

# ***Kampung Tangguh Bencana: A Community Based Climate Change Adaptation Program in Yogyakarta, Indonesia***

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**Abstract:** *Yogyakarta as one of main city in Indonesia has different kind of hydro-meteorological hazards like flood, storm, drought, lahar flood, and rain-triggered landslide. Those hazards are linked to climate change in many ways. Some communities are living in vulnerable areas who can be exposed by natural hazards anytime. A program named Kampung Tangguh Bencana drives communities in vulnerable areas to gain more awareness and increase preparedness. This paper aims to evaluate the effectiveness of this program as climate change adaptation within 2012-2016 in Yogyakarta. To enrich our study, we compiled data from various government resources and compared it with field data, especially in-depth interview with communities in Kampung Cokrokusuman. Results from the study indicates that KTB program increases awareness and preparedness in disaster prone areas. In addition, respondents admit that government has serious concern about disaster education to vulnerable communities.*

**Keywords:** *climate change, adaptation, Kampung Tangguh Bencana, Yogyakarta*

## **1. Introduction**

### **1.1. Climate Change Impact in Indonesia**

Nowadays climate change becomes a serious threat to the entire globe. The emissions of greenhouse gases of recent decennia, combined with current emissions, lead to a continued global warming for at least the next decades [1]. Southeast Asia is one of the most vulnerable area in the world due to its large and growing population, long coastline, agricultural-based economy growth and dependency to its natural resources. Indonesia, one of the most populous country in Southeast Asia, is the largest archipelagic state in the world with more than 17,000 islands, around 6,000 inhabited, covering almost 2 million km<sup>2</sup>. It has a diverse ethnic and religious population of approximately 241 million. According to World Bank, Indonesia's gross domestic product (GDP) per capita is USD 3,570.3. As an equatorial country, this archipelago exposed by sunlight along the year. Indonesia has a tropical climate with two distinct monsoonal wet and dry seasons.

Indonesia also becomes the host of other natural disasters like flood, landslide, forest fire, storm, high tide and drought. According to Indonesia's National Disaster Management Authority (BNPB), 1186 natural hazards have occurred in 2015. Those hydro-meteorological hazards are linked to climate change in many ways. Climate change has significant role in increasing average rainfall about 10-50 mm and surface air temperature (SAT) around 0.5°C during the 20<sup>th</sup> century [2]. Simple Ocean Data Assimilation (SODA) shows that Indonesia's sea level rise (SLR) is about 0.8 mm/year. Average SLR then increased to 1.6 mm/year since 1960 and jumped to 7 mm/year in 1993 [3]. Extreme weather change also becomes anomaly in climate system to increase unusual events around the country.

Indonesia has several studies and policies to face the impacts of climate change. National Development and Planning Agency (Bappenas) launched two main references which are the Indonesia Climate Change Sectoral Roadmap (ICCSR) in 2010 and National Action Plan for Climate Change Adaptation (RAN-API) in 2013. Both documents discuss about multisectoral policy directions to adapt the impacts of climate change. In ICCSR, it was mentioned that the potential impacts of climate change in the future can affect several main sectors such as water, marine and fisheries, health, agriculture and forestry.

By 2100, sea level is expected to rise by 70 cm which puts many parts of Indonesia at high risk condition. Many productive activities are found along the coastal and major floodplain areas. Along with this scenario, extreme weather and SAT increase will create a competition for water resources. More broadly, increased evaporation and evapotranspiration will reduce water supplies for agriculture, drinking water, and other uses [4]. This water crisis could affect productivity in agricultural sector, resulting food supply scarcity. Flood, rain triggered landslide, and droughts which are generally caused by the rainfall also becomes serious threat to vulnerable communities.

### **1.2. Climate change adaptation**

Adaptation is increasingly conceived of as the management of climate risk [5], that means building an adaptive capacity to reduce vulnerability. The IPCC defines vulnerability to climate change as a function of the level of exposure and sensitivity of a system to climate change hazards, and also its adaptive capacity to moderate potential damages or take advantage of associated opportunities [6]. The factors that influencing adaptive capacity can be categorised into socio-economic and bio-physical nature. The adaptive capacity of the physical fabric of a city encompasses issues including the quality and location of physical infrastructure, such as transport networks and electricity generation and supply. From a socioeconomic perspective, looking specifically at a city's population, differences in adaptive capacity are driven by variations in awareness of climate change hazards, relative mobility, socio-economic status, length of residence time or the extent of community support [7].

Mitigation of climate change should be a main agenda for political agenda in every different level. However, despite all efforts to minimise the changes in the climate, it is easier to human kind to adapt to the changes. This adaptation is important to prevent communities from disasters caused by climate change [8]. Several studies show that climate change adaptation has many kind of approaches especially by capacity building to the communities [9] and main role of urban governance [10].

Yogyakarta as an important city in Indonesia, in term of history and tourism, has several kind of hydro-meteorological hazards like flood, lahar flood, and rain triggered landslide. Most of these vulnerable communities live in riverbank along three rivers (Code, Winongo and Gajahwong). In this paper, we would like to underline a program conducted by local government in Yogyakarta city named *Kampung Tangguh Bencana* (Disaster Resilient *Kampung*) as a climate change adaptation mechanism based on urban settlement communities. This program has been developed from 2012 until now and gain positive responds from local communities in vulnerable areas.

### **1.3. Kampung as genuine urban settlement characteristic in Yogyakarta**

Word 'kampung' or 'kampong' is commonly found in South East Asian countries like Indonesia, Malaysia, Brunei, Singapore, Thailand, Cambodia and Lao PR. This Malay word means "rural settlement system". The scale of *kampung* is between town and hamlet, mostly located in rural area outside the city boundary, practices the culture of helping each other as a community ('gotong royong') with close family ties characteristic. *Kampung* also described as an unstructured, unorganized and informal settlement in relation to the broader socio-economic system [11]. It can also be realized as a settlement in an urban area without infrastructure, planning or urban economic networking. Poverty and poor of quality of life are the features of *kampungs*.

The term *kampung* being used since the early of the 20<sup>th</sup> century by the Dutch colonial government through a program known as *Kampung Verbrechting*. In the beginning, the term of *kampung* was always associated with

oblique views. For example, from the starting point the Dutch colonial government had explicitly separating between ordinary citizens or *kampung* people in Surabaya (known as ‘*Indlandsche Gemeente*’) with high level residents (‘*Stads Gemeente*’) [12]. In the context of urban housing, *kampung* represents autonomy housing concept which the communities have freedom and authority to determine their own living environment. *Kampung* as a complex system of urban settlement also represents “housing as a process, as a verb” [13].

Term *kampung kota* is used to describe the phenomenon of village housing in urban that has been built by migrants from the countryside. *Kampung kota* is such like settlement in rural villages, but located in urban areas. According to Spatial Planning Dictionary [14], *kampung kota* means clusters of housing that has high population density, implies the houses are not formally built (following the provisions of the relevant city), lack of infrastructure, very densely populated and tend to be more dense.

Negative view of self-help housing or *kampung* is contrary with its roles, potentials, privileges, and the peculiarities. *Kampungs* not only dominate land use in Indonesian cities (around 70%), but also became a mainstay for 70 – 85% citizen housing in the city [15]. Meanwhile, housing provision through the private sector and government can only be provided about 15% from total housing needs in urban areas. *Kampung* has been being a cornerstone for most of the citizens in Indonesian cities. Not only in terms of number, *kampung* also provides various forms, conditions, and housing and room prices which is suitable with citizens’ various needs and fund ability. In Yogyakarta itself more than 70% of its residents live in *kampungs* which are not only provide quick access to the city centre, but also offer cheaper housing.

Despite the roles of *kampung* seem special, in almost all major cities it showed a widespread and uncontrolled increase along with economic crisis in 1998. Besides its own natives, there are many rural migrants that seeking a better life in the city living in *kampung*. They usually settle for various reasons such as close to their workplace and, of course, the living cost is suitable with their budget. For example, Kampung Cokrokusuman in Cokrodiningratan Sub-district grew from an ex Chinese cemetery in 1960s to a dense urban settlement nowadays. Volcanic sedimentation process from Mount Merapi eruption material in Code River body creates riverbank alongside the stream and attracted people to move in. Most of them built their house by using simple material, then made improvement year-by-year.

*Kampung* will be a serious problem because they do not obey the land use and building rules such as the distance between buildings are not appropriate with the standards. In *kampung* usually they do not provide enough space for the vehicles [12]. If there is a fire, it easily spreads to the whole *kampung* because fire fighters cannot reach the fire victim area. Likewise the drainage system, sanitation, and health norms are often ignored like the absence of sunlight, air circulation, distance between public toilet and water resources, drinking water facilities and so on. If left uncontrolled, this settlement will be slums.

Most *kampungs* also become pockets of unhealthy and unproductive residents. Although in general the social capital in *kampung* is still strong, under certain conditions, social capital can be eroded, weak, and not able to be used as support for vulnerable residents. Many *kampung* also face internal conflict and do not have strong local leadership, thus failing to mobilize collective resources for the benefit of the villagers. This condition causes the villagers vulnerable to be exploited and become the object of economic and social system that is more powerful in the city.

Status and legality of the *kampung* are a complicated issue and dilemma. Indeed, most of the *kampung* were built on unclear land ownership, such as state land, the land along the banks of the river, on either side of the railway tracks, and even in the Chinese graves. Such *kampungs* it can be called illegal aspect of the land. Nevertheless, most of the *kampung* were built and developed on the basis of clear land rights, whether certified or not. In the context of land administration which has not been established in Indonesia, the absence of a certificate of land in the village cannot be a reason for others to say it as illegal and invalid, and thus can be evicted. In situations where access to the city is increasingly difficult, either because land prices are too high, land speculation, and control and monopoly of land by those who are able, use of marginal lands or public lands by poor villagers should be understood as a ‘survival strategy’ that needs to be appreciated. As far as we are not

in a position to perform urban land reform that ensures access to land for the poor and vulnerable, the use of public lands by *kampung* residents to be seen in a more proportional.

## 2. Methodology

The basic hypothesis of the study was that *Kampung Tangguh Bencana (KTB)* as a community based climate change adaptation program can increase the adaptive capacity and preparedness in vulnerable communities in Yogyakarta, especially in urban settlement like Kampung Cokrokusuman from 2012-2016. This paper uses qualitative method by using content analysis combined with field survey and in-depth interview. Kampung Cokrokusuman has four hamlets (RW) with each RW headed by a chief and a secretary. We had in-depth interviews with the chiefs, the management of KTB, and some government bodies like Regional Development Planning Agency (Bappeda) and Regional Disaster Management Agency (BPBD) of Yogyakarta. During the research, we also conducted a field survey to observe the real condition of the *kampung*. Some indicators were created to see the comparison between four RWs (Table 1).

KTB program was developed from a community based disaster risk reduction (PRBBK) by some NGOs after Bantul earthquake in 2006. PRBBK itself aimed to increase community capacity in disaster risk reduction through disaster mitigation action plan during before, ongoing and after disaster. The PRBBK development model was adopted by BNPB to launch Disaster Resilient Village program prioritized for communities that prone to earthquake and tsunami disasters in west coast of Sumatra and the southern coast of Java. Disaster Resilient Village was modified by Regional Disaster Management Agency (BPBD) of Yogyakarta which the level increased from village to *kampung* level, where the community has high social ties and wider coverage.

The reinforcement of KTB in Yogyakarta is an effort to encourage the process of PRBBK in *kampung* communities. The process invites the public to understand that disaster management efforts can start from their own power without waiting for outside assistance, either government or private. With a strong sense of togetherness among members in the *kampung*, they can realize the spirit of mutual cooperation in every phase of disaster risk reduction. This is a great capital to create a resilient *kampung* to face the disaster threats. Resilient in term of being able to adapt, be able to anticipate, and quickly recover after a disaster occurs.

## 3. Discussion

The main target of *Kampung Tangguh Bencana* is the involvement of the community in disaster mitigation start from early warning, evacuation process and management of the temporal evacuation post. Communities are encouraged to be actively involved in identifying disaster characteristics in their areas, assessing, analysing, handling, monitoring, evaluating and mitigating existing disaster risks in their territory. *Kampung* is resilient if they can be able to assess existing disaster risks in their surroundings and design an action plan to reduce disaster risks. KTB program is implemented by appointing facilitators from the community and doing intense communication with related institutions. Facilitators are trained to have basic disaster management capacity so they can complete all targets from local government.

A resilient *kampung* must meet formidable indicators which are formulated during the facilitation activities like disaster awareness building processes (e.g. early warning system), understanding of disaster characteristics, risk reduction planning, and disaster simulation. In Kampung Cokrokusuman which are consisted of four hamlets or RWs (RW 08, RW 09, RW 10, and RW 11), the program was managed by a community named "Murwakani". This community builds public awareness from disaster in their *kampung* by organizing some training, meeting and simulation. Each RW has their own person in charge (PIC) who responsible to organize evacuation process when disaster occurs. As a community, Murwakani also gives periodic education to all *kampung* residents about disaster risk management and evacuation process. Cooperated with Cokrodiningratan Sub-district, they manage some training to volunteers about evacuation, first aid, logistic, early warning system, volunteerism and trauma healing management.

TABLE I: The Indicators of *Kampung Tangguh Bencana*

Indicators	Sub indicators	RW 08	RW 09	RW 10	RW 11
Disaster awareness building process	Disaster education	Yes	Yes	Yes	Yes
	Socialization in neighbourhood meeting	Every month	Twice a month	Every month	Every month
Understanding of disaster characteristics	Education to the youth	School and mosque	School and mosque	School and mosque	School and mosque
	Knowing different kind of disasters (%)	90%	80%	75%	95%
	Willingness to move from disaster prone area	High-middle	Low	Middle	Low
Risk reduction planning	Evacuation lane	Existed	Existed	Existed	Existed
	Early warning system	Radio	Radio, sirens/alarm	Radio	Radio, sirens
	Trained volunteers	Yes	Yes	Yes	Yes
	Equipment to cope with disaster	Three-wheel motorcycle, first medical aid, water pump, generator, chainsaw, rope, boots	Three-wheel motorcycle, first medical aid, water pump, generator, chainsaw, rope, boots	Three-wheel motorcycle, first medical aid, water pump, generator, chainsaw, rope, boots	Three-wheel motorcycle, first medical aid, water pump, generator, chainsaw, rope, boots
Disaster simulation	Mitigation and evacuation planning	Existed	Existed	Existed	Existed
	Periodic simulation	Twice a year	Twice a year	Twice a year	Twice a year
	Meeting point	Mosque square	Mosque square	Mosque square	Badminton court

In Kampung Cokrokusuman disaster education was organized by Murwakani community using some existing media in the *kampung*. Various instruction media can be seen around the *kampung*'s streets and alleys. They usually use routine neighbourhood meeting as a forum to discuss various agendas like simulation, volunteer training, meeting with local government and equipment maintenance. Furthermore, they make a collaboration with some NGOs, sub-district government and community service to reach the youth. They held some disaster education events in school and mosque (e.g. simulation, evacuation, and disaster knowledge).

Disaster education to the different level of ages results high percentage of people who can specify what is a disaster and how to handle it. Many of them know kind of disasters that threaten their *kampung* like flood, lahar flood, and landslide. For example, when flood and lahar flood occurs, they know how to move immediately after sirens are ringing. Children know where the meeting points are. Unfortunately, the high level of knowledge is not accompanied by a willingness to move from vulnerable locations. Some houses in RW 9 and 10 are located in disaster prone locations can be inundated by water anytime. Most of them know that their living place is dangerous but they do not have any choices to move from their residential because of the accessibility to the city centre. Most of them are low-middle income residents, so it will take more costly if they move to suburban. Moreover, they cannot sell their house because the land status is riverbank without land certificate.

Evacuation lane and early warning system become two important things to get noticed. Evacuation path and instructions can be seen everywhere across the *kampung*. The signs direct people to move from different ways to the meeting point. There are two meeting points in Kampung Cokrokusuman: mosque square in the north and open air badminton court in the south. The Murwakani Community also has four sets of radio and sirens, which are supported by BPBD, for gaining immediate information about river status and evacuation sign. Trained volunteers also have periodic meetings and trainings to face dangerous conditions. Emergency equipment like

three-wheel motorcycle helps them to move the elders across the narrow alleys. Volunteers also trained to use the rope for vertical evacuations. Besides that, periodic simulation was conducted to evaluate how the people and volunteers move when real condition happens.

#### 4. Conclusion

This study demonstrates that *Kampung Tangguh Bencana* program, especially in Kampung Cokrokusuman, can increase awareness and preparedness of hydro-meteorological disaster risk to the urban settlement residents. Number of KTB in Yogyakarta rises from 10 in 2012 to 75 *kampungs* in 2016. This data proves that local government has genuine concern in participatory bottom-up disaster mitigation. Otherwise, the lack of equipment maintenance budget was complained by communities. They cannot fund daily maintenance like changing wheel, repairing broken parts, or buying missing tools.

KTB program that has been initiated from the pilot project has many lessons in this 4 years. At the field, we can see how different kind of character in the community can be organized. The role of the facilitators becomes very important in communicating every step to reach the mutual goals. For the sustainability of the program, each *kampung* must increase their capacity and find another funding outside government. First aid training, early warning, and other trainings must be prepared to keep volunteers act appropriately. In addition, the KTB forum can be formed to be part of the disaster risk reduction forum in Yogyakarta so that the grass root voices become consideration in policy making in Yogyakarta.

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