Climate Risk and Vulnerability Assessment Tool: Communities and Water Infrastructure Projects

Guidance Document

June 2018

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List of Acronyms

Acronym	Long Form
AR5	Assessment Report, Fifth revision
CCRA	Climate change risk assessment
CRIDF	Climate Resilient Infrastructure Development Facility
DFID	Department for International Development
GCRP	Global Change Research Programme
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
IPCC	Intergovernmental Panel on Climate Change
ITCZ	Inter Tropical Convergence Zone
LCLIP	Local Climate Impacts Profile
NAPA	National Adaptation Plans of Action
NGOs	Non-Government Organisations
RS	Resilience Screening
SADC	Southern Africa Development Community
SHE	Stakeholder Engagement
SOM	Self-Organising Maps
THIRA	Threat and Hazard Identification Risk Assessment
WASH	Water Sanitation and Hygiene
SST	Sea Surface Temperature
RVAT	Risk and Vulnerability Assessment Tool
VMT	Vulnerability Mapping Tool

1 Introduction

1.1 Background to CRIDF

CRIDF (Climate Resilient Infrastructure Development Facility) is the United Kingdom's Department for International Development's (DFID's) water infrastructure programme for Southern Africa. Working to deliver sustainable small-scale infrastructure across 12 SADC countries, the demand-driven programme focuses on water services, water resource management, and water for livelihoods, fostering sustainable development of the region's water resources and addressing the water, food and energy nexus.

CRIDF was initiated as an International Climate Fund (ICF) funded programme for Southern Africa with the desired impact of achieving peaceful and climate resilient management of shared water resources in SADC for the benefit of the poor. Its anticipated outcomes were reduced water related climate change vulnerability and attainment of the realization of the benefits of cooperative shared water management. Its key outputs are delivery of infrastructure and the mobilisation of finance, together with the engagement and capacitation of stakeholders. CRIDF's project selection is guided by beneficiary entity priorities, perspectives and alignment with CRIDF's own mandate.

CRIDF began in 2013 and will run until 2020 (Phase I between 2013 and 2017, and Phase II planned between 2017 and 2020). CRIDF is positioned within a highly complex and differentiated social, environmental, economic and political landscape, spanning the substantial geographical area that is mainland Southern Africa Development Community (SADC). It provides support to improved water infrastructure planning and budgeting across the 13 shared watercourses.

SADC is a key partner in this effort, as they represent a conducive transnational institutional framework from which to address the issues of shared water resource management in southern Africa.

During this phase of the programme, CRIDF will assist SADC and its Member States to prepare projects and mobilise funding in an effort to achieve the programme objectives and outputs.

1.2 CRIDF's Climate Resilient Tools

CRIDF has produced a number of resilience and vulnerability tools to assist and guide decision making and planning for water infrastructure projects aimed at building climate change resilience in transboundary basins. This guidance note outlines the bespoke tool developed for use at early (pre-feasibility) project stages to inform design options analyses.

1.3 Objective of the Risk and Vulnerability Assessment Tool

The objective of the Risk and Vulnerability Assessment Tool (RVAT) is to evaluate, at a preliminary project stage, the climate risk and vulnerability of communities, as well as water infrastructure projects in communities.

The tool assesses how current and future climate hazards (such as temperature, rainfall, droughts and floods) impact the broader community, as well as existing and potential water infrastructure projects in communities. Based on the prevailing risk and vulnerability, the tool explores potential interventions that will improve climate resilience.

1.4 Need for this Tool

This tool is a revised version of the 'Vulnerability Assessment Tool' developed under CRIDF 1, which focused solely on assessing the current risk and vulnerability levels for communities. In addition to the infrastructure lens that has been included in the updated tool, green infrastructure and the socio-ecological benefits are also explored.

The tool also utilises the updated Intergovernmental Panel on Climate Change (IPCC) methodology, as discussed in detail in the section below. The Vulnerability Sourcebook by Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) also provided a useful framework for the tool.

1.5 Framework

In line with the Fifth Assessment Report (AR5) by the IPCC, the tool includes the following aspects:

- **Hazard:** the occurrence or potential occurrence of a climate-related event (such as rainfall or temperature) and/or a natural or human-induced impact (such as flood or droughts), that has or may cause harm, injury, damage or the loss of a system, species or asset.
- **Exposure:** the degree to which a system, species or asset is 'exposed', due to its location or presence in a place or setting that is or could be impacted by a climate-related hazard.
- **Sensitivity:** the susceptibility of a system, species or asset to climate-related impacts, or the degree to which the system, species or asset is or can be directly or indirectly impacted by a climate-related hazard.
- **Adaptive Capacity:** the proven or perceived ability of a system, species or asset to respond to existing or potential climate-related impacts and adjust to damage, so as to cope with consequences and take advantage of opportunities.
- **Vulnerability:** the inclination of a system, species or asset to be impacted by climate-related hazards, encompassing its sensitivity and its ability to cope or adapt to climate-related impacts.
- **Risk:** refers to the potential for (and the likelihood of) adverse climate-related impacts on a system, species or asset, resulting from the interaction of vulnerability, exposure, and hazard.

As defined in AR5, the following conceptual framework will be used in the tool.

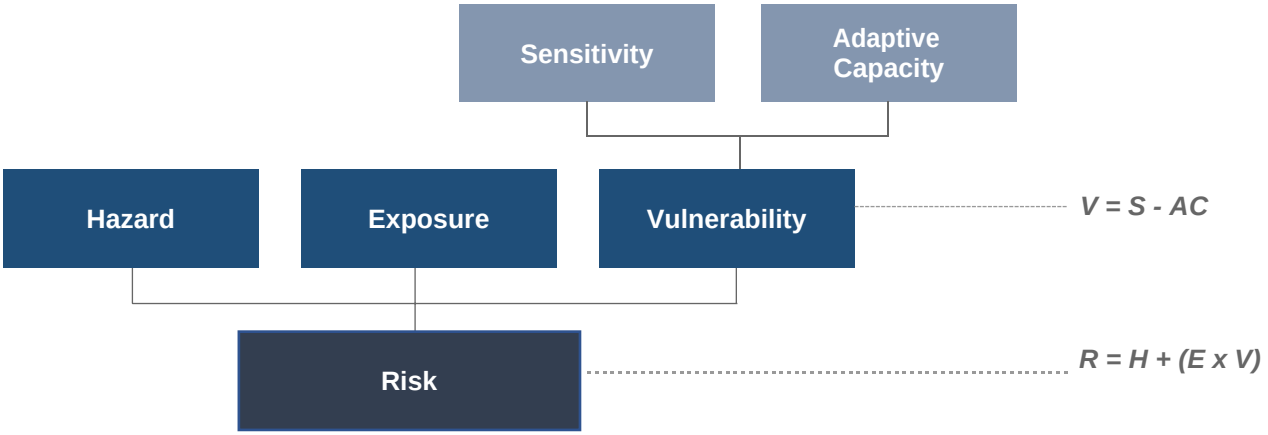


Figure 1: Framework based on IPCC AR5

The tool relies on asking several questions that assess hazard, exposure, sensitivity and adaptive capacity. The responses to these questions, are assigned numerical values (0 to 3) which enables an assessment of risk and vulnerability. Based on the prevalent risk and vulnerability, the tool explores potential response measures that will improve climate resilience by either decreasing sensitivity or increasing adaptive capacity. In addition, whenever possible, measures to decrease exposure will be explored.

2 Guidance

The questions within the tool are designed to be completed by an individual representing a specific community (such as a community representative, municipal officer or project official). Alternatively, this tool can also be completed during a stakeholder workshop, where answers to the questionnaires will be decided by the group workshop attendees.

2.1 Functionality of the Tool

The tool lands on the home page shown below:

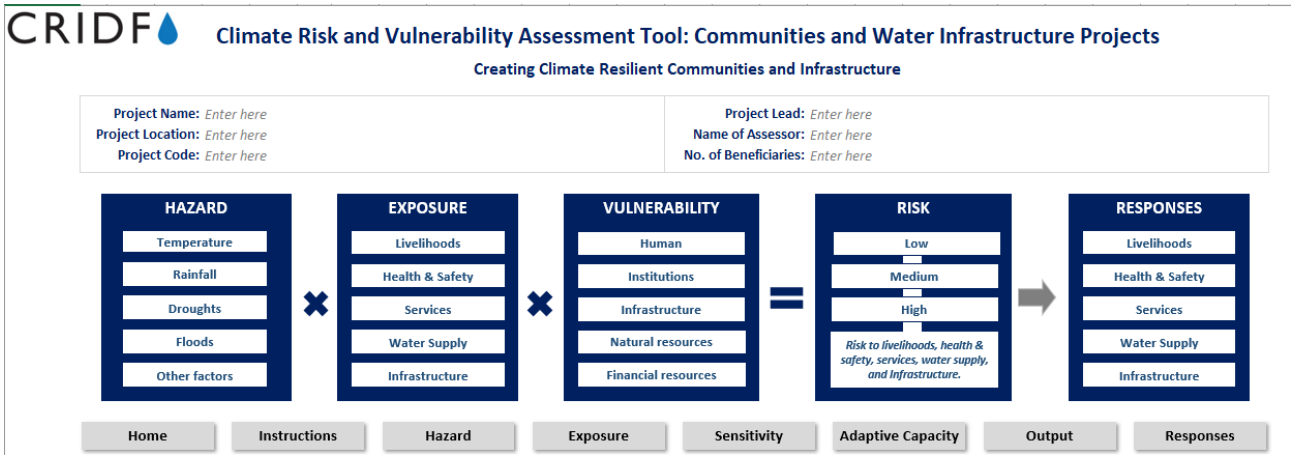


Figure 2: Screen Shot: Home Page

The grey boxes enable the user to navigate through the tool. The boxes will either lead the user to a different place in the same tab, or to a new tab. Therefore, please click on any grey box to navigate and to complete questions within the tool.

The “Instruction” tab introduces the tool, provides background information and context to the tool, and also provides the user with guidance on how to utilise the tool.

The user is required to answer the questions provided under the "Hazard", "Exposure", "Sensitivity", and "Adaptive Capacity" tabs. The user can access these tabs by clicking on the "Hazard", "Exposure", "Sensitivity", and the "Adaptive Capacity" boxes. In these tabs, questions are provided for current and future "Hazard", "Exposure", "Sensitivity", and "Adaptive Capacity".

The "Output" box leads the user to the "RVAT_Output" tab, where the responses to each question are analysed using the IPCC framework, assessed and graphed. Specifically, the tool provides outputs for "Vulnerability" and "Risk". Therefore, as shown in the image below, the “RVAT_Output” tab not only provides a synthesis of the responses to the questionnaires, it also provides outputs for the "Vulnerability" and "Risk" Assessment.

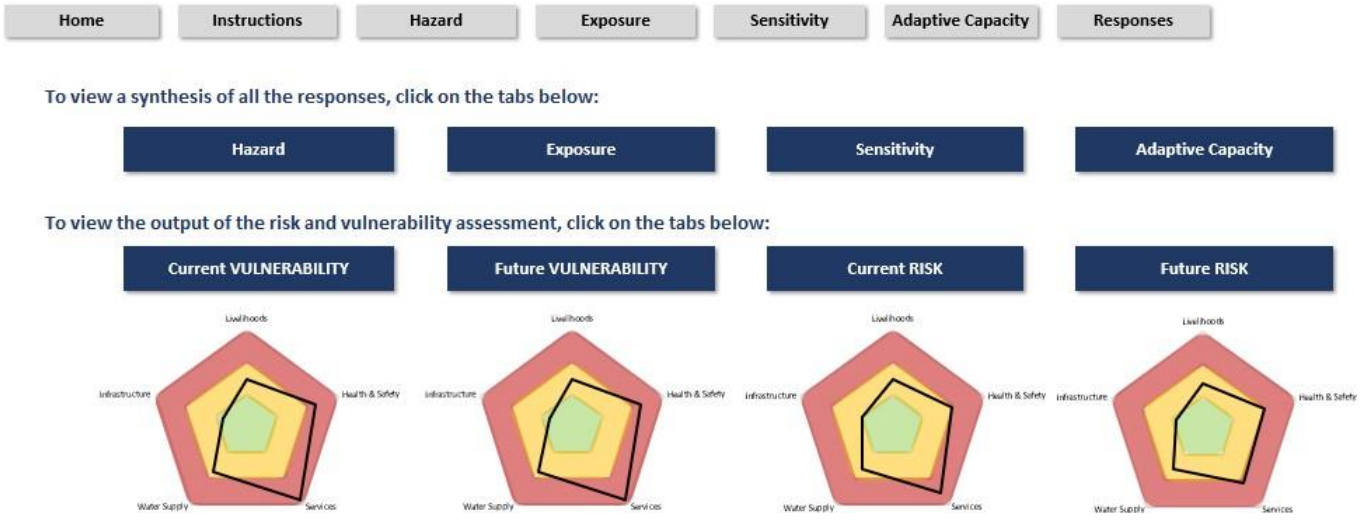


Figure 3: Screen Shot – RVAT Output Page

Based on the “Risk” output, which incorporates “vulnerability”, the tool provides response options. These can be accessed by clicking on the "Responses" box at the top of your screen, or by clicking the "Responses" tab.

Below is a detailed description of each of the components that are critical for the tool, namely hazard, exposure, sensitivity, adaptive capacity, vulnerability and risk.

2.2 Components of the Tool

Hazard

As defined in Section 1.5, a **hazard** refers to the occurrence or potential occurrence of a climate-related event (such as rainfall or temperature) and/or a natural or human-induced impact (such as flood or droughts), that has or may cause harm, injury, damage or the loss of a system, species or asset.

Questions on Current Hazards are provided in the “Hazard” tab (as indicated in Figure 4 and Appendix A). The user is required to answer the questionnaire by selecting a response from the drop-down menu provided in each question. A total of 20 questions are provided, which are based on the following guiding question:

Which hazards currently occur, or are likely to occur in the community/project area?

Should the user opt to clear all the answers, the user can click on the “Clear Answers” button. The user should note that once the button has been clicked the actions cannot be undone.

NOTE: ONCE YOU CLICK THIS BUTTON YOU CANNOT UNDO YOUR ACTIONS | Clear Answers

CURRENT HAZARDS

Hazard			Question	Comments/Description	Response?
1	Temperature	Seasons	Does your area experience seasonal temperature variability?	*During the year (across seasons), is temperature higher/lower than usual?*	Yes, higher than usual
		Annual Trends	Does your area experience inter-annual temperature variability?	*Over multiple years (i.e. trend), is temperature higher/lower than usual?*	Yes, higher than usual
		Hot days	During the hottest days, are you impacted by heat related stress	*How often do you experience heat related water stress?*	Yes
2	Rainfall	Seasons	Does your area experience seasonal rainfall variability?	*During the year (across seasons), is rainfall higher/lower than usual?*	Yes, higher than usual
		Annual Trends	Does your area experience inter-annual rainfall variability?	*Over multiple years (i.e. trend), is rainfall higher/lower than usual?*	Yes, lower than usual
		Heavy Rainfall	Are heavy rainfall events prevalent in your area?	*Do you often have high rainfall events?*	Yes
3	Droughts	Events	Are droughts prevalent in your area?	*Do you often experience droughts?*	Yes
		Timing	If droughts do occur, do they occur at the same time of the year?	*Is the timing of droughts consistent?*	Often
		Extent	If droughts do occur, is the extent and intensity of the drought changing?	*Are droughts getting worse or better?*	Yes, getting worse
		Effect	When droughts do occur, do they impact any part/aspect of your area?	*Are you affected by droughts?*	Sometimes
4	Floods	Events	Are floods prevalent in your area?	*Do you often experience floods?*	Yes
		Timing	If floods do occur, do they occur at the same time of the year?	*Is the timing of floods consistent?*	Sometimes
		Extent	If floods do occur, is the extent and intensity of the floods changing?	*Are floods getting worse or better?*	Yes, getting better
		Effect	When floods do occur, do they impact any part/aspect of your area?	*Are you affected by floods?*	Not applicable
5	Other Factors	Fire	Do you frequently experience fires? And if yes, are you impacted?	*Are you impacted by fire in and around your area?*	Yes, and impacted
		Snow	Do you frequently experience snow fall? And if yes, are you impacted?	*Are you impacted by snow fall in and around your area?*	Yes, but not impacted
		Hail	Do you frequently experience hail storms? And if yes, are you impacted?	*Are you impacted by hail in and around your area?*	No
		Tornado	Do you frequently experience tornadoes? And if yes, are you impacted?	*Are you impacted by tornadoes in and around your area?*	Yes, and impacted
		Earthquake	Do you frequently experience earthquakes? And if yes, are you impacted?	*Are you impacted by earthquakes in and around your area?*	Yes, and impacted
		Volcano	Do you frequently experience volcanoes? And if yes, are you impacted?	*Are you impacted by volcanoes in and around your area?*	Yes, and impacted

Figure 4: Screen Shot: Current Hazards Questionnaire

Questions on Future Hazard are also provided in the "Hazard" tab (as indicated in Figure 5 and Appendix A). The user is required to answer the questionnaire by selecting a response from the drop-down menu provided in each question. A total of 20 questions are provided. If clicked, the "Clear Answers" option described above will also clear the answers on Future Hazard. The user should note that once the button has been clicked the actions cannot be undone.

FUTURE HAZARDS

Period of assessmet (for future climate conditions)?	year?

Hazard			Question	Comments/Description	Response?
1	Temperature	Seasons	Do climate projections indicate that your area will experience seasonal temperature variability?	*During the year (across seasons), will temperature be higher/lower than usual?*	Yes, higher than usual
		Annual Trends	Do climate projections indicate that your area will experience inter-annual temperature variability?	*Over multiple years (i.e. trend), will temperature be higher/lower than usual?*	Yes, higher than usual
		Hot days	During the hottest days, will you be impacted by heat related stress	*How often will you experience heat related water stress?*	Yes
2	Rainfall	Seasons	Do climate projections indicate that your area will experience seasonal rainfall variability?	*During the year (across seasons), will rainfall be higher/lower than usual?*	Yes, higher than usual
		Annual Trends	Do climate projections indicate that your area will experience inter-annual rainfall variability?	*Over multiple years (i.e. trend), will rainfall be higher/lower than usual?*	No, not really
		Extremes	Willl heavy rainfall events prevalent in your area?	*Will you often have high rainfall events?*	No
3	Droughts	Events	In future, will droughts be prevalent in your area?	*Will you often experience droughts?*	Yes
		Timing	If droughts will occur, will they occur at the same time of the year?	*Will the timing of droughts be consistent?*	Often
		Extent	If droughts will occur, will the extent and intensity of the drought change (from current conditions)?	*Will droughts get worse or better?*	Not applicable
		Effect	When droughts do occur, will they impact any part/aspect of your area?	*Will you be affected by droughts?*	Sometimes
4	Floods	Events	In future, will floods be prevalent in your area?	*Will you often experience floods?*	Sometimes
		Timing	If floods will occur, will they occur at the same time of the year?	*Will the timing of floods be consistent?*	Sometimes
		Extent	If floods will occur, will the extent and intensity of the floods change (from current conditions)?	*Will floods get worse or better?*	Yes, getting better
		Effect	When floods do occur, will they impact any part/aspect of your area?	*Will you be affected by floods?*	Not applicable
5	Other Factors	Fire	Will you frequently experience fires? And if yes, will you be impacted?	*Will you be impacted by fire in and around your area?*	Yes, and impacted
		Snow	Will you frequently experience snow fall? And if yes, will you be impacted?	*Will you be impacted by snow fall in and around your area?*	Yes, but not impacted
		Hail	Will you frequently experience hail storms? And if yes, will you be impacted?	*Will you be impacted by hail in and around your area?*	No
		Tornado	Will you frequently experience tornadoes? And if yes, will you be impacted?	*Will you be impacted by tornadoes in and around your area?*	Yes, but not impacted
		Earthquake	Will you frequently experience earthquakes? And if yes, will you be impacted?	*Will you be impacted by earthquakes in and around your area?*	Yes, but not impacted
		Volcano	Will you frequently experience volcanoes? And if yes, will you be impacted?	*Will you be impacted by volcanoes in and around your area?*	Yes, and impacted

Figure 5: Screen Shot: Future Hazards Questionnaire

The responses to the questionnaires are then analysed in the "RVAT_Output" tab. Below is a screenshot illustrating a synthesis of the results, for each of the 5 categories (i.e. Temperature, Rainfall, Droughts, Floods, and Other Factors) and their corresponding sub-categories (noting the screenshot only illustrates current hazards; future hazards are synthesised in a similar manner). For each sub-category, a traffic light system is used to indicate the occurrence or potential occurrence of a climate hazard – where green indicates a low hazard, orange indicates a medium hazard, and red indicates a high hazard.

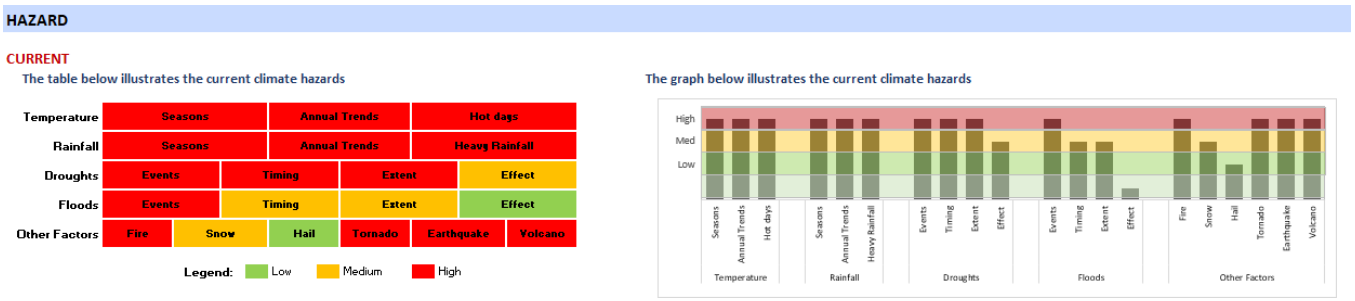


Figure 6: Screen Shot – RVAT Output Page – Hazard Synthesis

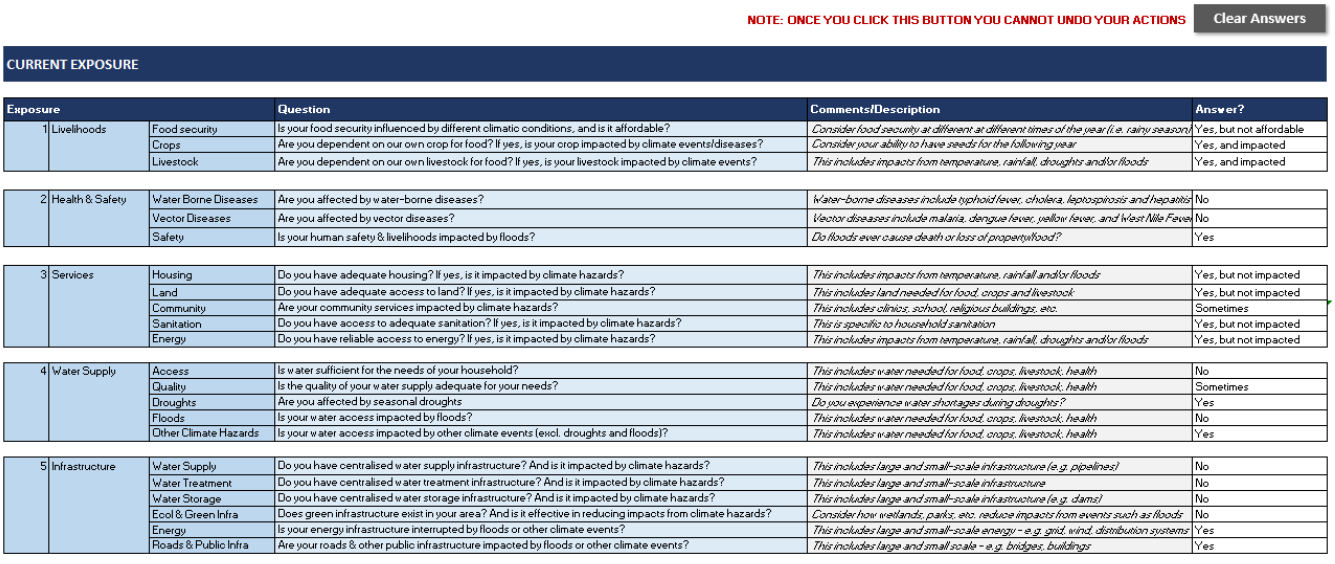
Exposure

As defined in Section 1.5, **exposure** refers to the degree to which a system, species or asset is 'exposed', due to its location or presence in a place or setting that is or could be impacted by a climate-related hazard.

Questions on Current Exposure are provided in the "Exposure" tab (as indicated in Figure 7 and Appendix B). The user is required to answer the questionnaire by selecting a response from the drop-down menu provided in each question. A total of 22 questions are provided, which are based on the following guiding question:

Which aspects are exposed to and/or impacted by climate hazards?

Should the user opt to clear all the answers, the user can click on the "Clear Answers" button. The user should note that once the button has been clicked the actions cannot be undone.



Exposure		Question	Comments/Description	Answer?
1 Livelihoods	Food security	Is your food security influenced by different climatic conditions, and is it affordable?	*Consider food security at different at different times of the year (i.e. rainy season)*	Yes, but not affordable
	Crops	Are you dependent on our own crop for food? If yes, is your crop impacted by climate events/diseases?	*Consider your ability to have seeds for the following year*	Yes, and impacted
	Livestock	Are you dependent on our own livestock for food? If yes, is your livestock impacted by climate events?	*This includes impacts from temperature, rainfall, droughts and/or floods*	Yes, and impacted
2 Health & Safety	Water Borne Diseases	Are you affected by water-borne diseases?	*Water-borne diseases include typhoid fever, cholera, leptospirosis and hepatitis*	No
	Vector Diseases	Are you affected by vector diseases?	*Vector diseases include malaria, dengue fever, yellow fever, and West Nile Fever*	No
	Safety	Is your human safety & livelihoods impacted by floods?	*Do floods ever cause death or loss of property/food?*	Yes
3 Services	Housing	Do you have adequate housing? If yes, is it impacted by climate hazards?	*This includes impacts from temperature, rainfall and/or floods*	Yes, but not impacted
	Land	Do you have adequate access to land? If yes, is it impacted by climate hazards?	*This includes land needed for food, crops and livestock*	Yes, but not impacted
	Community	Are your community services impacted by climate hazards?	*This includes clinics, school, religious buildings, etc.*	Sometimes
	Sanitation	Do you have access to adequate sanitation? If yes, is it impacted by climate hazards?	*This is specific to household sanitation*	Yes, but not impacted
	Energy	Do you have reliable access to energy? If yes, is it impacted by climate hazards?	*This includes impacts from temperature, rainfall, droughts and/or floods*	Yes, but not impacted
4 Water Supply	Access	Is water sufficient for the needs of your household?	*This includes water needed for food, crops, livestock, health*	No
	Quality	Is the quality of your water supply adequate for your needs?	*This includes water needed for food, crops, livestock, health*	Sometimes
	Droughts	Are you affected by seasonal droughts	*Do you experience water shortages during droughts?*	Yes
	Floods	Is your water access impacted by floods?	*This includes water needed for food, crops, livestock, health*	No
	Other Climate Hazards	Is your water access impacted by other climate events (excl. droughts and floods)?	*This includes water needed for food, crops, livestock, health*	Yes
5 Infrastructure	Water Supply	Do you have centralised water supply infrastructure? And is it impacted by climate hazards?	*This includes large and small-scale infrastructure (e.g. pipelines)*	No
	Water Treatment	Do you have centralised water treatment infrastructure? And is it impacted by climate hazards?	*This includes large and small-scale infrastructure*	No
	Water Storage	Do you have centralised water storage infrastructure? And is it impacted by climate hazards?	*This includes large and small-scale infrastructure (e.g. dams)*	No
	Ecol & Green Infra	Does green infrastructure exist in your area? And is it effective in reducing impacts from climate hazards?	*Consider how wetlands, parks, etc. reduce impacts from events such as floods*	No
	Energy	Is your energy infrastructure interrupted by floods or other climate events?	*This includes large and small-scale energy – e.g. grid, wind, distribution systems*	Yes
	Roads & Public Infra	Are your roads & other public infrastructure impacted by floods or other climate events?	*This includes large and small scale – e.g. bridges, buildings*	Yes

Figure 7: Screen Shot: Current Exposure Questionnaire

For Future Exposure the tool provides the user with two options, namely (1) future exposure will be the same as current exposure, and (2) future exposure will be different to current exposure. A dropdown list is provided to enable the user the user to select an option (as illustrated in the image below). Once the user selects an option, the "Update" button should be clicked as this enables the cells for Future Exposure to be populated based on the selection. Should the user wish to change the response to the initial question above (i.e. current vs future), the "Update" button should be clicked again.

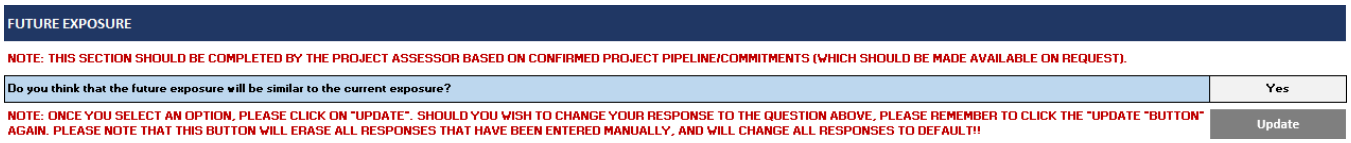


Figure 8: Screen Shot: Future Exposure Questionnaire

The responses to the questionnaires are then analysed in the "RVAT_Output" tab. Figure 9 provides a screenshot illustrating a synthesis of the results for each of the 5 categories (i.e. Livelihoods, Health & Safety, Services, Water Supply and Infrastructure) and their corresponding sub-categories (noting the screenshot only illustrates current exposure; future exposure is synthesised in a similar manner). For each sub-category, a traffic light system is used to indicate the level of exposure – where green indicates a low exposure, orange indicates a medium exposure, and red indicates a high exposure.

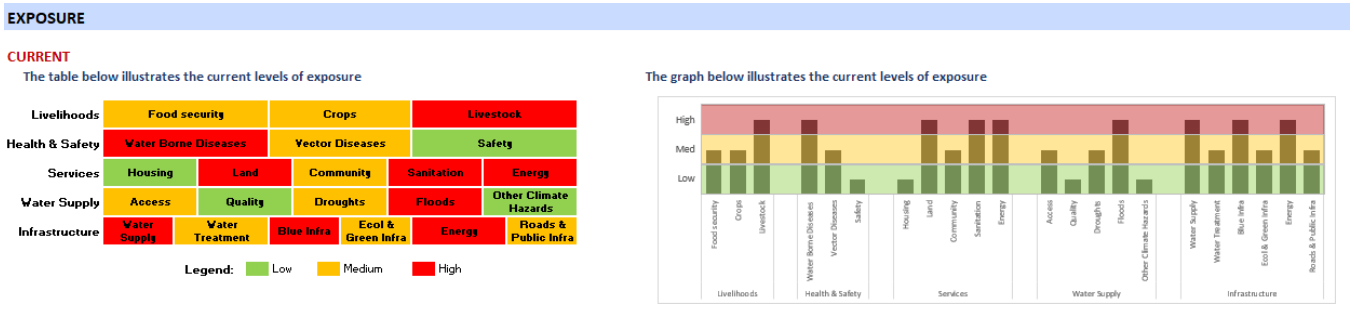


Figure 9: Screen Shot - RVAT Output Page – Exposure Synthesis

Vulnerability

As defined in Section 1.5, **vulnerability** refers to the inclination of a system, species or asset to be impacted by climate-related hazards, encompassing its sensitivity and its ability to cope or adapt to climate-related impacts. Put differently, vulnerability is a component of "Sensitivity" and "Adaptive Capacity".

Sensitivity

As defined in Section 1.5, **sensitivity** refers to the susceptibility of a system, species or asset to climate-related impacts, or the degree to which system, species or asset is or can be directly or indirectly impacted by a climate-related hazard.

Questions on Current Sensitivity are provided in the "Sensitivity" tab (as shown in Figure 10 and Appendix C). The user is required to answer the questionnaire by selecting a response from the drop-down menu provided in each question. A total of 20 questions are provided, which are based on the following guiding question:

Which aspects make you more susceptible to climate hazards and/or impacts?

Should the user opt to clear all the answers, the user can click on the "Clear Answers" button. The user should note that once the button has been clicked the actions cannot be undone.

NOTE: ONCE YOU CLICK THIS BUTTON YOU CANNOT UNDO YOUR ACTIONS | Clear Answers

CURRENT SENSITIVITY

Sensitivity			Question	Comments/Description	Response?
1	Human	Diverse Livelihoods	Do you have other ways to support your livelihood?	*Including non-agricultural activities*	Sometimes
		Climate Information	Do you have adequate education levels to understand climate information?	*Consider school level*	No
		Agr Information	Have you received any training on climate smart agriculture?	*This includes info/skills on temperature, rainfall, droughts and/or floods*	No
		Women	Are you involved in agriculture and/or securing water in your household ?	*nb - specific to women*	Sometimes
		Health	Would you consider you and your family to be healthy?	*This includes water borne and vector diseases*	No
2	Institutions	Water user forums	Are you part of a group that discusses water challenges in your area?	*Do they exist and do you feel adequately represented by these structures?*	Yes, but not adequate
		Farming forums	Are you part of a group that discusses farming challenges in your area?	*Do they exist and do you feel adequately represented by these structures?*	Yes, but not adequate
		Weather data	Do you have a group/organisation that disseminates climate/weather data?	*Is there someone who tells you what the weather will be like in future?*	Yes, but not adequate
		Health	Do you have reasonable access to health services?	*Consider access to clinincs and hospitals?*	Yes, but not adequate
3	Infrastructure	Water Storage	Do you have access to water storage facilities?	*If not, where are possible options for water storage?*	No
		Water Supply	If it exist, is your water supply and/or treament infrastructure reliable?	*Consider if these are damaged during flood or other climate events*	Yes
		Roads & Transport	Are your roads and transport infrastructure in adequate condition?	*Consider if these are damaged during flood or other climate events*	No
		Energy	If it exist, is your energy supply dependent on water?	*Consider if these are impacted during droughts, flood or other climate events*	Yes
		Housing / Shelter	During climate events do you have access to your shelter?	*Consider if it is damaged during flood or other climate events*	Yes
4	Natural Resources	Land	Do you have secure land rights?	*Do you own your land?*	Yes
		Water Resources	Are the water resources in your area healthy?	*Is your area's water resource healthy?*	Sometimes
		Ecosystems	Are you situated in a healthy ecosystem?	*Are your area's ecosystem and natural resources healthy?*	Sometimes
		Soil	Is your soil of adequate quality for your livelihood needs?	*Is your area's soil healthy?*	No
5	Financial Resources	Sustainable Income	Do you have a sustainable source of income?	*This includes a salary, as well as resources to get you through tough times*	Yes, but not adequate
		Diverse Income	Do you have diversified income sources?	*Do you have more than one source of income?*	Yes

Figure 10: Screen Shot: Current Sensitivity Questionnaire

As with Future Exposure, for Future Sensitivity the tool provides the user with two options, namely (1) future exposure will be the same as current exposure, and (2) future exposure will be different to current exposure. A dropdown list is provided to enable the user to select an option (as illustrated in the image below). Once the user selects an option, the "Update" button should be clicked as this enables the cells for Future Sensitivity to be populated based on the selection. Should the user wish to change the response to the initial question above (i.e. current vs future), the “Update" button should be clicked the again.

FUTURE SENSITIVITY

NOTE: THIS SECTION SHOULD BE COMPLETED BY THE PROJECT ASSESSOR BASED ON CONFIRMED PROJECT PIPELINE/COMMITMENTS (WHICH SHOULD BE MADE AVAILABLE ON REQUEST).

Do you think that the future sensitivity will be similar to the current sensitivity?	Yes

NOTE: ONCE YOU SELECT AN OPTION, PLEASE CLICK ON "UPDATE". SHOULD YOU WISH TO CHANGE YOUR RESPONSE TO THE QUESTION ABOVE, PLEASE REMEMBER TO CLICK THE "UPDATE "BUTTON" AGAIN. PLEASE NOTE THAT THIS BUTTON WILL ERASE ALL RESPONSES THAT HAVE BEEN ENTERED MANUALLY, AND WILL CHANGE ALL RESPONSES TO DEFAULT!! | Update

Figure 11: Screen Shot: Future Sensitivity Questionnaire

The responses to the questionnaires are then analysed in the “RVAT_Output” tab. Figure 12 provides a screenshot illustrating a synthesis of the results, for each of the 5 categories (i.e. Human, Institutions, Infrastructure, Natural Resources, and Financial Resources) and their corresponding sub-categories. For each sub-category, a traffic light system is used to indicate the level of sensitivity – where green indicates a low sensitivity, orange indicates a medium sensitivity, and red indicates a high sensitivity.

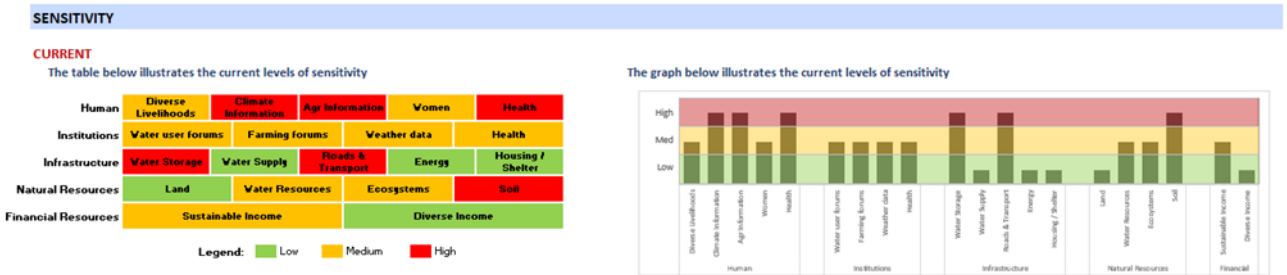


Figure 12: Screen Shot - RVAT Output Page – Sensitivity Synthesis

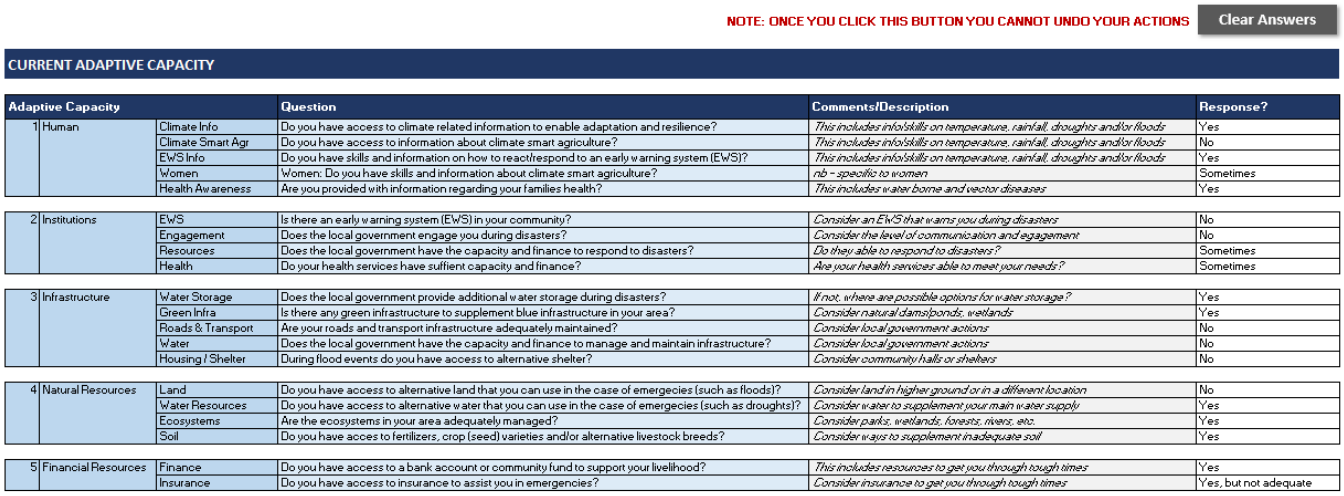
Adaptive Capacity

As defined in Section 1.5, **adaptive capacity** refers to the proven or perceived ability of a system, species or asset to respond to existing or potential climate-related impacts and adjust to damage, so as to cope with consequences and take advantage of opportunities.

Questions on Current Adaptive Capacity are provided in the “Adaptive Capacity” tab (as shown in Figure 13 and Appendix D). The user is required to answer the questionnaire by selecting a response from the drop-down menu provided in each question. A total of 20 questions are provided, which are based on the following guiding questions:

> ***Do you have the ability, resources and/or capacity to respond or cope?***
>
> ***Which aspects enable/hinder your ability to respond or cope***

Should the user opt to clear all the answers, the user can click on the “Clear Answers” button. The user should note that once the button has been clicked the actions cannot be undone.



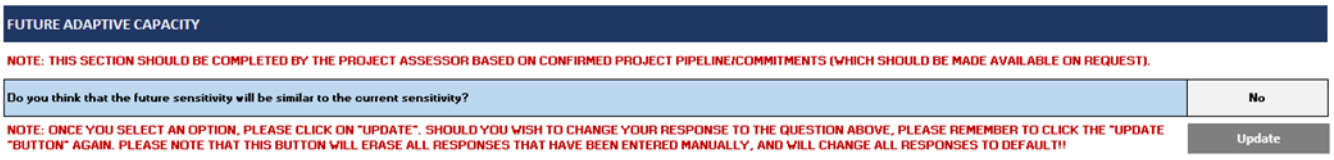
NOTE: ONCE YOU CLICK THIS BUTTON YOU CANNOT UNDO YOUR ACTIONS | Clear Answers

CURRENT ADAPTIVE CAPACITY

Adaptive Capacity		Question	Comments/Description	Response?
1 Human	Climate Info	Do you have access to climate related information to enable adaptation and resilience?	*This includes info/skills on temperature, rainfall, droughts and/or floods*	Yes
	Climate Smart Agr	Do you have access to information about climate smart agriculture?	*This includes info/skills on temperature, rainfall, droughts and/or floods*	No
	EWS Info	Do you have skills and information on how to react/respond to an early warning system (EWS)?	*This includes info/skills on temperature, rainfall, droughts and/or floods*	Yes
	Women	Women: Do you have skills and information about climate smart agriculture?	*nb - specific to women*	Sometimes
	Health Awareness	Are you provided with information regarding your families health?	*This includes water borne and vector diseases*	Yes
2 Institutions	EWS	Is there an early warning system (EWS) in your community?	*Consider an EWS that warns you during disasters*	No
	Engagement	Does the local government engage you during disasters?	*Consider the level of communication and engagement*	No
	Resources	Does the local government have the capacity and finance to respond to disasters?	*Do they able to respond to disasters?*	Sometimes
	Health	Do your health services have suffient capacity and finance?	*Are your health services able to meet your needs?*	Sometimes
3 Infrastructure	Water Storage	Does the local government provide additional water storage during disasters?	*If not, where are possible options for water storage?*	Yes
	Green Infra	Is there any green infrastructure to supplement blue infrastructure in your area?	*Consider natural dams/ponds, wetlands*	Yes
	Roads & Transport	Are your roads and transport infrastructure adequately maintained?	*Consider local government actions*	No
	Water	Does the local government have the capacity and finance to manage and maintain infrastructure?	*Consider local government actions*	No
	Housing / Shelter	During flood events do you have access to alternative shelter?	*Consider community halls or shelters*	No
4 Natural Resources	Land	Do you have access to alternative land that you can use in the case of emergecies (such as floods)?	*Consider land in higher ground or in a different location*	No
	Water Resources	Do you have access to alternative water that you can use in the case of emergecies (such as droughts)?	*Consider water to supplement your main water supply*	Yes
	Ecosystems	Are the ecosystems in your area adequately managed?	*Consider parks, wetlands, forests, rivers, etc.*	Yes
	Soil	Do you have acces to fertilizers, crop (seed) varieties and/or alternative livestock breeds?	*Consider ways to supplement inadequate soil*	Yes
5 Financial Resources	Finance	Do you have access to a bank account or community fund to support your livelihood?	*This includes resources to get you through tough times*	Yes
	Insurance	Do you have access to insurance to assist you in emergencies?	*Consider insurance to get you through tough times*	Yes, but not adequate

Figure 13: Screen Shot: Current Adaptive Capacity Questionnaire

As with Future Exposure, for Future Adaptive Capacity the tool provides the user with two options, namely (1) future exposure will be the same as current exposure, and (2) future exposure will be different to current exposure. A dropdown list is provided to enable the user to select an option (as illustrated in the image below). Once the user selects an option, the "Update" button should be clicked as this enables the cells for Future Adaptive Capacity to be populated based on the selection. Should the user wish to change the response to the initial question above (i.e. current vs future), the “Update" button should be clicked the again.



FUTURE ADAPTIVE CAPACITY

NOTE: THIS SECTION SHOULD BE COMPLETED BY THE PROJECT ASSESSOR BASED ON CONFIRMED PROJECT PIPELINE/COMMITMENTS (WHICH SHOULD BE MADE AVAILABLE ON REQUEST).

Do you think that the future sensitivity will be similar to the current sensitivity?	No
NOTE: ONCE YOU SELECT AN OPTION, PLEASE CLICK ON "UPDATE". SHOULD YOU WISH TO CHANGE YOUR RESPONSE TO THE QUESTION ABOVE, PLEASE REMEMBER TO CLICK THE "UPDATE "BUTTON" AGAIN. PLEASE NOTE THAT THIS BUTTON WILL ERASE ALL RESPONSES THAT HAVE BEEN ENTERED MANUALLY, AND WILL CHANGE ALL RESPONSES TO DEFAULT!!	Update

Figure 14: Screen Shot: Future Adaptive Capacity Questionnaire

The responses to the questionnaires are then analysed in the “RVAT_Output” tab. Figure 15 is a screenshot illustrating a synthesis of the results, for each of the 5 categories (i.e. Human, Institutions, Infrastructure,

Natural Resources, and Financial Resources) and their corresponding sub-categories (noting the screenshot only illustrates current adaptive capacity; future adaptive capacity is synthesised in a similar manner) For each sub-category, a traffic light system is used to indicate the adaptive capacity – where green indicates a good adaptive capacity, orange indicates an average adaptive capacity, and red indicates a poor adaptive capacity.

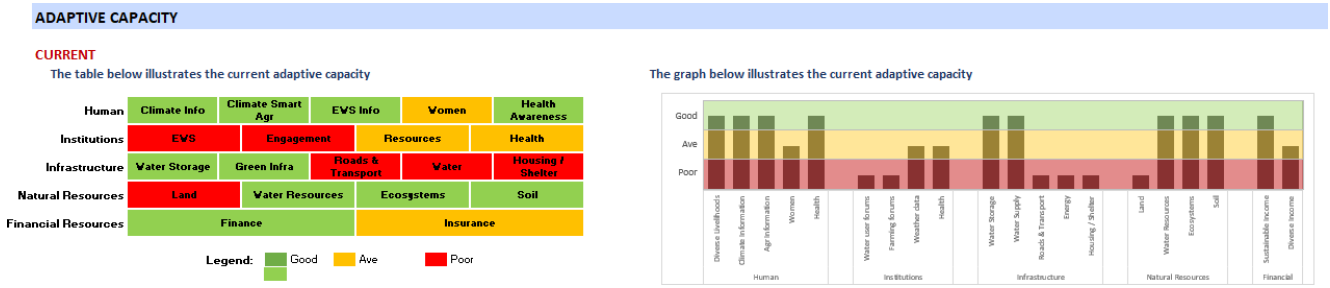


Figure 15: Screen Shot - RVAT Output Page – Adaptive Capacity Synthesis

Output: Vulnerability

As defined in Section 1.5, **vulnerability** refers to the inclination of a system, species or asset to be impacted by climate-related hazards, and it encompasses its sensitivity and its ability to cope or adapt to climate-related impacts.

The "Output" box leads the user to the "RVAT_Output" tab, where the responses to each question are analysed using the framework (in Section 1.5) in order to obtain the "Vulnerability" for:

- each of the 5 categories (i.e. Human, Institutions, Infrastructure, Natural Resources, and Financial Resources) – these are the same categories utilised for assessing “Sensitivity” and “Adaptive Capacity”.
- each of the 5 categories (i.e. Livelihoods, Health & Safety, Services, Water Supply and Infrastructure) and their corresponding sub-categories – these are the same categories utilised for assessing “Exposure”.

Two categories are used to illustrate vulnerability as, firstly, it is a function of sensitivity and adaptive capacity, and secondly, it is utilised to calculate the risk using the exposure and hazard outcomes – the relationship between these aspects is illustrated in Figure 1. Below is a screenshot illustrating a synthesis of the results for vulnerability. (The screenshot only illustrates current vulnerability; a similar image is used in the tool to synthesise future vulnerability.) For each sub-category, a robot system is used to indicate the degree of vulnerability – where green indicates a low vulnerability, orange indicates a medium vulnerability, and red indicates a high vulnerability.

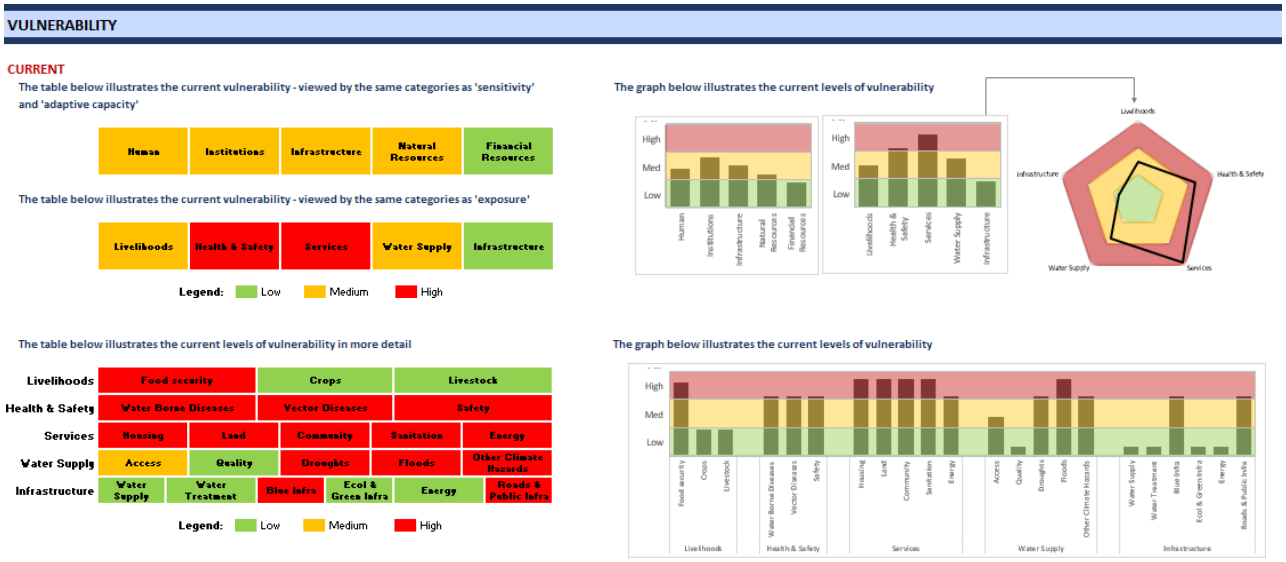


Figure 16: Screen Shot - RVAT Output Page – Vulnerability Analysis and Synthesis

Risk

As defined in Section 1.5, a **risk** refers to the potential for (and the likelihood of) adverse climate-related impacts.

The "Output" box leads the user to the "RVAT_Output" tab, where the responses to each question are analysed using the framework (in Section 1.5) in order to obtain the "Risk". Below is a screenshot illustrating a synthesis of the results, for each of the 5 categories (i.e. Livelihoods, Health & Safety, Services, Water Supply and Infrastructure) and their corresponding sub-categories (noting the screenshot only illustrates current risks; future adaptive capacity is synthesised in a similar manner). For each sub-category, a traffic light system is used to indicate the potential for (and likelihood) of a risk – where green indicates a low risk, orange indicates a medium risk, and red indicates a high risk.

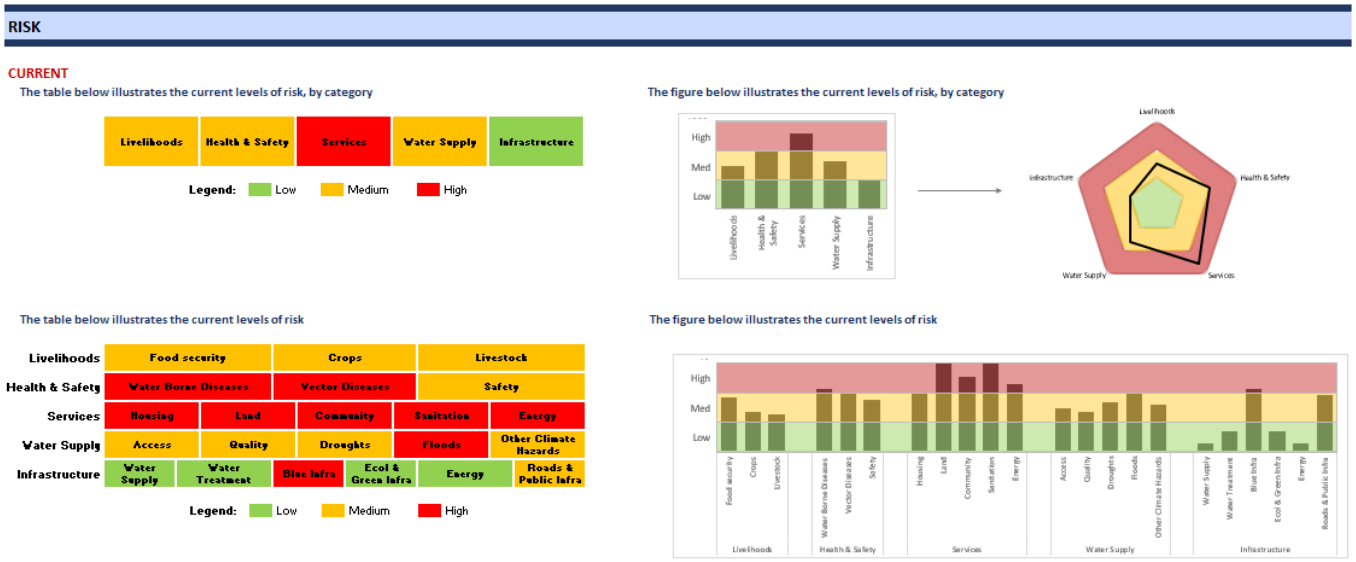


Figure 17: Screen Shot - RVAT Output Page – Risk Analysis and Synthesis

Responses

The “Responses” tab, which can also be accessed by clicking on the “Responses” box, begins by providing a high overview of the current and future vulnerability, as well as current and future risk (as shown in Figure 18).

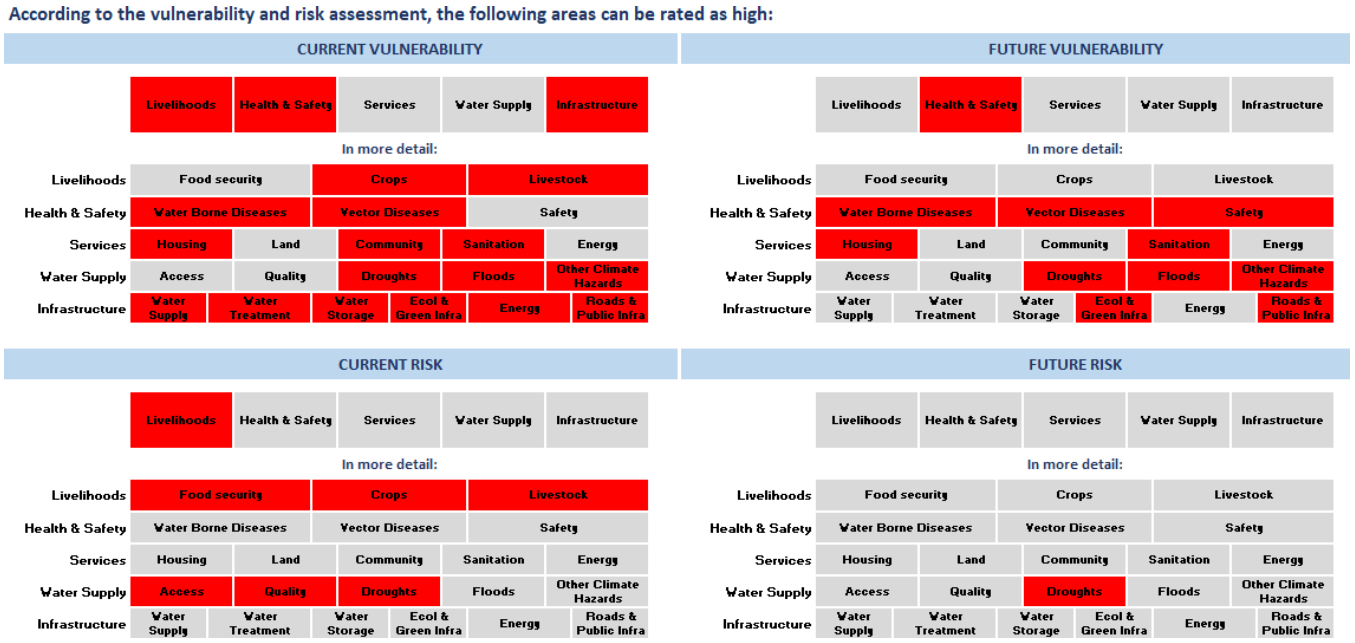


Figure 18: Screen Shot - Responses Page – High Vulnerability and High-Risk Areas

The high-vulnerability and high-risk areas have been determined by applying the framework (as shown in Section 1.5). For each of the high-vulnerability and high-risk areas, several response options have been developed (these can be accessed by clicking on the “Response Options” box shown in Figure 19). By clicking on the “Response Options” box, the user will activate a priority list, which focuses on addressing high-vulnerability and high-risk areas. As shown in Figure 20, these responses are intended to decrease the vulnerability and/or risk by either reducing sensitivity or increasing the adaptive capacity. Whenever possible, initiatives that reduce exposure will also be explored.

Figure 19: Screen Shot - Responses Page – Navigating Response Options

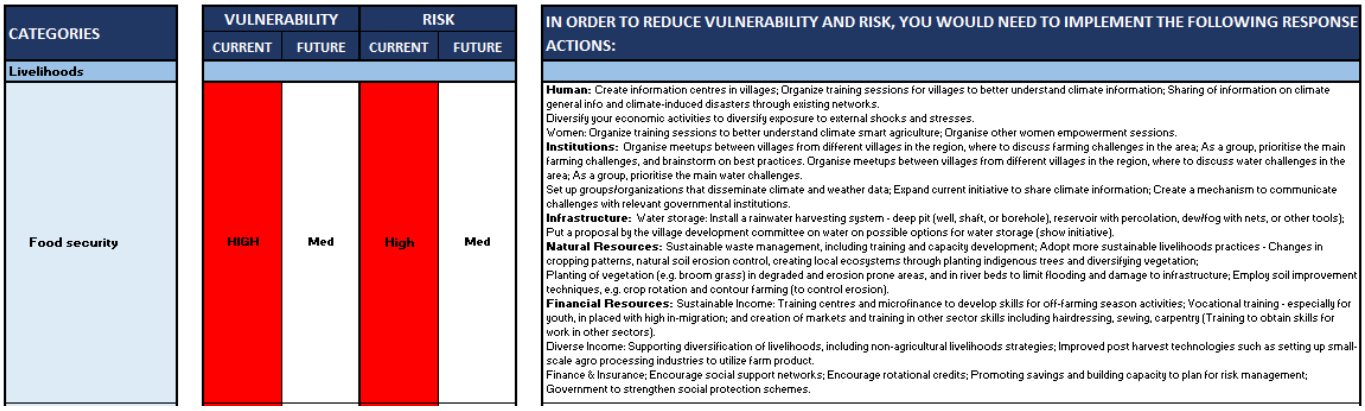


Figure 20: Screen Shot - Responses Page – Response Options for High-Vulnerability and High-Risk Areas

A complete list of the response options is provided in Appendix E. This list can also be accessed by clicking on the “Show All Response Options” box (as shown in Figure 21).

Figure 21: Screen Shot - Responses Page – Navigating Response Options

2.3 Interpreting the results

An example of the completed tool is available on SharePoint here (using random responses, unrelated to a specific project/context) – it provides an indication of the type of responses and ratings that could inform an intervention and design decisions. The RVAT will be piloted on a CRIDF project in July 2018. This Guidance Document will be updated to include the outputs and interpretation of results, with the aim of helping users understand the tool application process through a practical example.

2.4 Additional Information

Sources that will help answer some of the questions:

1. The **CRIDF Climate Vulnerability Tool**, which can be accessed by following this link: http://geoservergisweb2.hrwallingford.co.uk/CRIDF/metadata.htm
2. WRI - **Aqueduct Water Risk Atlas**, which can be accessed by following this link: http://www.wri.org/resources/maps/aqueduct-water-risk-atlas
3. CRIDF - **Resilience Screening and Climate Change Risk Assessment Guidelines** (Protocol)

3 Closing remarks

In conclusion, it is important to emphasise that this tool is intended to assess the climate risk and vulnerability of the broader community and water infrastructure projects, as well as to provide response options to manage these risks. This tool is not intended to provide strategic recommendations; it is merely intended to provide various potential initiatives that can minimise and/or mitigate climate-related impacts due to current and future hazards, and help design teams at preliminary project stages determine the most appropriate solutions to support target communities adjust and cope when faced by climate-related hazards.

Appendix A: Hazard Questionnaire

The questionnaire for current and future hazards is provided below.

CURRENT HAZARDS

Hazard			Question	Comments/Description	Response?
1	Temperature	Seasons	Does your area experience seasonal temperature variability?	*During the year (across seasons), is temperature higher/lower than usual?*	Yes, higher than usual
		Annual Trends	Does your area experience inter-annual temperature variability?	*Over multiple years (i.e. trend), is temperature higher/lower than usual?*	Yes, higher than usual
		Hot days	During the hottest days, are you impacted by heat-related stress	*How often do you experience heat-related water stress?*	Yes
2	Rainfall	Seasons	Does your area experience seasonal rainfall variability?	*During the year (across seasons), is rainfall higher/lower than usual?*	Yes, lower than usual
		Annual Trends	Does your area experience inter-annual rainfall variability?	*Over multiple years (i.e. trend), is rainfall higher/lower than usual?*	Yes, lower than usual
		Heavy Rainfall	Are heavy rainfall events prevalent in your area?	*Do you often have high rainfall events?*	Yes
3	Droughts	Events	Are droughts prevalent in your area?	*Do you often experience droughts?*	Yes
		Timing	If droughts do occur, do they occur at the same time of the year?	*Is the timing of droughts consistent?*	Sometimes
		Extent	If droughts do occur, is the extent and intensity of the drought changing?	*Are droughts getting worse or better?*	Yes, but more
		Effect	When droughts do occur, do they impact any part/aspect of your area?	*Are you affected by droughts?*	Often
4	Floods	Events	Are floods prevalent in your area?	*Do you often experience floods?*	No
		Timing	If floods do occur, do they occur at the same time of the year?	*Is the timing of floods consistent?*	Not applicable
		Extent	If floods do occur, is the extent and intensity of the floods changing?	*Are floods getting worse (more impact/intensity) or better (less impact/intensity)?*	Not applicable

		Effect	When floods do occur, do they impact any part/aspect of your area?	*Are you affected by floods?*	Not applicable

5	Other Factors	Fire	Do you frequently experience fires? And if yes, are you impacted?	*Are you impacted by fire in and around your area?*	No
		Snow	Do you frequently experience snowfall? And if yes, are you impacted?	*Are you impacted by snowfall in and around your area?*	No
		Hail	Do you frequently experience hail storms? And if yes, are you impacted?	*Are you impacted by hail in and around your area?*	No
		Tornado	Do you frequently experience tornadoes? And if yes, are you impacted?	*Are you impacted by tornadoes in and around your area?*	No
		Earthquake	Do you frequently experience earthquakes? And if yes, are you impacted?	*Are you impacted by earthquakes in and around your area?*	No
		Volcano	Do you frequently experience volcanoes? And if yes, are you impacted?	*Are you impacted by volcanoes in and around your area?*	No

FUTURE HAZARDS

NOTE: THIS SECTION SHOULD BE COMPLETED BY THE PROJECT ASSESSOR / TECHNICAL EXPERT BASED ON ADEQUATES DESKTOP RESEARCH.

Period of assessment (for future climate and hazard conditions)?	**year?**

Hazard			**Question**	**Comments/Description**	**Response?**
1	Temperature	Seasons	Do climate projections indicate that your area will experience seasonal temperature variability?	*During the year (across seasons), will temperature be higher/lower than usual?*	Yes, higher than usual
		Annual Trends	Do climate projections indicate that your area will experience inter-annual temperature variability?	*Over multiple years (i.e. trend), will temperature be higher/lower than usual?*	Yes, higher than usual
		Changes	Do climate projections indicate a change in the temperature?	*Temperature - Increase, decrease, or constant?*	Yes, higher than usual

2	Rainfall	Seasons	Do climate projections indicate that your area will experience seasonal rainfall variability?	*During the year (across seasons), will rainfall be higher/lower than usual?*	No, not really
		Annual Trends	Do climate projections indicate that your area will experience inter-annual rainfall variability?	*Over multiple years (i.e. trend), will rainfall be higher/lower than usual?*	No, not really
		Changes	Do climate projections indicate a change in the rainfall patterns?	*Rainfall - Increase, decrease, or constant?*	No, not really

3	Droughts	Events	In future, will droughts be prevalent in your area?	*Will you often experience droughts?*	Yes
		Timing	If droughts will occur, will they occur at the same time of the year?	*Will the timing of droughts be consistent?*	Often
		Extent	If droughts will occur, will the extent and intensity of the drought change (from current conditions)?	*Will droughts get worse or better?*	Yes, but more
		Effect	When droughts do occur, will they impact any part/aspect of your area?	*Will you be affected by droughts?*	Often

4	Floods	Events	In future, will floods be prevalent in your area?	*Will you often experience floods?*	Sometimes
		Timing	If floods will occur, will they occur at the same time of the year?	*Will the timing of floods be consistent?*	Sometimes
		Extent	If floods will occur, will the extent and intensity of the floods change (from current conditions)?	*Will floods get worse (more impact/intensity) or better (less impact/intensity)?*	Yes, but less
		Effect	When floods do occur, will they impact any part/aspect of your area?	*Will you be affected by floods?*	Sometimes

5	Other Factors	Fire	Will you frequently experience fires? And if yes, will you be impacted?	*Will you be impacted by fire in and around your area?*	No
		Snow	Will you frequently experience snowfall? And if yes, will you be impacted?	*Will you be impacted by snowfall in and around your area?*	No
		Hail	Will you frequently experience hail storms? And if yes, will you be impacted?	*Will you be impacted by hail in and around your area?*	No
		Tornado	Will you frequently experience tornadoes? And if yes, will you be impacted?	*Will you be impacted by tornadoes in and around your area?*	No
		Earthquake	Will you frequently experience earthquakes? And if yes, will you be impacted?	*Will you be impacted by earthquakes in and around your area?*	No
		Volcano	Will you frequently experience volcanoes? And if yes, will you be impacted?	*Will you be impacted by volcanoes in and around your area?*	No

Appendix B: Exposure Questionnaire

The questionnaire for current and future exposure is provided below.

CURRENT EXPOSURE

Exposure			Question	Comments/Description	Response?
1	Livelihoods	Food security	Is your food security influenced by different climatic conditions, and is it affordable?	*Consider food security at different at different times of the year (i.e. rainy season)?*	Yes, but not affordable
		Crops	Are you dependent on our own crop for food? If yes, is your crop impacted by climate events/diseases?	*Consider your ability to have seeds for the following year*	Yes, and impacted
		Livestock	Are you dependent on our own livestock for food? If yes, is your livestock impacted by climate events?	*This includes impacts from temperature, rainfall, droughts and/or floods*	Yes, and impacted
2	Health & Safety	Water Borne Diseases	Are you affected by water-borne diseases?	*Water-borne diseases include typhoid fever, cholera, leptospirosis and hepatitis A.*	No
		Vector Diseases	Are you affected by vector diseases?	*Vector diseases include malaria, dengue fever, yellow fever, and West Nile Fever*	No
		Safety	Is your human safety & livelihoods impacted by floods?	*Do floods ever cause death or loss of property/food?*	Yes
3	Services	Housing	Do you have adequate housing? If yes, is it impacted by climate hazards?	*This includes impacts from temperature, rainfall and/or floods*	Yes, but not impacted
		Land	Do you have adequate access to land? If yes, is it impacted by climate hazards?	*This includes land needed for food, crops and livestock*	Yes, but not impacted
		Community	Are your community services impacted by climate hazards?	*This includes clinics, school, religious buildings, etc.*	Sometimes
		Sanitation	Do you have access to adequate sanitation? If yes, is it impacted by climate hazards?	*This is specific to household sanitation*	Yes, but not impacted
		Energy	Do you have reliable access to energy? If yes, is it impacted by climate hazards?	*This includes impacts from temperature, rainfall, droughts and/or floods*	Yes, but not impacted

4	Water Supply	Access	Is water sufficient for the needs of your household?	*This includes water needed for food, crops, livestock, health*	No
		Quality	Is the quality of your water supply adequate for your needs?	*This includes water needed for food, crops, livestock, health*	Sometimes
		Droughts	Are you affected by seasonal droughts	*Do you experience water shortages during droughts?*	Yes
		Floods	Is your water access impacted by floods?	*This includes water needed for food, crops, livestock, health*	No
		Other Climate Hazards	Is your water access impacted by other climate events (excl. droughts and floods)?	*This includes water needed for food, crops, livestock, health*	Yes

5	Infrastructure	Water Supply	Do you have centralised water supply infrastructure? And is it impacted by climate hazards?	*This includes large and small-scale infrastructure (e.g. pipelines)*	No
		Water Treatment	Do you have centralised water treatment infrastructure? And is it impacted by climate hazards?	*This includes large and small-scale infrastructure*	No
		Water Storage	Do you have centralised water storage infrastructure? And is it impacted by climate hazards?	*This includes large and small-scale infrastructure (e.g. dams)*	No
		Ecol & Green Infra	Does green infrastructure exist in your area? And is it effective in reducing impacts from climate hazards?	*Consider how wetlands, parks, etc. reduce impacts from events such as floods*	No
		Energy	Is your energy infrastructure interrupted by floods or other climate events?	*This includes large and small-scale energy - e.g. grid, wind, distribution systems*	Yes
		Roads & Public Infra	Are your roads & other public infrastructure impacted by floods or other climate events?	*This includes large and small scale - e.g. bridges, buildings*	Yes

FUTURE EXPOSURE

NOTE: THIS SECTION SHOULD BE COMPLETED BY THE PROJECT ASSESSOR BASED ON CONFIRMED PROJECT PIPELINE/COMMITMENTS (WHICH SHOULD BE MADE AVAILABLE ON REQUEST).

Do you think that future exposure will be similar to current exposure?	**Yes**

NOTE: ONCE YOU SELECT AN OPTION, PLEASE CLICK ON "UPDATE". SHOULD YOU WISH TO CHANGE YOUR RESPONSE TO THE QUESTION ABOVE, PLEASE REMEMBER TO CLICK THE "UPDATE "BUTTON" AGAIN. PLEASE NOTE THAT THIS BUTTON WILL ERASE ALL RESPONSES THAT HAVE BEEN ENTERED MANUALLY, AND WILL CHANGE ALL RESPONSES TO DEFAULT!!

UPDATE

Exposure			Question	Comments/Description	Response?
1	Livelihoods	Food security	Will your food security influenced by different climatic conditions, and will it beaffordable?	*Consider food security at different at different times of the year (i.e. rainy season)?*	Yes, but not affordable
		Crops	Will you be dependent on our own crop for food? If yes, will your crop be impacted by climate events/diseases?	*Consider your ability to have seeds for the following year*	Yes, and impacted
		Livestock	Will you be dependent on our own livestock for food? If yes, will your livestock be impacted by climate events?	*This includes impacts from temperature, rainfall, droughts and/or floods*	Yes, and impacted
2	Health & Safety	Water Borne Diseases	Will you be affected by water-borne diseases?	*Water-borne diseases include typhoid fever, cholera, leptospirosis and hepatitis A.*	No
		Vector Diseases	Will you be affected by vector diseases?	*Vector diseases include malaria, dengue fever, yellow fever, and West Nile Fever*	No
		Safety	Will your human safety & livelihoods be impacted by floods?	*Will floods cause death or loss of property/food?*	Yes
3	Services	Housing	Will you have adequate housing? If yes, will it be impacted by climate hazards?	*This includes impacts from temperature, rainfall and/or floods*	Yes, but not impacted
		Land	Will you have adequate access to land? If yes, will it be impacted by climate hazards?	*This includes land needed for food, crops and livestock*	Yes, but not impacted
		Community	Will your community services be impacted by climate hazards?	*This includes clinics, school, religious buildings, etc.*	Sometimes
		Sanitation	Will you have access to adequate sanitation? If yes, will it be impacted by climate hazards?	*This is specific to household sanitation*	Yes, but not impacted
		Energy	Will you have reliable access to energy? If yes, will it be impacted by climate hazards?	*This includes impacts from temperature, rainfall, droughts and/or floods*	Yes, but not impacted
4	Water Supply	Access	Will water be sufficient for the needs of your household?	*This includes water needed for food, crops, livestock, health*	No
		Quality	Will the quality of your water supply be adequate for your needs?	*This includes water needed for food, crops, livestock, health*	Sometimes
		Droughts	Will you be affected by seasonal droughts	*Will you experience water shortages during droughts?*	Yes
		Floods	Will your water access be impacted by floods?	*This includes water needed for food, crops, livestock, health*	No
		Other Climate Hazards	Will your water access be impacted by other climate events (excl. droughts and floods)?	*This includes water needed for food, crops, livestock, health*	Yes

5	Infrastructure	Water Supply	Will you have centralised water supply infrastructure? And will it be impacted by climate hazards?	*This includes large and small-scale infrastructure (e.g. pipelines)*	No
		Water Treatment	Will you have centralised water treatment infrastructure? And will it be impacted by climate hazards?	*This includes large and small-scale infrastructure*	No
		Water Storage	Will you have centralised water storage infrastructure? And will it be impacted by climate hazards?	*This includes large and small-scale infrastructure (e.g. dams)*	No
		Ecol & Green Infra	Will green infrastructure exist in your area? And will it be effective in reducing impacts from climate hazards?	*Consider how wetlands, parks, etc. reduce impacts from events such as floods*	No
		Energy	Will your energy infrastructure be interrupted by floods or other climate events?	*This includes large and small-scale energy - e.g. grid, wind, distribution systems*	Yes
		Roads & Public Infra	Will your roads & other public infrastructure be impacted by floods or other climate events?	*This includes large and small scale - e.g. bridges, buildings*	Yes

Appendix C: Sensitivity Questionnaire

The questionnaire for current and future sensitivity is provided below.

CURRENT SENSITIVITY

Sensitivity			Question	Comments/Description	Response?
1	Human	Diverse Livelihoods	Do you have other ways to support your livelihood?	*Including non-agricultural activities*	Sometimes
		Climate Information	Do you have adequate education levels to understand climate information?	*Consider school level*	Yes
		Agric Information	Have you received any training on climate-smart agriculture?	*This includes info/skills on temperature, rainfall, droughts and/or floods*	Yes
		Women	Are you involved in agriculture and/or securing water in your household?	*nb - specific to women*	Yes
		Health	Would you consider you and your family to be healthy?	*This includes waterborne and vector diseases*	No
2	Institutions	Water user forums	Are you part of a group that discusses water challenges in your area?	*Do they exist, and do you feel adequately represented?*	No
		Farming forums	Are you part of a group that discusses farming challenges in your area?	*Do they exist, and do you feel adequately represented?*	No
		Weather data	Do you have a group/organisation that disseminates climate/weather data?	*Is there someone who tells you what the weather will be like in future?*	No
		Health	Do you have reasonable access to health services?	*Consider access to clinics and hospitals?*	Yes, but not adequate
3	Infrastructure	Water Storage	Do you have access to water storage facilities?	*Consider household water storage*	Yes
		Water Supply	If it exists, is your water supply and/or treatment infrastructure reliable?	*Consider if these are damaged during floods or other climate events*	Not applicable
		Roads & Transport	Are your roads and transport infrastructure in adequate condition?	*Consider if these are damaged during floods or other climate events*	No
		Energy	If it exists, is your energy supply dependent on water?	*Consider if these are impacted by droughts, flood or other climate events*	Not applicable
		Housing / Shelter	During climate events do you have access to your shelter?	*Consider if it is damaged during floods or other climate events*	Yes
4	Natural Resources	Land	Do you have secure land rights?	*Do you own your land?*	Yes

		Water Resources	Are the water resources in your area healthy?	*Is your area's water resource healthy?*	Sometimes
		Ecosystems	Are you situated in a healthy ecosystem?	*Are your area's ecosystem and natural resources healthy?*	Sometimes
		Soil	Is your soil of adequate quality for your livelihood needs?	*Is your area's soil healthy?*	No
5	Financial Resources	Sustainable Income	Do you have a sustainable source of income?	*This includes a salary, as well as resources to get you through tough times*	No
		Diverse Income	Do you have diversified income sources?	*Do you have more than one source of income?*	No

FUTURE SENSITIVITY

NOTE: THIS SECTION SHOULD BE COMPLETED BY THE PROJECT ASSESSOR BASED ON CONFIRMED PROJECT PIPELINE/COMMITMENTS (WHICH SHOULD BE MADE AVAILABLE ON REQUEST).

Do you think that future sensitivity will be similar to current sensitivity?	**Yes**

NOTE: ONCE YOU SELECT AN OPTION, PLEASE CLICK ON "UPDATE". SHOULD YOU WISH TO CHANGE YOUR RESPONSE TO THE QUESTION ABOVE, PLEASE REMEMBER TO CLICK THE "UPDATE "BUTTON" AGAIN. PLEASE NOTE THAT THIS BUTTON WILL ERASE ALL RESPONSES THAT HAVE BEEN ENTERED MANUALLY, AND WILL CHANGE ALL RESPONSES TO DEFAULT!!

UPDATE

Sensitivity			Question	Comments/Description	Response?
1	Human	Diverse Livelihoods	Will you have other ways to support your livelihood?	*Including non-agricultural activities*	*Sometimes*
		Climate Information	Will you have adequate education levels to understand climate information?	*Consider school level*	*Yes*
		Agric Information	Will you receive any training on climate-smart agriculture?	*This includes info/skills on temperature, rainfall, droughts and/or floods*	*Yes*
		Women	Will you be involved in agriculture and/or securing water in your household?	*nb - specific to women*	*Yes*
		Health	In future, will you consider you and your family to be healthy?	*This includes waterborne and vector diseases*	*No*

2	Institutions	Water user forums	Will you be part of a group that discusses water challenges in your area?	*Will they exist, and will you feel adequately represented?*	*No*
		Farming forums	Will you be part of a group that discusses farming challenges in your area?	*Will they exist, and will you feel adequately represented?*	*No*
		Weather data	Will you have a group/organisation that disseminates climate/weather data?	*Will there be someone who tells you what the weather will be like in future?*	*No*
		Health	Will you have reasonable access to health services?	*Consider access to clinics and hospitals?*	*Yes, but not adequate*

3	Infrastructure	Water Storage	Will you have access to water storage facilities?	*Consider household water storage*	*Yes*
		Water Supply	If it exists, will your water supply and/or treatment infrastructure be reliable?	*Consider if these will be damaged during floods or other climate events*	*Not applicable*
		Roads & Transport	Will your roads and transport infrastructure be in adequate condition?	*Consider if these will be damaged during floods or other climate events*	*No*
		Energy	If it exists, will your energy supply be dependent on water?	*Consider if these will be impacted during floods or other climate events*	*Not applicable*
		Housing / Shelter	During climate events will you have access to your shelter?	*Consider if it will be impacted during floods or other climate events*	*Yes*

4	Natural Resources	Land	Will you have secure land rights?	*Will you own your land?*	*Yes*
		Water Resources	Will the water resources in your area be healthy?	*Will your area's water resource be healthy?*	*Sometimes*
		Ecosystems	Will you be situated in a healthy ecosystem?	*Will your area's ecosystem and natural resources be healthy?*	*Sometimes*
		Soil	Will your soil be of adequate quality for your livelihood needs?	*Will your area's soil be healthy?*	*No*

5	Financial Resources	Sustainable Income	Will you have a sustainable source of income?	*This includes a salary, as well as resources to get you through tough times*	*No*
		Diverse Income	Will you have diversified income sources?	*Will you have more than one source of income?*	*No*

Appendix D: Adaptive Capacity Questionnaire

The questionnaire for current and future adaptive capacity is provided below.

CURRENT ADAPTIVE CAPACITY

Adaptive Capacity			Question	Comments/Description	Response?
1	Human	Climate Info	Do you have access to climate-related information to enable adaptation and resilience?	*This includes info/skills on temperature, rainfall, droughts and/or floods*	Yes
		Climate Smart Agr	Do you have access to information about climate-smart agriculture?	*This includes info/skills on temperature, rainfall, droughts and/or floods*	No
		EWS Info	Do you have skills and information on how to react/respond to an early warning system (EWS)?	*This includes info/skills on temperature, rainfall, droughts and/or floods*	No
		Women	Do women have skills and information about climate-smart agriculture?	*nb - specific to women*	No
		Health Awareness	Are you provided with information regarding your families' health?	*This includes waterborne and vector diseases*	Yes
2	Institutions	EWS	Is there an early warning system (EWS) in your community?	*Consider an EWS that warns you during disasters*	No
		Engagement	Does the local government engage you during disasters?	*Consider the level of communication and engagement*	No
		Resources	Does the local government have the capacity and finance to respond to disasters?	*Are they able to respond to disasters?*	Sometimes
		Health	Do your health services have sufficient capacity and finance?	*Are your health services able to meet your needs?*	Sometimes

3	Infrastructure	Water Storage	Does the local government provide additional water storage during disasters?	*Consider possible options for water storage*	No
		Green Infra	Is there any green infrastructure to supplement blue infrastructure in your area?	*Consider natural dams/ponds, wetlands*	Sometimes
		Roads & Transport	Are your roads and transport infrastructure adequately maintained?	*Consider local government actions*	No
		Maintenance	Does the local government have the capacity and finance to manage and maintain infrastructure?	*Consider local government actions*	No
		Housing / Shelter	During flood events do you have access to alternative shelter?	*Consider community halls or shelters*	Yes

4	Natural Resources	Land	Do you have access to alternative land that you can use in the case of emergencies (such as floods)?	*Consider land in higher ground or in a different location*	No
		Water Resources	Do you have access to alternative water that you can use in the case of emergencies (such as droughts)?	*Consider water to supplement your main water supply*	No
		Ecosystems	Are the ecosystems in your area adequately managed?	*Consider parks, wetlands, forests, rivers, etc.*	No
		Soil	Do you have access to fertilizers, crop (seed) varieties and/or alternative livestock breeds?	*Consider ways to supplement inadequate soil*	No

5	Financial Resources	Finance	Do you have access to a bank account or community fund to support your livelihood?	*This includes resources to get you through tough times*	Yes, and adequate
		Insurance	Do you have access to insurance to assist you in emergencies?	*Consider insurance to get you through tough times*	No

FUTURE ADAPTIVE CAPACITY

NOTE: THIS SECTION SHOULD BE COMPLETED BY THE PROJECT ASSESSOR BASED ON CONFIRMED PROJECT PIPELINE/COMMITMENTS (WHICH SHOULD BE MADE AVAILABLE ON REQUEST).

Do you think that future adaptive capacity will be similar to current adaptive capacity?	**Yes**

NOTE: ONCE YOU SELECT AN OPTION, PLEASE CLICK ON "UPDATE". SHOULD YOU WISH TO CHANGE YOUR RESPONSE TO THE QUESTION ABOVE, PLEASE REMEMBER TO CLICK THE "UPDATE "BUTTON" AGAIN. PLEASE NOTE THAT THIS BUTTON WILL ERASE ALL RESPONSES THAT HAVE BEEN ENTERED MANUALLY, AND WILL CHANGE ALL RESPONSES TO DEFAULT!!

UPDATE

Adaptive Capacity			Question	Comments/Description	Response?
1	Human	Climate Info	Will you have access to climate-related information to enable adaptation and resilience?	*This includes info/skills on temperature, rainfall, droughts and/or floods*	Yes
		Climate Smart Agr	Will you have access to information about climate-smart agriculture?	*This includes info/skills on temperature, rainfall, droughts and/or floods*	No
		EWS Info	Will you have skills and information on how to react/respond to an early warning system (EWS)?	*This includes info/skills on temperature, rainfall, droughts and/or floods*	No
		Women	Will women have skills and information about climate-smart agriculture?	*nb - specific to women*	No
		Health Awareness	Will you be provided with information regarding your families' health?	*This includes waterborne and vector diseases*	Yes
2	Institutions	EWS	Will there be an early warning system (EWS) in your community?	*Consider an EWS that warns you during disasters*	No
		Engagement	Will the local government engage you during disasters?	*Consider the level of communication and engagement*	No
		Resources	Will the local government have the capacity and finance to respond to disasters?	*Will they be able to respond to disasters?*	Sometimes
		Health	Will your health services have sufficient capacity and finance?	*Will your health services be able to meet your needs?*	Sometimes

3	Infrastructure	Water Storage	Will the local government provide additional water storage during disasters?	*Consider possible options for water storage*	No
		Green Infra	Will there be any green infrastructure to supplement blue infrastructure in your area?	*Consider natural dams/ponds, wetlands*	Sometimes
		Roads & Transport	Will the roads and transport infrastructure be adequately maintained?	*Consider local government actions*	No
		Maintenance	Does the local government have the capacity and finance to manage and maintain infrastructure?	*Consider local government actions*	No
		Housing / Shelter	During flood events will you have access to alternative shelter?	*Consider community halls or shelters*	Yes
4	Natural Resources	Land	Will you have access to alternative land that you can use in the case of emergencies (such as floods)?	*Consider land in higher ground or in a different location*	No
		Water Resources	Will you have access to alternative water that you can use in the case of emergencies (such as droughts)?	*Consider water to supplement your main water supply*	No
		Ecosystems	Will the ecosystems in your area be adequately managed?	*Consider parks, wetlands, forests, rivers, etc.*	No
		Soil	Will you have access to fertilizers, crop (seed) varieties and/or alternative livestock breeds?	*Consider ways to supplement inadequate soil*	No

5	Financial Resources	Finance	Will you have access to a bank account or community fund to support your livelihood?	*This includes resources to get you through tough times*	Yes, and adequate
		Insurance	Will you have access to insurance to assist you in emergencies?	*Consider insurance to get you through tough times*	No

Appendix E: Response Options

The complete list of the response options is provided below.

CATEGORIES	IN ORDER TO REDUCE VULNERABILITY AND RISK, YOU WOULD NEED TO IMPLEMENT THE FOLLOWING RESPONSE ACTIONS:
Livelihoods	
Food security	**Human:** Create information centres in villages; Organize training sessions for villages to better understand climate information; Sharing of information on climate general info and climate-induced disasters through existing networks. Diversify your economic activities to diversify exposure to external shocks and stresses. Women: Organize training sessions to better understand climate smart agriculture; Organise other women empowerment sessions. **Institutions:** Organise meetups between villages from different villages in the region, where to discuss farming challenges in the area; As a group, prioritise the main farming challenges, and brainstorm on best practices. Organise meetups between villages from different villages in the region, where to discuss water challenges in the area; As a group, prioritise the main water challenges. Set up groups/organizations that disseminate climate and weather data; Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions. **Infrastructure:** Water storage: Install a rainwater harvesting system - deep pit (well, shaft, or borehole), reservoir with percolation, dew/fog with nets, or other tools); Put a proposal by the village development committee on water on possible options for water storage (show initiative).
	Natural Resources: Sustainable waste management, including training and capacity development; Adopt more sustainable livelihoods practices - Changes in cropping patterns, natural soil erosion control, creating local ecosystems through planting indigenous trees and diversifying vegetation; Planting of vegetation (e.g. broom grass) in degraded and erosion prone areas, and in river beds to limit flooding and damage to infrastructure; Employ soil improvement techniques, e.g. crop rotation and contour farming (to control erosion). **Financial Resources:** Sustainable Income: Training centres and microfinance to develop skills for off-farming season activities; Vocational training - especially for youth, in placed with high in-migration; and creation of markets and training in other sector skills including hairdressing, sewing, carpentry (Training to obtain skills for work in other sectors). Diverse Income: Supporting diversification of livelihoods, including non-agricultural livelihoods strategies; Improved post harvest technologies such as setting up small-scale agro processing industries to utilize farm product. Finance & Insurance; Encourage social support networks; Encourage rotational credits; Promoting savings and building capacity to plan for risk management; Government to strengthen social protection schemes.

Crops	**Human:** Diversify your economic activities to diversify exposure to external shocks and stresses. Organize training sessions for villages to better understand climate information and climate smart agriculture; Building knowledge and skills on adaptation strategies; Promoting climate resilient agricultural practices: (a) Promote inter-cropping, natural fertilizer/pesticides and avoid monocultures", (b) Promotion of drought resistant local crops and species through community based nursery, (c) Promotion of local seed exchange system to conserve the environmentally stressed varieties, and (d) Prompting sustainable agriculture, organic farming, and appropriate technology to reduce degradation. ; Promote awareness about health risks. Women: Organize training sessions to better understand climate smart agriculture; Organise other women empowerment sessions **Institutions:** Organise meetups between villages from different villages in the region, where to discuss farming challenges in the area; As a group, prioritise the main farming challenges, and brainstorm on best practices. Organise meetups between villages from different villages in the region, where to discuss water challenges in the area; As a group, prioritise the main water challenges. Set up groups/organizations that disseminate climate and weather data; Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions. **Infrastructure:** Introducing technologies to address water stresses for agriculture; Install a rainwater harvesting system - deep pit (well, shaft, or borehole), reservoir with percolation, dew/fog with nets, or other tools). Food reserves: Promote local and community food storage, grain/seed banks and silos - establishing food and seed banks in places sage from hazards. **Natural Resources:** Sustainable waste management, including training and capacity development; Adopt more sustainable livelihoods practices - Changes in cropping patterns, natural soil erosion control, creating local ecosystems through planting indigenous trees and diversifying vegetation; Planting of vegetation (e.g. broom grass) in degraded and erosion prone areas, and in river beds; Employ soil improvement techniques, e.g. crop rotation and contour farming (to control erosion). **Financial Resources:** Sustainable Income: Training centres and microfinance to develop skills for off-farming season activities; Vocational training - especially for youth, in placed with high in-migration; and creation of markets and training in other sector skills including hairdressing, sewing, carpentry (Training to obtain skills for work in other sectors). Diverse Income: Supporting diversification of livelihoods, including non-agricultural livelihoods strategies; Improved post harvest technologies such as setting up small-scale agro processing industries to utilize farm product. Finance & Insurance; Encourage social support networks; Encourage rotational credits; Promoting savings and building capacity to plan for risk management; Government to strengthen social protection schemes.

Livestock	**Human:** Organize training sessions for villages to better understand climate information and climate smart agriculture; Building knowledge and skills on adaptation strategies; Promoting climate resilient livestock practices; Promote awareness about health risks. Diversify your economic activities to diversify exposure to external shocks and stresses. Women: Organize training sessions to better understand climate smart agriculture; Organise other women empowerment sessions. **Institutions:** Organise meetups between villages from different villages in the region, where to discuss farming challenges in the area; As a group, prioritise the main farming challenges, and brainstorm on best practices. Organise meetups between villages from different villages in the region, where to discuss water challenges in the area; As a group, prioritise the main water challenges. Set up groups/organizations that disseminate climate and weather data; Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions. **Infrastructure:** Introducing technologies to address water stresses for agriculture; Install a rainwater harvesting system - deep pit (well, shaft, or borehole), reservoir with percolation, dew/fog with nets, or other tools). **Natural Resources:** Sustainable waste management, including training and capacity development; Adopt more sustainable livelihoods practices; Planting of vegetation in degraded and erosion prone areas, and in river beds; Employ livestock rotation techniques (to control erosion). **Financial Resources:** Sustainable Income: Training centres and microfinance to develop skills for off-farming season activities; Vocational training - especially for youth, in placed with high in-migration; and creation of markets and training in other sector skills including hairdressing, sewing, carpentry (Training to obtain skills for work in other sectors). Diverse Income: Supporting diversification of livelihoods, including non-agricultural livelihoods strategies; Improved post harvest technologies such as setting up small-scale agro processing industries to utilize farm product. Finance & Insurance; Encourage social support networks; Encourage rotational credits; Promoting savings and building capacity to plan for risk management; Government to strengthen social protection schemes.
Health & Safety	
Water Borne Diseases	**Human:** Sharing of information on climate general info and climate-induced disasters through existing networks. EWS, such as organise training sessions for villager on responses to climate risk information; strengthening access to EWS / building capacity to analyse risks; Implement/Expand SMS system to send villagers relevant information; Consider a "village committee" to promote sharing of EWS information. Women: Organize training sessions to better understand climate smart agriculture; Organise other women empowerment sessions. Health: Expand the number of health surveillance assistants; Promote awareness about health risks.. **Institutions:** Expand proximity health services; Facilitate transport to health facilities. Organise meetups between villages from different villages in the region, where to discuss water challenges in the area; As a group, prioritise the main water challenges. Set up groups/organizations that disseminate climate and weather data; Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions. **Infrastructure:** Improving health services to withstand hazards, including road and transportation network to promote access. **Natural Resources:** Implement ecological infrastructure (e.g. wetlands) to promote healthy ecosystems. **Financial Resources:** Encourage social support networks; Encourage rotational credits; Promoting savings and building capacity to plan for risk management; Government to strengthen social protection schemes.

Vector Diseases	**Human:** Sharing of information on climate general info and climate-induced disasters through existing networks. EWS, such as organise training sessions for villager on responses to climate risk information; strengthening access to EWS / building capacity to analyse risks; Implement/Expand SMS system to send villagers relevant information; Consider a "village committee" to promote sharing of EWS information. Women: Organize training sessions to better understand climate smart agriculture; Organise other women empowerment sessions. Health: Expand the number of health surveillance assistants; Promote awareness about health risks **Institutions:** Expand proximity health services; Facilitate transport to health facilities. Organise meetups between villages from different villages in the region, where to discuss water challenges in the area; As a group, prioritise the main water challenges. Set up groups/organizations that disseminate climate and weather data; Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions. **Infrastructure:** Improving health services to withstand hazards, including transportation network to promote access. **Natural Resources:** Implement ecological infrastructure (e.g. wetlands) to promote healthy ecosystems **Financial Resources:** Encourage social support networks; Encourage rotational credits; Promoting savings and building capacity to plan for risk management; Government to strengthen social protection schemes.
Safety	**Human:** Create information centres in villages; Organize training sessions for villages to better understand climate information; Sharing of information on climate general info and climate-induced disasters through existing networks. EWS, such as organise training sessions for villager on responses to climate risk information; strengthening access to EWS / building capacity to analyse risks; Implement/Expand SMS system to send villagers relevant information; Consider a "village committee" to promote sharing of EWS information. Women: Organize training sessions to better understand climate smart agriculture; Organise other women empowerment sessions. **Institutions:** Organise meetups between villages from different villages in the region, where to discuss water challenges in the area; As a group, prioritise the main water challenges. Set up groups/organizations that disseminate climate and weather data; Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions. **Infrastructure:** Improving shelters and communities to withstand hazards, including road and transportation network to promote access. **Natural Resources:** Hill stabilisation and catchment restoration (by planting trees) to prevent erosion and promote stability (to minimise land slides / other impacts). **Financial Resources:** Encourage social support networks; Encourage rotational credits; Promoting savings and building capacity to plan for risk management; Government to strengthen social protection schemes.
Services	
Housing	**Human:** Create information centres in villages; Organize training sessions for villages to better understand climate information; Sharing of information on climate general info and climate-induced disasters through existing networks. EWS, such as organise training sessions for villager on responses to climate risk information; strengthening access to EWS / building capacity to analyse risks; Implement/Expand SMS system to send villagers relevant information; Consider a "village committee" to promote sharing of EWS information **Institutions:** Set up groups/organizations that disseminate climate and weather data; Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions. Set up groups/organizations that disseminate climate and weather data; Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions. **Infrastructure:** Improving shelters to withstand hazards **Natural Resources:** Do land zonation and rehabilitation; Hill stabilisation and catchment restoration (by planting trees) to prevent erosion and promote stability (to minimise land slides / other impacts). **Financial Resources:** Encourage social support networks; Encourage rotational credits; Promoting savings and building capacity to plan for risk management; Government to strengthen social protection schemes.

Land	**Human:** Create information centres in villages; Organize training sessions for villages to better understand climate information; Sharing of information on climate general info and climate-induced disasters through existing networks. EWS, such as organise training sessions for villager on responses to climate risk information; strengthening access to EWS / building capacity to analyse risks; Implement/Expand SMS system to send villagers relevant information; Consider a "village committee" to promote sharing of EWS information **Institutions:** Expand proximity health services; Facilitate transport to health facilities. Set up groups/organizations that disseminate climate and weather data; Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions; Increase institutional finance and human resource capacity. **Infrastructure:** Improving access in the face of hazards, including road network to promote access. **Natural Resources:** Adopt legislation protecting land rights; Do land zonation and rehabilitation. **Financial Resources:** Encourage social support networks; Encourage rotational credits; Promoting savings and building capacity to plan for risk management; Government to strengthen social protection schemes.
Community	**Human:** Sharing of information on climate general info and climate-induced disasters through existing networks. EWS, such as or strengthening access to EWS / building capacity to analyse risks; Implement/Expand SMS system to send relevant information. **Institutions:** Expand proximity and/or facilitate transport to health services and other facilities (e.g. school, church). Set up groups/organizations that disseminate climate and weather data; Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions. **Infrastructure:** Improving community services to withstand hazards, including road and transportation network to promote access. **Natural Resources:** Sustainable water and waste management, including trainings and capacity development; Hill stabilisation and catchment restoration (by planting trees) to prevent erosion and promote stability (to minimise land slides / other impacts). **Financial Resources:** Encourage social support networks; Encourage rotational credits; Promoting savings and building capacity to plan for risk management; Government to strengthen social protection schemes.
Sanitation	**Human:** Organize training sessions for villages to better understand climate information; Sharing of information on climate general info and climate-induced disasters through existing networks. EWS, such as or strengthening access to EWS / building capacity to analyse risks; Implement/Expand SMS system to send relevant information. **Institutions:** Set up groups/organizations that disseminate climate and weather data; Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions; Increase institutional finance and human resource capacity. **Infrastructure:** Promoting access to good quality sanitation that can withstand climate hazards; Promote access to a centralised sanitation system. **Natural Resources:** Sustainable waste management, including trainings and capacity development; Catchment restoration and implementing green infrastructure such as wetlands to improve water quality (due to poor sanitation). **Financial Resources:** Encourage social support networks; Encourage rotational credits; Promoting savings and building capacity to plan for risk management; Government to strengthen social protection schemes.
Energy	**Human:** Sharing of information on climate general info and climate-induced disasters through existing networks. EWS, such as or strengthening access to EWS / building capacity to analyse risks; Implement/Expand SMS system to send relevant information. **Institutions:** Set up groups/organizations that disseminate climate and weather data; Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions; Increase institutional finance and human resource capacity. **Infrastructure:** Promote a diversified energy supply sources; Promote access to national grid **Natural Resources:** Sustainable waste management, including trainings and capacity development - such as promoting the implementation of the water-energy-food nexus. Catchment restoration - for deforestation. **Financial Resources:** Encourage social support networks; Encourage rotational credits; Promoting savings and building capacity to plan for risk management; Government to strengthen social protection schemes.
Water Supply	

Access	**Human:** Create information centres in villages; Organize training sessions for villages to better understand climate information; Sharing of information on climate general info and climate-induced disasters through existing networks. EWS, such as organise training sessions for villager on responses to climate risk information; strengthening access to EWS / building capacity to analyse risks; Implement/Expand SMS system to send villagers relevant information; Consider a "village committee" to promote sharing of EWS information. Women: Organize training sessions to better understand climate smart agriculture; Organise other women empowerment sessions. **Institutions:** Organise meetups between villages from different villages in the region, where to discuss water challenges in the area; As a group, prioritise the main water challenges. Set up groups/organizations that disseminate climate and weather data; Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions. **Infrastructure:** Install/update a rainwater harvesting system - tank, deep pit (well, shaft, or borehole), reservoir with percolation, dew/fog with nets, or other tools) **Natural Resources:** Sustainable waste management, including training and capacity development; Adopt more sustainable livelihoods practices; Planting of vegetation in degraded and erosion prone areas, and in river beds. **Financial Resources:** Encourage social support networks; Encourage rotational credits; Promoting savings and building capacity to plan for risk management; Government to strengthen social protection schemes.
Quality	**Human:** Create information centres in villages; Organize training sessions for villages to better understand climate information; Sharing of information on climate general info and climate-induced disasters through existing networks. EWS, such as organise training sessions for villager on responses to climate risk information; strengthening access to EWS / building capacity to analyse risks; Implement/Expand SMS system to send villagers relevant information; Consider a "village committee" to promote sharing of EWS information. Women: Organize training sessions, specifically for women, to better understand climate smart agriculture; Organise other women empowerment sessions. **Institutions:** Organise meetups between villages from different villages in the region, where to discuss water challenges in the area; As a group, prioritise the main water challenges. Set up groups/organizations that disseminate climate and weather data; Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions. **Infrastructure:** Install/update a rainwater harvesting system - tank, deep pit (well, shaft, or borehole), reservoir with percolation, dew/fog with nets, or other tools) **Natural Resources:** Sustainable waste management, including training and capacity development; Catchment restoration and implementing green infrastructure such as wetlands to improve water quality (due to poor water quality). **Financial Resources:** Encourage social support networks; Encourage rotational credits; Promoting savings and building capacity to plan for risk management; Government to strengthen social protection schemes.
Droughts	**Human:** Create information centres in villages; Organize training sessions for villages to better understand climate information; Sharing of information on climate general info and climate-induced disasters through existing networks. EWS, such as organise training sessions for villager on responses to climate risk information; strengthening access to EWS / building capacity to analyse risks; Implement/Expand SMS system to send villagers relevant information; Consider a "village committee" to promote sharing of EWS information. **Institutions:** Organise meetups between villages from different villages in the region, where to discuss water challenges in the area; As a group, prioritise the main water challenges. **Infrastructure:** Install/update a rainwater harvesting system - tank, deep pit (well, shaft, or borehole), reservoir with percolation, dew/fog with nets, or other tools) **Natural Resources:** Sustainable waste management, including training and capacity development; Catchment restoration and implementing green infrastructure such as wetlands to minimise drought impacts. **Financial Resources:** Encourage social support networks; Encourage rotational credits; Promoting savings and building capacity to plan for risk management; Government to strengthen social protection schemes.
Floods	**Human:** Create information centres in villages; Organize training sessions for villages to better understand climate information; Sharing of information on climate general info and climate-induced disasters through existing networks. EWS, such as organise training sessions for villager on responses to climate risk information; strengthening access to EWS / building capacity to analyse risks; Implement/Expand SMS system to send villagers relevant information; Consider a "village committee" to promote sharing of EWS information. **Institutions:** Organise meetups between villages from different villages in the region, where to discuss water challenges in the area; As a group, prioritise the main water challenges. Set up groups/organizations that disseminate climate and weather data; Expand current initiative to share climate information; Create a mechanism to communicate challenges with

	relevant governmental institutions. **Infrastructure:** Improving households to withstand hazards **Natural Resources:** Hill stabilisation and catchment restoration (by planting trees) to prevent erosion and promote stability (to minimise land slides / other impacts); Implementing green infrastructure such as wetlands to minimise flood impacts. **Financial Resources:** Encourage social support networks; Encourage rotational credits; Promoting savings and building capacity to plan for risk management; Government to strengthen social protection schemes.
Other Climate Hazards	**Human:** Create information centres in villages; Organize training sessions for villages to better understand climate information; Sharing of information on climate general info and climate-induced disasters through existing networks. EWS, such as organise training sessions for villager on responses to climate risk information; strengthening access to EWS / building capacity to analyse risks; Implement/Expand SMS system to send villagers relevant information; Consider a "village committee" to promote sharing of EWS information. **Institutions:** Set up groups/organizations that disseminate climate and weather data; Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions. **Infrastructure:** Improving shelters to withstand hazards **Natural Resources:** Hill stabilisation and catchment restoration (by planting trees) to prevent erosion and promote stability; Implementing green infrastructure such as wetlands to minimise impacts. **Financial Resources:** Encourage social support networks; Encourage rotational credits; Promoting savings and building capacity to plan for risk management; Government to strengthen social protection schemes.
Infrastructure	
Water Supply	**Human:** Sharing of information on climate general info and climate-induced disasters through existing networks. EWS, such as or strengthening access to EWS / building capacity to analyse risks; Implement/Expand SMS system to send relevant information. **Institutions:** Organise meetups between villages from different villages in the region, where to discuss water challenges in the area; As a group, prioritise the main water challenges. Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions; Increase institutional finance and human resource capacity. **Infrastructure:** Building small and medium dams; Expand supply networks; Put together a plan for future developments in water infrastructure; Install a rainwater harvesting system - deep pit (well, shaft, or borehole), reservoir with percolation, dew/fog with nets, or other tools); Promote operational maintenance. **Natural Resources:** Sustainable waste management, including training and capacity development; Planting of vegetation (e.g. broom grass) in degraded and erosion prone areas, and in river beds to limit flooding and damage to infrastructure. **Financial Resources:** Government should explore innovative funding/financial arrangements (GCF, PPPs); Promoting gov-led savings and building capacity to plan for risk management; Government to strengthen social protection schemes.
Water Treatment	**Human:** Sharing of information on climate general info and climate-induced disasters through existing networks. EWS, such as or strengthening access to EWS / building capacity to analyse risks; Implement/Expand SMS system to send relevant information. **Institutions:** Organise meetups between villages from different villages in the region, where to discuss water challenges in the area; As a group, prioritise the main water challenges. Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions; Increase institutional finance and human resource capacity. **Infrastructure:** Building/upgrade water treatment systems; Use small scale/on-site low-cost water treatment; Promote operational maintenance. **Natural Resources:** Implementing green infrastructure such as wetlands to minimise water quality impacts. Sustainable waste management, including training and capacity development; Planting of vegetation in degraded and erosion prone areas, and in river beds to limit flooding and damage to infrastructure. **Financial Resources:** Government should explore innovative funding/financial arrangements (GCF, PPPs); Promoting gov-led savings and building capacity to plan for risk management; Government to strengthen social protection schemes.
Water Storage	**Human:** Sharing of information on climate general info and climate-induced disasters through existing networks. EWS, such as or strengthening access to EWS / building capacity to analyse risks; Implement/Expand SMS system to send relevant information.

	Institutions: Organise meetups between villages from different villages in the region, where to discuss water challenges in the area; As a group, prioritise the main water challenges. Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions; Increase institutional finance and human resource capacity. **Infrastructure:** Put together a plan for future developments in water infrastructure; Building small and medium projects **Natural Resources:** Sustainable waste management, including training and capacity development; Promoting blue-green infrastructure balance - creating local ecosystems through planting indigenous trees and diversifying vegetation; Planting of vegetation in degraded and erosion prone areas, and in river beds to limit flooding and damage to infrastructure. **Financial Resources:** Government should explore innovative funding/financial arrangements (GCF, PPPs); Promoting gov-led savings and building capacity to plan for risk management; Government to strengthen social protection schemes.
Ecol & Green Infra	**Human:** Sharing of information on climate general info and climate-induced disasters through existing networks. EWS, such as or strengthening access to EWS / building capacity to analyse risks; Implement/Expand SMS system to send relevant information. **Institutions:** Organise meetups between villages from different villages in the region, where to discuss water challenges in the area; As a group, prioritise the main water challenges. **Infrastructure:** Supplement blue and green infrastructure - promote payment for ecosystem services (PES) or water-energy-food (WEF) Nexus **Natural Resources:** Sustainable waste management, including training and capacity development; Creating local ecosystems through planting indigenous trees and diversifying vegetation; Planting of vegetation in degraded and erosion prone areas, and in river beds. **Financial Resources:** Government should explore innovative funding/financial arrangements (GCF, PPPs); Promoting gov-led savings and building capacity to plan for risk management; Government to strengthen social protection schemes.
Energy	**Human:** Sharing of information on climate general info and climate-induced disasters through existing networks. EWS, such as or strengthening access to EWS / building capacity to analyse risks; Implement/Expand SMS system to send relevant information. **Institutions:** Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions; Increase institutional finance and human resource capacity. **Infrastructure:** Promote a diversified energy network - explore alternative and decentralised energy, e.g. solar, wind; Develop an energy infrastructure resilience strategy; Promote operational maintenance **Natural Resources:** Sustainable waste management, including trainings and capacity development - such as promoting the implementation of the water-energy-food nexus. **Financial Resources:** Government should explore innovative funding/financial arrangements (GCF, PPPs); Promoting gov-led savings and building capacity to plan for risk management; Government to strengthen social protection schemes.
Roads & Public Infra	**Human:** Sharing of information on climate general info and climate-induced disasters through existing networks. EWS, such as or strengthening access to EWS / building capacity to analyse risks; Implement/Expand SMS system to send relevant information. **Institutions:** Expand current initiative to share climate information; Create a mechanism to communicate challenges with relevant governmental institutions; Increase institutional finance and human resource capacity. **Infrastructure:** Develop a road and infrastructure resilience strategy for roads and infrastructure in the community; Build and/or improve the road network and existing infrastructure to make it resilient to climate events (incl. disasters-resistant) - to ensure market access. For example, villages can dig their own small scale road drainage; Promote operational maintenance. **Natural Resources:** Planting of vegetation (e.g. broom grass) in degraded and erosion prone areas, and in river beds to limit flooding and damage to infrastructure. **Financial Resources:** Government should explore innovative funding/financial arrangements (GCF, PPPs); Promoting gov-led savings and building capacity to plan for risk management; Government to strengthen social protection schemes.