Robust Adaptation Toolkit

An Explanatory Note

1. Introduction

This Explanatory Note should be used alongside a detailed **"Adaptation Toolkit Guidebook for Researchers and Adaptation Practitioners Working with Local Communities"** which is available on the weADAPT Platform https://tinyurl.com/ycncmamr. The Toolkit provides a detailed description and methods of seven (7) tools to guide researchers and community practitioners wishing to conduct participatory climate change vulnerability assessment and adaptation planning. An Outline of these tools and their expected Outputs is presented in Table 1.

Table 1. Description of Tools in the Robust Adaptation Toolkit

1

Resource mapping:
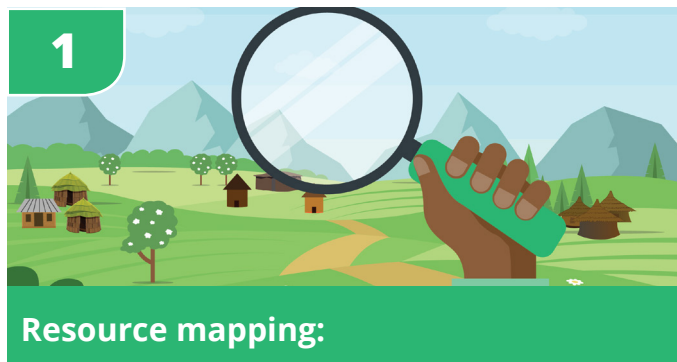
This tool helps to identify or set boundaries to the area you will assess and maps out available biophysical resources and their spatial distribution. It generates discussions around issues like land tenure, resource allocation and management, use, and benefits obtained from the resources, and relationships between the different resources. It provides a good basis for discussing what generates climate vulnerabilities and/or the capacity to adapt.
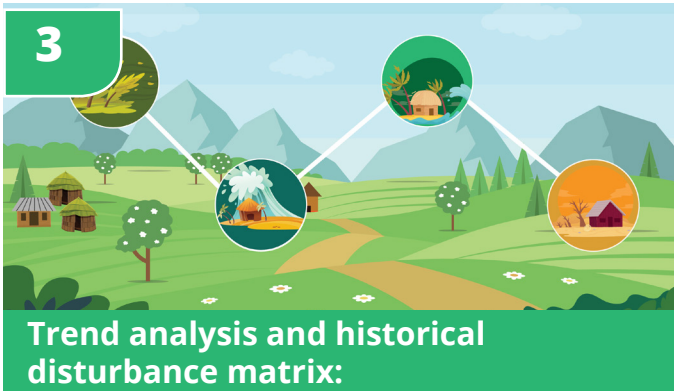
OUTPUT

A map showing the study area, available resources and their geographical distribution, and identification of key factors that shape the relationships between the social actors and the biophysical resources in the site.

2

Capacity mapping:

This tool identifies various capacities, skills and assets in community/stakeholder group/project site that could be further strengthened and built upon for future adaptation.

OUTPUT

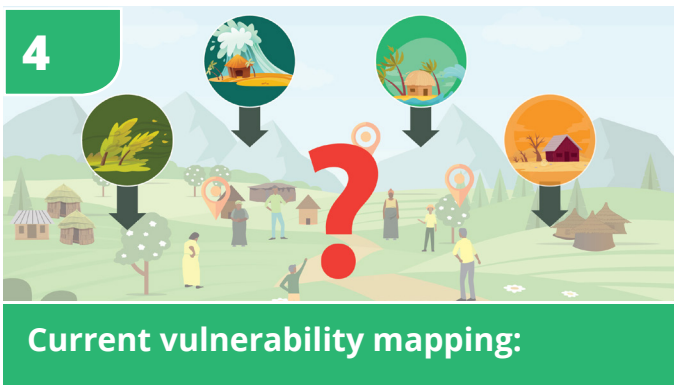A graphic overview of available capacities, skills and assets on site.

3

Trend analysis and historical disturbance matrix:

This tool helps to identify climate-related events that have affected the area in the past, either positively or negatively, as a basis for understanding current vulnerability.

4

Current vulnerability mapping:

This tool helps to establish the degree and range of impacts of different climate hazards on resources, livelihoods and social groups.

5

Climate change perceptions:

This tool assesses the community's perception of climate change. It helps to bring out and make explicit what local people view as being the drivers and consequences of climate variability and change.

6

Participatory scenario building:

This tool aids community members to plan for the future and make adaptation decisions based on their past experiences, current capacity and available assets, and the vision and goals they have for the future.

7

The Adaptation Decision explorer (ADx):

ADx is a decision support tool to screen adaptation options. Users are able to access several methods to select the most appropriate and widely preferable adaptation options for their site.

The two case studies conducted in Nigeria (Enugu) and Kenya (Migori) as part of the project; **"Bridging Climate Information Gaps to Strengthen Capacities for Climate Informed Decision-making"** (CDSF) applied a selection of these tools through a participatory process to identify the climate vulnerability in the project areas, and to co-identify, with stakeholders, the adaptation options in the different sectors considered (agriculture, land, water etc.) at both local and regional (sub-national scales). The purpose of this Explanatory Note is to describe in detail the "Adaptation Screening" Tool and its application using two methods; (a) the MCA (Multicriteria Analysis), and (b) Analytic Hierarchy Process (AHP) and showcase their potential application in the prioritisation of adaptation choices as applied to the Kenyan case study. Section 1 gives the introduction. Section 2 describes the multicriteria methods, including their benefits and limitations. Section 3 shows the application of the MCA to compare, rank and ultimately prioritise the adaptation options identified during the Migori case study to inform the development of the County Adaptation Plan (CAP), and Section 4 Concludes with an Outlook.

2. Multicriteria methods for Adaptation Screening

The MCA (Multicriteria Analysis), and (b) Analytic Hierarchy Process (AHP) are part of family of multicriteria assessment methods which aim to compare, rank and ultimately prioritise options. This section provides a description of the multicriteria methods and their benefits/limitations. We discuss also fully-fledged modelling techniques used for options appraisal.

2.1. Multicriteria Analysis

MCA is a common tool in appraisal when there are multiple objectives. MCA uses the judgements of decision makers or experts on the importance of the various criteria, which are then used to assess options. In MCA, weights are given to each criterion, ideally reflecting the preferences of the decision makers. The weighted sum of the different criteria is taken in order to get an overall score for option, which can be used to rank options.

MCA can prioritise alternative policy options. Based on a thorough analysis of the most suitable criteria that decision makers can adopt in their decision making, a multi- level MCA can categorize and rank promising and feasible adaptation options. The steps include a clear problem definition, which includes the identification of all alternatives, selection of a set of criteria and assessment of scores. Then the scores are standardized, and the weight of each criteria is determined.

MCA is a potentially elegant method to assess alternative policy options, on the basis of a set of alternatives and an explicit set of criteria. The main problem is that such an approach is inevitably subjective, and/or requires very large stakeholder input, in relation to the scoring and weighting assessments. When choosing the weights, a natural candidate is equal weights; this mirrors an unweighted summation of the scores. Another relevant weighting is to give a higher weight to urgency, thereby indicating that this is the most important criterion. There is a scope for the use of MCA in those areas where monetary benefits are only a part of the criteria used.

Source: PROVIA/MEDIATION toolbox: https://tinyurl.com/y7ycg8pr

MCA in 5 STEPS

Step 1: Identify a set of options to evaluate.

Step 2: Identify multiple criteria and a weights for each criteria.

Step 3: Associate a value for each criteria to each alternative. This steps yields a matrix.

Step 4: Compute the weighted sum (called score) for each alternative.

Step 5: Decision rule: choose the alternative with the highest score.

An example MCA. The decision maker selects the relative weights for the separate criteria, and then the relative scores for the options on each criterion. In this example, Car 1 would be the best choice, with the highest final score, which represents the weighted average of the three criteria scores for each option.

	cost (.6)	safety (.3)	styling (.1)	Total score
Car 1	0.5	0.2	0.3	0.39
Car 2	0.3	0.1	0.5	0.26
Car 3	0.2	0.7	0.2	0.35

Source: MEDIATION Deliverable D4.1
See also the MEDIATION Technical Brief No. 6 at https://tinyurl.com/ydhogbuh

2.2. Analytic Hierarchy Process

AHP is another type of multi-criteria assessment technique for analysing complex decisions. It was developed in the early 1980s to help decision-makers find the option that best suits their goal and understanding of the 'problem'. Nowadays it is applied in a wide variety of fields (mainly engineering, business strategic management, education, quality assessment).

The method is used to compare a set of options by using participants data, experience and judgment, and converting these into numerical values. It allows them to compare in a rational and consistent way diverse elements that are often difficult to measure (AHP measures intangibles in relative terms).

It evaluates various elements by comparing them to one another two at a time (pairwise comparison). Comparisons are made using a scale of 'absolute judgements' that represents how much more one element dominates another with respect to a given reference point.

AHP is very flexible and can be adapted to different needs and contexts. Criteria (or attributes/objectives) can be decided in advance or through a participatory process (increase transparency and dialogue). Criteria can be tangible and intangible, can have sub criteria and be as many as necessary. The process can involve as many participants as required. The number of alternatives to evaluate can also vary.

AHP in 5 STEPS

Step 1: Defining the problem and goal, options to evaluate and criteria to compare.

Step 2: Structuring the goal, criteria and set of options for the decision-making process.

Step 3: Doing pairwise comparisons (two at a time) of options with respect to the different criteria, and pairwise comparisons of criteria in relation to the goal.

Step 4: Applying weighting and calculating relative priorities.

Step 5: Aggregating relative priorities to produce an overall ranking of options.

Source: weADAPT website https://tinyurl.com/ybj2cth6

See also the MEDIATION Technical Brief No. 7 at https://tinyurl.com/y93h8pld and the following videos:
https://www.powtoon.com/online-presentation/deBstzTGhjv
https://www.powtoon.com/online-presentation/fuVL54nWNg4

Example:

Example: Structuring the goal, criteria and options for reducing flood risk in Ebo Town, The Gambia. Facing sea-level rise and high temperature stress, a wetland in a pilot community, Ebo Town, is being encroached upon. Some inhabitants are trying to reclaim portions of the wetland by filling it up with solid waste. This can lead to serious flooding during the rainy season, polluting the river and soil with toxins. Having defined the goal and selected the options to compare, the decision-makers/ participants must then produce a set of decision criteria. The example illustrates that each criterion can relate to different dimensions of the challenge (climatic, environmental, social, economic, political, etc.).

Source: Adaptation Toolkit Guidebook, UNITAR/weADAPT

GOAL

minimise flood risk during rainy season in Ebo Town

CRITERION	CRITERION	CRITERION	CRITERION
climate risk reduction	economic feasibility	employment creation	economic protection
climatic	economic	social	environmental

option	option	option	option
construction of new drains	cleaning of existing drains	construction of concrete structures	halting wetland encroachment

2.3. Differences: benefits/limitations

On the surface, AHP and MCA may appear very similar, and this is true certainly in the way the decision problem is clearly structured, options and criteria are selected. The process is broadly similar (see 5 steps above). Benefits of both methods include the flexibility to be applied in different decision situations, integration of different types of knowledge (technical, policy and other participant data and local information).

Participation of stakeholders in the application of AHP and MCA is strongly encouraged. Most adaptation takes place at local levels in situations where local information (economic, ecological, political aspects) that stakeholders possess is crucial – just as important as technical data. Participation of community and local representatives, as well as technical experts means that different perceptions and adaptation needs are more likely to be aired, and taken into account in the process. Both methods are well suited for this.
The illustrative examples above hopefully show that both methods can be easy for decisionmakers to appreciate and to apply. In fact, some real-world applications can be considerably more complex. The methods can be adapted to the ambition of the users and to the time available. They generate results that can be useful to decision makers – a ranking of promising and feasible adaptation options – but also the discussions themselves can reveal crucial new information and provide opportunities for learning.

A limitation of AHP is that it does not scale well in the more complex cases: the number of comparisons required increases non-linearly, and thus the time needed. A limitation for MCA is the high data requirements. Data for MCA are not usually easily available in the right format (i.e.. normalised, single value data as in Car example above), they often occur in ranges, and may come from different (and potentially incompatible) sources. A common limitation of both multicriteria methods is that data and knowledge are inevitably subjective, and unlikely to be completely free from bias.

Three differences are, firstly that AHP does not use explicit data. Participants apply their knowledge implicitly during in the pairwise comparison, whereas MCA can incorporate quantitative, qualitative, or ordinal data explicitly. Numerical values in AHP are relative scores and do not represent real quantities. A second difference is that more tangible/measurable criteria will need to be used in the case of MCA (i.e. because data are explicit) whereas those of AHP need not be. A final difference is that MCA is much more closely related to economic analysis methods. Cost-benefit analysis (CBA) is a

more objective method than MCA and is suitable for optimisation (e.g. benefits per unit cost). CBA can provide an absolute measure of desirability, albeit judged by only one criterion: economic efficiency. It may not be able to incorporate other important criteria, whereas MCA can do so.

The choice of method depends on the analysis. In the case of AHP and MCA, a final choice might turn on the expectations for data availability or ease of data collection, as well as the goals of the study, i.e. is economic appraisal one of the main targets? It is worth mentioning that there are more fully-fledged tools available for research into the economics of adaptation. For example, appraisal of adaptation options was part of the 2009 UNEP-funded AdaptCost study. This study employed Integrated Assessment Models (Policy Analysis of the Greenhouse Gas Effects: PAGE and the Climate Framework for Uncertainty, Negotiation and Distribution: FUND) that provide model projections for Africa across sectors for all included adaptation options. Models provide economic forecasts into the medium and long term (2040, 2060 and 2100) however these timeframes are not suitable for informing development planning at the sub-national level (e.g. at State and County level in Nigeria and Kenya respectively). A further DFID/ DANIDA funded study also employed these techniques using national data for Kenya, Burundi, Rwanda and Tanzania.

The MCA approach for prioritisation/ ranking of options is based on similar premise. Identification and costing of adaptation options is an essential first step to inform prioritisation methods. However, these can use simpler economic costing techniques and can provide results on time frames useful for country planning.

Another relevant method is Structured Decision Making (SDM). Many analysts categorize decisions according to the degree of structure involved in the decision-making activity; they describe a structured decision as one in which all three components of a decision—the data, process, and evaluation—are determined. To apply SDM there are six steps to follow: (1) Clarify the Decision Context, (2) Define Objectives and Evaluation Criteria, (3) Develop Alternatives, (4) Estimate Consequences, (5) Evaluate Trade-Offs and Select Options, and (6) Implement and Monitor. Applications of SDM to climate change adaptation or mitigation problems are still rare, but there are many examples related to natural resource management

> Source: FRACTAL
> https://tinyurl.com/y6v487jl

There are strong arguments for using more than one method together (as was done with the Robust Adaptation Toolkit in the CDSF case studies in Kenya and Nigeria). The core argument is that applying multiple methods to a given set of adaptation options and comparing their outputs may provide a more robust assessment. Our work with the Adaptation Options Explorer (ADX) has investigated the possibility of comparison of methods for adaptation decision-making. SEI's philosophy is that there is no cure-all method to analyse everything: do not rely on only one approach!

> Source: weADAPT - ADX Factsheet :
> https://tinyurl.com/yceth4b9

Relevant links :
Work on the economics of adaptation in Africa: https://www.weadapt.org/knowledge-base/economics-of-adaptation

Other resources - Mediation Technical Brief on MCA: https://tinyurl.com/ydhogbuh
Other resources - Mediation Technical Brief on AHP: https://tinyurl.com/y93h8pld

MEDIATION Toolbox: https://tinyurl.com/y7ycg8pr
Working paper: research methods for decision making: https://tinyurl.com/y6v487jl

3.

Application of the MCA approach in the CDSF Kenyan Case Study

3.1. Background

The Kenyan case study for the CDSF project was implemented in Migori County, which is situated in the South western part of Kenya. The County had identified climate change as a major challenge to the realisation of the development goals laid out in the County Integrated Development Plan (CIDP), and initiated a process to develop a County Climate Change Adaptation Plan (CCAP) in line with the Climate Change Act, 2016, the second National Climate Change Action Plan (NCCAP, 2018-2022), and the Kenya National Adaptation Plan (NAP 2015-2030). As part of the CDSF project, SEI, ATPS, the Ministry of Environment and Forestry, the Migori County Government, and other partners (World Vision Kenya and CARE International) organised two stakeholder consultative workshops in August 2018 and May 2019 as part of the process to develop the Climate Change Adaptation Plan. Below we describe how the MCA is being applied in the Migori County Climate Adaptation Process.

3.2. Why we should use Multicriteria methods for county adaptation planning?

Climate change is having significant consequences on key sectors and livelihoods, particularly agriculture, and this was recognised as a priority issue during the Migori climate change adaptation workshops held as part of the CDSF project. Adaptation is needed to minimise current and future risks to these sectors and communities. Within the framework of Kenya's current National Adaptation Plan (NAP: 2016-2030) and the Migori County Development Plan (CIDP), the County Government is making progress in the process of developing the Migori County Climate Change Adaptation Plan (CAP). Besides the workshops, as part of the CDSF project, SEI is implementing a multicriteria analysis approach to assist in adaptation prioritisation within the CAP development process and contribute to future policy dialogues among stakeholders during the CAP implementation. This note introduces Multicriteria Analysis (MCA) and Analytic Hierarchy Process (AHP) and shows how these methods can be useful in the context of county adaptation planning.

The study has the following aims :
1. Elaborate key criteria and priorities for adaptation by including county stakeholders in a structured set of participatory steps
2. Develop the evidence base for adaptation by integrating different kinds of information on most promising options; and finally
3. Generate a robust prioritisation/ranking of adaptation options that can feed into future policy dialogue in the county

The work builds on the Robust Adaptation Toolkit Guidebook and its application to the CDSF case study in Migori (farmer and community consultations and workshops). To support the multicriteria work, the output will include the development of an online interface for the toolkit so that it can be more readily accessed and used via common Web browser software, and results can be easily shared.

3.3. Applicability

In this section we look at applicability of the methods to CDSF case studies. In other words, we illustrate multicriteria appraisal in a CDSF context. This is intended as a first step in support of the 3 aims mentioned above.

For example, we can look at a selection of options under consideration for the County Climate Adaptation Plan for Migori. the ones co-identified by stakeholders at the 2nd Migori County Climate Change workshop in May 2019 (Migori County Government). The three intervention actions identified from group 2 discussion: climate change integration in agriculture, a selection of these actions are:
1. Extension services: Provide timely and accurate weather information to farmers
2. Agricultural development: Promote Climate Smart Agriculture (CSA)
3. Agricultural development: Promote integrated pest management (IPM) practices

These options could be evaluated because they are clear and easy to understand. They are roughly comparable, in the sense that they do not have different scales of action, and they relate to a single sector. It is generally not possible to compare alternative strategies that affect different sectors, because it is very difficult to find a common outcome attribute/criteria across sectors.

A next step will be building on the workshop discussions to clarify and formulate assessment criteria. For example, while the first option, weather information provision for farmers, may emphasise the economic and risk reduction values of climate action, the second option about CSA, is concerned with ecological implications and biodiversity while also improving farm incomes. Thus, when problematising climate change integration in agriculture, it will be important to include criteria that reflect each of these concerns (and other relevant ones). We need to involve stakeholders to elaborate on each of these options, to give reasons (pros and cons) for including them. The next step will be to agree which options will be appraised and which criteria should be used.

In addition, SEI researchers will design an online tool for appraising potential climate actions identified at county level. This will make it easier to use the multicriteria method and help to speed up the application. User friendly features can be included such as the ability to print out worksheets, to enter data online etc.

4. Outlook section

This Explanatory Note to the Robust Adaptation Toolkit (RAT) has been produced as part of the "Bridging Climate Information Gaps to Strengthen Capacities for Climate Informed Decision-making" (CDSF), a two-year project funded by the African Development Bank (AfDB) with the overall goal to strengthen the capacities of relevant stakeholders in five project countries - Cameroon, Kenya, Malawi, Nigeria, and Tunisia - to understand and deploy appropriate climate information and best practices to inform decision-making. Specifically, the project aims to: (1) identify and analyse climate information needs, provide support for climate information production, synthesis, and use; (2) build the capacities and knowledge of stakeholders (government agencies, research institutions, extension agents and contact famers) to collect and utilize high quality, demand-driven climate information for adaptation planning and decision-making; and (3) facilitate the mainstreaming of climate change issues in regional policy dialogue aimed at raising awareness on climate change issues to strengthen understanding, use and mastery of climate information.

The CDSF project consists of two components, the first involves climate information synthesis, and the second involves capacity enhancement and climate information dissemination. This second component includes two pilot case studies in Kenya and Nigeria that is led by the Stockholm Environment Institute (SEI) working in collaboration with ATPS. The overall purpose of the component is to further develop and apply the robust adaptation toolkit (RAT) to support adaptation planning and policymaking.

The two case studies conducted in Nigeria (Enugu State) and Kenya (Migori County) applied a selection of tools from the RAT, through participatory processes, to identify the climate vulnerability in the project areas, and to co-identify, with stakeholders, the adaptation options in the different sectors considered (agriculture, land, water etc.) at both local and regional (sub-national scales). This Explanatory note provides a detailed explanation of the multicriteria methods for Adaptation Screening as is being applied in the Kenyan case study to develop the Migori Climate Adaptation Plan. By involving different stakeholders with different priorities, the approach is pluralistic and provides representation and decision-relevance, in both the process and its outputs. Added to the fact that the each of the steps can be shared and reviewed by the participants also makes the application of the method quite transparent. These factors can improve support and increase buy-in for the outputs. The continued stakeholder work will build on earlier knowledge needs assessments to help to sharpen the communications strategy for the Adaptation Plan.

To make the tool more widely accessible, SEI will explore the opportunity to develop an online interactive version of the toolkit. The design will be based on an approach we have used in developing many examples from different climate change adaptation sectors that was used in the Adaptation Toolkit Guidebook above. We expect that the toolkit interface will be hosted on weADAPT platform (or alternatively in an independent domain hosting). We expect this will be an improved, user-friendly, visually appealing, modern web application.

The tools presented in the RAT and the processes described in this Explanatory Note provides a guide to governments and development actors that wish to identify the climate vulnerability in targeted areas using participatory processes, and to co-identify, with stakeholders, the adaptation options for agriculture and other related sectors such as water, land, energy etc. This Explanatory Note is a living document that will continue to be revised and updated to include new information and examples.