

## **Exercise 6: Multi-criteria analysis**

Total time: **2 h50 minutes**

### **Learning Objectives:**

By the end of this exercise, participants will be able to:

- Outline key steps in carrying out an MCA
- Discuss the advantages and disadvantages of using MCA as a tool in appraisal of adaptation options.
- Conduct a simple multi-criteria analysis for adaptation options.

### **Case-study: Improving food security in Taranoa Islands**

#### **Background**

Taranoa Islands is a country made up of hundreds of coral atolls and small volcanic islands. The Taranoa Islands' climate is tropical. More than 90% of the Taranoa population lives in rural communities along the coast and is dependent on agricultural production such as local food crops, fishing and forest products.

#### **Impacts of climate change on taro**

Climate-induced disturbances are observed to be increasing in magnitude in the last years. More frequent and severe extreme weather events, as well as raising temperatures, longer draught periods and less precipitation are already affecting food production, putting local communities at risk and threatening the entire nation with food shortage.

Safeguarding food security and sustainable economic growth are of high priority for the Taranoa islands. One of the focus areas for the agricultural sector is the cultivation of an endemic taro variety, characterized by high nutritious value and a unique taste. It is one of the main root crops traditionally consumed on the Taranoa islands. Its taste is also highly praised in other countries and the preparation of the traditional taro dish is a touristic attraction. Until recently, the entire domestic demand was met through half of the local production, while the other half was exported, contributing to 5% of the GDP, which makes it the most important agricultural export product for the country.

In the past 3 years, Taro production has declined by 50% due to climate change and was just enough to meet the domestic demand. Two stronger than usual tropical cyclones hit the islands in 2016 and 2017. They swept off 20% of the arable land in coastal areas and damaged 20% more by flooding with seawater. Another 5% was lost due to climate induced pests and climate variations. It has been observed that taro pests are thriving under the higher temperatures. Longer draught periods and less precipitation are affecting not only the total volume of taro production, but also the size of the crop, making it difficult to meet the export requirements of the export partners.

In addition, the population of Taranoa Islands is increasing and is expected to double by 2028, which is also putting pressure on natural resources and land for food production, building materials, and other life support systems. With depletion of forest resources, communities are finding it increasingly difficult to access forest products, housing materials, food, and clean water, which are all important for village livelihoods. As taro is produced mainly by women, they are expected to be disproportionately affected by the production decline. In addition, food shortage could lead to health problems, higher mortality of infants and old people and migration.

A recent economic report showed that the demand for taro for domestic consumption in the Taranoa Islands is expected to double by 2028. If production would remain at 2018 levels and no other measures are taken, the growing taro shortage may lead to a food crisis in the next three years.

According to the Ministry of Finance the easiest and most straightforward solution for ensuring food security in the Taranoa Islands is the import of taro – it will be needed if no other measures are taken to avoid the food crisis. However, it was not desirable, as it would lead to loss of economic welfare and stimulate migration of workforce. The Ministry of Environment was also not happy, because this measure would not advance long-term resilience to the negative impacts of climate change and another cyclone might have even more devastating consequences. The Ministry of Agriculture pleaded for measures that will benefit local smallholder farmers, which comprise the majority of the farmers in the Taranoa islands. In response, the Ministerial Committee requested a think-tank to identify more options that would avoid import of taro and address not only food security, but also sustainable and resilient development, including continued employment for smallholder farmers. The think-tank presented the following list of measures:

- A. Focus on marine agriculture for food and export.
- B. Increase of cultivation of native salt-tolerant crops, such as beets and coconut palm trees.
- C. Introduction of non-native salt-tolerant crops, such as barley, quinoa and salt-tolerant taro found on other islands.
- D. Expedited introduction of a genetically modified salt-resistant taro based on the local variety, which is still in an experimental phase and has not been used for food yet.
- E. Building of sea walls to protect the coastal area and reclaim land back from the sea overtime;
- F. Planting mangrove forests and other native salt-tolerant trees along the coast to protect coastal areas, reclaim land back from the sea and restore soil quality overtime;
- G. Growing vegetables in raised beds and improved home gardening techniques;
- H. The introduction of the 'soils school' extension methodology to help smallholder farmers understand their soil and how best to manage it for sustainable food production.

The Ministerial Committee requested your expert group to prepare recommendations for decision-making on which three options should be prioritised in the National Adaptation Planning, as the available financial resources are limited. You decided to carry out an Multi-Criteria Analysis (MCA).

The available data is insufficient and you will need to rely on estimations and assumptions, based on the expert opinion within the group or other information.

The Multi-Criteria Analysis can be conducted in various forms, depending on the circumstances and the context. For this exercise you may use the simplified worksheet provided.

Carry out a MCA on the adaptation options and advice the Ministerial Committee of the Taranoa Islands which three options to prioritise in their National Adaptation Plan.

Instructions:

1. Participants are grouped into 4 teams of 8-10 people. Lead Facilitator will assist with the grouping. Ensure that participants from the same country join different teams.
2. Ensure that all participants have a copy of the instructions sheet (handout xx).
3. Each team appoints someone to take notes and someone to report.
4. Ensure each team has a flipchart stand and flipchart paper and at least 2 flipchart markers.
5. Encourage participants to carry out the MCA following the MCA key steps:
  - Agree on the adaptation objective and identify potential adaptation options (NB: this step has already been done for this exercise)
  - Agree on the decision criteria (refer to Unit 5 of the Participants Manual)
  - Score the performance of each adaptation option against each of the criteria
  - Assign a weight to criteria to reflect priorities
  - Rank the options (refer to the Exercise Handout MCA worksheet)
6. Allow 5 minutes for participants to familiarize themselves with the 4 adaptation options.
7. Allow participants about 20 minutes to agree on the decision criteria. They should discuss as a group and allow all concerns to be raised.
8. Allow participants about 20 minutes to score the performance of each adaptation option against each criteria. Complete the MCA worksheet accordingly.
9. Allow participants 20 minutes to assign a weight to reflect priorities.
10. Allow participants 15 minutes to rank the options.
11. Once they have finished ranking, ask them to discuss, in their groups, the question : Do you agree with the ranking? Give them 15 minutes to discuss. Allow them to make the necessary changes if they like.
12. Ask them to think about the challenges they faced using this methodology? What were the advantages?
13. Let them know they have to structure their 10 minutes plenary report: Which two options did they pick?
14. Did they all agree with the ranking?
15. Challenges and advantages of using the tool
16. Q & A from plenary

**Required material:**

- Flipcharts with paper (at least 5 flipchart stands)
- Flipchart markers (at least 10 – 5 different colors)
- Handouts:
  - Handout exercise
  - Exercise Instructions (one copy per participant)

Lead Facilitator: Ana Maria Kleymeyer

Resource Person: : Ju Youn Kang / Mozaharul Alam

## **MCA Handout 1 : Instructions sheet**

Total time: **You will have 1 hour and 30 minutes for this exercise**

### **Learning Objectives:**

By the end of this exercise, participants will be able to:

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The Multi-Criteria Analysis can be conducted in various forms, depending on the circumstances and the context. For this exercise you may use the simplified worksheet provided.

Carry out a MCA on the adaptation options and advice the Ministerial Committee of the Taranoa Islands which three options to prioritise in their National Adaptation Plan.

**Instructions:**

1. Participants are grouped into 4 teams of 8-10 people. Lead Facilitator will assist with the grouping. Ensure that participants from the same country join different teams.
2. Given the limited resources, you are tasked to carry out a multi-criteria analysis on the list of adaptation options and advise the government of Taranoa Islands which three options to implement to improve their food security.
3. In your groups of 8 – 10, appoint someone to report; one person to take notes and someone to facilitate the discussion/exercise.
4. Read the “MCA Handout 1: Instructions sheet”.
5. Familiarize yourselves with the “MCA Handout 2: MCA worksheet”
6. In teams carry out the MCA. You are encouraged to follow the key MCA steps:
  - a. Agree on the adaptation objective and identify potential adaptation options (NB: this step has already been done for this exercise)
  - b. Agree on the decision criteria (refer to Unit 5 of the Participants Manual)
  - c. Score the performance of each adaptation option against each of the criteria
  - d. Assign a weight to criteria to reflect priorities
  - e. Rank the options (refer to the Exercise Handout MCA worksheet)

**Handout: MCA worksheet**

	<b>Criteria</b>	<b>Estimated cost</b>	<b>Increased taro production</b>	<b>Improved health</b>	<b>Reduced emigration</b>	<b>Summary of weighting</b>	<b>Ranking</b>
<b>Options</b>	Weights to be multiplied with standardised results						
Focus on marine agriculture for food and export.							
Increase of cultivation of native salt-tolerant crops, such as beets and coconut palm trees.							
Introduction of non-native salt-tolerant crops, such as barley, quinoa and salt-tolerant taro found on other islands.							
Expedited introduction of a genetically modified salt-resistant taro based on the local variety, which is still in an experimental phase and has not been used for food yet.							

Building of sea walls to protect the coastal area and reclaim land back from the sea overtime;							
Planting mangrove forests and other native salt-tolerant trees along the coast to protect coastal areas, reclaim land back from the sea and restore soil quality overtime;							
Growing vegetables in raised beds and improved home gardening techniques;							
The introduction of the 'soils school' extension methodology to help smallholder farmers understand their soil and how best to manage it for sustainable food production.							