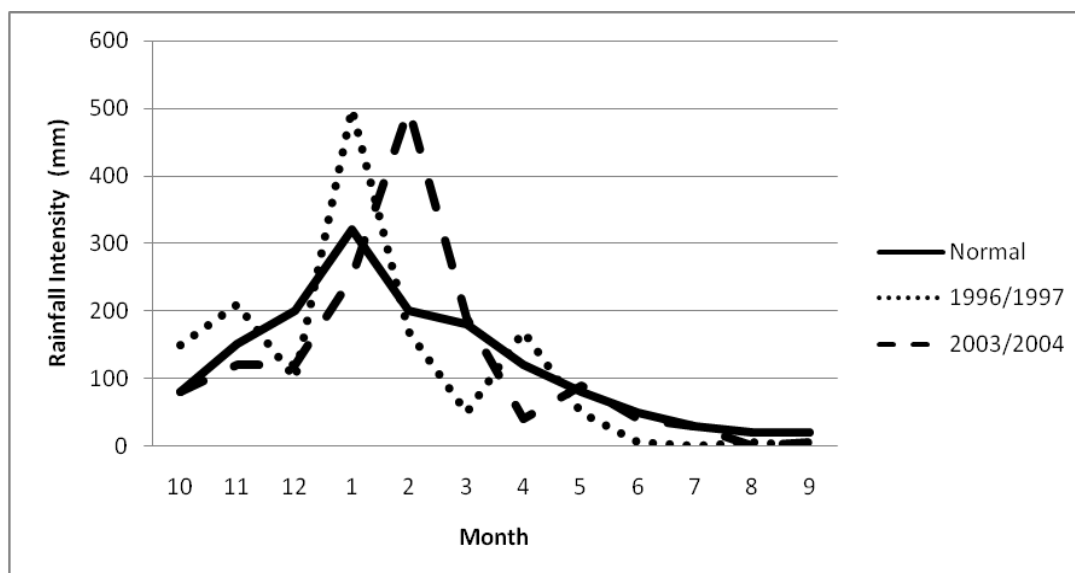
The rise of water levels in North Java between 1985 to 2008 has been as much as 7.8 to 8 mm/year. This has caused the erosion of the coastline as high as 329.1 Ha between the years of 1963 to 2003 in the Indramayu District. In the following 100 years, the areas flooded by tidal waves in Indramayu District might cover 55. 707 Ha or equal to an area the distance of 6.6 to 12.8 km from the mainland to the coastline (Ministry of Fisheries Affairs, 2008).



**Figure 2 Estimation of Sea Level Rise in 2108**

*Source: (Ministry of Fisheries Affairs, 2008)*

Climate change also influences the change in wind patterns and rainfall intensity. In Indramayu, the rainy season may end sooner or the extreme peak season could be longer than the average (Figure 3); thus could triggering disasters such as droughts and floods. Changing wind patterns experienced by fishermen include stronger winds and a higher wave reduces the number of “fishing days”. Sometimes fishermen cannot go fishing at all or they inaccurately predict the wave height affecting their ability to catch fish.



**Figure 3 Rainfall Intensity and Changes in Indramayu**

*Source: (Bogor Institute of Agriculture et al., 2009)*

The environmental and climate change in Indramayu have triggered disasters such as droughts, floods, agriculture pests, and high tidal waves. The intensity of flooding in the

Indramayu district has increased every year (General Directorate of Water Management Resources, 2008). Areas inundated with flood cover as much as 40.000 to 50.000 Ha or 25% of the total area of the Indramayu district. Considering Indramayu located downstream of the Cimanuk River, the situation worsen due to the high sedimentation rate in the river, decreasing its capacity to store the water.

On the contrary, Indramayu district is prone to drought. Droughts have been expanding the land as much as 1.491 Ha/year from 1989 to 2008. Drought areas have been increasingly caused by a decrease in rainfall intensity as well as level of river during the dry season alongside poor watershed management. Nearly 45% of the total 6.954 number of farming irrigation system have been damaged (Kompas, 2009). In addition, 90% of the sluice do not functioning because they were either stolen (50%) or broken (40%) causing failure in the irrigation flow (Kompas, 2008). In the next sub-sections, the paper will discuss the impact of climate change in Indramayu to the agriculture and fisheries sectors in Eretan Wetan and Singaraja villages.

#### **4.1. Impact to Agriculture Sector**

In this section, the discussion will draw from the changes in rainfall patterns, droughts, flooding and pest attacks in the study areas. The impact on the agriculture sector has been mainly influenced by the change in rainfall patterns significantly affecting the plantation timetable. Rain patterns have become harder to predict every year. For instance, in 2010 it rained throughout the year; whereas 2011 was dry for the whole year. Thus, the farmers in Singaraja Village were confused as to when to plant the lands and when to allow the lands to rest. Usually, fields are planted after the first rice harvest but because of climate change, the rainy season ends sooner creating drought conditions and thus leading to productions loss.

*(Farmer 1) "In 2009, the rainy season did not come until the end of October, thus the land could only be planted again on December. Therefore, we could only plant once a year because dry season followed closely after. In contrast in 2010, rain fell throughout the year, thus the main harvest was delayed until the end of March or beginning of April.*

The public work agency officer of Indramayu District also shared the same sentiment:

*"The change of rain pattern in Indramayu, make the rain pattern unpredictable and create drought. In 2010, rain poured unceasingly, whereas in 2011, the rain did not come. Unfortunately, in 2011 the farmer already thought that the rain would come as it had come in 2010, which was not and thus creating total failure of the crops.*

In particular, droughts have inflicted the village of Singaraja, impacting the water supply that comes from rainwater catchments, which is how farmers' irrigate their paddy fields. This conventional system meaning that the farmers do not use irrigation system but depend solely on rainwater. This kind of farming system is the most vulnerable against climate change, because if the rainy season does not come then the farmers will suffer from drought conditions.

*(Farmer 4) At Singaraja Village, if the rain does not come, the farmers will certainly suffer a drought, because there are no other water sources.*

In Singaraja, droughts occurring over the last 20 years have placed a strain on the farmers. Since 2000, droughts have become more frequent in Indramayu causing harvest failure. Additionally, seawater flows into the body of the river body making it unsuitable for

irrigation use and thus adding to drought conditions. This condition is contrast to the previous condition where almost all the area of the village of Singaraja was productive rice paddy fields which extend until the coastline of Java Sea as suggested by a respondent:

*(Farmer 2) "When I was young, around, approximately 20 years ago (around 1970-1980) agriculture in this place was very productive. The entire rice paddy fields were luscious, no drought had ever occurred because the water was abundant but since the river water became salty in 2000, freshwater for irrigation became hard to find, especially when rain were not coming."*

When rainfall is high, the Prawira River in Singaraja will flood overflowing onto farmlands. In Singaraja Village, flooding has become more frequent beginning in 2000 until now. The floodwaters tend to reach to 0.5 m but can reach to 1 m, if the rainfall rate is high. Thus, those affected houses, farms, and fisheries.

*(TKI 7) "Floods became more often in 2000s. But if compared to other districts, the floods here are less occurring. It only happens if there is a very high rainfall rate, with about 0.5 m tall."*

The Singaraja villagers who live near the river note that floods do not generally do too much damage to their houses, because furniture is not damaged. The farmers' concur that the floods are not severe enough to cause a harvest failure since they rarely occur, and when they happen farms are impacted for 1 to 2 days. This is very different from droughts, which could occur for a longer period of time causing harvest failure.

*(TKI 8) "...well, the floods would only swamp the house, it would never cause serious damage to house construction."*

*(Farmer 5) "The floods in the farms would merely swamp them for 1-2 days, it would be not too damaging, even we are grateful because there is rain occurred. It is different from drought; we could really have a failed harvest."*

The unpredictability of the climate causes irregular paddy planting forcing the farmers in Singaraja to use the land unceasingly without fallowing the land, which allows pests to breed at an increased rate. Droughts and floods cause a delay in rice production as whereby farmers continue to cultivate the paddy fields without allowing the land to "rest"; thus creating the perfect condition for pest to reproduce become a major problem. This occurred in Singaraja in 2010, when the 1<sup>st</sup> planting season was delayed and the farmers immediately began to plant for the 2<sup>nd</sup> planting season. Although the farmers knew that by not allowing the land pests would surely attack, their greater worry was the dry season and being delayed in planting.

*(Farmer 1) "... due to the changing rainfall pattern, field was immediately planted again which result in the attack of pests. But, because we solely depend on the rain water for irrigating, we could only plant on rain season; planting on dry season was not a choice"*

To counterattack pests, particularly rats, traditional rat hunting is arranged yearly; however, due to the exceptionally large population of rats, it is impossible for farmers to manage the pests, which has caused a significant loss in their rice production. It was said that in a single attack, the number of rats killed was a thousand. Nonetheless, in 2011 culling the rat population became useless because even though thousands of rats were killed, there were that many more that continued to destroy the agricultural land. To conclude, the method that was once successful in managing the rat population was no longer effective.

The increase in pest attacks in the Singaraja Village is also common in every other district of Indramayu Regency. Pest activity in Indramayu has increased in the last 20 years from 1990 to 2009 with the expansion of 1561.8 Ha yearly. The most severe invasion was in 2007, where almost 25.000 Ha of paddy fields were damaged. In addition, the types of pests have varied. In 1990, only rats and paddy stem borers (*penggerek batang*) existed, but since 2000 there are new pests such as paddy bug (*walang sangit*), wood-mason (*ganjur*), and bacteria leaf blight (*kresek*), plant-hopper (*wereng*), and leaf-folder (*hama putih*). Nevertheless, the most dominant pest noted by Department of Agriculture continues to be the rat, which has been identified as an endemic incursion in Indramayu. In the period from 1991 to 2008, the invasion of rats has increased to 500 Ha of paddy fields per year, covering 33.7% of the total pest infestation in Indramayu district (Resource).

Crop failure due to climate and environmental changes such as droughts and flooding has not only affected farmers' livelihoods but has caused livelihood loss. This has influenced villagers' decision-making with respect to choosing their livelihood since being a farmer is no longer a benefit. As production decreased in the 1990s, the proportion of farmers during that same period also decreased. In 1991, 88% of the Indramayu residents worked as farmers (WIRASBAWA, 1990); while in 2005 only 43% of them worked as farmers.

*“Being a farmer means uncertainty and potentially gets losses. To cultivate a paddy field that is around 0,7 ha, it needs 3 million IDR to buy fertilizer, pesticides, and to pay for labor costs. The production from the harvest is around 5 ton for 0,7 ha which is around 2,700 / kg, therefore 13,5 million IDR . If that is subtracted by the land rent around 6,5 million IDR and production cost around 2 million IDR, at least there is net revenue around 4 million IDR which is used for the living costs.*

*“(TKI 1) My husband chose to work as a labor in Jakarta since in Indramayu there is not satisfying job. Since his education very low, his possibility to work in Indramayu is only as a farmer/fishermen. As being a farmer has a lot of losses, why should we keep working as a farmer?”*

## **4.2. Impact to Fishery Sector**

In this section, the discussion will draw from the changes in tidal waves and high tidal waves, which have affected fishery workers and fishermen's livelihoods. In the study area, the village of Eretan Wetan, experiences tidal waves (the local term is a “rob”) taking place at each full moon, from the 13<sup>th</sup> to 15<sup>th</sup> of every month. The flooding from the tidal wave generally lasts for a day; however, since 2000 flooding has lasted up to 3 days or even a week, particularly in January and February when the rainfall rate is at its highest.

*(Head of Village Eretan Wetan) “closer to now, rob occurs more often and gets higher from 2000s. It usually only flood the village for a day, now it can lasts for 3 days of even a week, especially at January-February, everything just turned into sea.*

Tidal waves affect the *milkfish* fishpond and *black tiger shrimp*. During normal weather conditions, 1 Ha fishery can produce an average of 400 kg of milkfish, while a catch of shrimp can reach 300 kg. When rob occurs, the fisheries production rate decreases, and the fishery workers can only produce around 100 to 200 kg. This is due to seawater intrusion causing fish to die or taking them back out to the sea. To counter the fish lost, the fishery workers put nets in the fishing grounds, but if the rob is too high, this effort is futile.

*(Fishermen 2) "Tidal wave extent increases every year that causes the fish production decreases and the fishermen get losses because the salty water reach the fishpond and caused the fish to dead"*

*(Fisherman 5) "If a rob occurs, the fishes will immediately gone to the sea. Usually I put nets so the fishes don't go away. But if the rob is very high, the fishes will keep taken and lost to the sea."*

Climate change is causing high tidal waves and a higher frequency of storms. These have a major impact on fishermen. High tidal waves halt the fishermen in Indramayu from sailing too far out to sea or sailing for several days. For example, in 2010, the wave conditions in the Java Sea were unpredictable. The fishermen would depart in normal wave conditions but unexpectedly encounter 3 meters high waves. The fishermen do not have any safety instruments for these kinds of waves and if they do sail, the fish are harder to. These seawater conditions stopped 70% of the fishermen from going out to sea for two weeks.

*(Fisherman 5) "I could not sail for 5 days due to high tidal wave in 2010. The weather is unpredictable, we better refrain from sailing rather than hit by a storm."*

The high tidal waves also affected the fishing ground locations. The fishing ground is usually located near the shoreline; however, with high tidal waves, the fishing grounds need to be moved further out to sea. Thus, the fishermen must sail farther, increasing their probability of encountering severe weather.

*(Fisherman 9) today, if we want to catch fishes, we must go into deep seas, because the there are no more fishes near the shore, but we are only small scale fishermen. We do not have good equipment to sail far to the deep seas, we are afraid of the storms."*

A decrease in the fishermen's income has impacted their quality of life, even forcing some fishermen to sell their houses to meet their basic needs. With the more frequent high tidal waves, earnings attained from fishing no longer support a family.

*(Fisherman 4) "When we do not sail, our wives and children will suffer if there is no income, while we couldn't think any other means to gather money."*

*(Fisherman 2) "I had a house once, now my incomes keep decreasing, so now I live in my child's house. My former house are damaged, its furniture already sold to fulfill daily necessities."*

Similar to what has happened in the agriculture sector; the disasters in Indramayu have caused a great loss for fishermen. In the village of Eretan Wetan, nearly 90% of the residents worked as fishermen but in 2011 that number dropped to approximately 20%.

Apart from climate change issues, the environmental problems in the area, such as water pollution from the oil refinery in Pertamina has also contributed to reducing number of the fish. The waste that was spilled in 2008 was still present in 2011. The spill killed fish seeds that eventually decreased the quantity of fish caught. According to the fishermen of Singaraja Village, the oil leak was located in the heart of the fish habitat driving the fishermen to sail further from the coastline. Moreover, in 1999 the increase in fuel price and unpredictability of the climate caused financial losses for the fishermen despite an increase in fish price and technological advances..

*(Fisherman 1) "It is true that in 2000 the fish price was increased, nevertheless the production price was also increased due to the increase in fuel price. The quantity of*

*the fish captured also fluctuates in a decreasing trend due to unpredictability in climate. In a good day, I can catch 10 kg of fish, but in a bad weather, I can only catch 2 kg of fish or even none at all. Sometimes being a fisherman means earning 10 thousand Rupiah (1 USD) per day.”*

## 5. Livelihood Adaptation as Foreign Migrant Workers

From the interviews, the authors have formed several reasons for the migration of Indramayu residents. We will discuss these reasons in detail in the following paragraphs.

**Table 1 Reasons for Migrations (n=23)**

Reasons for migration		Total
Climate Related Risks	Drought impact	6
	Pest attack	4
	Flood and tidal wave impact	15
Working Condition	Higher salary	23
	Difficut to find a job	18
	Comfortable working condition	7
Social Network	Informed by friend	6
Government Policy	Easy procedure and criteria	7

### Agriculture

In Singaraja Village, droughts have caused harvest failures forcing the farmers to either sell their lands or to develop them into fishponds. Furthermore, seawater intrusion has caused the water from the river to become acidic contributing to the drought conditions, which makes it more appealing for the farmers to develop a more suitable livelihood such as fish farming. As agricultural land becomes less productive, fishponds are perceived as more beneficial than agriculture. A number of farmers are exchanging their land for fisheries; and therefore, changing their livelihood from farmer to fishery worker.

*(Farmer 3) “Salty river water here is more suitable for fish ponds (fisheries). The steady loss of income makes many farmers sold their land for fisheries and some turn into fishery workers.”*

An agricultural labor’s wage is only 25,000 IDR per day (\$3 USD) working normal days during the harvest season. Although, some agricultural labors have to work part time as labors and part time as tricycle (becak) drivers. However, farmers that have relatively larger endowment money become entrepreneurs by starting up businesses such as a grocery shop.

*(Farmer 2) “In the past before 1996s working only as a farmer was enough for my living. In 2004, beside a farmer, I had to also work other things to get enough for living.”*

### Fishery

Losses suffered by the fishermen have forced them to adapt. For example, a number of them have chosen more secure livelihoods such as a fishery worker that has a reliable income. Other fishermen have chosen to work on larger boats or become labourers in other sectors.

*(Fisherman 8) “Fisherman has a hard and uncertain live. I change job to fishery worker, even if I get hit by rob, I’m still not as poor as fishermen.”*



(Fisherman 7) *“The small fishermen here keep suffering loss, and the result is they change job into less vulnerable jobs, like a crew on large-scale fishermen, or a labor, so they could have steady income for their family.”*

While fishponds have become another source of income and a way to adapt, but they are not completely free from disasters. In Eretan Village, the fishery workers have lost income when they have tried to adapt by exchanging types of fish such as sensitive milkfish for adaptable catfish.

(Fishermen 2) *“..Therefore, the fishpond has changed the fish to catfish since milkfish fish and shrimps are sensitive to water condition”*

In Eretan Wetan Village, when rob occurs not only fisheries are damaged, but also settlements. In 2000, due to the high rob, villagers who lived adjacent to the sea had to relocate to the south of village. The 150 m tidal wave destroyed 50 houses causing local migration.

### **Working condition**

Even though farmers and fishermen have made an effort to adapt, their income is still far from enough to meet their basic needs. The living conditions of the Indramayu Regency are poor with few livelihood opportunities, which forces residents to seek jobs elsewhere to improve their welfare. The continual loss has forced a number of farmers and fishermen's of children and wives to become migrant workers.

(Farmer 3) *“..My kid saw the drought we suffer and our losses, and then he decided to work as a TKI”*

(TKI 2) *“Because the income of being a fisherman is uncertain, not enough money while my kids are getting bigger and in need of school education, more and more expenditure, I decided to be a TKI to help my family income”*

(TKI 9) *“..the problem is, there is no decent job in Indramayu, because farming and fishing won't suffice, so we seek jobs abroad.”*

The migrant worker pattern in Indramayu can be seen as a traditional response or strategy to cope with livelihood loss. TKI can attain the following net incomes by migrating to other countries: 1.3-1.5 billion rupiah in the Middle East region; 2 billion rupiah in Malaysia and Singapore; and 5-6 billion in Taiwan, South Korea, and Japan. These salaries are higher than the salaries of farmers, fishery workers, or even fishermen in Indramayu.

(TKI 15) *“The salary which given by the Arab Saudi's employer is higher than most of the salary as farmer, fishermen, and fishery worker at Indramayu. Moreover the salary at Taiwan and South Korea are far higher than working here in Indramayu.”*

Well-being and a high salary are considered important for the people of Indramayu and thus they strive to adapt in order to mitigate disasters. The salary they gain as TKI helps them to meet daily necessities, which they could never fulfill as farmers and fishermen. Moreover, the remittance obtained from being a TKI is used for operating businesses such as buying for fishponds or buying motorcycles for taxi-motor service. Diversifying business opportunities help the fishermen families during difficult time when going out to the sea is too challenging due to strong winds and high waves. In addition, remittances are also used to raise the houses to avoid flooding from tidal waves.

*(TKI 12) "Now I am working as a fisherman, having fishpond and being a taxi motor driver if I don't go to sea. The money for buying fishpond and motorcycle was from my wife's work as a TKI. Also, we could rebuild our house bigger and with higher floor to anticipate the tidal wave that occurs here (Eretan Wetan Village)"*

Comfortable working conditions also become a contributing factor for the villagers to become TKIs. Nice employers and high bonuses were reasons why the villagers were interested in becoming TKIs. Requests from employers for villagers to stay and work instead of returning home has led to a number of migrant workers in Indramayu to extend their contracts as TKI. [Were there any reported cases of abuse? Many female domestic workers (in Malaysia) experience exploitation by their employers (late payment of salary, violence, poor working conditions). Since 2009 there is a ban on Indonesian domestic workers due to the abuses – and then Cambodian domestic workers started going – and I just completed a study that examine their experiences of abuse/exploitation. Now the Cambodian Govt. has implemented a ban within the past year. I think this section, and the previous one, should further discuss the 'feminization of migration' and the specific experience of why women and children (illegal actually) to provide for their families in this context is problematic yet required given the circumstances.

### **Social Network**

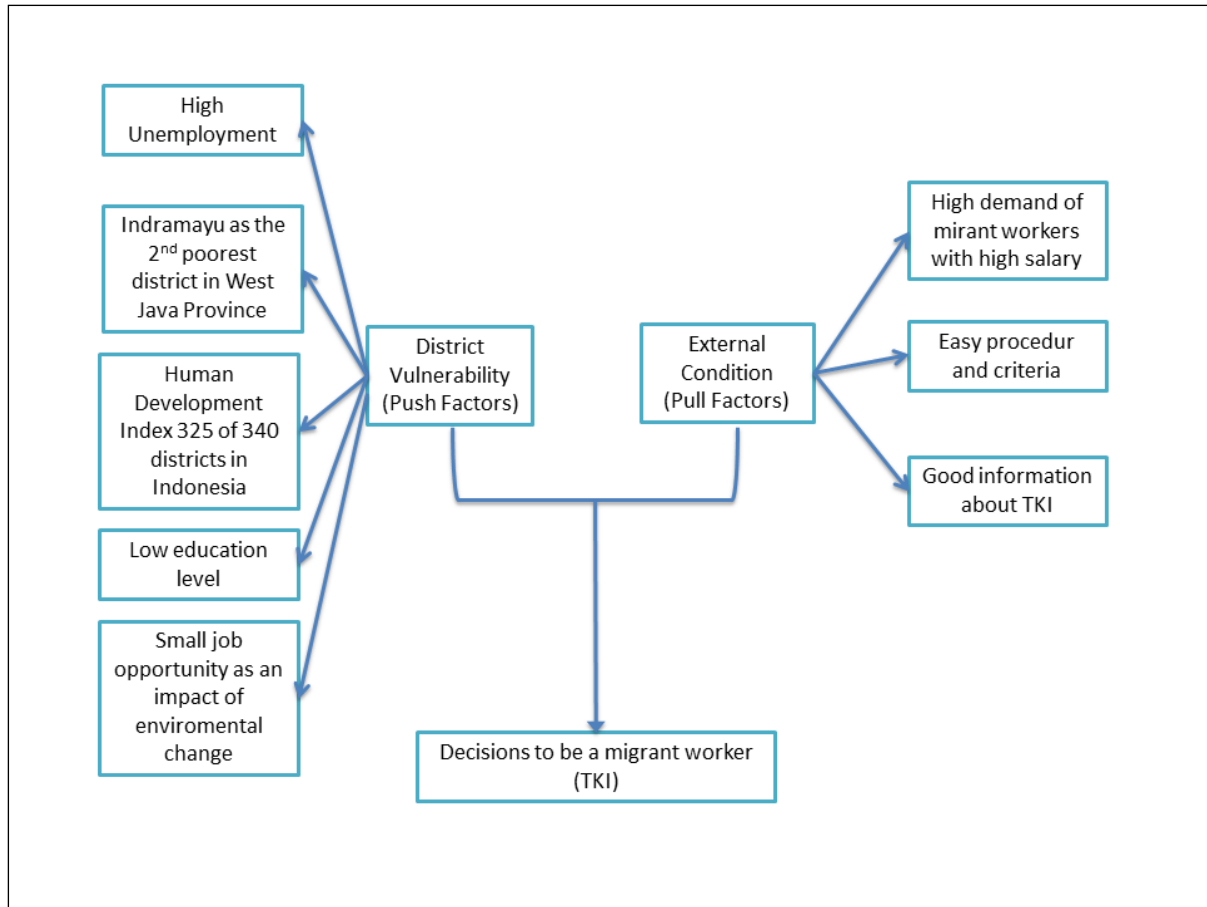
Individuals who decide to leave Indramayu gain knowledge about being a migrant worker from their family and friends who have either worked as migrant workers or continue to work as migrant workers; thus learning from their experiences and successes. While there are risks and uncertainties with living abroad, these diminish with the fact that living in Indramayu has more uncertainties.

*(TKI 8) "I have many friends and family who are TKI, most of people in this village go and work as TKI. When the migrant workers return from abroad, they tell about the story there and bring money. As the job provision here is limited, I feel sorry to see my family are in need of money, thus I decided to go (as a TKI)."*

### **Easy criteria**

The criteria to become a TKI are easy enough for residents of Indramayu. To work in Singapore, Taiwan, Japan, and South Korea they only need to speak the language of the destination country and completed junior high school. The countries in the Middle East do not have specifications; thus furthering individuals' desire to become TKIs.

*(TKI 4) "I do not find an adequate job for living in Indramayu. I have neither good education nor money to run business. So, not much choice here, thus I decided to be a migrant worker, easy criteria and relatively more money."*



**Figure 4 District Vulnerability, External Conditions and Decisions for Migrant Workers**

## 6. Discussion

In the previous sections, we argue that TKI has become an important adaptation strategy for communities affected by climate change impacts in Indramayu. Nevertheless, TKI trends are not without problems. The numbers of law violation cases stemming from claims by TKI in destination countries to date is more than 4.000 cases (ANTARA, 2012). Due to a lack of regulated monitoring, the majority of individuals that go abroad as TKI are illegal migrant workers. Thus, there are numerous cases of domestic violence towards TKIs by the household employer such as physical abuse, sexual harassments and withholding of the migrant worker's salary. This has led to a number of TKIs to seek justice on their own by acting violent towards their employers, and thus breaking the law. In 2011, based on government legislation related to employment, Indonesian Government issued a moratorium to cancel the permit of TKIs to Saudi Arabia. That same year TKI cases in Saudi Arabia ranked first compared to TKI placements in other nations at 10.393 cases (ANTARA, 2012). This moratorium was enforced to not only provide better services but also protection for Indonesian TKIs until an agreement can be achieved between the Governments of Indonesia and Saudi Arabia.

Another destination country that has proved to be problematic for TKIs, or if not more is Malaysia. Since 2005, violence against TKIs in Malaysia has reached 173 cases, but only 9 cases have gone through the court. Similar to Saudi Arabia, the majority of cases reported are

to do with violence, sexual harassment, or homicide. These are very regrettable, because both Saudi Arabia and Malaysia are the main income source for TKIs.

Destination countries that are less problematic are Japan and Korea. Both countries pay the highest salary for TKIs than any other destination country. These two countries cooperate with the Government of Indonesia regarding TKI employment. TKIs who want to go to Japan or Korea are directly handled by the governments since private sector involvement is strictly forbidden. Furthermore, there is an explicitly written agreement regarding the legal rights of TKIs between the Governments of Indonesia and Japan. Besides Japan, this type of agreement does not exist between the Indonesian Government and any other destination country; thus making TKIs vulnerable to abuse and exploitation. How is recruitment conducted in the other countries?

The relationship between environmental changes and migration cannot be seen as a linear pattern but rather a complex interaction, in which there is a relationship to vulnerability and community. There are regions that depend on traditional livelihoods such as the agriculture and fishery sectors; the when environmental changes occur over a long period, these sectors are impacted along with the society. Environmental changes contribute to the decline in production causing losses. The losses, namely financial, affect individuals and families' welfare because when household income is decreased it becomes more challenging to meet basic needs. The environmental changes in Indramayu have reduced the number of livelihood options for residents. This is exacerbated by the limited abilities of residents due to minimal education and insufficient welfare. The limited availability of work forces residents to seek employment elsewhere. In some countries that offer employment opportunities for migrant workers, the criteria for migrant workers is easy in that individuals with minimal skills and education can be paid a higher salary than what they could earn at home.

Chambers and Conway (1992) states that one way to achieve sustainable livelihoods is to decrease vulnerability and external risks such as disasters. As TKIs, individuals increase their income revenue, improve their food security, and mitigate their vulnerabilities to disasters. The linkages between those several factors make TKI a promising strategy as a sustainable livelihood. The migrant worker phenomenon apart from solving some unemployment problems in Indonesia and increase foreign exchange, it also solves the problems of the migrants and their family.

## **7. Conclusion**

This paper has illustrated how environmental and climate change affect people's livelihoods, increasing their vulnerability to risks, particularly disasters such as drought and floods. The adaptation measure to deal with such risks is seeking alternative livelihood options by temporarily moving away from their home of origin and going to work in cities or abroad. As pressures from environmental changes steadily increase, people will continue to be forced to find work elsewhere. Hence, being a migrant worker is not only one of the adaptation options but could be the main adaptation strategy. For individuals with minimal education, working abroad with a comparatively higher salary can be more beneficial than staying in their villages.

Yet, the current trend of migrant workers shows a number of negative impacts towards this group. As discussed, minimal education of migrant workers as well as a lack of protective measures for them in destination countries can be unsafe. There are some migrant workers employed abroad who do not have a clear understanding on their rights or do not know who to

contact when there is a serious problem. In some cases, this can be due to a low level of education, a low skill-base or a lack of preparation among migrant workers before working abroad.

Working abroad has a number of benefits for migrant workers; and therefore, it is important for the Government of Indonesia to support migrant workers by providing services that better prepare them to go abroad. At governmental level, there needs to be bilateral-multilateral cooperation between Indonesia and the countries where migrant works are employed. By the assistance of the Indonesian Government, it important to improve the skills of migrant workers before they go abroad; moreover, supporting them while they are abroad as well as when they transition home is just as critical.

Finally, the Government of Indonesia needs to improve its monitoring system for illegal migrant workers. Illegal migrant workers encounter many problems due to a lack of Indonesia protection in the destination country that they are working in. In the case of Indramayu, the government has recognized that environmental changes and climate change have a major impact causing a number of challenges such as a limited harvest season due to droughts or flooding as well as a lack of livelihood opportunities.

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