



Global Climate Screening Tool – User Guide

Revision 2

Sitra

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For more information see Annex I.

Glossary

| | |
|-------------|--|
| Adaptation | Actions taken to adapt to a future, changing climate to cope with, for example, rising sea-levels, changes in rainfall amounts or intensity and increases in heatwave duration and severity. |
| AR5 | IPCC Fifth Assessment Report |
| CMIP5 | Coupled Model Intercomparison Project Phase 5 |
| COP21 | Conference of the Parties |
| HDCC | Human Dynamics of Climate Change |
| INDC | Intended Nationally Determined Contributions |
| IPCC | Intergovernmental Panel on Climate Change |
| KNMI | The Royal Netherlands Meteorological Institute/Koninklijk Nederlands Meteorologisch Instituut |
| Mitigation | Actions taken to prevent given levels of climate change occurring. This is usually achieved by decreasing the amount of greenhouse gases present in the atmosphere through reducing emission rates or enhancing processes which remove these gases. |
| Projections | Climate model experiments run using plausible estimates for future greenhouse gas emissions and other processes that affect the climate to provide best possible information for future conditions. Different scenarios can be created by using different emission models. |
| RCP8.5 | This RCP scenario has continued increases in atmospheric greenhouse gas concentrations throughout the 21st century. |
| RCPs | Representative Concentration Pathways |
| UK | United Kingdom |
| UN FAO | United Nations Food and Agriculture Organization |
| UNFCCC | United Nations Framework Convention on Climate Change |

Introduction

The United Kingdom (UK) Met Office has been commissioned by Sitra, the Finnish Innovation Fund, to develop a climate screening tool. This report acts as a user guide. The Met Office has produced an additional technical report to accompany this report and the climate screening tool.

Organisations in Finland and the Nordics are keen to protect themselves from future global hazards affecting their business. Assessments of risks related to resource availability and other megatrends influencing the business environment are thought to be ahead of those from climate change. For this reason Sitra, the Finnish Innovation Fund, commissioned the development of the climate screening tool to enable Finnish organisations to understand and manage potential risks associated with climate change. The tool has been tested and developed in collaboration with Fortum and the Climate Leadership Council in Finland, and it is made available for all Finnish companies and the wider public by Sitra with the aim of encouraging companies to assess and evaluate their climate risks.

Aim

The climate change screening tool (and this report) aims to provide a high level tool to inform business users of the risks of climate change which may influence their operations. It is designed as an initial “entry point” to enable users to start considering future risks and in cases where the tool indicates medium or high risks, users are directed to further information. All the information used is ‘broad scale’, from global assessments and is suitable for initial screening work only. Any detailed site assessments require more detailed information.

In addition, the climate screening tool can be used to determine whether a risk exists, the high level consequences of the risk and whether further consideration of the risk is required. By highlighting the potential high level risks of climate change on business operations these can be considered in more detail to be included in companies risk registers. Note: The tool does not provide bespoke consultancy nor does it provide adaptation or mitigation advice for the highlighted risks of climate change.

An overview of climate change is provided in the Technical Report.

User Guide

This section provides information on how to use the tool and also how to interpret the results of the climate screening tool. The tool takes into account the magnitude of the physical changes resulting directly (biophysical) and indirectly (socio-economic changes) from climate change and the ability of the countries in the chosen region to mitigate and adapt to climate change. The tool ultimately provides an overall risk score/rating. Further details are provided in Overall Risk Rating section and for further information see the Technical report – Overall Risk Rating section.

All worksheets in the climate change screening tool have been formatted to be easily printed or saved as pdf documents. There are also “user notes” boxes which can be populated with any notes which are specific to your business or operation.

Hint: if using the climate screening tool for multiple regions, sectors or operations then save the spreadsheet with a different name in order to provide an audit process. Always use the template file to undertake each new analysis/assessment.

Hint: when using the tool, please make sure you selected meaningful combinations in the “1. Control” worksheet when changing the input parameters. Also, please ensure you have selected an option for each input parameter drop-down menus in order.

The climate screening tool consists of six worksheets:

0. Instructions
1. Control
2. Score card
3. Data
4. Impacts all sectors
5. Bibliography

A summary of each worksheet is provided below.

The tool is compatible with Excel 2007, 2010 and 2013.

0. Instructions

This worksheet provides a summarised version of the instructions in this user guide. Alternatively, click on the “instructions” cell shaded dark grey in the top left corner on each of the worksheets within the climate screening tool which will generate summarised instructions.

1. Control

This worksheet requires the user to make **four** selections, see Figure 1.

In order to make a selection click on the gray outlined boxes, an arrow will appear to the right of the box, click on the arrow and a drop-down menu will be generated enabling the selection of options.

1. **Section of land region.** This refers to the terrestrial block where the operation will occur. A geographical figure is provided on this worksheet to help the user identify which block they should select. The options are presented in Table 1, Figure 1 and Figure 2.
2. **Selection of oceanic region.** This option will provide a selection of oceanic regions to select based on the terrestrial block chosen in question one. A geographical figure is provided on this worksheet to help the user identify which block they should select. These regions are equivalent to the fishing regions defined by the UN Food and Agriculture Organization (FAO). The available options of oceanic regions are presented in Table 1 and Figure 3.

Note: even if you do not have any marine options, please select the most appropriate oceanic region in order to correctly populate the databases; the next option will enable the user to discount this region from affecting the Overall Risk Rating.

3. **Selection of business sector.** Please select the most appropriate option for your business or operation being assessed. This will affect the vulnerability and risk scores generated. The business sector options are:
 - Transportation
 - Wholesale and retail trade
 - Agriculture, forestry and fishing

- Manufacturing
- Construction
- Energy
- And Other industries (including water)

Hint: if your operations cover multiple business sectors then save the spreadsheet with a different name in order to allow a cross comparison of key parameters and climate trends across the business. The score cards can be printed or exported as pdfs to allow easy contrast. Always use the template file to undertake each new analysis/assessment.

4. Selection of whether the assessed operations (or supply chains) are dependent on coastal or marine infrastructure. The two choices are “Yes” or “No”.

This selection *will* affect which climatic changes are accounted for in the generation of the risk score. Examples of dependencies could include but not limited to:

- Freight shipping
- Dependency on ports and harbours
- Coastal infrastructure/buildings
- Marine infrastructure
- And Aquaculture or wild fishing

Additional (optional) inputs include company name (45 character limit) and a brief description of the company/operation (300 character limit).

Figure 1: Screenshot of “1.Control” worksheet.

SITRA

Global Climate Screening Tool
Developed by the UK Met Office for SITRA



Instructions

| | |
|--|-------------------------|
| Company Name (max 45 characters): | Please type here |
| Brief company/operation description: (max 300 characters) | Please type here |
| Please select Region (See Map 1 (below)) | Central North America |
| Please select Oceanic Region (See Map 2 (below)) | 21 - Northwest Atlantic |
| Please select Business Sector | Construction |
| Are your operations (or supply chains) dependent on coastal or marine infrastructure? | Yes |

This tool presents information about present-day human dynamics, and shows some of the projections of climate change impacts and population change. The climate projections are taken from the latest generation of climate and impacts models, for the end of the 21st century (2071—2100) relative to a 1981—2010 baseline, under a 'business as usual' greenhouse gas concentration scenario (RCP8.5). The population change follows a 'middle of the road' socio-economic scenario (SSP2). Please see the supplementary technical report for further details.

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Figure 2: Geographical Overview of terrestrial blocks.

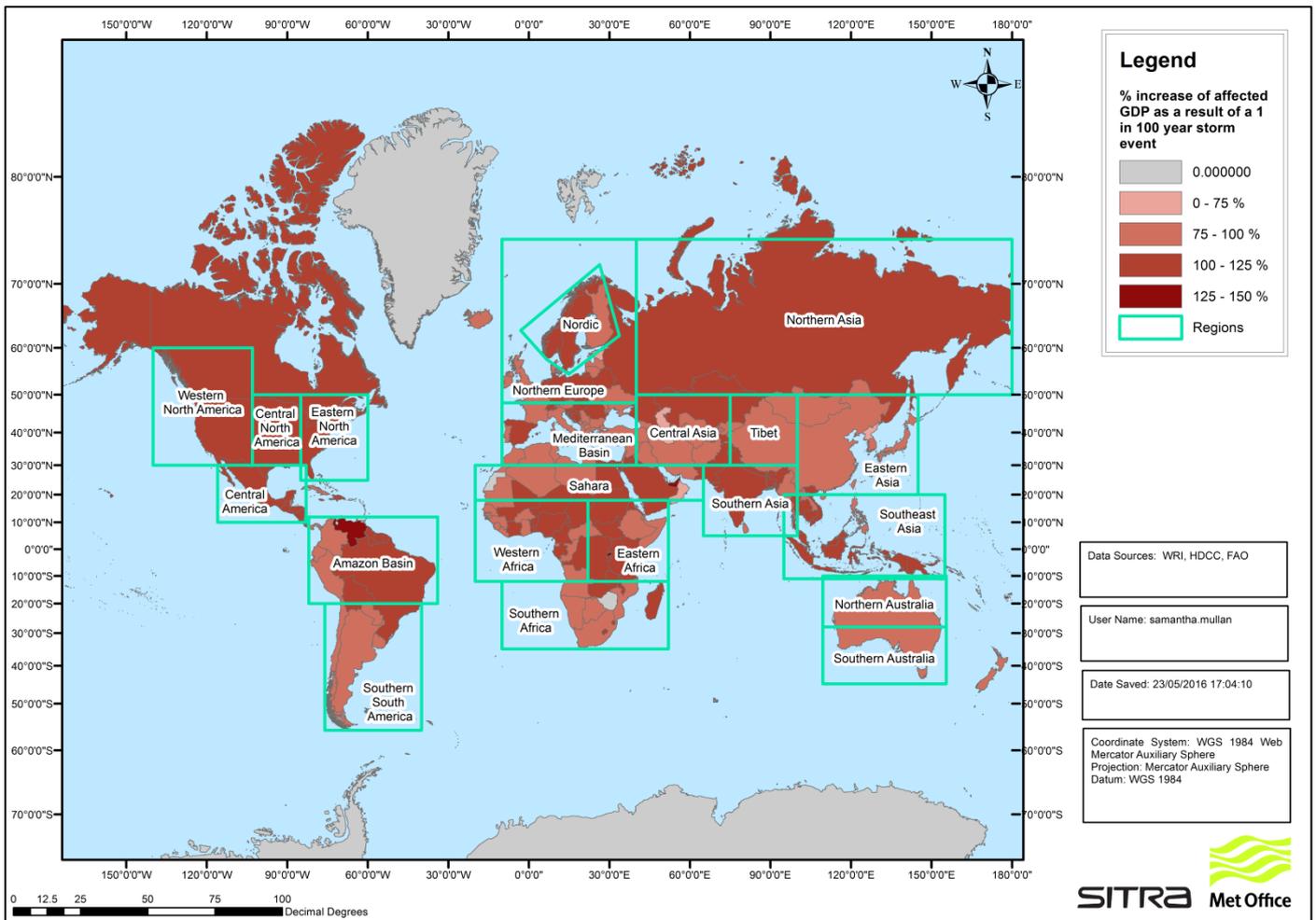


Figure 3: Geographical Overview of oceanic blocks.

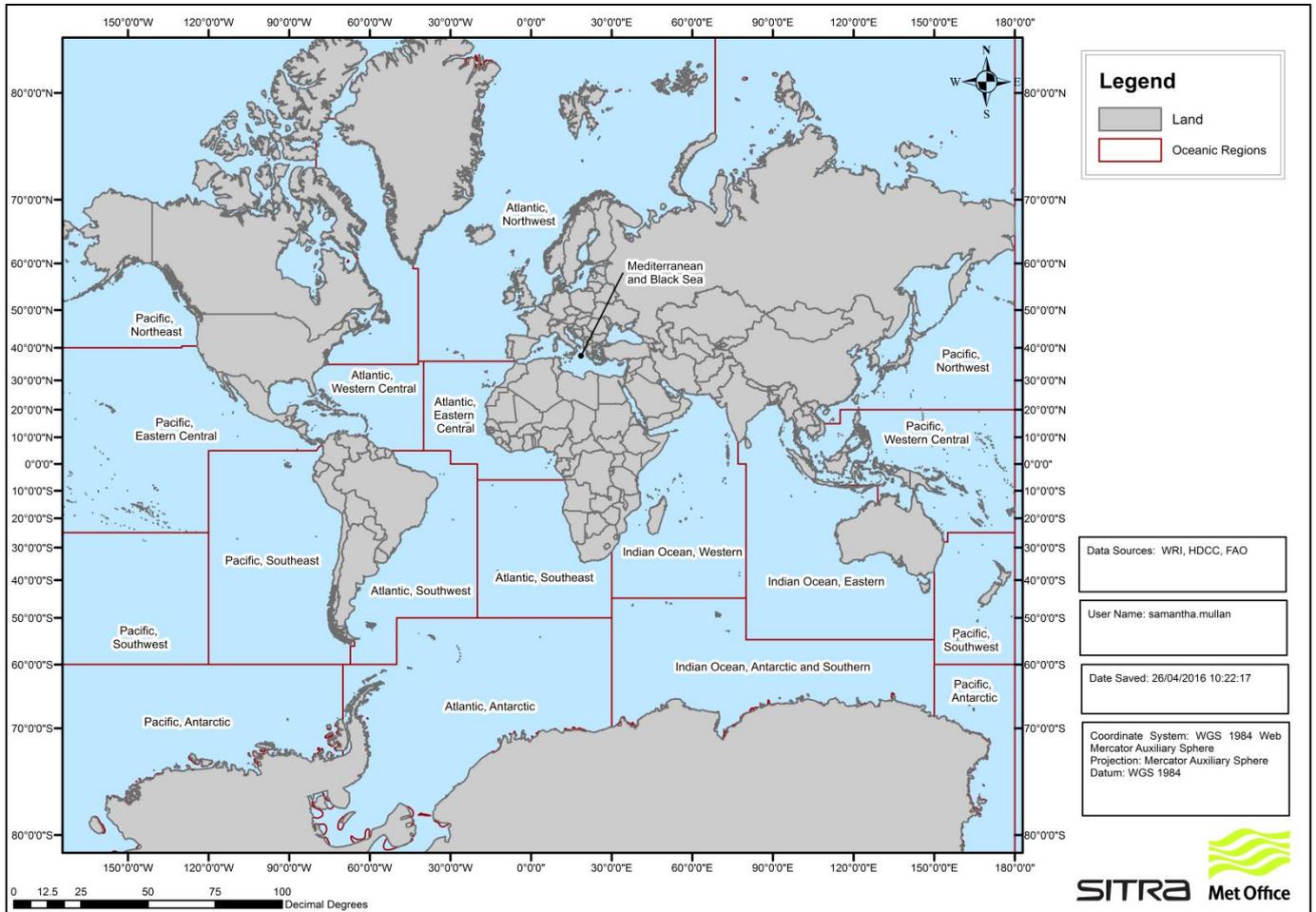


Table 1: Terrestrial and Oceanic Region combinations for selection in the “1. Control” worksheet.

| Terrestrial regions | Oceanic/FAO Regions To select from: | | | |
|-------------------------------|-------------------------------------|----------------------------------|-------------------------------|------------------------------|
| Nordic | 27 - Northeast Atlantic | | | |
| Amazon Basin | 41 - Southwest Atlantic | 87 - Southeast Pacific | 31 - Western Central Atlantic | 77 - Eastern Central Pacific |
| Central America | 31 - Western Central Atlantic | 77 - Eastern Central Pacific | | |
| Central Asia | 51 - Western Indian Ocean | 37 - Mediterranean and Black Sea | | |
| Central North America | 31 - Western Central Atlantic | 77 - Eastern Central Pacific | 21 - Northwest Atlantic | 67 - Northeast Pacific |
| Eastern Africa | 51 - Western Indian Ocean | | | |
| Eastern Asia | 61 - Northwest Pacific | | | |
| Eastern North America | 21 - Northwest Atlantic | 31 - Western Central Atlantic | | |
| Mediterranean Basin | 37 - Mediterranean and Black Sea | | | |
| Northern Asia | 18 - Arctic Sea | 61 - Northwest Pacific | 67 - Northeast Pacific | |
| Northern Australia | 57 - Eastern Indian Ocean | 71 - Western Central Pacific | | |
| Northern Europe | 27 - Northeast Atlantic | | | |
| Southern Africa | 47 - Southeast Atlantic | 51 - Western Indian Ocean | | |
| Sahara | 37 - Mediterranean and Black Sea | 34 - Eastern Central Atlantic | 51 - Western Indian Ocean | |
| Southern Asia | 51 - Western Indian Ocean | 57 - Eastern Indian Ocean | | |
| Southern Australia | 57 - Eastern Indian Ocean | 71 - Western Central Pacific | | |
| Southeast Asia | 57 - Eastern Indian Ocean | 71 - Western Central Pacific | | |
| Southern South America | 41 - Southwest Atlantic | 87 - Southeast Pacific | 88 - Antarctic Pacific | 48 - Antarctic Atlantic |
| Tibet | 51 - Western Indian Ocean | 57 - Eastern Indian Ocean | 61 - Northwest Pacific | 71 - Western Central Pacific |
| Western Africa | 34 - Eastern Central Atlantic | 47 - Southeast Atlantic | | |
| Western North America | 67 - Northeast Pacific | 71 - Western Central Pacific | | |

2. Score Card

The score card is designed to provide high level information and key messages for each assessment/selection. All projections are based on the RCP8.5 scenario and for the end of century unless otherwise specified in the table headers.

The following information is presented:

- The Overall Risk Rating (see **Overall Risk Rating** section)
- A headline statement for the region
- The key parameters in terms of the selected operation
- Sector specific example impacts and mitigation and risk management actions
- High level data table with confidence levels
- A figure to provide global context

The Overall Risk Rating is presented as Very High, High, Medium or Low. Each outcome then has a statement summarising the severity of this result and potential next steps, see Table 2 and **Overall Risk Rating** section.

Table 2: Overall Risk Ratings with associated context and potential actions

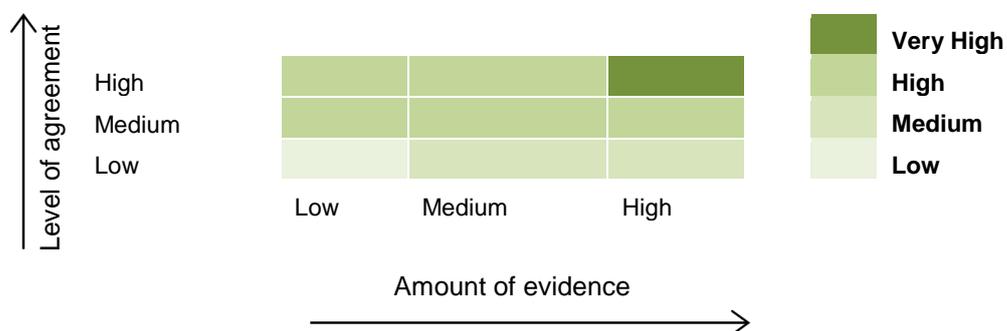
| Overall Risk Rating | Context and Potential Actions |
|---------------------|--|
| Very High | A very high score indicates that there is a significant risk to businesses operating in the selected selector and region. In order to determine effective and strategic mitigation measures and to quantify the risk a detailed local or regional study may be required. |
| High | A high score indicates that there is a relatively significant risk to businesses operating in the selected selector and region. In order to determine effective and strategic mitigation measures and to quantify the risk a detailed local or regional study may be required. |
| Medium | A medium score indicates that there is a moderate risk to businesses operating in the selected selector and region. In order to determine whether strategic mitigation measures are required and to quantify the risk a detailed local or regional study may be required. |
| Low | A low score indicates that there is a relatively insignificant risk to businesses operating in the selected selector and region. If an aspect of operations may be significantly affected by weather and climate then a local study may be required to quantify the risk. |

The plot on the last page of the score card presents each of the regions in terms of their vulnerability (ND-GAIN score) against their Overall Risk Rating (magnitude of climate change and ability to adapt to the projected changes, see Overall Risk Rating). Each of the regions is shaded depending on which continent they belong to. This allows the user's selection to be placed in both a global and continental context. The user's selection is presented as a red circle. The thresholds for the different overall risk scores have been included on the plot (Medium, High and Very High). Points further to the right of the x-axis indicate a higher vulnerability to climate change, in terms of socio economics, and are less able to adapt. Points higher on the y-axis indicate higher Overall Risk Ratings.

Confidence Levels

We have presented a measure of confidence for each of the parameters presented, ranging from “Low” to “Very High”. These confidence scores have been chosen by available classifications in the IPCC AR5 reports (IPCC, 2013) and expert judgement. Confidence scores are derived from the level of agreement and the amount of evidence available, see Figure 4.

Figure 4: Illustrative example of confidence levels applied to each parameter.



Other uncertainties such as natural variability, modelling uncertainty and rates of important processes like melting of ice caps mean that results are presented as a range of values for each specific emissions scenario and time period. The results presented in the tool only cover a limited range of possible outcomes but provide a starting point for high level risk assessment and awareness.

3. Data

This worksheet provides a greater range of data than the “2.Score card” worksheet; this allows the user to understand the degree of uncertainty and the potential extremes. This worksheet presents a large matrix of all of the projected climate change data for a wider range of statistics including different percentile values, maximum and minimum values. The database is generated based on the selection in the “1. Control” worksheet.

The matrix provides both biophysical and socioeconomic data for the region selected in the “1. Control” worksheet. The data include:

- Change in warm day temperatures (°C)
- Changes in projected flood hazard (%)
- Changes in drought (%)
- Changes in water run-off (%)

- The global percentage of crops the region currently produces
- Changes in crop yields (wheat, maize, rice and soya beans)
- Changes in water demand for irrigation
- Changes in precipitation
- Changes in near surface temperature
- The calculated ND-GAIN scores, measure of vulnerability and readiness to adapt to climate change (see Technical report – ND-GAIN section.
- Number of Top Ten Fund for Peace’s Fragile State Index Countries since 2005
- Changes in population
- Estimated risks to GDP from flooding under different storm events

In addition, this worksheet also provides a range of data for the oceanic region selected including:

- Quantity of oil transport choke points and quantity of oil transported through it
- Changes in sea surface temperature
- Quantity of fish catch in 2011

All projected data are based on the RCP8.5 scenario. Data presented as a relative change have been extracted from a baseline 1981-2010 (1985 to 2005*) and a future projection of 2071-2100 (or 2081-2100*). The different time periods are due to the availability and analysis of data from different sources. For more information about the datasets used in the tool see the Technical Report – Data Sources section.

* Data extracted from the Coupled Model Intercomparison Project Phase 5 (CMIP5) (IPCC Fifth Assessment Report (AR5) Atlas subset) models were extracted for RCP 8.5 as a relative change from 1985-2005 (baseline) to 2081-2100 (projection) under the RCP8.5 scenario.

4. Impacts

The worksheet “4. Impacts all sectors” provides a database of potential impacts which may affect businesses across all sectors. The database provides example impacts and mitigation/risk management actions which could affect all business sectors. The database can be filtered on direct or indirect impacts, the impact itself, the confidence level or by the example adaptation/risk management options.

This table is designed to supplement the risks presents in the “2. Score card” worksheet.

Overall Risk Rating

The climate screening tool presents an Overall Risk Rating to help contextualise the results and data for the user. This score has been developed by the UK Met Office for the climate screening tool. The tool will calculate one of four qualitative scores – Very High, High, Medium or Low, see Table 2. These scores have been numerically calculated as a function of the socio-economic vulnerability (see Technical Report – ND-GAIN section) and the relative severity of projected climatic change for the selected block.

References

- Giorgi, F. R. Francisco, Evaluating uncertainties in the prediction of regional climate change, GRL (2000)
- IPCC, 2013: Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- IPCC, 2016, Intergovernmental Panel on Climate Change, accessible from: <http://www.ipcc.ch/>
- KNMI, no date, KNMI Climate Change Atlas, accessible from: https://climexp.knmi.nl/plot_atlas_form.py
- The UK Met Office, 2013, Human dynamics of climate change, accessible from: <http://www.metoffice.gov.uk/climate-guide/climate-change/impacts/human-dynamics/>.
- The UK Met Office, 2015, What is climate change?, accessible from: <http://www.metoffice.gov.uk/climate-guide/climate-change>
- University of Notre Dame, 2013, University of Notre Dame Global Adaptation Index - Detailed Methodology Report, accessible from: <http://www3.nd.edu/~nchawla/methodology.pdf>
- World Resources Institute, 2015, Aqueduct Global Flood Analyzer, accessible from: <http://www.wri.org/resources/maps/aqueduct-global-flood-analyzer>

Annex I

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Flood analyzer data -World Resources Institutue,
<http://creativecommons.org/licenses/by/3.0/legalcode>, <http://floods.wri.org/#/>

Intergovernmental Panel on Climate Change (IPCC) -IPCC, 2013: IPCC, 2013:
Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis.
Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental
Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J.
Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University
Press, Cambridge, United Kingdom and New York, NY, USA.

The Royal Netherlands Meteorological Institute (KNMI) -
https://climexp.knmi.nl/plot_atlas_form.py?id=someone@somewhere

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