

Multi-Criteria Analysis (MCA)

Multi-criteria Analysis (MCA)

- Allows consideration of both quantitative and qualitative data in ranking options
- Considers several criteria even when not possible to monetarily quantify costs and benefits
- Allocation of criteria – each with a weight
- Ranking based on weighting criteria – overall score for each option
- Option with highest score is selected

When to use MCA?

- Good alternative when:
 - Only partial data is available
 - Cultural and ecological considerations are difficult to quantify
 - The monetary benefit or effectiveness are only of many criteria.
- Involves defining framework to integrate different decision criteria in a quantitative analysis without assigning a monetary value to all factors.
- Inclusive – stakeholder consultations and/or expert input
- Can be complemented by CBA and CEA

MCA in adaptation planning

- High relevance for adaptation
- Allows inclusion of uncertainty and other adaptation elements
- Flexible approach that allows qualitative information
- Purpose is to place adaptation options in order - preferred to least preferred with values expressed by those consulted

MCA steps

Agree on the adaptation objective and identify potential adaptation options



Agree on the decision criteria



Score the performance of each option against each criteria



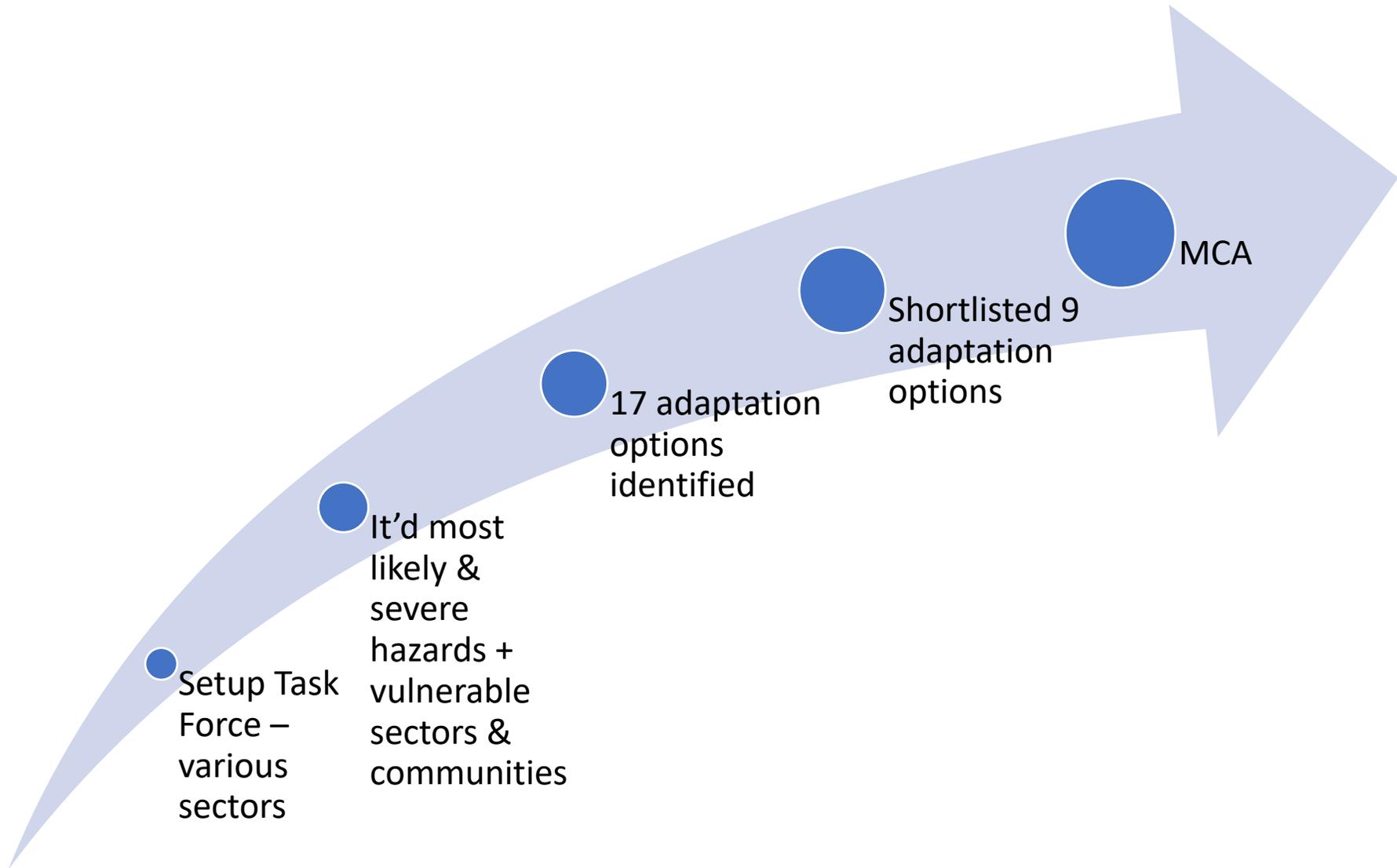
Assign a weight to criteria to reflect priorities



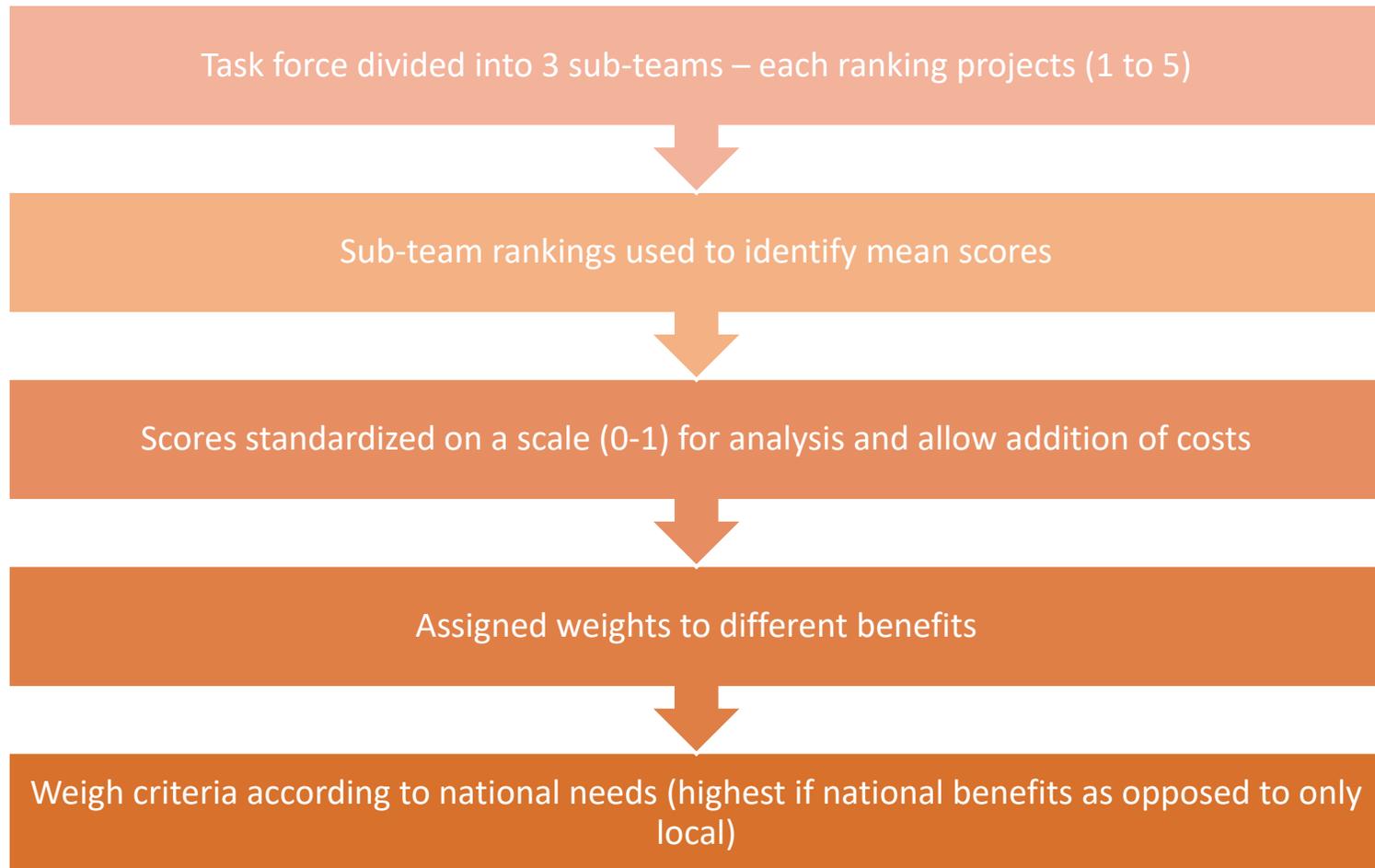
Rank the options

The option with the highest score is selected.

Case Study: Bhutan NAPA



Bhutan NAPA – MCA steps



MCA Results

Options	Criteria	Estimated cost	Human life/ health saved	Arable land, water supply etc. saved	Essential infrastructure and monuments saved	Summary of weighing	Initial rank	National (N) Regional (R) Local (L)	Adjusted ranking
	Weights to be multiplied with standardised results							N +15% R +/- 0% L -15%	
		0.20	0.33	0.27	0.20				
(1)	Disaster Management Strategy (Food Security and Emergency Medicine)	0.71	1.00	0.75	0.25	0.7245	2	N 0.833175	1
(2)	Landslide Management & Flood Prevention	0.56	0.75	0.75	0.50	0.662	4	R 0.662	4
(3)	Rainwater Harvesting	0.56	0.75	0.50	0.00	0.4945	7	N 0.568675	6
(4)	Weather Forecasting System to Serve Farmers and Agriculture	0.81	0.75	0.50	0.25	0.5945	5	N 0.683675	3
(5)	Artificial Lowering of Thorthomi Glacier Lake	0.26	1.00	0.75	1.00	0.7845	1	R 0.7845	2
(6)	Installation of Early Warning System on Pho Chu Basin	0.85	0.75	0.00	0.25	0.4675	8	R 0.4675	8
(7)	Promote Community-based Forest Fire Management and Prevention	0.81	0.25	0.50	0.25	0.4295	9	R 0.4295	9
(8)	GLOF Hazard Zoning	0.93	0.50	0.25	0.50	0.5185	6	R 0.5185	7
(9)	Flood Protection of Downstream Industrial and Agricultural Area	1.00	0.75	0.25	1.00	0.715	3	L 0.60775	5

Exercise - Taranoa Island

[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.

Exercise - Taranoa Island

[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.

Exercise - Taranoa Island

[Impacts of climate change on taro]

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.

Exercise - Taranoa Island

[Impacts of climate change on taro]

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.

Exercise - Taranoa Island

[Impacts of climate change on taro]

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.

Exercise - Taranoa Island

[Impacts of climate change on taro]

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.

Exercise - Taranoa Island

[Impacts of climate change on taro]

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.

Exercise Instructions (cont...)

- You are invited to carry out an MCA exercise and advice on which two options.
- Consider following the Steps:
 1. Agree on the adaptation objective and identify potential adaptation options
 2. Agree on the decision criteria.
 3. Score the performance of each adaptation option against each of the criteria.
 4. Assign a weight to criteria to reflect priorities.
 5. Rank the options.
- Which two options would you recommend to the Republic of Taranoa Islands?

Exercise Instructions (cont...)

1. Sharing experiences

Exercise Instructions (cont...)

2. Agree on the decision criteria
(20 min).

Estimated cost	Increased taro production	Improved health	Reduced emigration
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Exercise Instructions (cont...)

3. Score the performance of each adaptation option against each of the criteria (20min.)

Exercise Instructions (cont...)

4. Assign a weight to criteria to reflect priorities (15min.).

Exercise Instructions (cont...)

5. Rank the options(15min.).