

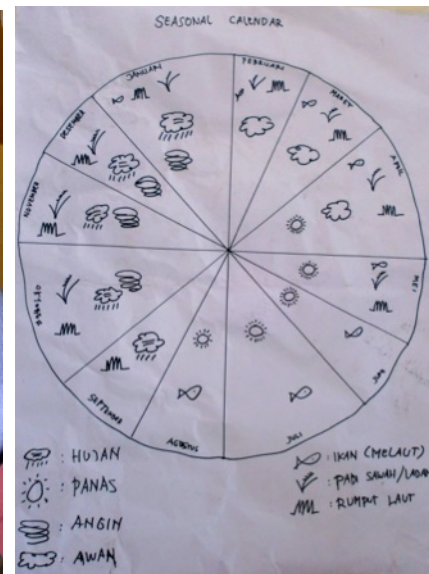


# INTERNATIONAL WATERS EXPERIENCE NOTES

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## Seaweed-producing village heeds wake-up call for early action adaptation planning



**Abstract:** The climate change adaptation subproject of CTI-SEA in Indonesia aims to raise the awareness of national and local government planners as well as coastal communities about climate change. As a first step, a participatory vulnerability assessment (VA) was conducted in Arakan, Tatapaan, South Minahasa in February 2014 using the Guide to Vulnerability Assessment and Local Early Action Planning (LEAP) tool. Results showed that the village was vulnerable to the impacts of climate change due to their exposure, high sensitivity and low capacity of the community. The process not only catalyzed local early action but also taught citizens that they had to develop their own adaptation plans based on their needs and ensure that these are ready for institutional support.

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Coastal and Marine Resources Management in the Coral Triangle-Southeast Asia (CTI-SEA)

# Seaweed-producing village heeds wake-up call for early action adaptation planning

Experience of the GEF/ADB-sponsored  
Coastal and Marine Resources Management in the Coral Triangle–Southeast Asia (CTI-SEA)  
GEF ID: 3589, RETA 7813 (2012–2016)

## PROJECT DESCRIPTION

Coastal and Marine Resources Management in the Coral Triangle–Southeast Asia (CTI-SEA) aims to increase the resilience of coastal and marine ecosystems and human communities in Indonesia, Malaysia, and the Philippines through improved management of coastal and marine resources in the Sulu–Sulawesi Marine Ecoregion priority seascape. It will support the introduction of more effective management of coastal and marine resources, especially those associated with coral reef ecosystems, to build their resilience in a period of increased threats arising from human-induced and climate change impacts.

In Arakan in Tatapaan, South Minahasa in Indonesia, local leaders are working with CTI-SEA on a regional subproject on vulnerability assessment (VA) of coastal and marine ecosystems and climate change adaptation (CCA). The aim is to raise the awareness of national and local government planners and decision-makers, as well as the coastal communities, about climate change.

The subproject will also support the planning and pilot-testing of achievable measures to increase the resilience of communities to climate change impacts. In Arakan village, the agreement was to conduct a VA and to prepare and implement an early action adaptation plan.

## THE EXPERIENCE

### Issue

“Fifty-two houses were destroyed in our area in 2012 because of heavy winds and rains,” said Pak Mochtar Ottay, head of Arakan village. He vividly recalled how their small community was ravaged by the impacts of climate change. Another resident showed with his hands that floodwaters once reached thigh level and destroyed their rice and corn crops.

The 334 households in Arakan village have good reason to be concerned. The lush mangroves, which used to protect this conservation area of Bunaken National Park from strong winds and waves during high tide and stormy weather, have been cut down. Their coastline has eroded 50 meters in the last three years, exposing low-lying areas in the village to flooding.

As a result, their main sources of livelihood have been badly affected. Severe windstorms have made it risky for fishermen to go out into the sea. Even during normal weather, their fish catch has decreased and the fish they catch are now smaller compared to previous years. Higher seawater temperature has resulted to massive “ice-ice” disease in seaweeds that decreased their harvests.

Seaweeds are sensitive to change in the level of salinity, ocean temperature, and light intensity. These can cause stress, leading to ice-ice disease. As a result, seaweeds produce a “moist organic substance” that attracts bacteria in the water. It also induces the characteristic “whitening” and hardening of the seaweed’s tissues. Ice-ice disease is a big blow to the village since they are one of the biggest seaweed producers in North Sulawesi besides Sondaken and Rap Rap villages.

Residents have also observed the changes in weather patterns in recent years, and they know that the worst is not yet over. However, while they expect more intense rainfall and flood events in the near future, they want to be prepared to protect their community.



**Figure 1. The community has observed that climate change has resulted in floods, sea level rise, erratic rainfall patterns, and high temperature.**

## Addressing the Challenge

The Regional Climate Change Specialist (Dr. Rosa Perez) and the National Climate Change Specialist (G.A. Anggara Kasih) conducted a participatory VA in February 2014 using the Guide to Vulnerability Assessment and Local Early Action Planning (LEAP)<sup>1</sup> tool. The results of the qualitative part are summarized in this experience note while the quantitative part will be presented in another learning note after the survey of the agreed socioeconomic and environmental parameters is completed by Sam Ratulangi University (UNSRAT). Meanwhile, climate projections will be calculated through simulation and downscaling by the Indonesia Meteorological, Climatological, and Geophysical Agency (BMKG). The VA drew on indigenous and scientific knowledge. It also helped the community understand the link between climate change and the community's livelihood. There are three major steps, namely:

**Step 1: Getting organized.** Ten community members formed the core group, which included the village head, and a mix of farmers, fishers, housewives, and representatives of women's and youth groups. Representatives from the District Fishery Agency, District Forestry Agency, Bunaken National Park Authority, District Disaster Management, and District Health Agency participated in the VA and in the adaptation planning consultation, which was supported by the District Head. The adaptation planning team also collected background information about the community.

**Step 2: Participatory VA.** Stakeholders developed a climate story and mapped the socioeconomic condition of their community. They described past, current, and expected future climate conditions and identified the ecological and social target resources. This enabled the team to understand target resource conditions and trends as well as their exposure and sensitivity to climate threats.

**Step 3: Early action adaptation planning.** This was the final step to help the community identify and prioritize adaptation actions based on effectiveness, benefit-to-cost ratio, and feasibility of implementation given the timing and synergy with other stakeholders. The group also developed an implementation schedule for priority actions by the end of the VA.

## RESULTS AND LEARNING

Table 1 presents the results of the VA in Arakan village. Overall, the village is highly vulnerable due to its exposure, high intensity, and low adaptive capacity of the people. Although Arakan village is endowed with biophysical resources, it is exposed to erratic rainfall patterns, rising air and sea temperature, and sea level rise. These extreme events have resulted in flooding, drought, storm surges, and coastal erosion, which have, in turn, affected the vulnerable resources in the community, as described in Table 1.

- **Ecological resources.** Up to 1990, the condition of the coastal area, especially the western part, was quite good. Since then, the original coastline has been eroded by almost 15 m. Coral reefs, which used to be dense and in good condition, have been damaged by human activities especially since 2013. The mangrove cover was dense until 1995. From that time up to 2013, there was widespread mangrove deforestation as local villagers cut down the mangrove trees for use as firewood and free roaming goats feasted on the mangrove saplings. In 2009, some villagers initiated mangrove replanting, but some 3 hectares still need to be planted.
- **Infrastructure.** The major infrastructure facilities in the village include the main road and the piped clean water supply. These are easily damaged when floods occur due to high tide and heavy rains.
- **Social target resources.** There is no health center in Arakan village that could cater to the basic needs of the population. Patients have to be brought to Amurang or Manado for emergency treatment, but travel time is more than two hours by land during good weather. A solid waste management facility is available for both household and animal wastes.



**Figure 2. Depleted mangrove areas in the village will be rehabilitated with bamboo, mangroves, and other plants as part of the early action adaptation.**

<sup>1</sup> VA-LEAP is a simple planning document developed by the US CTI Support Program Team. It is one of the tools included

**Table 1. Key Findings from the Participatory Vulnerability Assessment in Arakan**

<p style="text-align: center;"><b>EXPOSURE</b></p> <p>The probability or likelihood that a given location (including the natural ecosystem, human settlements, infrastructure, and other natural and man-made elements) will be affected by natural or human-induced hazards</p>	<p style="text-align: center;"><b>SENSITIVITY</b></p> <p>The level of expected injury or damage that may be experienced due to exposure to the climate hazards</p>	<p style="text-align: center;"><b>ADAPTIVE CAPACITY</b></p> <p>Describes how much natural and human systems can adjust to climate changes to moderate potential damage, take advantage of opportunities, or cope with consequences</p>
<ul style="list-style-type: none"> <li>• The village is highly exposed to coastal hazards because of the lack of coastal vegetation.</li> <li>• Extreme rainfall and storm events have occurred more frequently in recent years.</li> <li>• Flooding is the most frequent hazard threatening the village. Due to lack of proper drainage, floodwaters take weeks to recede.</li> <li>• Settlements have encroached upon mangrove areas, and domestic animals (goats) threaten the growth of mangroves.</li> </ul>	<ul style="list-style-type: none"> <li>• The economy relies on subsistence fishing, aquaculture, and seaweed cultivation. There are no available alternative livelihoods aside from farming.</li> <li>• Roads and the lone port are in bad condition.</li> <li>• Standing floodwater poses risks to health (mosquito-borne diseases).</li> <li>• Improper waste disposal (garbage) and goats' excreta are pose added threats to public health.</li> <li>• Health services are poor.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Medium</b> – The national and district-level government agencies are ready to provide monetary and technical assistance.</li> <li>• <b>Low</b> – understanding of the connection between the physical vulnerability of natural resources and socio-economic aspects</li> <li>• <b>Low</b> – particularly with respect to the protection of natural resources.</li> </ul>
<p><b>VULNERABILITY</b> - The degree to which geophysical, biological, and socio-economic systems are susceptible to, and unable to cope with, the adverse impacts of climate change</p>		

The sensitivity of the area is high so that problems are aggravated by non-climate threats, such as decreasing family income, the community’s limited understanding of the climate change phenomenon, ineffective coping mechanism for natural hazards/disasters, difficulties in solid waste management and sanitation, poor health services, and inadequate early warning system.

Although the village usually receives aid from institutions, such as the social agency, civil works agency, and other government committees, in response to climate-related disasters, the support is limited vis-à-vis the magnitude of the challenge. Stakeholders also realized that their local institutions need to be strengthened, and effective coordination established between the communities members and the organizations to enable them to adapt better to climate change impacts. It is also critical for community members to develop their own adaptation plan and prepare them for possible institutional support.

**Early Action Adaptation Planning**

The priority adaptation options chosen by the representatives were based on ecological, social, and governance benefits. These can be grouped into three categories, namely: natural resource management, community development, and disaster management strategies.

- **Natural resource management** - Mangroves, bamboo, cemara laut (*Casuarina equisetifolia*), munggur/trembesi (*Albizia saman*), and lamtoro/petaicina (*Leucaena leucocephala*) will be planted in the mangrove areas and behind the seawall. The initial plan is to cover 3 hectares with 30,000 mangrove seedlings (*Rhizophora sp*). The Provincial Fishery Agency and the District Forestry Agency committed to contribute the mangrove seedlings as well as the seedlings of bamboo, Albizia, etc. The ecosystem rehabilitation group also agreed to maintain the community nursery garden. This will be the source of replanting materials as well as revenues from the sale of seeds/seedlings.
- **Community development** - Capacity building on solid waste management will be handled by the women’s group. A minimum of seven dumping areas will be built in partnership with the District Civil Works Agency, which will also help in setting up the sanitation system.
- **Enhanced seaweed seed production** - The community plans to acquire heat-resistant seaweed seeds, which can withstand the increasing seawater temperature. They plan to source the tissue culture from the Balai Besar Pengembangan Budidaya Laut (BBPBL) in Lampung and develop a seaweed nursery area by batches. Four persons will take charge of the seedlings and seaweed production. If the first attempt is successful, the number of group members may increase.



- **Disaster management** - Since there is no stay-in doctor (or at least a nurse) in the village, one option is to arrange with the district health agency for a doctor or health worker to visit regularly. There is also a plan to conduct training on first aid and disaster preparedness to help reduce the loss of life and property during disasters.
- **Communication and public awareness initiatives** - A communication campaign on CCA will be carried out in partnership with the local government and civil society to disseminate information on the climate change phenomenon to key audiences (e.g., schools, religious groups, out-of-school youth, NGOs) and move them to action.

## REPLICATION

Based on the experience of CTI-SEA, the VA LEAP Guide is useful for researchers but it will be much better if it can be simplified. VA will be easier for communities to do and replicate with support from their local government if they have reference materials especially designed for their needs.

Second, when conducting the VA, the team has to invest time in evaluating not only the environmental situation but also the socioeconomic aspect and the culture in their chosen area. These factors affect the political condition and influences how early action adaptation strategies will be carried out. In Arakan, the VA drew on indigenous and scientific knowledge and used participatory methods to engage the community. Once implementation starts, the big challenge is how to sustain the change in people's habits and way of life. It means the implementation not only based on the project but also how to keep the sustainability of the implementation action.



**Figure 3. The team drew on both scientific and indigenous knowledge during the VA to come up with priority adaptation options for the community.**

## SIGNIFICANCE

Decision makers and civil society must take quick and decisive action to respond to the threat of climate change. In Arakan village, ignoring the signs could lead to the further degradation of their coastal resources, a collapse of their livelihood, widespread hunger, and greater poverty.

Fortunately, however, the community and the local government have taken the VA results to heart. Armed with new knowledge, they developed their own climate change adaptation plan for immediate implementation. There is no one-size-fits-all solution to address climate change, but with strong stakeholder commitment and a focused approach, vulnerable coastal communities like Arakan stand a chance to achieve a climate-resilient future.

## REFERENCES

Vulnerability Assessment LEAP Guide - [http://climatechange-asiapac.com/sites/default/files/Tool\\_4\\_VA-LEAP\\_Guide\\_US-CTI-CCA\\_Toolkit\\_Version\\_1.pdf](http://climatechange-asiapac.com/sites/default/files/Tool_4_VA-LEAP_Guide_US-CTI-CCA_Toolkit_Version_1.pdf)

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## KEYWORDS

- ◆ Climate change adaptation
- ◆ Vulnerability assessment
- ◆ Coral Triangle Initiative

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