# About Tuong Van

Tuong Van community is one of the five villages that are administrated by the Trieu An commune under the Trieu Phong district. The village has nearly 1,500 habitants living in 350 households across two residential areas, Lang and Dong, which have socially close relationships and share several social and economic activities. For instance, they not only share the same governmental administrative system and formal social networks such as unions of farmers and women, but many families in one residential area have relatives in the other. The number of households in these two residential areas is similar.

The governmental administrative system is the most important formal network of the village, and formally connects the residents with higher levels of government as well as non-governmental organizations (NGO). This system was established by higher levels of government when Quang Tri obtained the liberation in 1973. The system includes a village leadership board, which executes social-economic development for the village. Tuong Van has four local associations: Unions of Youth and Women, Agriculture Association, and Fartherland to assist the administrative system.

Lang and Dong have similar social and economic characteristics, but the former has a higher level of exposure to hazardous zones including the Thach Han River and the Cua Viet Sea. Lang is located closer to the Thach Han River, which annually brings floods to its residents. In addition, Lang is on low land and near the river mouth opening to the Cua Viet Sea, which commonly receives strong winds and storm surges. In contrast, Dong residents not only live on higher land, but are also shielded from the more hazardous zones by An Loi village and Lang.

Tuong Van is connected formally and informally with its neighbouring villages. For instance, the community is not only joined with the other four villages of the Trieu An community in the governmental program of storm and flood disaster risk reduction, but many families in the community have relatives in Ha Tay and Thanh Xuan villages. In addition, Tuong Van relates to villages of other neighbouring communes. For example, Lang residents are involved in some livelihoods on the Bac Phuoc alluvial islet of Trieu Phuoc commune, despite being separated by the Thach Han River.

# Economics

The community lives on agriculture, aquaculture, forestry and exploitation of natural resources. Agriculture is the key sector because it not only engages but also provides almost all the community a major source of foods and household income. Agriculture involves diverse activities, but most households live on subsidiary and rice cultivation as well as livestock and poultry production. In addition to the agriculture sector, the residents also have some alternative livelihoods that provide them with an additional source of foods and income, for example exploitation of river clams and wild shrimp.

The community has a diverse suite of resources, which have been used to support the human security and livelihoods of the villagers. These resources are classified into five groups including financial, physical, natural, human and social capitals although they play different roles in the community. These resources are unevenly distributed across the community. For instance, wild fish and clams are concentrated in Lang, while others such as Melaleuca forests and CTT are mainly distributed in Dong. However, many resources in Tuong Van, for instance the land for rice and shrimp production and flood dikes are concentrated in Lang.

Tuong Van has various livelihoods. The main agricultural activities are paddy rice, subsidiary crops and vegetables, as well as livestock and poultry. Rice production is traditional livelihood and involves about 50% of the households. Rice is the food supply throughout the year, but subsidiary crops and animal production provide daily food and additional income for households. Apart from agriculture, about 50% of households involved in aquaculture including shrimp and freshwater fish. Shrimp culture is a commercial activity for both Lang and Dong residents, but freshwater fish is only stocked in Dong as a main source of food and additional income.

Tuong Van also involves in exploitation of natural resources including clams, wild vegetables, and medical herbs, but residents in Lang and Dong use the resources differently. River clams, wild fish and vegetables on flooding abandoned rice fields, and nuts are collected commonly by Lang residents, while Dong mainly exploit medical herb rather than involving in Lang’s livelihood activities.

# Environments

Tuong Van is exposed directly to the Thach Han River, which is approximately 800 meters wide and annually brings floods to the community. The village is about 1.5 km away from the mouth of the river opening to the Cua Viet Sea, which commonly receives strong winds and storm surges. Moreover, the community is frequently flooded by high tides because most of its land is no more than 4 meters above sea level.

The villagers, their livelihoods and resources are highly vulnerable to climate hazards as they are exposed to hazardous zone. Despite being in the same community, Lang and Dong have different levels of vulnerability as they have geographically and climatically different conditions. Lang has been more exposed to floods, storm surges, tidal flooding and salinization as it is located closer to the Thach Han River and the Cua Viet Sea. Dong is less vulnerable to these hazards since it is shielded by An Loi and Lang, but they have been at higher risks to rain flooding in rainy seasons as its residents live in the valleys beneath sandy hills, which is annually flooded by heavy rains.

At least nine climate-related hazards have threatened the community over the last three decades. Beside rapid-onset hazards including storms and floods, the community has also been impacted by seven gradual and prolonged stressors such as droughts and salinization. Some hazards such as floods and droughts are routine, while others are relatively new to the community, for instance sea level rise and the resulting salinization. Among the nine hazards, floods and droughts as the most important. It is critical to note that, from community perspectives, storms were evaluated less important than flooding induced by heavy rains and high tides although they are considered one of the top two hazards across Vietnam.

The impacts of changing climate on the community vary over time. Climate hazards threaten the community throughout the year, but the most disastrous in rainy and dry seasons. In the rainy seasons, the community suffers most from storms, floods and flooding, while during dry seasons it is threatened by droughts and salinization. The community has been increasingly at climate risks as it is not only exposed to recurrent threats, but it also confronts with emerging impacts of climate change such as rising sea level and increasing salinization.

Changing climate has impacted the community in different ways. Some climate events such as southwest and northeast monsoons have become less adverse, while sea level rise and the resulting salinization have increasingly threatened the community. Climate impacts also vary across the community. Lang have been threatened more heavily by floods, droughts, tidal flooding and salinization, while Dong has suffered more from flooding induced by heavy rains. Climate hazards do not threaten resources of the community in the same way. For instance, freshwater is highly impacted by salinization and droughts, while the dike and transport systems are severely eroded by floods.

The adverse impacts of changing climate on Tuong Van community are a result of complex interactions among climate hazards and geographical conditions. Climate hazards do not occur independently but rather they interact one with others. For instance, salinization is resulted from tidal flooding, while storms commonly cause floods. Each hazard has its own impacts, but it could become more disastrous if it occurs with others. For instance, salinization in Tuong Van was resulted from tidal flooding during rainy seasons and its impacts were magnified by droughts during dry seasons.

Finally, it is important to note that climate events have also provided the community with some benefits or opportunities although they have caused losses of life and properties. For example, a flood might erode dike system, but it could provide the residents with wide fish and shrimps as a source of foods and additional income. In addition, a hazard could magnify, but it might also reduce the impacts of other hazards. As an example, tidal flooding and droughts could magnify limiting impacts of salinization on crops, but such effects might be reduced by heavy rains and floods following the tidal flooding.

# Trieu An

The Trieu An commune is one of the Trieu Phong district. Trieu An has a total land of approximately 14 km2. In 2012, the population of the commune was 7,000 residents living in 1,600 households across five villages. Agriculture, shrimp farming, coastal and marine fisheries, and forestry are key economic sectors of the commune. Two coastal villages of Trieu An mainly depend on marine fisheries, while the three others are involved in agriculture (rice, peanuts, cassava production and livestock production), forestry as well as inland and freshwater and brackish-water aquaculture and fisheries.

The commune is threatened by rapid onset hazards including storms and floods in the rainy seasons due to its direct exposure to the Thach Han River and the South China Sea. Over the last three decades, the commune has been threatened by six storms and floods. Most floods and storms occurred during October and November. The flood in 1983 was the most disastrous, not only killed 148 people but also damaged over 4,500 houses. Some floods occurred with storms. For instance, the storms in 1999 and 2005 not only damaged houses, but also induced subsequent floods, which swept away many houses. In addition, the commune has also been affected by gradual and prolonged stressors such as droughts and salinization during summers.

# Trieu Phong and Quang Tri

Quang Tri is located in the North Central Coast of Vietnam and covers a total area of 4,700 square kilometres. Mountains and hills are concentrated to the west and they occupy 80% of the provincial territory. The remaining quarter of the province accounts for plains and sandy areas along the coast, where agriculture, aquaculture and fisheries are concentrated. The province has nearly 600,000 inhabitants living in 10 districts, four of which are bordered by the South China Sea.

The annual average GDP of the province grew by 10.7% for the period from 2006 to 2011, but its average income per capita remained low at US$ 1,000. Between 25% and 45% of the population was classified as poor for the period of 2004 to 2010 and Quang Tri is one of the four poorest provinces in the central coast. There was a shift in the economic structure of the province over the last two decades. The economy of the province was characterized by the extensive development of agriculture, aquaculture and fisheries during the 1990s, but then it has gradually been supplanted by the construction and manufacturing sectors. In 2014, the agriculture, aquaculture and fishery sectors contributed a smaller portion, approximately 25%, to the provincial GDP, but they provided employment to 66% of the provincial population.

Quang Tri has a tropical monsoon climate, with the daily maximum temperature varying between 7.7 and 42.1⁰C. The rainy season usually lasts from September to December and it is characterized by heavy rains, storms and floods. The dry season typically starts from March and ends in late August and it is characterized by hot and dry southwest monsoons and droughts. The province has been impacted by a wide range of climate hazards, of which floods and storms are considered as the key threats.

Fifty-six major climate events, especially storms and floods, leading to human and economic losses have happened over the last two decades. The most disastrous flood (1999) killed 58 people and damaged 3,000 houses across the province, while the most devastating storm (Ketsana in 2009) damaged 42,000 houses, with 12 human deaths and 33 injuries. Overall, the number of human deaths during 2010s was reduced by 50% in comparison to the period of 1990s, but the number of damaged houses and human injuries increased considerably over the same period.

Trieu Phong and Hai Lang districts are the most vulnerable to climate hazards because they are directly exposed to large rivers and the South China Sea. Trieu Phong has been more susceptible to storms and floods in terms of economic loss and human injuries, thus it was selected for this research. Besides storms and floods, this district has also been affected by gradual and prolonged stressors such as droughts, sea level rise, and salinization of ground water and soil. These stressors have not caused loss of human life, but recent reports reveal significant impacts on human health and the livelihood of local communities across the province.