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# Climate in context:

## An interdisciplinary approach for climate risk analysis and communication

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# 1. Introduction

As climate change continues apace, the need to build resilience and adapt to a changed and changing climate has become increasingly important. Recognition that climate change represents a threat, particularly to the world's most vulnerable populations is not, on its own, enough. There is also a need to understand the nature of the threat, and to integrate that information with the wider economic, political, cultural and societal influences on human well-being and security.

This report sets out guidance on best practise for undertaking assessments of future climate risk at regional or national scales, for international development planners (for example donors and funders such as the UK's Foreign, Commonwealth and Development Office) and policy makers.

## Why do we need analysis and communication of climate risk?

Information about climate change and about impacts is already widely available, not least through ambitious research collaborations and synthesis projects, such as the assessments conducted by the Intergovernmental Panel on Climate Change (IPCC). However, the evidence from climate science is most often framed and presented with reference to greenhouse gas concentration or temperature scenarios, and in isolation from other factors. This information is valuable for assessing the scale of the threat associated with climate change, and therefore to support discussion and negotiation on the climate mitigation challenge. However, this framing of the research is less helpful to inform resilience and adaptation action for living in the current or future climate, or to manage risk in the context of complex socio-ecological systems and identifying compounding risks.

## What is climate risk?

Climate risk can be understood as a combination of exposure to hazard and vulnerability (see Figure 1).

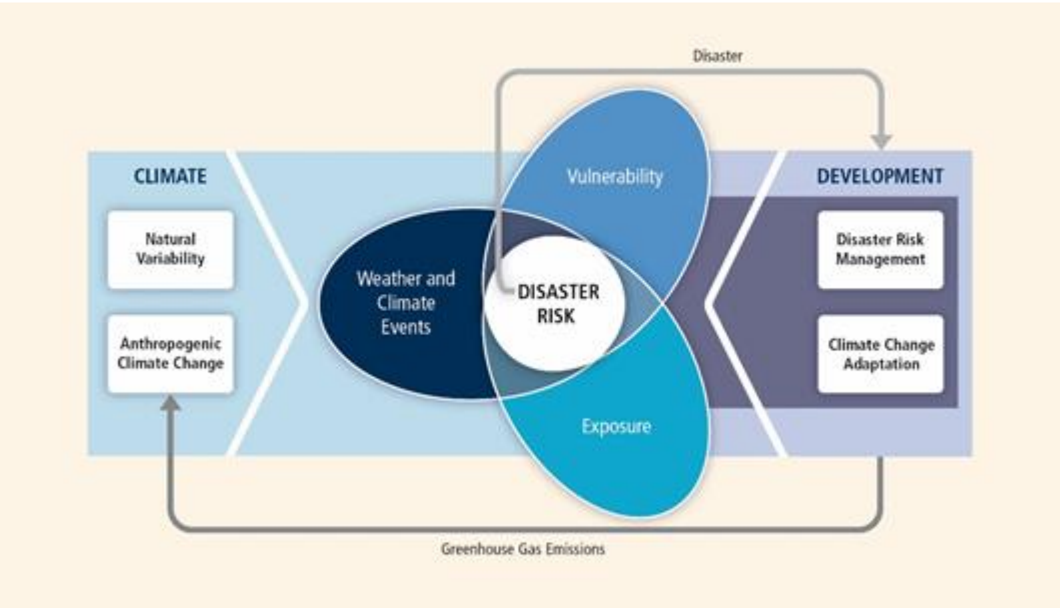


*Figure 1: Climate risk diagram from IPCC (2014)*

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Critically, the climate hazard is only one component of the climate risk. From this perspective, action to manage risks requires information about the hazard within the context of the exposure and vulnerability of systems. Much of the information currently available leads with an analysis of the climate hazard, often using standardised metrics of impact from climate impact models, rather than assessing impacts through a socio-economic lens. This has consequences for the way climate risk is understood by decision makers and the relevance of the output to support action.

## Informing development planning

Development goals, such as the Sustainable Development Goals (SDGs), are threatened by climate change, but climate is only one component of the complex development landscape. As such, there is a need for information on climate hazards that can be understood and incorporated into the wider decision context by development planners and policy makers. This means analysing and presenting climate information from the perspective of development goals, which primarily means interpreting what climate means for lives and livelihoods through a socio-economic assessment. This information can sit alongside expertise and understanding of other development threats and challenges to better inform development planning.

## Setting the standard

This methodology takes a top-level view of the information need, which can be applied in different ways, depending on the requirements of different users. The approach aims to standardise aspects of climate analysis and communication for development, where there are common decisions to be made. The three key components of the approach are:

- A framework to support a transdisciplinary approach to climate risk analysis that facilitates the integration of social and climate science worldviews allowing for a holistic risk assessment aligned with development planning and policy decision making;
- Standard scientific best-practice guidance for climate data analysis to inform sub-regional climate risk assessments, for historical climate data and climate model projections;
- Close involvement and co-production approaches with users to ensure the climate risk information provided is fit-for-purpose.

## Output from this approach

Setting out this approach is an opportunity to share best practise through experience and use, and this document can be seen as an evolving guide to climate analysis and communication of climate risk for development planners and policy makers. The hope is that by outlining an approach to best practice in the production of climate information to support adaptation and resilience, that it becomes easier to undertake such assessments. Assessments that follow the guidance set out here can be relied on to be of a high standard of scientific integrity, providing a clear and authoritative source of evidence on climate change in a development context from the integration of informed socio-economic and climate analysis. The approach aims to address a critical information gap in science and socio-economic evidence to inform action on adaptation and resilience within a development planning context, as the need to prepare for the changing climate grows ever more urgent.

# 2. Core methodology

This section describes the core methodology for conducting 'Climate in context' analysis. Firstly, the key stages of the methodological approach are summarised in section 2.1, including information about the order the key stages are conducted and the division of tasks across the project team members. Specific methods and standards for the different components of the analysis are provided in Boxes 1-3; socio-economic methods and standards in Box 1 and the methods and standards for the baseline and future climate data analysis components in Boxes 2 and 3 respectively. Limitations and assumptions for the methodology are discussed in Section 2.2.

## 2.1 Methodological approach

There are five key stages in the proposed interdisciplinary methodological approach. These key stages are described below and presented as a schematic diagram demonstrating the division of tasks across the project team in Figure 2.

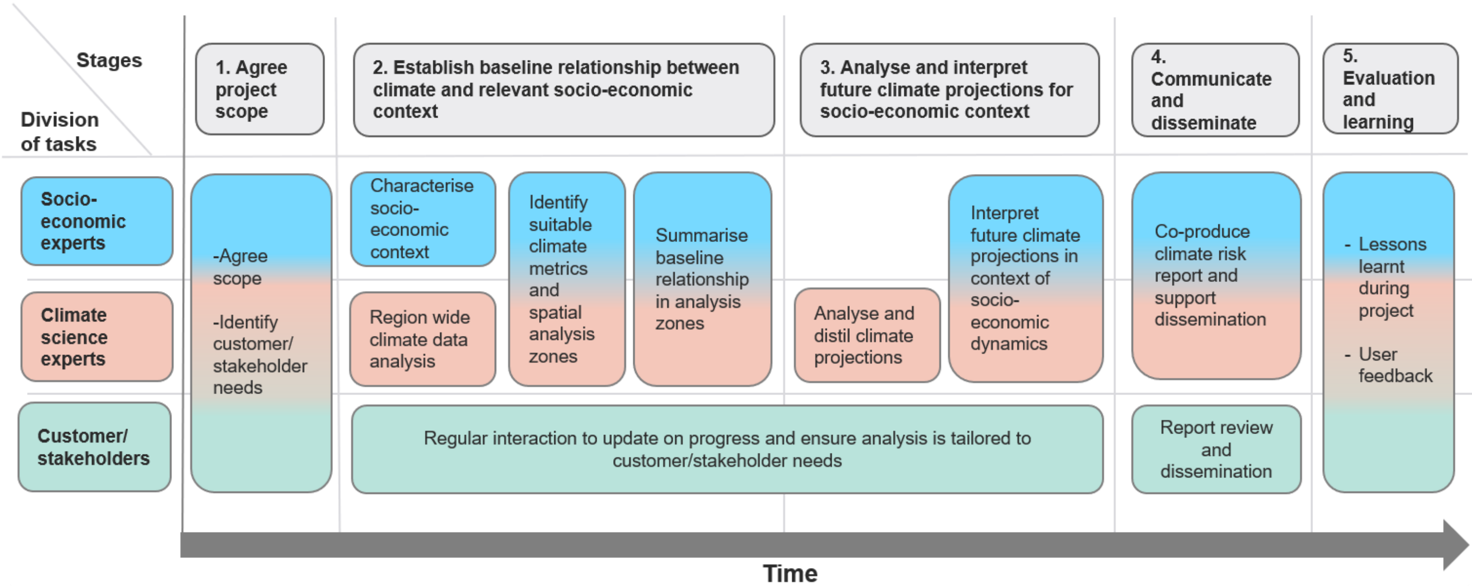


*Figure 2 – Schematic diagram of the key stages in the methodology and division of tasks between the socio-economic analysts, the climate analysts and the project team.*

### Stage 1: Agree project scope

As with any climate analysis project, the first stage involves engagement across the project team to agree the scope of the work, format of the outputs and identify any risks and dependencies.

For the 'Climate in context' approach, there are certain aspects of the project that are already agreed, such as the need for climate information to be analysed and presented in the context of the socio-economic system to inform decision-making and policy planning. Therefore, discussions during this first engagement stage should focus on identifying the customer's needs for the analysis, how they plan to use the final 'climate in context' information and what information is already accessed and used, to ensure the output is tailored appropriately. Such discussions should involve bringing together both climate and socio-economic experts (such as international development experts and sector experts) to better scope the customer's needs through a development lens. Specific decisions that should be discussed and agreed across the project team in stage 1 are summarised in Table 1.

*Table 1 – Decisions to make in Stage 1 of the 'Climate in context' methodology*

| **Stage 1: Agree project scope** | | |
|---|---|---|
| ***Stage*** | ***Decisions to be made*** | ***Who is responsible?*** |
| **1** | Socio-economic context and sectors or themes of interest to customer to inform planning – this could be one focus sector, or a range of different contexts depending on the customer's needs | Customer to identify needs for planning, supported by socio-economic experts |
| | Most suitable spatial scale for analysis, e.g. regional, sub-regional, national, sub-national | Customer to identify needs for planning, guided by expertise from climate and social scientists on plausibility and approach |
| | Most suitable climate time periods to use for both the baseline and future for climate analysis (e.g. mid or end of century) | Customer to identify needs for planning, supported by expertise from climate and socio-economic experts on plausibility |

## Stage 2: Establish baseline relationship between climate and relevant socio-economic context

The aim of this second stage of the approach is to provide a qualitative assessment of the baseline climate in the context of the key socio-economic themes identified by the project team in Stage 1. This stage requires characterisation of both the socio-economic themes of interest and the key climate vulnerabilities, alongside identification and description of the baseline climate. There are 3 stages in establishing the baseline relationship, summarised below:

### *Stage 2.1: Characterise current socio-economic context*

This stage involves gathering and summarising key socio-economic information for the relevant spatial regions (e.g. regional, national), tailored to the customer's interests identified in Stage 1. Methods and standards for this socio-economic component of the methodology, including example datasets, are discussed in Box 1.

This stage of the work will be led by the socio-economic analysts with regular iteration and discussion across the project team to draw out the relevant information to inform decisions around the climate analysis, such as:

- Key climate-related vulnerabilities and exposure to climate-related hazards,
- Most suitable climate variables/metrics to analyse based on the key vulnerabilities identified,
- Resolution of mismatch between social and climate temporal and spatial scales by identifying and agreeing the most appropriate scales for analysis.

## Box 1 - Methods and standards: socio-economic analysis

### Dataset selection

When selecting suitable datasets for characterising the socio-economic context in Stage 2.1, the following factors should be considered:

- Suitability of the data metrics for the customer's interests (example datasets for different socio-economic contexts are given in the table below);
- The datasets are from trustworthy sources that can be referenced;
- Spatial aggregation of the datasets, i.e. are the data national, district level, and how consistent are these data across these scales? Datasets with consistent metrics across the broad spatial region of interest are preferred to inform comparative analysis;
- Temporal periods of the datasets, to establish the suitability for use as a baseline to use as indicators for future time periods (e.g. mid-21st century) i.e. when was the data collected, how representative are the datasets of the current situation, how does this compare to the baseline climate time period, how long is the time series?
- Where multiple datasets are selected the consistency of the metrics across the spatial and temporal scales should be considered.

| Socio-economic context | Example suitable data metrics |
|---|---|
| Economic development | Development metrics |
| Food security and nutrition | Maps of population density<br>Maps, calendars and statistics of crop and livestock production, livelihood activities, access to markets,<br>Maps and trends in food security crises, population data land use management; share of household income spent on food; health trend metrics (e.g. obesity, calorie intake, nutritional value). |
| Energy and infrastructure | Maps and metrics of infrastructure |
| Humanitarian assistance | Maps and statistics humanitarian assistance provided over a relevant time period |
| Publicly available policy documents | National Adaptation Plans<br>Disaster Risk Reduction Plans |
| Livelihood Zoning | Livelihood zoning maps<br>Aqueduct mapping tools<br>FAO Aqua maps |

**Box 1 - Methods and standards: socio-economic analysis (continued)**

**Focus of analysis**

When conducting the socio-economic analysis the following areas of focus should be prioritised:

- A systems approach should be adopted in order to consider a range of metrics in context of one another
- Characterisation of the geography of the key socio-economic challenges to provide sub-regional context.
    - Maps are used to identify topography, natural resource, population density, agricultural production, water availability and protected wildlife areas (e.g. FAO Aqua maps, WRI Aqueduct mapping tools)
- Identification of where the region's vulnerability to climate-related hazards lie in relation to:
    - Exposure to climate-related hazards
    - Sensitivity to climate-related hazards
    - Adaptive capacity of the systems or sectors of focus
- Previous observed trends and sector climate dependencies or vulnerabilities using case studies to demonstrate if relevant.

**Limitations**

The socio-economic analysis should be considered in context of the limitations of socio-economic data and adopting this approach. Such limitations include:

- Missing data
- Lack of consistency across datasets
- Typical spatial aggregations are driven by political borders and not compatible with gridded climate data or climatological classifications.

Specific decisions that should be discussed and agreed across the project team in Stage 2.1 are summarised in Table 2.

*Table 2 – Decisions to make in Stage 2.1 of the 'Climate in context' methodology*

| **Stage 2: Establish baseline relationship between climate and relevant socio-economic context** | | |
|---|---|---|
| ***Stage*** | ***Decisions to be made*** | ***Who is responsible?*** |
| **2.1** | Which socio-economic datasets are most suitable for the customer's needs | Socio-economic analysts |
| | Analytical framework to suit customer's needs | Socio-economic analysts and customer |
| | Identify key climate vulnerabilities | Climate analyst with socio-economic analyst and/or sector experts |
| | Identify most suitable climate variables and metrics to analyse | Climate analyst with socio-economic analyst and/or sector experts |

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### *Stage 2.2: Baseline climate data analysis*

This stage is conducted in parallel to stage 2.1 and involves characterisation of the baseline climate across the spatial region of interest, drawing on the information gathered in stage 2.1. As in stage 2.1 this component of the work requires continued iteration and close collaboration between the socio-economic and climate analysis. This stage therefore can be broken down to a few steps, as described below.

Firstly, an assessment is made of the most appropriate climate datasets to use to characterise the baseline climate. This can include observational data and/or reanalysis data, as well as the use of supportive literature and climate data tools such as the IPCC Interactive Atlas (2021). Methods, standards and considerations for this dataset assessment are discussed in Box 2.

Following selection of a dataset, region-wide climate analysis and visualisation is conducted for the variables of interest identified in Stage 2.1. This region-wide analysis is used to inform selection of the most appropriate spatial division of the region in collaboration with the socio-economic analysts, drawing on the socio-economic assessment in Stage 2.1. For a sub-regional analysis, spatial analysis zones are selected to characterise the sub-regional climate in the most appropriate way and are therefore selected predominantly based on the current climate using Köppen-Geiger climate classifications as a general guide for climate zones (Beck et al., 2018). Socio-economic factors, such as urban centres and regions of particular interest or climate vulnerability, are also taken into consideration. Methods, standards and considerations for the selection of spatial analysis zones are discussed in Box 2. Examples of the selection of spatial analysis zones for a national assessment of food security and climate change in Sudan (World Food Programme & Met Office, 2016) and for the Climate Risk Report for the East Africa Region (Richardson et al., 2022) are shown in Figure 3 and Figure 4 respectively.

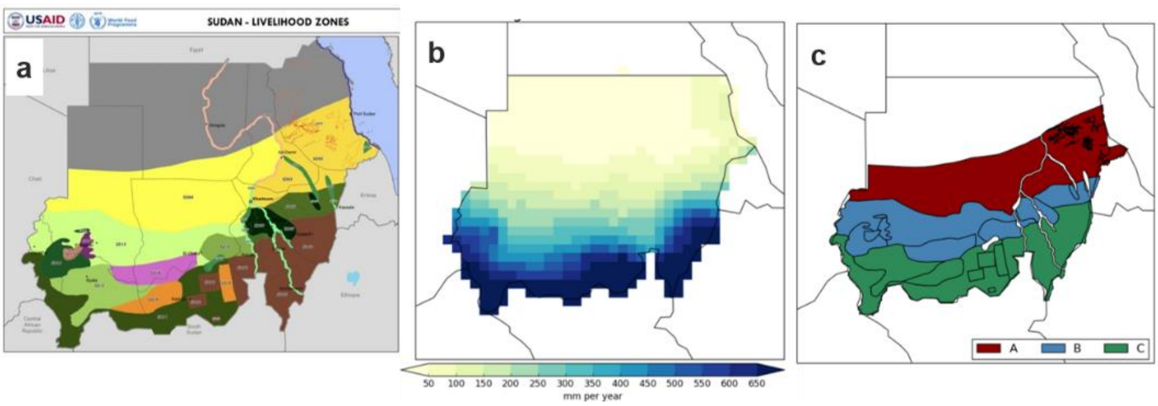


*Figure 3 – Example of spatial analysis zones selected for a food security and climate change assessment for Sudan (World Food Programme & Met Office, 2016). Panels a-c show maps of livelihood zones for Sudan, the annual average rainfall over the baseline period, and the three analysis zones selected by grouping livelihood zones to reflect the rainfall climatology.*

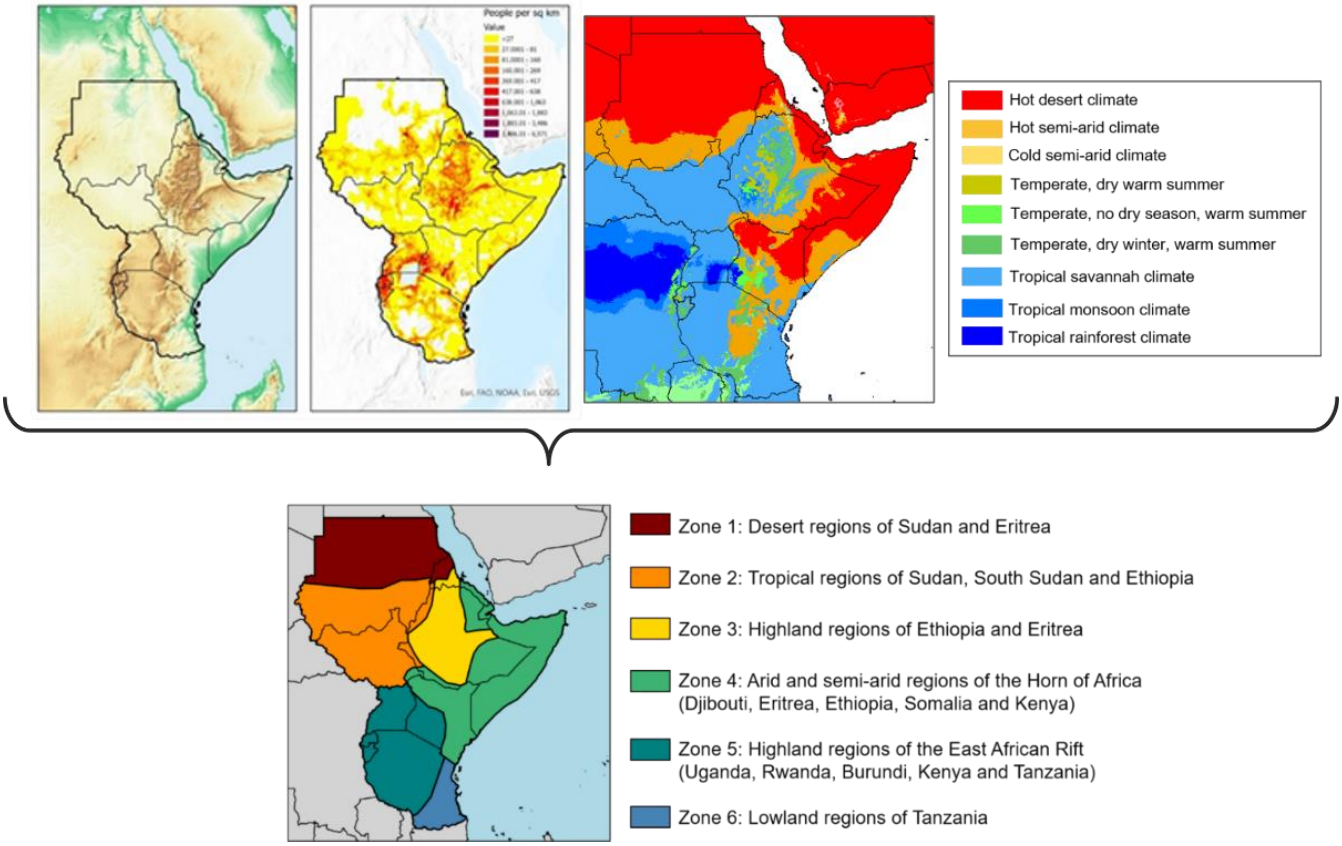


*Figure 4 – Example of spatial analysis zones selected for the Climate Risk Report for the East Africa Region (Richardson et al., 2022). Top panels show maps of elevation, population density and climate classifications used to inform the selection of the six sub-regional analysis zones elevation shown in the bottom panel.*

Once appropriate spatial analysis zones are identified, the baseline climate data is processed and plotted within these zones to characterise the climate for the variables of interest. An example for East Africa is provided in Figure 5 which highlights the diversity in annual cycles of precipitation and temperature across the six zones, and the benefit of using bespoke zones to characterise the climate rather than political borders or regional boxes as are often used, (see Richardson et al. 2022).

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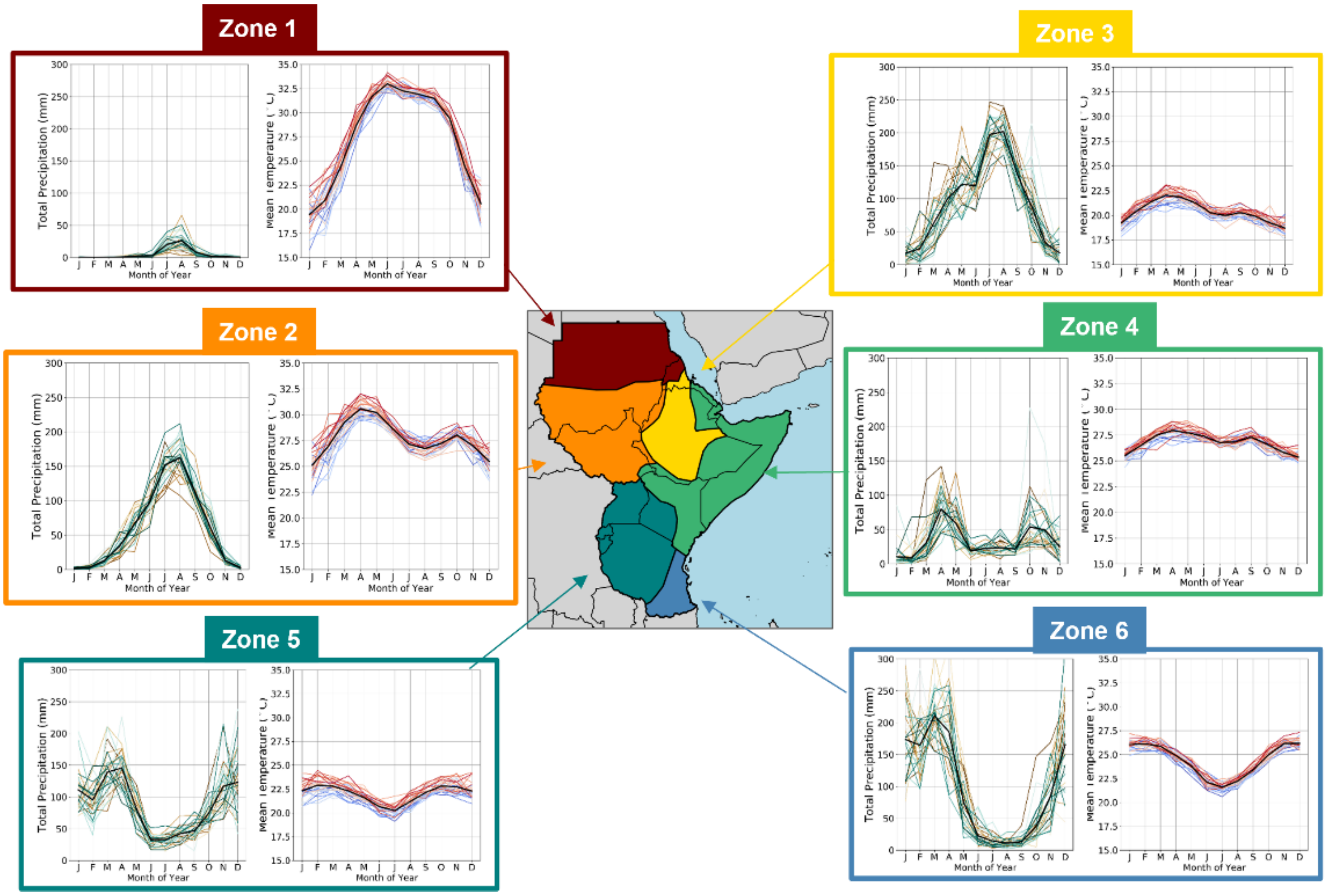



*Figure 5 – Time series plots of monthly precipitation and temperature in each of the six spatial analysis zones used for the Climate Risk Report for the East Africa Region (Richardson et al., 2022).*

Specific decisions that should be discussed and agreed across the project team in stage 2.2 are summarised in Table 3.

*Table 3 – Decisions to make in Stage 2.2 of the 'Climate in context' methodology*

| **Stage 2: Establish baseline relationship between climate and relevant socio-economic context** | | |
|---|---|---|
| ***Stage*** | ***Decisions to be made*** | ***Who is responsible?*** |
| **2.2** | Selection of appropriate sub-regional analysis zones | Climate analyst and socio-economic analysts |
| | Which observations/reanalysis datasets to use for the baseline climate analysis | Climate analysts |
| | Choice of baseline period | Climate analysts |

## Box 2 - Methods and standards: baseline climate data analysis

### Datasets

The baseline climate is characterised using either gridded observational datasets or reanalysis products that combine observations and model data. It is recommended that at least two datasets are considered for comparison and consistency, and supportive literature can help in identifying suitable datasets. Both global and regional products can be considered and the dataset with the best representation of the regional climate selected for use.

### Variables

Standard climatological variables such as temperature and precipitation are used to characterise the baseline climate. For temperature it is useful to consider daily minimum, mean and maximum values over both annual and seasonal timescales, and for precipitation annual and seasonal totals are assessed. Analysis is usually focused on climatological means, but other relevant metrics, such as extremes indices, may also be appropriate to assess if identified by the climate sensitivities identified in Stage 2.1.

### Time period

A 30-year time period is required to characterise the statistics of the baseline climate. The typical definition of the baseline time period in climate analysis is 1981-2010.

### Spatial analysis zone selection

Considerations when selecting spatial analysis zones include:

- The baseline climate (e.g. maps of climatological temperature and precipitation and climate classifications) – this should be the main driver of the zone selection.
- Information about the geography (e.g. elevation, river systems) and other relevant socio-economic factors (e.g. population density, common livelihood activities).
- The resolution of the future climate data to be used to ensure an appropriate number of climate model grid boxes is included in each zone (discussed in Box 3).

Spatial analysis zones are defined using shapefiles either by adapting existing shapefiles (e.g.

Figure 3), or by qualitatively combining maps and creating bespoke shapefiles (e.g. ). The shapefiles are used to extract the appropriate region from the gridded climate model data by selecting the grid boxes that intersect with at least 50% of the shape.

- Consideration of the resolution of the future data to be used (discussed in Box 3) as need to ensure an appropriate number of grid boxes from the climate models

### *Stage 2.3: Summaries of relationship between climate and socio-economic context*

This stage of the work aims to bring together the socio-economic assessment from stage 2.1 and the climate analysis in the identified zones from stage 2.2 to summarise these relationships.

Due to the complex nature of this assessment, the approach is a qualitative one where the project team collaborate to bring together the two analysis components. In each of the analysis zones the assessment brings together the climate vulnerabilities identified, the exposure to relevant climate-related hazards, and known relationships from the literature (such as critical temperature thresholds and water requirements for crop or livestock production).

These summary assessments in the different analysis zones provide the necessary baseline from which the future climate projections can be interpreted. Figure 6 demonstrates how stages 2.1, 2.2 and 2.3 feed into one another.

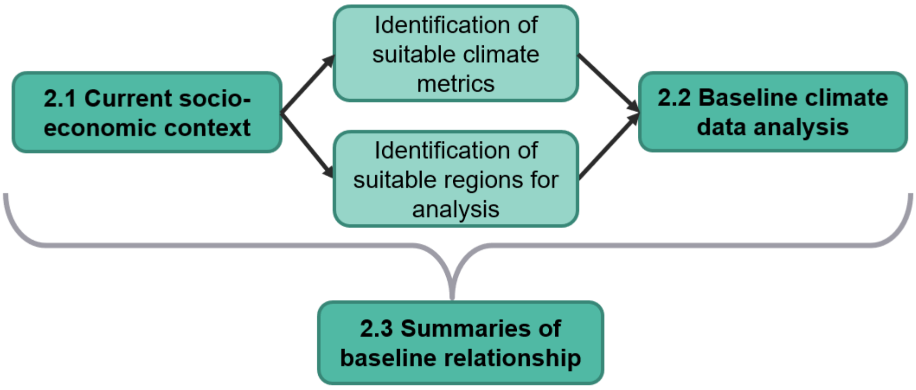
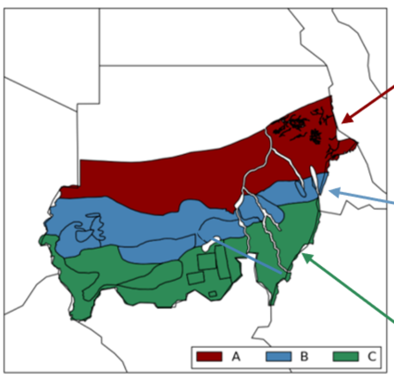



*Figure 6 – Schematic of the steps within Stage 2*

Examples of the summary baseline assessments of climate and livelihoods in the analysis zones for Sudan from World Food Programme & Met Office (2016) are given in Figure 7, and for the Climate Risk Report for the East Africa Region (Richardson et al., 2022) in Figure 8.




| | Climate | Livelihoods | Vulnerabilities |
|---|---|---|---|
| **Zone A** | • Driest zone (~100mm/yr)<br>• Rainy season Jun-Sep | Mostly pastoralists | • Livestock heat stress, water and fodder availability |
| **Zone B** | • ~300mm/yr<br>• Rainy season Mar-Oct | Mostly agro-pastoralists growing cereal and cash crops | • Crop temperature thresholds and water requirements<br>• Rainy season timing and amount<br>• Livestock heat stress, water and fodder availability |
| **Zone C** | • Wettest zone (~600mm/yr)<br>• Rainy season Apr-Nov. | Mostly agricultural | • Crop temperature thresholds and water requirements<br>• Less dependent on rainy season timing and amount |

*Figure 7 – Example of top level summaries of climate, livelihoods and key vulnerabilities identified in the baseline assessment for Sudan from (World Food Programme & Met Office, 2016).*

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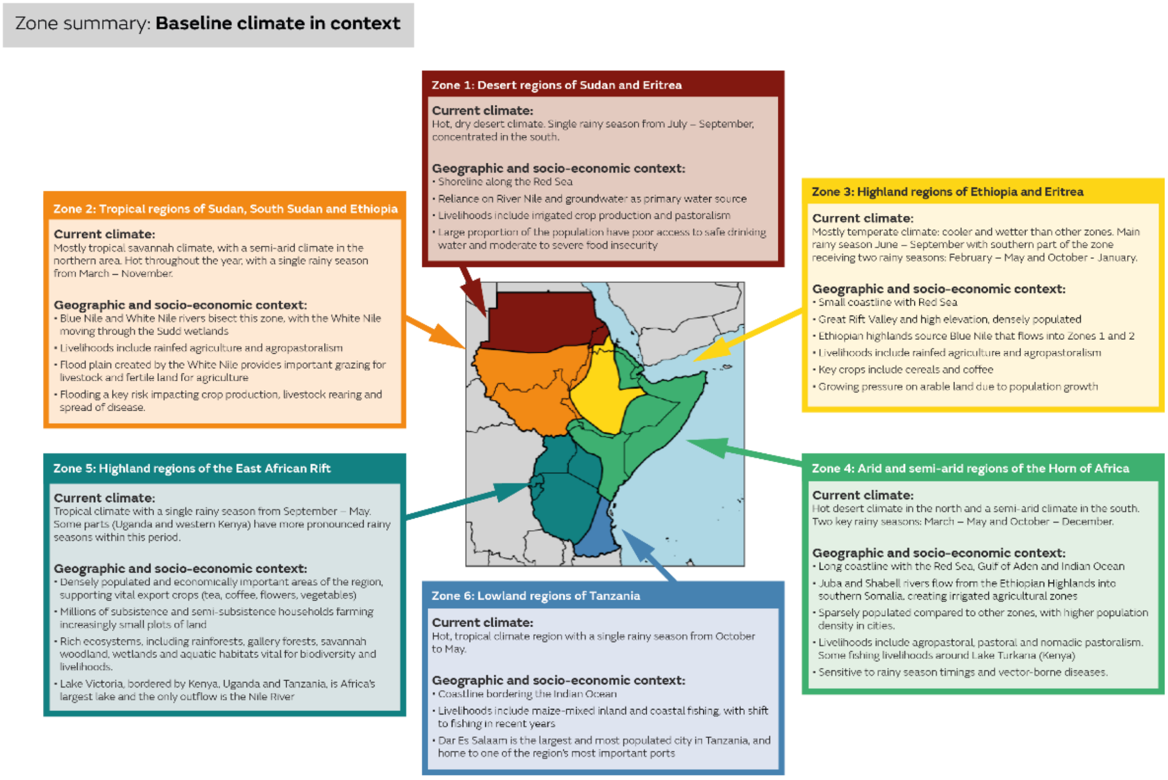


*Figure 8 – Baseline Climate in Context summaries from the Climate Risk Report for the East Africa Region (Richardson et al., 2022).*

## Stage 3: Analyse and interpret future climate projections for socio-economic context

The third stage of the project involves analysis of future climate projections and interpretation in the context of the key vulnerabilities and baseline assessments developed in Stage 2. Firstly, the quantitative future climate data analysis is conducted by the climate analysts, followed by collaborative interpretation of the future projections in the context of the key socio-economic challenges.

### *Stage 3.1: Future climate data analysis*

Quantitative analysis of projected trends in the relevant climate variables in the identified spatial analysis zones is conducted. This process includes selection of appropriate climate models, future time periods and emissions scenarios to analyse, guided by the latest science and customer needs identified in Stage 1. Once these decisions have been made, the process involves evaluation of the model simulations against the baseline analysis in Stage 2, followed by analysis and visualisation of the future time periods from the model simulations under the different emissions scenarios within the spatial analysis zones. Relevant literature and tools (e.g. the IPCC Interactive Atlas) are used to support the analysis of variables not suitable to the zones (e.g. coastal variables), and more complex metrics and indices, where appropriate.

A process of distillation of the range of plausible climate model projections into clear, concise statements about future change is also conducted. Methods and standards for the future climate data analysis are described in further detail in Box 3.

## Box 3 - Methods and standards: future climate data analysis

### Datasets

Global climate model projections from the Coupled Model Inter-comparison Project (CMIP) Phase 5 (CMIP5; Taylor *et al.,* 2012) and Phase 6 (CMIP6; Erying *et al.,* 2016) should be analysed for consistency with the latest IPCC AR6 report. Regional climate model projections such as those from the Co-ordinated Regional Climate Model Downscaling Experiment (CORDEX; Giorgi and Gutowski, 2015) may also be considered, but further evaluation is required to assess the validity of the global-regional model coupling.

### Future time periods

A 30-year time period surrounding the future period of interest is required to characterise the statistics of the future climate. For example, the years selected from the model simulations to analyse projections for the 2050s would be 2041-2070.

### Scenarios

Representative Concentration Pathways (RCPs; van Vuuren *et al.*, 2011) represent trajectories of greenhouse gas concentrations throughout the 21$^{st}$ century and more recently these are combined with Shared Socio-economic Pathways (SSPs) for the CMIP6 climate model projections. As it is not known which future pathway we will take, it is recommended that at least two are considered to sample the range of climate projections.

### Processing steps

| | |
|---|---|
| **1. Model evaluation** | Analysis of the model simulations over the baseline period and comparison with the baseline climate assessment in Stage 2. This analysis should include assessment of the spatial, temporal and statistical distribution of the climatology using anomaly maps, seasonal cycle plots and probability density functions to visualise the differences. Models with poor representation of the baseline climate should be excluded at this stage. |
| **2. Future trend analysis** | Analysis of the model simulations for the future time periods, emissions scenarios, and climate variables selected. The delta change method is used to assess projected change, by calculating the difference between the model future and model baseline for each model simulation. Visualisations of the projected trends include maps and seasonal cycles with the reanalysis baseline assessment included for comparison. |
| **3. Ensemble comparisons** | The range of projections across the ensemble of climate models should be assessed to understand the range of projections and the clustering of the model projections. Scatter plots and boxplots of the projected changes in annual and seasonal means are useful tools for visualisation of these ensemble comparisons, and communicating the model consensus. |
| **4. Scenario selection (optional)** | Two or three models that span the range of plausible projections are selected to be used as scenarios of future change. The selection is dependent on the outcome of the ensemble comparison, i.e. scenarios should reflect the opposing trends if model projections span zero or reflect the range of plausibility of important climatology characteristics, such as rainfall extremes or seasonality. Simple concise descriptions of the scenarios are developed for ease of reference and communication. |

The method of presenting the future scenarios is dependent on the size of the region, the range of projections and the needs of the customer. Examples include the use of scatterplots to communicate the uncertainty across model projections (Figure 9), or the use of models as scenarios of future climate that span the range of model projections (Figure 10), most appropriate for interactive engagement with non-technical stakeholders.

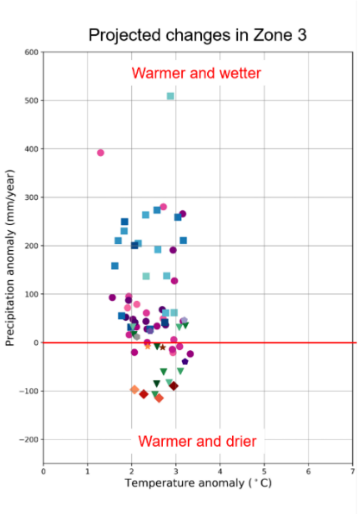


*Figure 9 – Example of an ensemble of climate model projections approach: scatter plot of the projected change in temperature and precipitation from a large ensemble of climate model projections for one of the spatial analysis zones in East Africa (Richardson et al., 2022).*

| Scenario | Description |
|---|---|
| **Warmer** and **wetter** | • **Warmer** and **wetter** than the baseline<br>• Little change in overall water availability -> higher levels of heat stress<br>• Little change in rainfall variability |
| **Hotter** and **drier** | • **Hotter** than scenario 1 and **drier** than the baseline<br>• Water availability lower than present day and scenario 1 -> even higher heat stress<br>• Rainfall amounts and timings typically less variable from year-to-year |
| **Hotter** and **mixed** | • **Hotter** than scenarios 1 and 2, mostly **drier** but **wetter** in some areas<br>• Water availability lower than present day and scenarios 1 and 2 -> even higher heat stress<br>• Largest year-to-year variability of rainfall amounts |

*Figure 10 – Example of a climate scenarios approach: the three future climate scenarios that span the range of plausible futures in Sudan (World Food Programme & Met Office, 2016).*

Specific decisions that should be discussed and agreed across the project team in stage 3.1 are summarised in Table 4.

*Table 4 – Decisions to make in Stage 3.1 of the 'Climate in context' methodology*

| **Stage 3: Analyse and interpret future projections for socio-economic context** | | |
|---|---|---|
| ***Stage*** | ***Decisions to be made*** | ***Who is responsible?*** |
| **3.1** | Which model datasets to use | Climate analysts |
| | Which future time period to use | Climate analysts |
| | Which climate scenarios to use | Climate analysts |
| | Which supportive literature/tools to use | Climate analysts |
| | Method for selecting and presenting the future climate projections | Climate analysts |

### *Stage 3.2: Interpret future climate projections in the context of the socio-economic dynamics*

Within this stage the interdisciplinary team undertake the core intersectoral expert analysis to bring together the zonal climate analysis and relevant socio-economic and/or sector analysis to produce a combined expert interpretation of the evidence on climate risks for the region of interest. The framing of these interpretations and resulting climate risk narratives should be determined by the needs of the customer.

The future climate projections identified in Stage 3.1 are interpreted in the context of the socio-economic challenges and baseline assessments made in Stage 2. Using this understanding of present climate sensitives of the key socio-economic themes of interest allows for the risk to be analysed and framed in consideration of pre-existing climate sensitivities and vulnerabilities. The aim of this process is to consider how the scale and direction of the projected climate trends may act as a risk multiplier to these existing systemic stresses.

The approach involves translation of the zonal analysis into an assessment of the key climate risks across the region of interest, for the socio-economic themes of interest, all defined in Stage 1.

The key focus of this interpretation is to adopt a trans-disciplinary approach to present the climate risk information in the language of the customer, identifying headline risk messages that relate to the customer's programming and planning tasks. Location specific examples are taken into consideration in analysing key risks and case studies are used, where appropriate.

This stage requires close collaboration from both the climate and socio-economic analysts drawing upon the climate and socio-economic data gathered. It is recommended this is done by bringing together the socio-economic and climate experts in a write-shop environment allowing for detailed discussions to understand and identify the future climate risks.

Specific decisions that should be discussed and agreed across the project team in stage 3.2 are summarised in Table 5.

*Table 5 – Decisions to make in Stage 3.2 of the 'Climate in context' methodology*

| **Stage 3: Analyse and interpret future projections for socio-economic context** | | |
|---|---|---|
| ***Stage*** | ***Decisions to be made*** | ***Who is responsible?*** |
| **3.2** | Identification of key climate risks to focus on | Socio-economic and climate analysts, input from customer needs |
| | Choice of cross cutting themes to consider | Socio-economic and climate analysts |

An example of the key outcomes for food security and livelihoods under three scenarios of climate change in Sudan is given in Figure 11, and the key climate risks identified across five sectors for East Africa in Figure 12.

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| Scenario | Interpretation for food security and livelihoods |
|---|---|
| Warmer and wetter | • **Land degradation** and **animal health** will both continue to be problems, exacerbated by increasing temperatures.<br>• **Negative impacts for cropping systems**, particularly within areas where temperatures are already close to crop heat tolerance levels<br>• **Patterns of food insecurity are likely to remain** similar to the present day, but with **additional stress** associated with higher temperatures, and possible **on-going desertification** in pastoral areas. |
| Hotter and drier | • **Water availability** will be a greater challenge<br>• All livelihood zones are likely to be exposed to significant challenges such as **land degradation** and **reduced crop yields**, with the possibility that **some crops may no longer be possible to grow**.<br>• **Food insecurity is likely to increase** unless significant measures are taken to address production and land degradation |
| Hotter and mixed | • **Likely to be large increases in food insecurity**, particularly in vulnerable and drought prone areas.<br>• **Crop production is likely to face important reductions** in yield nationally, resulting in increased need for imports and higher market price vulnerability.<br>• **Food insecurity is likely to be consistently higher** with an increase in wide-spread events.<br>• **Livelihoods will face much stronger pressure** in this scenario than the other scenarios, with local adaptations requiring modernised approaches |

*Figure 11 – Example of the interpretation of the future climate scenarios for Sudan in the context of the baseline climate, food security and livelihoods assessment, from World Food Programme & Met Office (2016).*

**Headline risk statements for East Africa**

| | |
|---|---|
| **Agriculture and food security** | • Agricultural production in East Africa will be severely impacted by climate change. Many livelihoods across the region are heavily dependent on agriculture and as such food security will be negatively affected, especialy for marginal rainfed farming and fragile pastoral livelihoods which are particularly vulnerable.<br>• Higher temperatures will increase water and heat stress for crops and livestock, lowering the productivity of pastoral livelihoods and negatively impacting the production of important crops such as maize, wheat, cotton, and coffee.<br>• Increased temperatures and heavy precipitation will result in the growth of pest populations, such as desert locusts which can devastate crops affecting both agricultural livelihoods and food availability across the region.<br>• Land degradation and soil erosion will be exacerbated by more intense rainfall events, posing risks to the natural resource base, agricultural productivity and subsequently food security, particularly in already degraded areas. |
| **Water resources and water dependent services** | • Mobilising and manging water for lives and livelihoods remains a key challenge in East Africa and will likely become more difficult as rainfall variability increases.<br>• The impacts of climate change on freshwater availability will likely be modest compared with demand-side pressures; localised 'hot spots' of over-exploitation are likely to grow in number, particularly in and around fast-growing urban centres.<br>• Greater rainfall variability may challenge hydropower generation across East Africa, with periods of low rainfall and river flow potentially affecting multiple sites across the region with concurrent reductions in electricity production.<br>• The impacts of climate change on water quality will be broadly negative and transmitted through rising temperatures and high flow/flood-related sediment and pollution loads, posing threats to health across both urban and rural areas. |
| **Health** | • Changing rainfall patterns and rising temperatures will affect the geographic range and incidence of vector-borne diseases, increasing incidence of malaria in highland areas that are currently not suitable for transmission, and increased Rift Valley Fever.<br>• Increasing temperature extremes will result in more days of the year exceeding critical heat-health thresholds; temperatures above 31°C are related to increased mortality and risks of non-communicable diseases which disproportionately affect children, the elderly, migrant workers, and those working outdoors.<br>• Higher temperatures are known to impact the nutritional value of crops which is associated with lower nutritional status for children, increasing the disease burden as the under-18 population is projected to increase considerably.<br>• More flood events that contaminate water sources and longer stretches of higher temperatures that facilitate bacterial growth increase the likely incidence of diarrheal and other water-related diseases. |
| **Urban environments and infrastructure** | • More intense rainfall events will increase flood risk in both rural and urban areas, with densely populated, low-lying urban areas particularly vulnerable.<br>• People and businesses in 'informal' settlements and fast-growing towns with poor infrastructure are exposed to multiple threats, including damage to housing, power, communications and water and sanitation systems.<br>• More intense flooding events and extreme heat can also damage roads and bridges, potentially leaving wide areas and large numbers of people without a connection to markets, supply chains and essential services.<br>• New infrastructure investments needed to unlock growth and reduce poverty that don't account for the changing climate potentially lock-in climate risk, particularly for long-lived investments designed for historical and/or average climate conditions. |
| **Coastal areas and fisheries** | • Rising sea levels, higher temperatures and more frequent and intense storm surges threaten coastal livelihoods and local economies.<br>• Rising temperatures and eutrophication pose risks to fish stocks and ecosystem health, compounded further by overfishing.<br>• Periodic flooding around shorelines and back-flooding into tributary rivers already cause problems, displacing people and disrupting transportation, drinking water, sanitation, and power systems<br>• In freshwater fisheries, rises in surface water temperature are reducing deep water nutrient upswelling and increasing thermal stratification, diminishing the productivity of pelagic fisheries. |

*Figure 12 – Example of headline risk statements for East Africa resulting from the interpretation of the climate model projections five key sectors from Richardson et al., 2022.*

## Stage 4: Communicate and disseminate

### *Stage 4.1: Co-produce report summarising the analysis and key findings*

The analysis and key findings are presented in a co-produced report. This stage requires input from the whole project team; the writing of the report is conducted by the socio-economic and climate analysts and the customer needs to be consulted in order to tailor the outputs to their needs.

The specific report structure, format and any additional outputs should be agreed with the customer, however a general report outline is as follows:

- *Executive summary*: includes the key take-away messages from the report;
- *Baseline assessment*: includes descriptions of the socio-economic context, the baseline climate in the sub-regional analysis zones, and the baseline summary assessments;
- *Future assessment*: includes descriptions of the future climate scenarios and the interpretation for the socio-economic context;
- *Summary:* includes a summary of the report;
- *References:* includes all references used to inform the analysis;
- *Appendices:* includes any additional technical detail about the analysis, for example datasets used and relevant plots and figures from the climate data analysis.

Although the analysis is conducted at the most appropriate spatial scales for the socio-economic and climate contexts, these analysis zones may not be the most appropriate scales for the customer's programming and planning. Political borders are often most suited for planning, and therefore the report may be best structured by political boundary where the results from the analysis are translated to the political borders to best suit the customer's needs. If national analysis is out of scope, such as in a regional assessment, reference tables can guide the reader to the most relevant aspects of the report for the country of interest, an example is given in Figure 13.

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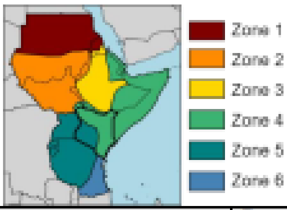
**Kenya country profile**

Kenya is located on the Indian Ocean coastline and is divided between two zones in this report: Zone 4 and Zone 5.




| Summary of analysis relevant to Kenya | Report section |
|---|---|
| The northern and eastern parts of Kenya are included in Zone 4 and experience an arid and semi-arid climate. In these areas, pastoral livelihoods are most common, though fish-based livelihoods are common along Lake Turkana.<br>This region has already experienced a significant amount of warming since pre-industrial times up to the present-day. In the 2050s, there is high confidence the region will be warmer than the current climate throughout the year resulting in more frequent days above 40˚C. Although there is less confidence in rainfall projections, our analysis suggests an increase in October – December seasonal rainfall. | 3.3.4 |
| The western and southern parts of Kenya are included in Zone 5 and experience a cooler and more temperate climate. Most people live in this part of Kenya, with concentrated populations in major cities such as Nairobi and near to Lake Victoria in the west. The primary livelihoods are highland perennial, maize mixed, and agropastoral. Near Lake Victoria, fish-based livelihoods are practiced.<br>This region has already experienced a significant amount of warming since pre-industrial times up to the present-day. In the 2050s, there is high confidence the region will be warmer than the current climate throughout the year resulting in more frequent days above 30˚C. Although there is less confidence in rainfall projections, our analysis suggests an increase in annual rainfall. | 3.3.5 |
| Across the country, variability in seasonal rainfall amounts and timings is also expected to increase, as is the frequency and intensity of heavy rainfall events. Sea levels will continue to rise and the frequency and intensity of marine heatwaves will also increase in all zones along the Kenyan coast. | 3.3.4, 3.3.5 |
| **Regional risks relevant to Kenya** | **Report section** |
| Household water security | 4.2.3 |
| Food security for agropastoralist and pastoral livelihoods in arid and semi-arid lands | 4.1.3 |
| Risks of high temperatures and floods in cities | 4.4.3 |
| Health risks as disease transmission moves to higher altitudes, higher temperatures increase non-communicable disease and malnutrition | 4.3.3 |
| Risks of flooding along Lake Turkana, Lake Victoria, and sea-level rise along coasts | 4.5.3 |
| Rising surface water temperatures in freshwater fisheries diminish productivity | 4.5.3 |
| Food security for maize-based livelihoods | 4.1.3 |

*Figure 13 – Example of a country reference table that aims to guide a user to the key messages and relevant report sections in a regional report (Richardson et al., 2022).*

Simple and effective methods for summarising and presenting the key messages should be used, such as key statements in bold and summary tables, an example of an executive summary summarising the outputs for the Sudan assessment are shown in Figure 14 (World Food Programme & Met Office, 2016). Other communication methods, such as posters, infographics or interactive webpages, are often impactful and desirable but can be resource intensive and the use of these methods will be determined by the project objective and budget.

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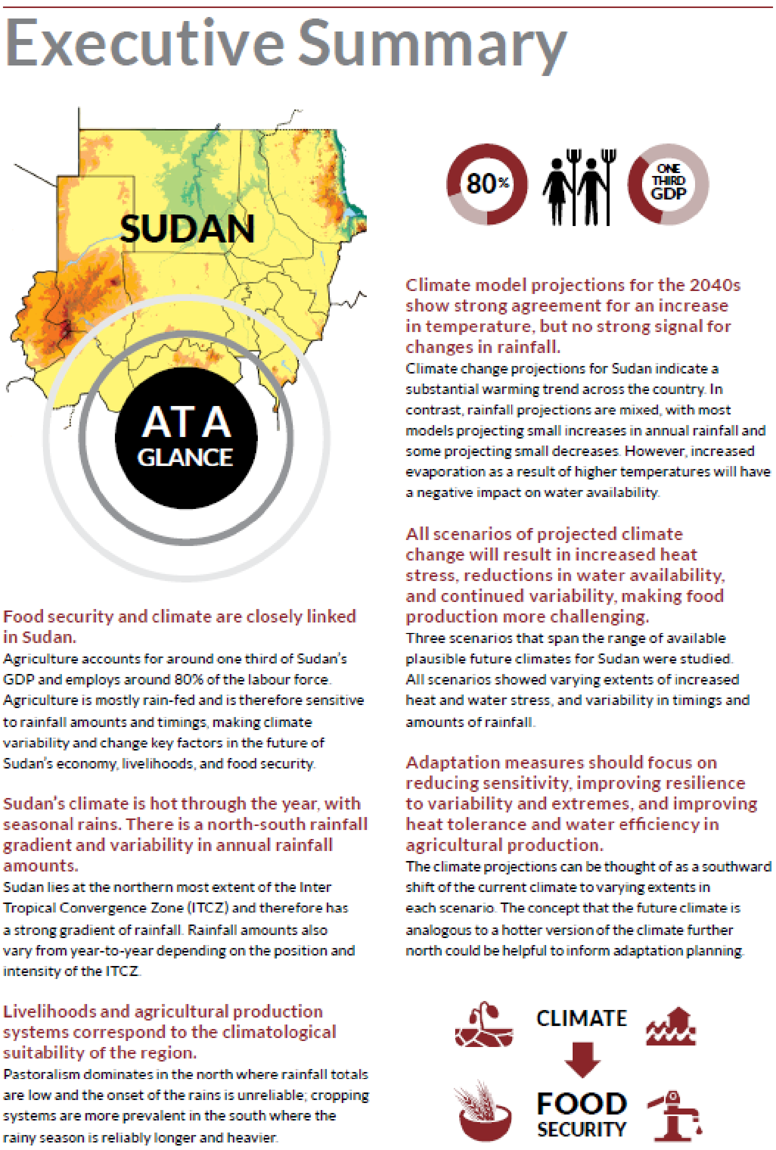

# Executive Summary

SUDAN

AT A GLANCE

80%

ONE THIRD GDP

**Food security and climate are closely linked in Sudan.**
Agriculture accounts for around one third of Sudan's GDP and employs around 80% of the labour force. Agriculture is mostly rain-fed and is therefore sensitive to rainfall amounts and timings, making climate variability and change key factors in the future of Sudan's economy, livelihoods, and food security.

**Sudan's climate is hot through the year, with seasonal rains. There is a north-south rainfall gradient and variability in annual rainfall amounts.**
Sudan lies at the northern most extent of the Inter Tropical Convergence Zone (ITCZ) and therefore has a strong gradient of rainfall. Rainfall amounts also vary from year-to-year depending on the position and intensity of the ITCZ.

**Livelihoods and agricultural production systems correspond to the climatological suitability of the region.**
Pastoralism dominates in the north where rainfall totals are low and the onset of the rains is unreliable; cropping systems are more prevalent in the south where the rainy season is reliably longer and heavier.

**Climate model projections for the 2040s show strong agreement for an increase in temperature, but no strong signal for changes in rainfall.**
Climate change projections for Sudan indicate a substantial warming trend across the country. In contrast, rainfall projections are mixed, with most models projecting small increases in annual rainfall and some projecting small decreases. However, increased evaporation as a result of higher temperatures will have a negative impact on water availability.

**All scenarios of projected climate change will result in increased heat stress, reductions in water availability, and continued variability, making food production more challenging.**
Three scenarios that span the range of available plausible future climates for Sudan were studied. All scenarios showed varying extents of increased heat and water stress, and variability in timings and amounts of rainfall.

**Adaptation measures should focus on reducing sensitivity, improving resilience to variability and extremes, and improving heat tolerance and water efficiency in agricultural production.**
The climate projections can be thought of as a southward shift of the current climate to varying extents in each scenario. The concept that the future climate is analogous to a hotter version of the climate further north could be helpful to inform adaptation planning.

CLIMATE

FOOD SECURITY

*Figure 14 – Examples of key messages presented in an executive summary using bold and coloured text to highlight key messages as well as infographics (World Food Programme & Met Office, 2016).*

### *Stage 4.2: Disseminate outputs*

The dissemination of the project outputs should be driven by the needs of the customer. This could be as simple as circulating the report to the intended users or could involve a more in-depth dissemination plan if the outputs are to be disseminated more widely to different customer and stakeholder groups and/or the general public. Specific dissemination material can be developed, such as websites, videos, social media campaigns, posters, and infographics, depending on the project scope and level of appetite for promotion of the outputs. Examples of some of these outputs include: an infographic summarising the main climate risks in West Africa (see Figure 15), a poster summarising the outputs of climate risks for the MENA region (see Figure 16), and examples of a webpage and video used to promote the key findings of the climate risk reports are available here (see also Figure 17), and for the Sudan food security and climate change assessment available here.

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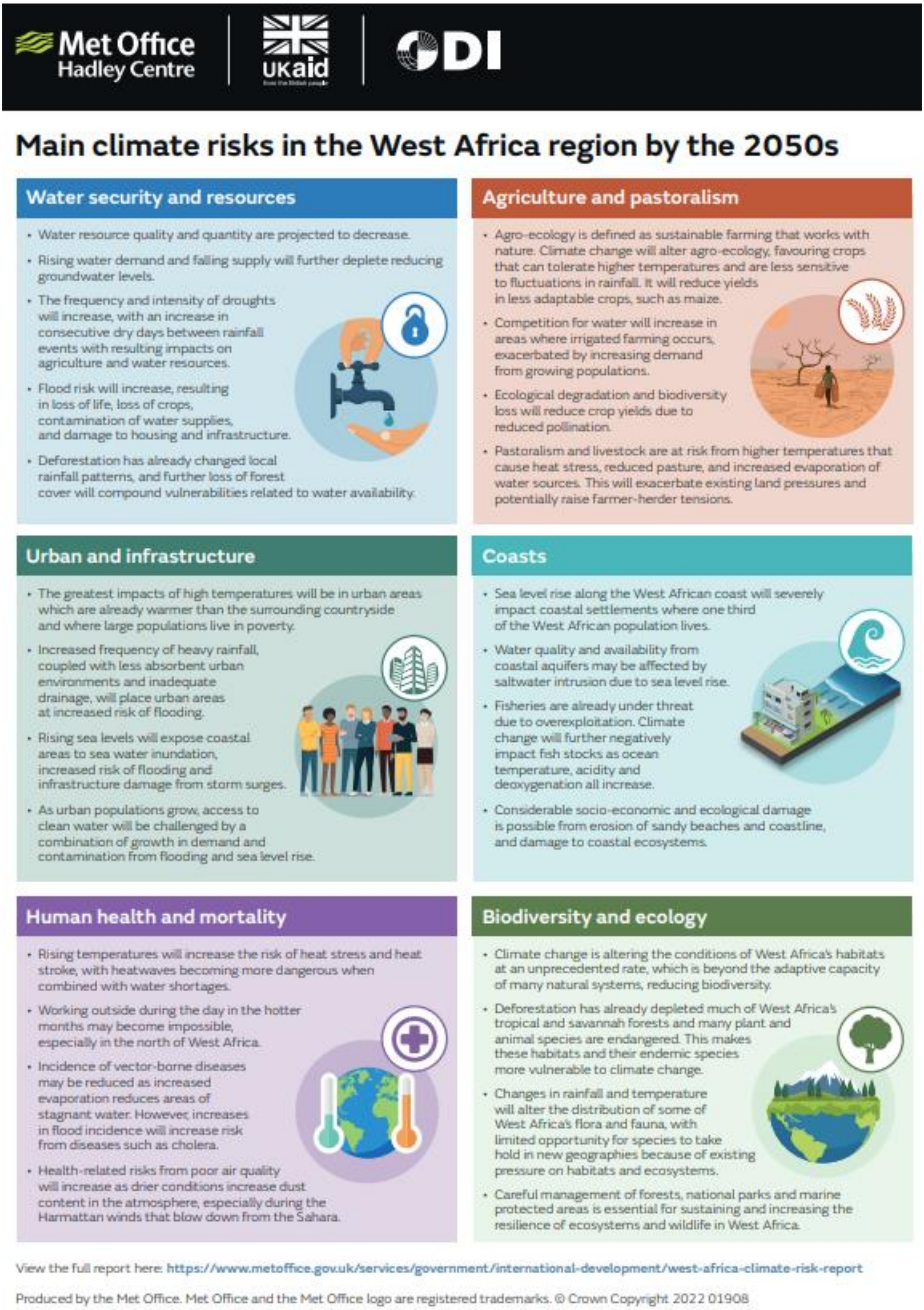


*Figure 15 – Example of infographic designed to communicate headline risks from a regional climate risk report for the West Africa region (Doherty et al. 2022).*

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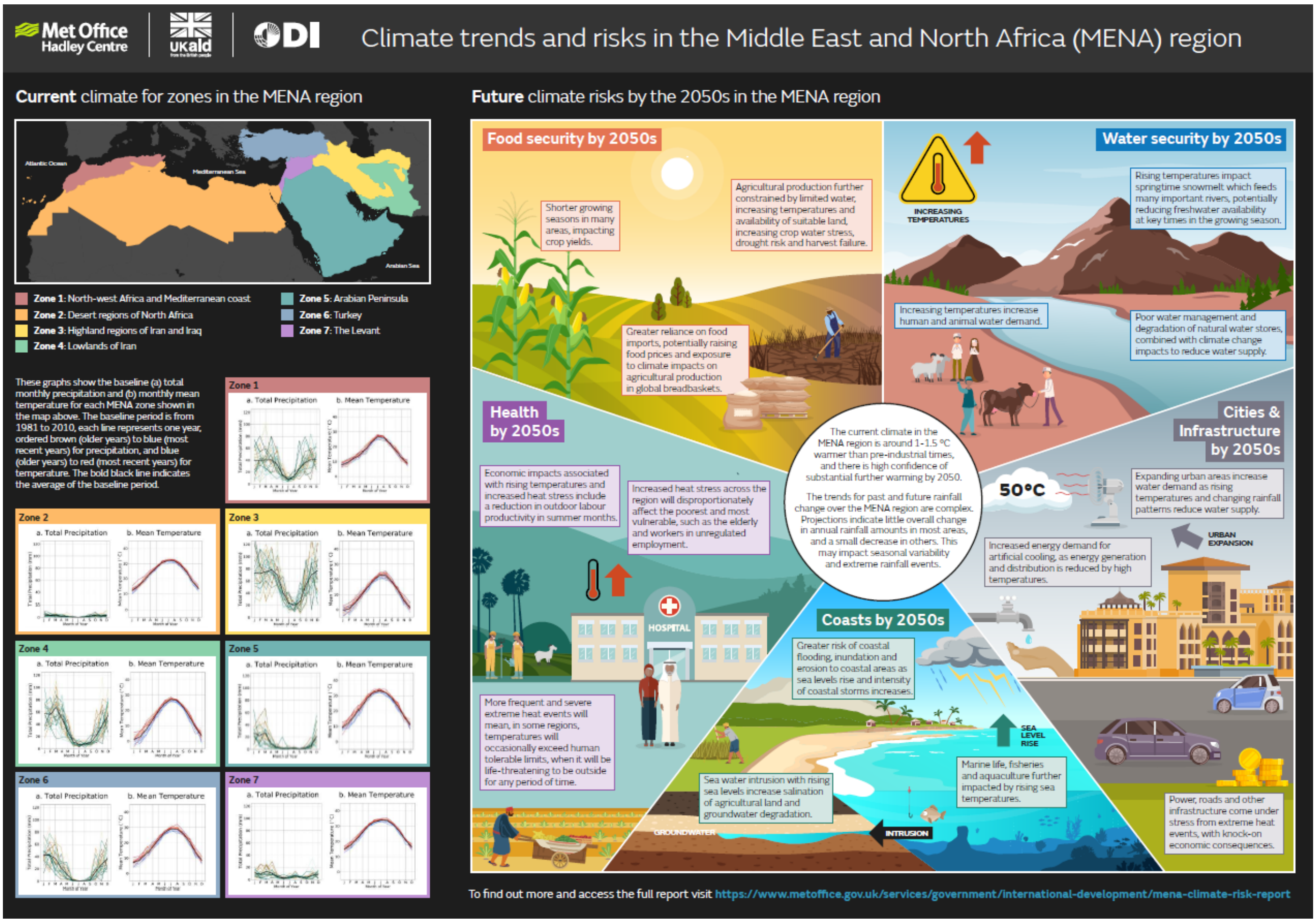


*Figure 16 - Example of a poster designed to communicate the key messages from a regional climate risk report for the Middle East and North Africa region (Richardson et al., 2021).*


*Figure 17 - Example video outlining the headline climate risk messages from the MENA climate risk report (Richardson et al. 2021) aimed to advise development policy makers. Video is available [here](#).*

Specific decisions that should be discussed and agreed across the project team in Stage 4 are summarised in Table 6.

*Table 6 – Decisions to make in Stage 4 of the 'Climate in context' methodology*

| **Stage 4: Communicate and disseminate** | | |
|---|---|---|
| ***Stage*** | ***Decisions to be made*** | ***Who is responsible?*** |
| **4.1** | Structure of the report | Project team |
| **4.2** | Which dissemination methods are most appropriate for the customer and project scope | Project team and customer |
| **4.2** | Whether translations of the report or dissemination materials are required | Customer |

### Stage 5: Evaluation and learning

Once the project outputs have been disseminated and actively used, the project team along with the customer should evaluate both the process and outputs to identify how they could be improved. Lessons learnt should be documented and incorporated into future applications of the methodology or the methodology process itself.

## 2.2 Limitations and assumptions of the methodology

One of the key limitations of the Climate in Context methodology is the lack of compatibility of the climate and socio-economic data. In terms of temporal compatibility, the 30-year time period used to define the baseline climate (typically 1981-2010) is not directly compatible with the most recent socio-economic data and representation of current situation. This makes it difficult to attribute recent observed trends associated with climate.

With regards to the spatial compatibility of climate and socio-economic data, climate data is represented by grid box averaged quantities whereas socio-economic data is often representative of political and administrative borders. The size of the grid boxes varies by dataset, ranging from large boxes of around 200 km from some global climate models to 25 km from regional climate models, and smaller for observations and reanalysis data. These grid boxes do not reflect political borders, and likewise political borders do not reflect the homogeneity or diversity of the climate. As such, large spatial regions are often required to average and quantify climate data, which are not necessarily representative of the detail of the socio-economic data within these regions. In addition, socio-economic datasets often lack consistency across large regions due to inconsistent data collection processes across different countries.

There are also many assumptions made when evaluating current climate sensitivities and vulnerabilities and drawing upon these to determine future risks. Therefore, care should be taken to try and carefully understand the likely future socio-economic trend using the current data as a baseline to account for future change and compounding risks.

# 3. Applications and adaptations

The purpose of this section is to provide examples of applications of the Climate in Context methodology and adaptations to the methodology to meet different customer requirements. This is a working document that we intend to update at regular intervals and customers and collaborators are invited to contribute to this section to demonstrate how the methodology has been applied and used in their context.

An interactive map of where the Climate in Context methodology has been applied to date, including links to the report outputs is available here.

## 3.1 Standardised climate risk reports for FCDO

The UK's Foreign, Commonwealth and Development Office (FCDO) regional and country offices are required to use information about climate change in their development programming. In 2020, FCDO commissioned the production of a set of standardised regional climate risk reports that apply the Climate in Context methodology to analyse and present climate information in the context and language of their development programming themes. The reports will act as an evidence base for the inclusion of appropriate climate information in development programming. The reports draw on existing socio-economic datasets relevant to the development themes of each of the FCDO regional hubs. Although the reports have a regional focus the information will be reported at country scale to support development programming in the FCDO national offices.

A pilot climate risk report for the Middle East and North Africa (MENA) region which trialled this approach was conducted and delivered to FCDO in 2021, with the Met Office leading on the climate analysis components and the Overseas Development Institute (ODI) leading on the socio-economic analysis components of the methodology (Richardson et al., 2021). Due to the success of this trial, the methodological approach has been rolled out across multiple regions defined by FCDO. Three regional climate risk reports have since been delivered in parallel using this approach; these are for East Africa (Richardson et al., 2022), West Africa (Doherty et al, 2022) and the Sahel (Holmes et al., 2022). Reginal Climate Risk Reports for Central Africa and Southern Africa are in progress, with more regions planned in the future.

A standardised approach to these climate risk reports ensures consistency in the application and use of climate information across FCDO regional and national offices. Additionally, it is important to ensure consistency with other climate information provided to FCDO offices, such as the monthly climate outlooks and climatology briefing notes. It is therefore necessary to fix some of the decisions that are required to be made when applying the Climate in Context methodology, such as the specific climate datasets and time periods used in the climate data analysis, to ensure consistency across the risk reports and with other FCDO climate information products. These decisions are documented in Table 7.

*Table 7 – Table documenting the specific choices for each of the decisions that need to be made when applying the Climate in Context methodology for conducting the FCDO climate risk reports.*

| Methodology stage | Decision to be made | Appropriate choice for FCDO climate risk reports |
|---|---|---|
| **1** | Socio-economic context for the risk analysis | A set of ~5 key themes to focus the socio-economic analysis on, driven by the key socio-economic challenges for the region and the requirements of the development planners. Examples include water resources, food security and agriculture, and health. |
| **1** | Spatial scale for analysis | Climate risk analysis is conducted at the regional scale. |
| **1** | Time periods to use | FCDO are interested in the 2050s future time period, and how this compares to the current situation. |
| **2.1** | Choice of socio-economic datasets | Driven by the development contexts and themes identified in Stage 1. |
| **2.1** | Analytical framework | Driven by the programming context of the FCDO regional/national offices and the key themes identified. |
| **2.1** | Choice of key climate vulnerabilities | Key climate vulnerabilities identified for each of the themes. This takes the form of identifying which climate hazards the region is exposed and sensitive to, and in what way. |
| **2.1** | Choice of climate variables and metrics to analyse | Determined by the identification of the key climate vulnerabilities. Temperature and precipitation are included in the analysis as standard, but the specific metrics are determined by the vulnerabilities. For example, for temperature is it daily maximum, mean or minimum temperatures that are important and are there critical temperature thresholds (e.g. for human health or for crop yield). For precipitation, which seasons are most important, is the timing of the precipitation important or the total over the season/year and is the region prone to flooding (extreme precipitation) or drought (lack of precipitation). Other variables and metrics, such as coastal variables are also identified here, based on the climate vulnerabilities identified. |
| **2.2** | Choice of sub-regional analysis zones | The region is split into bespoke zones that reflect regions of similar climatology. The number of zones should represent the diversity of the climate of the region. Other factors such as key urban environments or regions of similar livelihood activities may influence the specific selection of the zone shapes and to aid the socio-economic analysis. |

| | | |
|---|---|---|
| **2.2** | Choice of dataset for baseline climate analysis | The ERA5 and WFDE5 datasets are used to assess the baseline climate, along other gridded observation or reanalysis products that are deemed appropriate for the region of interest. The dataset that best represents the regional climate is selected. |
| **2.2** | Choice of baseline period | The baseline period is defined as 1981-2010, ensuring consistency with other climate reports such as IPCC AR6 (IPCC, 2021), and also the FCDO climatology briefing notes. |
| **3.1** | Choice of datasets for future climate analysis | Global climate model projections from CMIP5 and CMIP6, as well as regional climate model projections from the relevant CORDEX domain are used for the future climate analysis. This ensures consistency with the model simulations analysed in the IPCC AR6 report and the data available in the IPCC Interactive Atlas. |
| **3.1** | Choice of future time period | The analysis will focus on projections for the 2050s (2041-2070), however consideration of the longer-term climate trends will also take place (e.g. the 2080s; 2071-2100). |
| **3.1** | Choice of climate scenarios | As the analysis focuses on the 2050s time period, the specific RCP chosen for this time period is not important as the projections are very similar. The longer-term trend analysis should be conducted for both RCP4.5 and RCP8.5 to consider a range of future pathways dependent on the concentration of emissions. The SSP5-85 scenario is used for the CMIP6 model projections, for comparison with RCP8.5. |
| **3.1** | Choice of supportive literature/tools | The zonal analysis is supplemented by analysis from the IPCC AR6 reports and Interactive Atlas. |
| **3.1** | Choice of method for selecting and presenting future climate projections | Projections from the whole ensemble of model simulations considered will be used to communicate the plausible range of projected trends and the consensus across the models. |
| **3.2** | Choice of key climate risks to focus on | The key climate risks under each theme are identified in line with development planning to help frame the report structure. For example in the Sahel Risk report (Holmes et al., 2022) agriculture and pastoralism section focused on:<br>- Agricultural productivity and livelihoods<br>- Pastoralist’s livelihoods<br>- Livelihood adaptations<br>- Mobility and migration<br>- Conflict and associated complex drivers |

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| | | |
|---|---|---|
| **3.2** | Choice of cross-cutting themes | Cross-cutting themes are additional areas of consideration when analysis the risk. They allow for the contextualisation of climate risks within the context of compounding risks and help better understand potential risk-multiplier effect. Such cross-cutting themes may include: migration, demography or conflict. |
| **4.1** | Structure of the report | To ensure a standardised approach across all regional risk reports, a template report structure is as follows:<br>*Executive summary (key messages and country summaries)*<br>*1. Introduction*<br>*2. Vulnerability and climate resilience.*<br>*3. Climate in context: current and future climate*<br>*4. Climate risk impacts and interpretation*<br>*5. Summary*<br><br>The report will include top level key messages and tabular summaries of the climate analysis and interpretation statements. |
| **4.2** | Choice of dissemination methods | The key messages from the report will be presented to the FCDO regional and national representatives and hosted on the Met Office web page[1]. |
| **4.2** | Translations of materials | Some FCDO regional offices may request translations of the key messages, e.g. the executive summary and infographic from the Climate risk report for West Africa have been translated into French. |

1 https://www.metoffice.gov.uk/services/government/international-development/climate-risk-reports

## 3.2 Engagement with national stakeholders to inform food security adaptation policy

Another example of the application of the Climate in Context methodology is the country-level assessments of food security and climate change conducted by the Met Office in collaboration with the UN World Food Programme (WFP). Country-level assessments have so far been conducted for Sudan (examples of which have been included in Section 2.1; World Food Programme & Met Office (2016)) and Mozambique[2]. Further assessments are planned in Afghanistan, Nepal, Bangladesh and Pakistan over the next few years under the FCDO funded Asia Regional Resilience to a Changing Climate (ARRCC) programme, and potentially Laos, Zimbabwe and the Philippines which will be funded by WFP. The aim of these assessments is to provide the evidence base to inform long-term food security adaptation policy by assessing which livelihood activities are most at risk, from what, and where in the country to inform prioritisation of national planning.

The food security and climate change assessments present an application of the Climate in Context methodology where the socio-economic context is focussed specifically on food security and livelihoods at the national scale. Livelihood zoning maps are used to identify spatial zones for the climate analysis by grouping together livelihood zones to create sub-national regions that reflect the climatology. Top-level summaries of the key livelihood activities and their climate vulnerabilities in each of the zones are identified in the baseline assessment.

These assessments present an example of how this methodology is standardised in some respects, i.e. in the assessment and presentation of climate information in the context of the socio-economics, but flexible in other aspects. The specific approach taken in each country is dependent on the needs of the WFP country office, the amount of food security and livelihoods data already available for that country, what analysis has previously been done, and the governance structure of that country to ensure the outputs are tailored to government decision-making.

The main adaptations to the core methodology presented here are the allowance for collection of new socio-economic data, such as livelihood zoning analysis if this doesn't initially exist, to ensure a standardised approach can be taken across the MO/WFP country assessments. Also, through development and application of this methodological approach in the Sudan and Mozambique studies it was found that the outputs of the project were more likely to be used by national stakeholders to inform their planning if they were engaged in the process. Therefore, there is an emphasis on in-country stakeholder engagement in this application of the methodology, both to draw on their knowledge and expertise to inform the tailoring of the outputs, and to improve awareness and uptake at policy level.

[2] Report 'Food security and livelihoods under a changing climate in Mozambique: preparing for the future' due to be published soon.

The methodological approach for the country-level food security and climate change assessments therefore has more emphasis on in-country engagement throughout the project and the multi-stakeholder workshop is included as one of four key stages:

1. ***Baseline***: Define baseline relationship between climate, climate-related activities, food security and key livelihood activities;
2. ***Future***: Analyse climate change projections and identify scenarios of future climate change that span the plausible range;
3. ***Workshop***: Host a multi-stakeholder workshop to present and discuss the future climate scenarios;
4. ***Report***: Co-produce and disseminate a report summarising the project outcomes.

Further descriptions of these four stages are shown in Figure 18 to Figure 21 which were used as part of project inception meetings with new WFP country offices and included here for demonstration purposes.

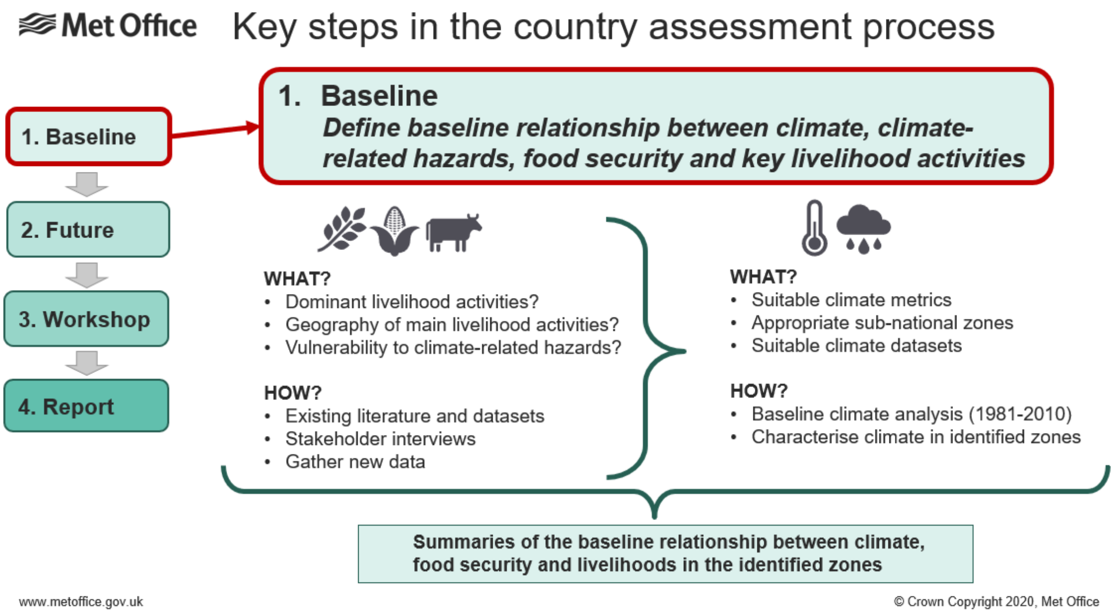


*Figure 18 – Schematic description of the baseline stage of the adapted Climate in Context methodology used in the country level food security and climate change assessments conducted by Met Office and WFP.*

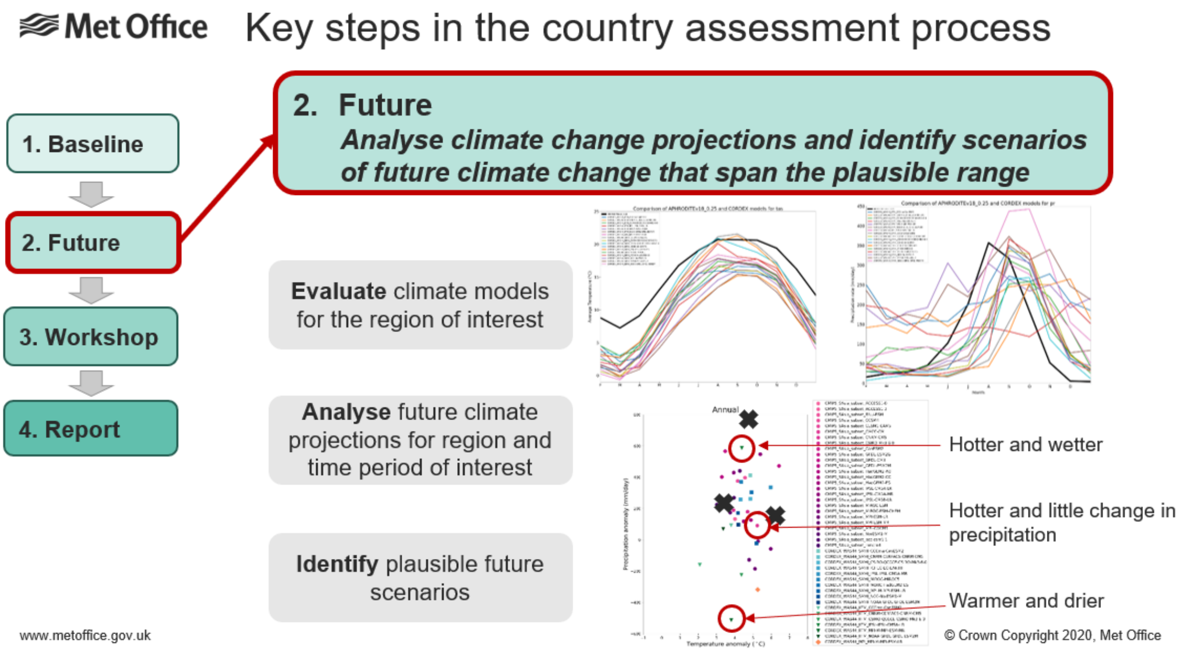


*Figure 19 - Schematic description of the future stage of the adapted Climate in Context methodology used in the country level food security and climate change assessments conducted by Met Office and WFP.*


*Figure 20 - Schematic description of the workshop stage of the adapted Climate in Context methodology used in the country level food security and climate change assessments conducted by Met Office and WFP.*

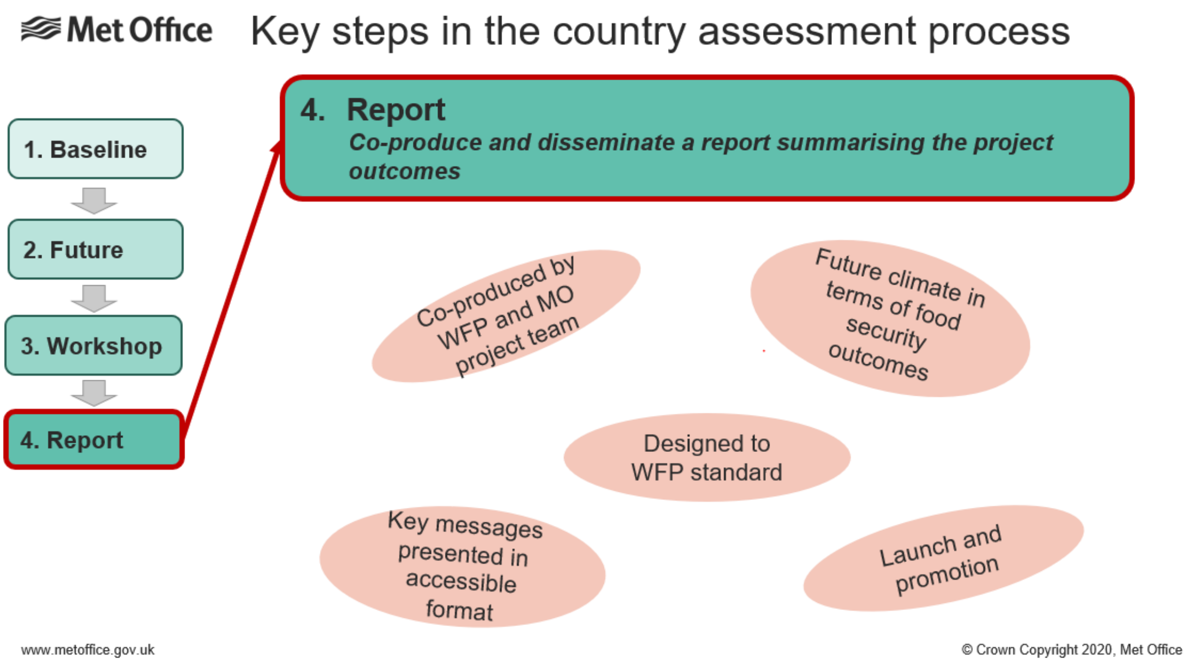


*Figure 21 - Schematic description of the report stage of the adapted Climate in Context methodology used in the country level food security and climate change assessments conducted by Met Office and WFP.*

## 4. Summary

This document has outlined the 'Climate in context' methodology designed to bring together climate with socio-economic analysis to better understand future climate risks through a socio-economic development lens. Although examples have been provided throughout this report, this is designed to be a guide to a possible approach rather than to be a prescriptive methodology. This is to allow for the customer needs and unique co-production approach within a multidisciplinary team to guide the process to meet the customer requirements when adopting such an approach.

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