

# The NAP Data Initiative

Advanced use of GitHub,  
R-Studio, RMarkdown  
and related tools to analyze  
and apply diverse data types  
in support of adaptation  
assessments, planning and  
investments under NAP 3.0

LDC Expert Group







# Summary

The NAP Data Initiative addresses challenges related to limited access to long-term climate data, Low technical capacity for data processing in LDCs, and difficulty in archiving and sharing data for future use. It equips NAP teams with user-friendly tools to access, manage, and analyze data, while promoting collaboration and creation of live, dynamic documents for continuous updates. It facilitates data reproducibility, adaptability, and archiving. It utilizes RStudio and R Markdown for

data analysis and visualization; and employs GitHub to co-produce reports and store data. Guidance is given for country teams to use the tools without specialist knowledge. Technical assistance to get started is provided via the LEG. This initiative underscores the importance of open data and technology in advancing climate resilience, particularly for the most vulnerable countries. It represents a critical step in streamlining climate adaptation processes globally.

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# 1.



## Introduction



Data are fundamental for adaptation assessment and planning, and data issues consistently rank highly among the challenges faced by countries in their work on adaptation. Besides there being only limited climate observations available to build up databases for the long term, the capacity to access and process data is also a key issue.

The national adaptation plan (NAP) Data Initiative of the Least Developed Countries Expert Group (LEG) is a collection of tools designed to facilitate access to available data from different sources around the globe and specially tailored to improve adaptation assessment and planning. The initiative takes advantage of the huge efforts made globally towards

assembling data and making them readily and freely available. Advances in information technologies have made it possible to store and process large volumes of data via the Internet, meaning it is no longer necessary to manage all data locally. The data initiative utilizes open-source software and tools and makes available access routines for which specialist expertise in programming or data sciences is not required. The main clusters of data and information discussed in this technical brief fall into the following adaptation cycle categories: assessment; planning; investment planning and implementation; and monitoring, evaluation and learning. The improvements in data and information access, analysis and processing resulting from the initiative will support the visions for NAP 3.0.





# 2.



**Motivation and examples  
of current data initiatives**



Lack of access to usable data, such as climate and environmental data, and the inability to analyse and use such data in assessments and planning usually rank highly among the challenges faced by countries, including the least developed countries (LDCs), when addressing adaptation needs and formulating their NAPs. While some data may be available in global or national databases, accessing and processing them via the Internet is very challenging for many LDCs.

Globally, tremendous progress has been made in making high-quality data freely available for global environmental change applications, including the creation of meticulous time series of observations (socioeconomic as well as biophysical data based on remote sensing).

Managing huge data sets is cumbersome and costly and can be daunting when conducting assessments and preparing NAPs. In many cases, the efforts made during the preparation of one product are not preserved for future activities or products, meaning those efforts must be repeated in order to access and process similar data. In cases where consultants carry out the work during a project, there is usually no mechanism to archive the data and tools used nationally and the data assembled are no longer available to the country.

Over the last couple of decades, many data centres with archived data and tools have been created to service the global environment community. While some of these centres were built for a specific data type or for ready-to-process satellite data, there are also data portals that enable users to view and download selected data on a particular topic of their choosing. In several cases, bundles of data have been processed to provide inputs to common assessments at the global, national or basin level.

## 2.1 Supporting adaptation assessment and planning

There are many examples of data bundles supporting adaptation assessment and planning as shown in this chapter.

The climate data time series collected by the University of East Anglia Climate Research Unit, gridded at 0.5° by 0.5°, is perhaps one of the most significant data sets used in climate studies and assessments. The latest data,<sup>1</sup> covering 1901–2023, cover the following variables: cloud cover; diurnal temperature range; frost day frequency; potential evapotranspiration; precipitation; relative humidity; sunshine duration; number of stations contributing to each interpolation; monthly average daily mean temperature; monthly average daily minimum temperature; monthly average daily maximum temperature; vapour pressure; wet day frequency and wind speed.

The WorldClim data set,<sup>2</sup> described in the *International Journal of Climatology*,<sup>3</sup> includes monthly climate data for minimum, mean and maximum temperature, precipitation, solar radiation, wind speed, water vapor pressure and total precipitation. There are also 19 bioclimatic variables.

HydroATLAS<sup>4</sup> is a comprehensive database containing a broad range of hydro-environmental attributes for three data sets for sub-basins, rivers and lakes. HydroATLAS contains data on 1 million sub-basins, 8.5 million river reaches and 1.4 million lakes. It has been created by compiling and reformatting a wide range of hydro-environmental attributes derived from existing global data sets in a consistent and organized manner. The resulting data compendium offers attributes grouped into the following categories: hydrology; physiography; climate; land cover and use; soils and geology; and anthropogenic influences. For each of the three sub-data sets, HydroATLAS contains 56 hydro-environmental variables, from which 281 individual attributes were derived. Further information can be found in *Scientific Data* articles.<sup>5</sup>

1 See <https://crudata.uea.ac.uk/cru/data/hrq>.

2 See <https://www.worldclim.org/data/worldclim21.html>.

3 Fick SE, and Hijmans RJ. 2017. WorldClim 2: new 1km spatial resolution climate surfaces for global land areas. *International Journal of Climatology*. 37 (12): 4302–4315.

4 See <https://www.hydrosheds.org/hydroatlas>.

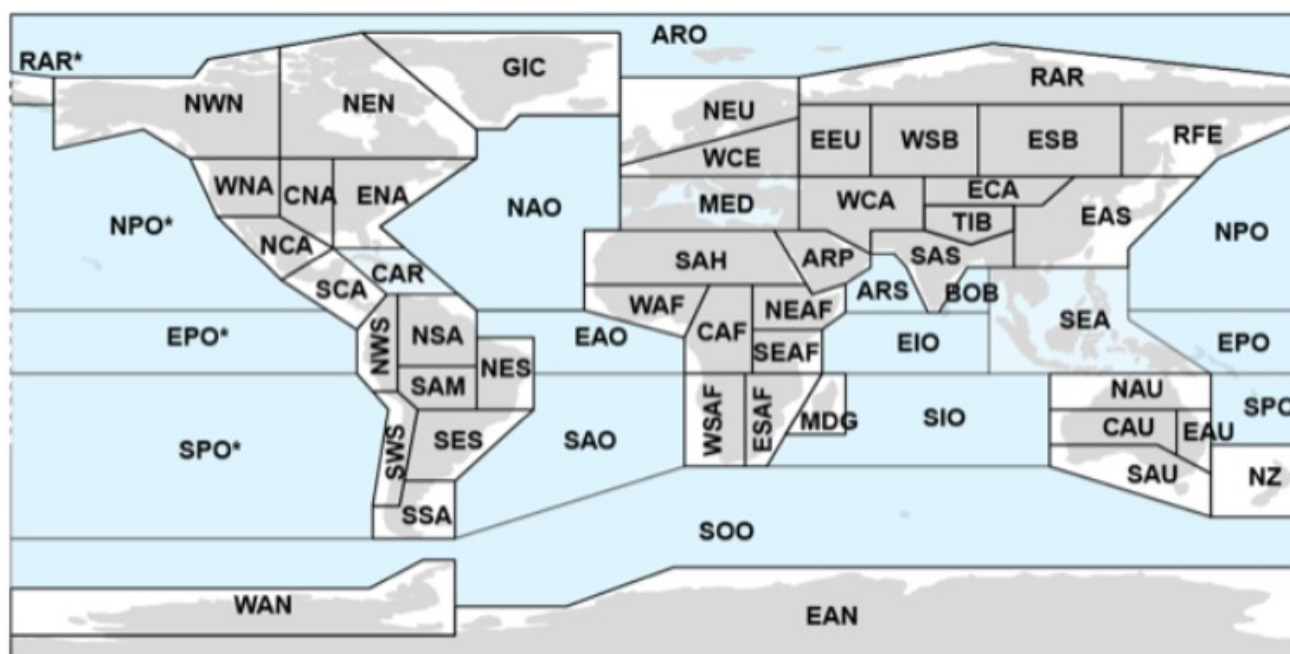
5 See, e.g., Linke S, Lehner B, Ouellet Dallaire C, Ariwi J, Grill G, Anand M, Beames P, Burchard-Levine V, Maxwell S, Moidu H, Tan F and Thieme M. 2019. Global hydro-environmental sub-basin and river reach characteristics at high spatial resolution. *Scientific Data*. 6: 283. Available at: <https://doi.org/10.1038/s41597-019-0300-6>; and Lehner B, Messenger ML, Korver MC, Linke S. 2022. Global hydro-environmental lake characteristics at high spatial resolution. *Scientific Data*. 9: 351. Available at: <https://doi.org/10.1038/s41597-022-01425-z>.



The Atlas chapter,<sup>6</sup> part of the contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), provides a region-by-region assessment of climate change and is complemented by an innovative online tool, the Interactive Atlas.<sup>7</sup> The Interactive Atlas provides flexible spatial and temporal analyses of regional climate change by means of two components: regional information and regional synthesis. The regional information component allows for flexible analysis of past and projected changes for over 25 variables and derived indices calculated from key climate data sets. The data are provided in the 46 land and 14 ocean reference regions (see figure 1).

The World Bank Climate Change Knowledge Portal<sup>8</sup> provides global data on historical and future climate vulnerabilities and impacts. It uses the climate data time series of the University of East Anglia Climate Research Unit as the source for observed historical data, and various others for future climate change scenarios. The Portal also provides country profiles, which give greater insight into the climate risks faced by each country and potential adaptation actions they could take. These profiles and associated data can be explored on the Portal in 'country' or 'watershed' view. For example, figure 2 shows some of the data available for the Lake Malawi/Shire river basin area under the 'watershed' view.

**Figure 1** IPCC WGI AR6 Atlas Reference Regions for Land and Ocean Areas (The package of tools and data for the Atlas is available on GitHub at <https://github.com/IPCC-WGI/Atlas?tab=readme-ov-file>).

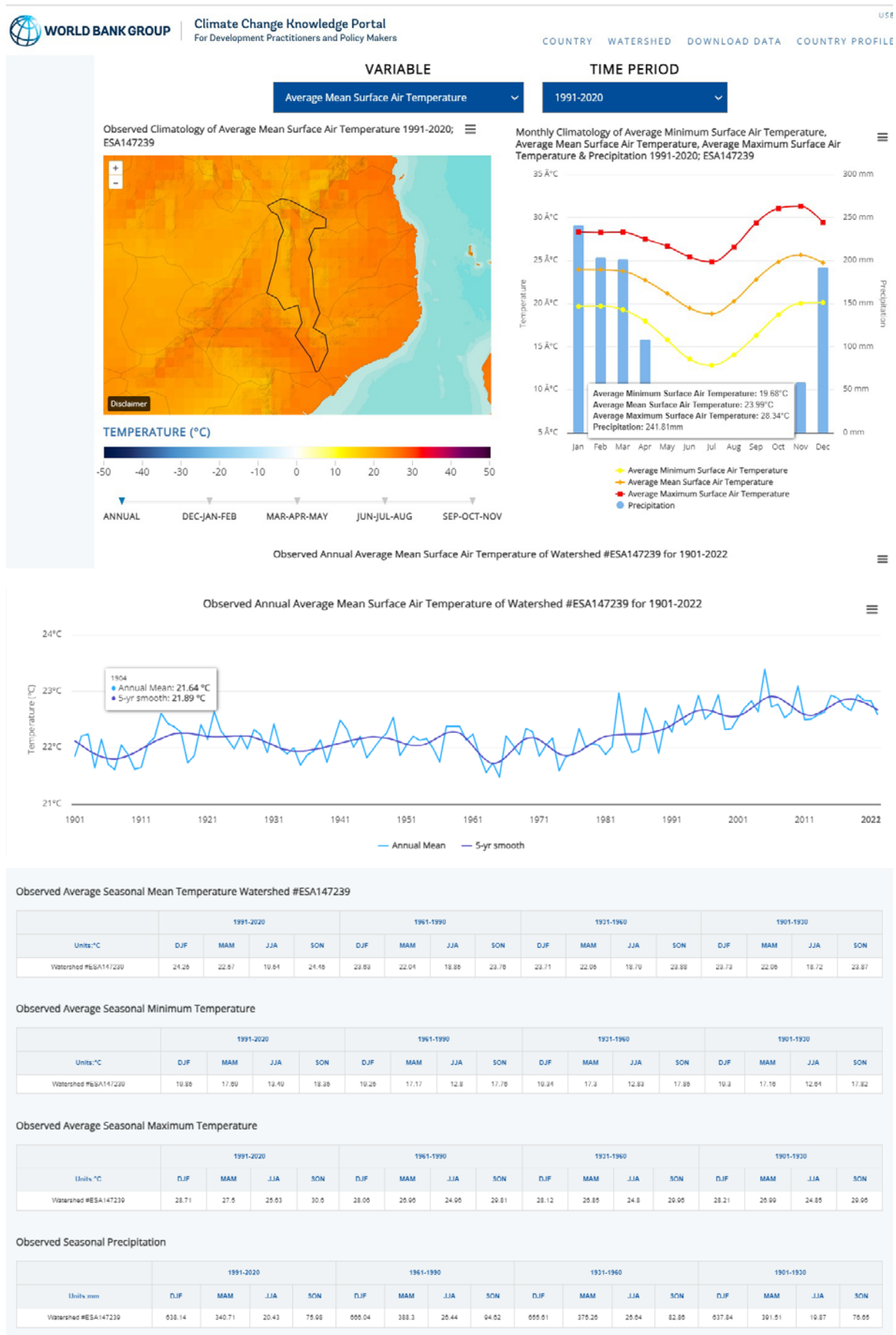


6 See <https://www.ipcc.ch/report/ar6/wg1/chapter/atlas/>. The package of tools and data for the Atlas chapter is available on GitHub at <https://github.com/IPCC-WGI/Atlas?tab=readme-ov-file>.

7 See <http://interactive-atlas.ipcc.ch>.

8 See <https://climateknowledgeportal.worldbank.org/>.

**Figure 2** World Bank Climate Change Knowledge Portal – Lake Malawi/Shire Basin Climate Data and Summary





Many other tools have been designed to support climate impact and adaptation assessments, and most of these tools require a huge amount of time and expertise in order to be fully understood and applied. While many of these tools are geared towards global or regional studies, they can provide data that are useful at the national level (for instance in cases where such data do not already exist in the country) and provide a good starting point for assessments. In cases where countries or other areas are grouped into regional blocks, this can result in some blocks not aligning with country borders, and a country may appear in more than one block. This problem is exemplified by the IPCC Atlas (see figure 1), where the globe has been segmented into boxes representing large regions.

In many of these tools, data summaries for climate variables are provided by country. These generic data are not very practical for assessment studies in countries that have more than one type of ecosystem or climate, since values that average out data collected from across the whole country do not allow for the differentiation needed to analyse subregions. Data must be collected for specific areas within countries, such as cities, river basins and mountainous regions, in order to devise adaptation measures suitable for those particular areas.

## 1.2 Supporting investment planning and implementation

Several portals track investments in climate change adaptation and offer information on sources of funding. The recent publication by the LEG on mapping of available funding for adaptation focused mainly on windows of funding under the Financial Mechanism of the Convention and Paris Agreement. Further work is expanding that analysis to cover other sources.

The Global Adaptation Mapping Initiative,<sup>9</sup> a collaborative network for mapping global evidence on climate change adaptation, is an example of a portal tracking climate change adaptation.<sup>10</sup>

## 1.3 Supporting monitoring, evaluation and learning

Tracking funded adaptation projects can provide useful learning opportunities as well as information that can be used to assess progress in addressing adaptation needs. Each of the major funding entities provides lists of funded projects and many make available online data files of projects that can be connected dynamically to other portals to provide up-to-date information. For example, the Global Environment Facility and the Green Climate Fund (GCF) websites provide Excel data files of their projects, facilitating direct access to up-to-date data that can be used in dashboards and portals.

A portal developed under NAP 3.0 to track adaptation projects under the Financial Mechanism is available on NAP Central and is shown later in figures 7 and 8.

<sup>9</sup> Available at <https://globaladaptation.github.io>.

<sup>10</sup> For more information, see Berrang-Ford L, Siders AR, Lesnikowski A. et al. 2021. A systematic global stocktake of evidence on human adaptation to climate change. *Nature Climate Change*. 11, 989–1000. Available at <https://doi.org/10.1038/s41558-021-01170-y>.

# 3.



## Goals and objectives



The NAP data initiative is designed to build the capacity of NAP teams to effectively and efficiently access, manage and analyse data when assessing and planning adaptation, without needing to consult specialists in data analysis and mapping. The initiative has the following objectives:



**To make data easily available to country teams without them needing to learn to use complex data analysis tools**



**To facilitate the development of tools that can seamlessly integrate data analysis results into reports, such as assessment reports or NAPs, and that can easily and continuously update figures and tables as data are updated over time, known as 'live documents'**



**To facilitate work with multiple data types, of any size, to produce analysis results and graphics that resemble high-quality displays typically produced by researchers or specialists**



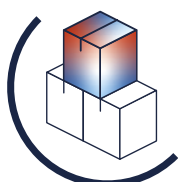
**To easily and consistently produce results in multiple formats to meet the need for outreach to different stakeholders**



**To facilitate collaboration in the production of assessments and adaptation and investment plans using state-of-the-art tools**



**To enable learning by reproducing published cases to conduct similar analyses**



**To facilitate archiving and sharing of data and tools over time**



# 4.

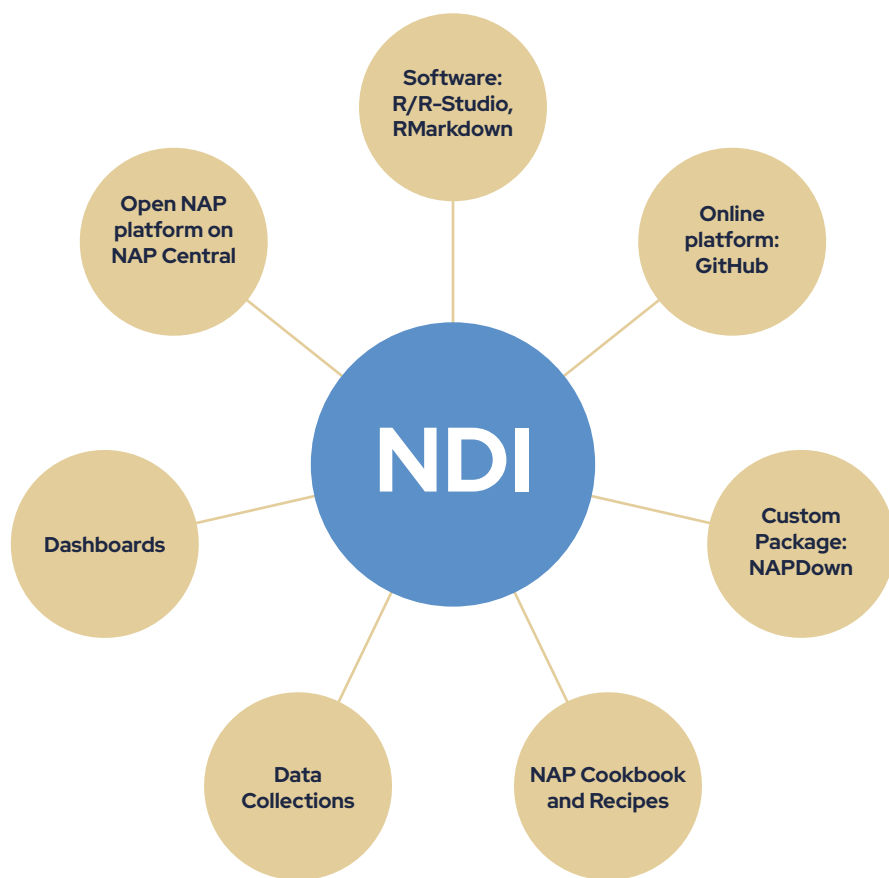


## Approach to the data initiative



The NAP Data Initiative (NDI) is a combination of data files, tools to analyze, format and display the data, and tools for online collaboration.

**Figure 3** NAP Data Initiative Components



**MAIN SOFTWARE**

The system is built around the R/RStudio open-source statistical package, using extension of Markdown in RMarkdown. Markdown is a simple yet powerful language for formatting text, similar to HTML that is used for webpages. An extension of Markdown for use in RStudio, called RMarkdown, makes it possible to

combine R code, formatted text, and results of data visualizations and data analysis using the code, into a single well-formatted output that can be shared easily and reproduced. The wide variety of outputs can be static or fully interactive. RStudio is able run multiple programming languages and produce outputs in most common formats.

**Figure 4** RMarkdown (RStudio) homepage available at <https://rmarkdown.rstudio.com/index.html>

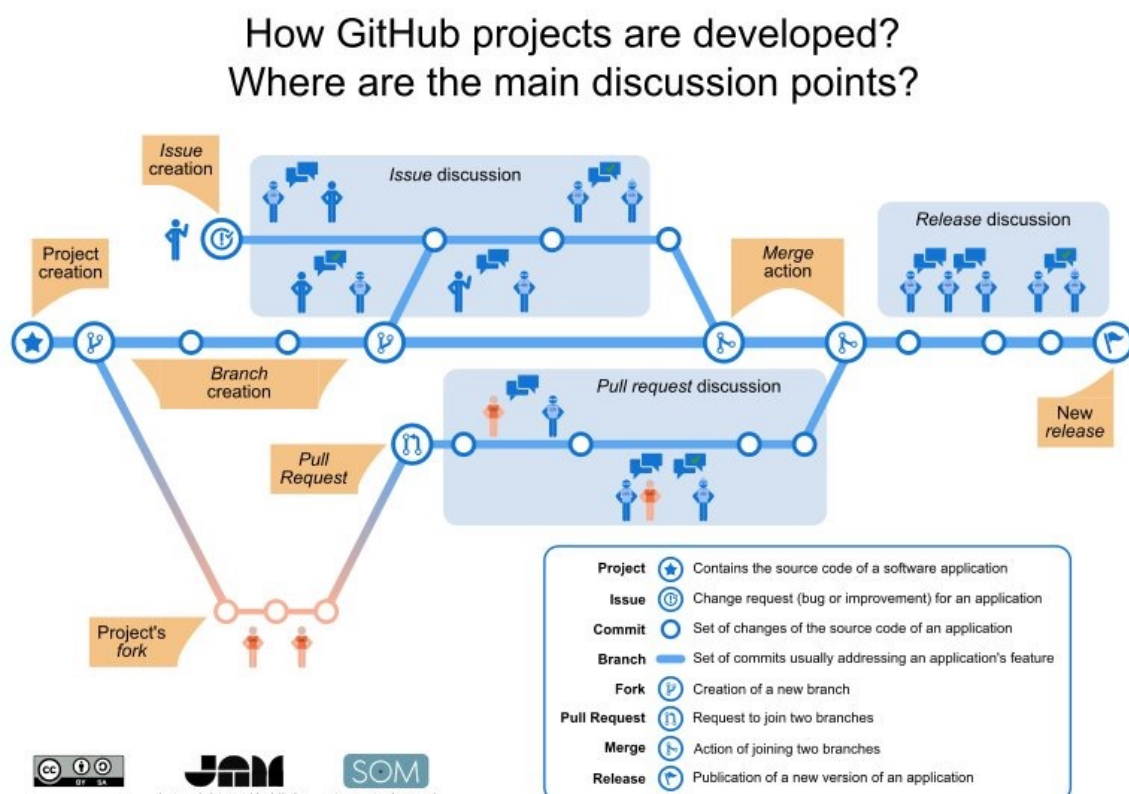


## ONLINE PLATFORM

The online collaboration platform GitHub is used to manage online archives and can run routines that process outputs to outlets such as websites.

GitHub is used by teams to co-produce products by working with multiple inputs that are easily aggregated into the main output (see figure 5)

**Figure 5** GitHub project development process and key steps (source: <https://livablesoftware.com/development-process-in-github-basic-infographic>)





## NAPDOWN CUSTOM PACKAGE

R Markdown in RStudio has been used to produce custom applications such as packages for writing books<sup>11</sup> and theses.<sup>12</sup> A custom collection of routines specific to NAPs is being developed into a custom package called NAPDown, which is based on BookDown. Users can employ these as templates to create their own outputs specific to their NAPs.

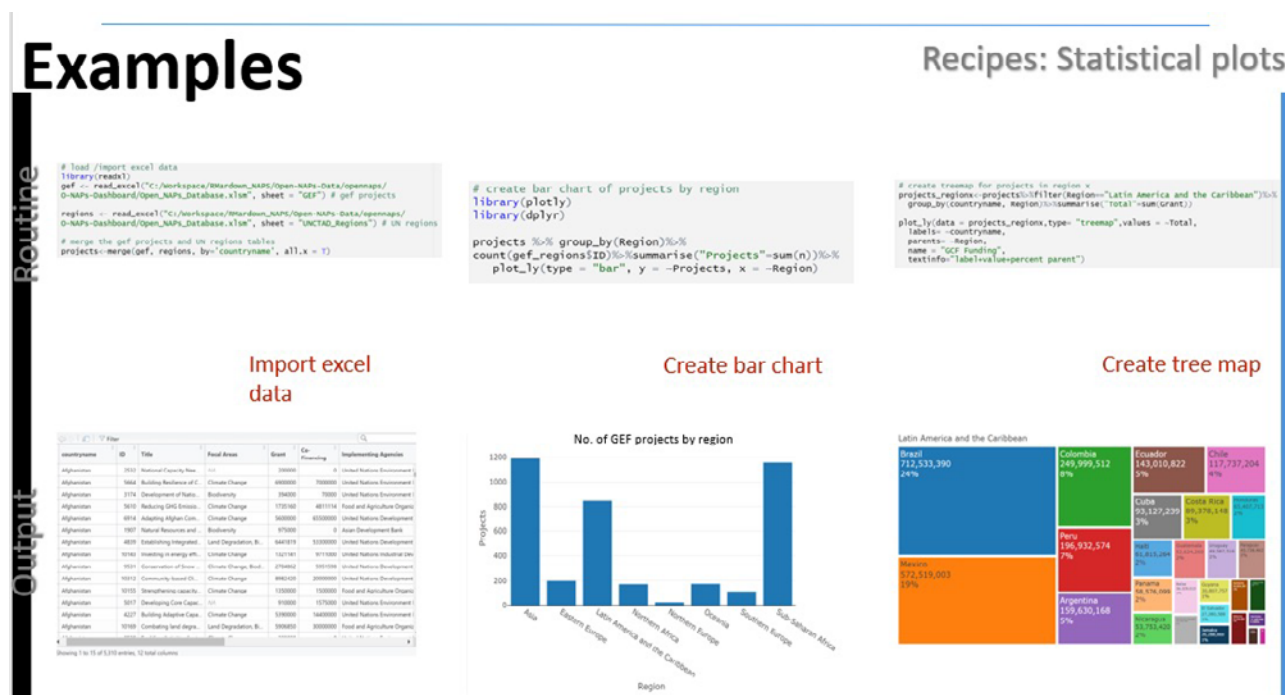
## NAP COOKBOOK AND RECIPES

R and RStudio are widely used and many sample codes are available for other users to copy and reproduce. A collection of useful ready-to-use routines (called 'recipes') is being assembled into a NAP 'cookbook', which NAP teams can use to produce outputs they wish to integrate into their work and reports.

## DATA NAVIGATOR

The data navigator navigates to available data points in collections that can be explored and used and, in many cases, routines are developed to access the data and subset and process them into results for use in NAP assessment and planning. Some data packages, such as HydroATLAS, contain multiple data sets, all processed to work with each other (for example by aligning geographical projections). Routines are prepared within HydroATLAS to extract data on areas of interest, such as by basin or by country, thereby creating more portable and manageable database sizes. A list of data sources is given in the annex, with a more up-to-date list available in the online version of this technical brief under resources on NAP Central.

**Figure 6** NAP Cookbooks and Recipes Examples (i.e., Statistical plots, excel, bar chart, tree map)



11 Such as BookDown. See <https://bookdown.org>.

12 Such as ThesisDown. See <https://github.com/ismayc/thesisdown>.

DASHBOARDS

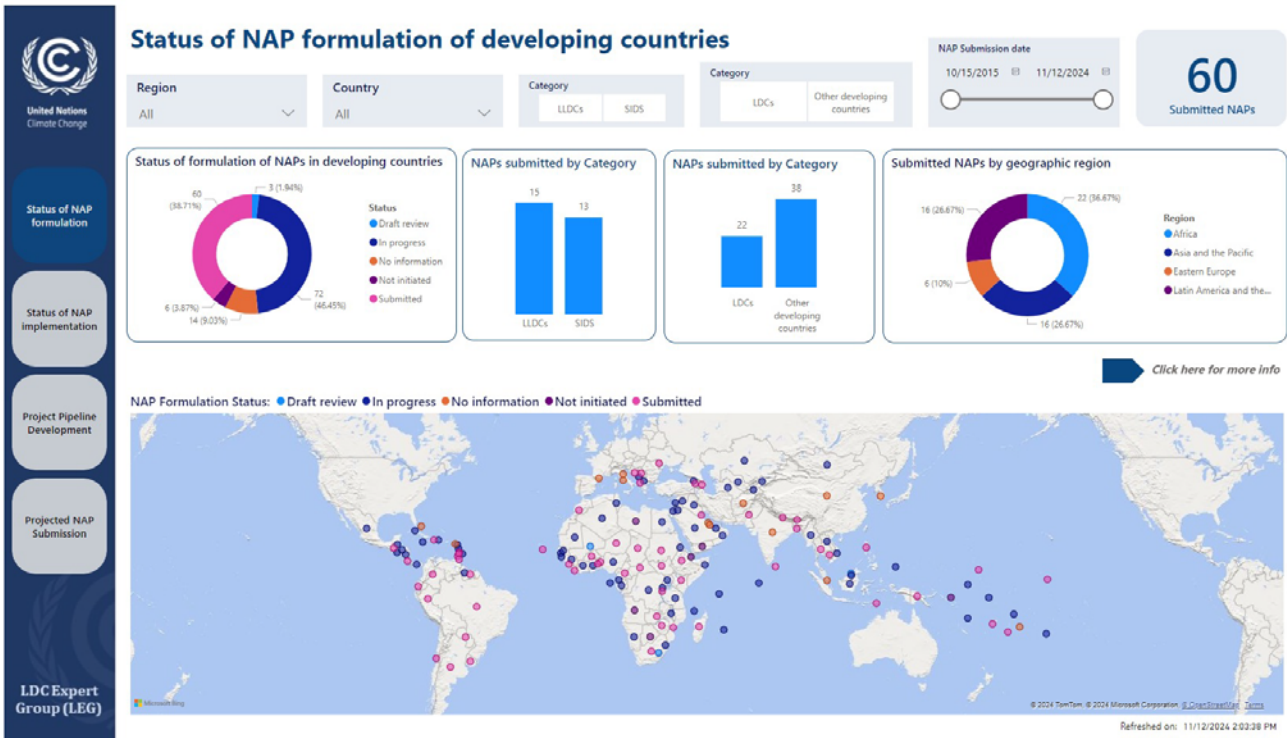
Dashboards are a useful way to display data and information for general use. Online dashboards can easily be designed and implemented using RStudio. A recent example of a widely used dashboard is the coronavirus disease 2019 pandemic dashboards, which displayed real-time updates on numbers of infected persons and so on. The programmes for running those dashboards were openly available for public use via GitHub and facilitated by open data-sharing by various data producers.

A dashboard for tracking projects<sup>13</sup> under the Financial Mechanism, available on NAP Central and developed under NAP 3.0, is shown in figure 7.

OPEN NAP PLATFORM

One of the main purposes of the initiative is to promote a collaboration platform for the co-production of assessment reports and NAPs. Sample projects as part of the Open NAP initiative are under development under NAPDown on GitHub.

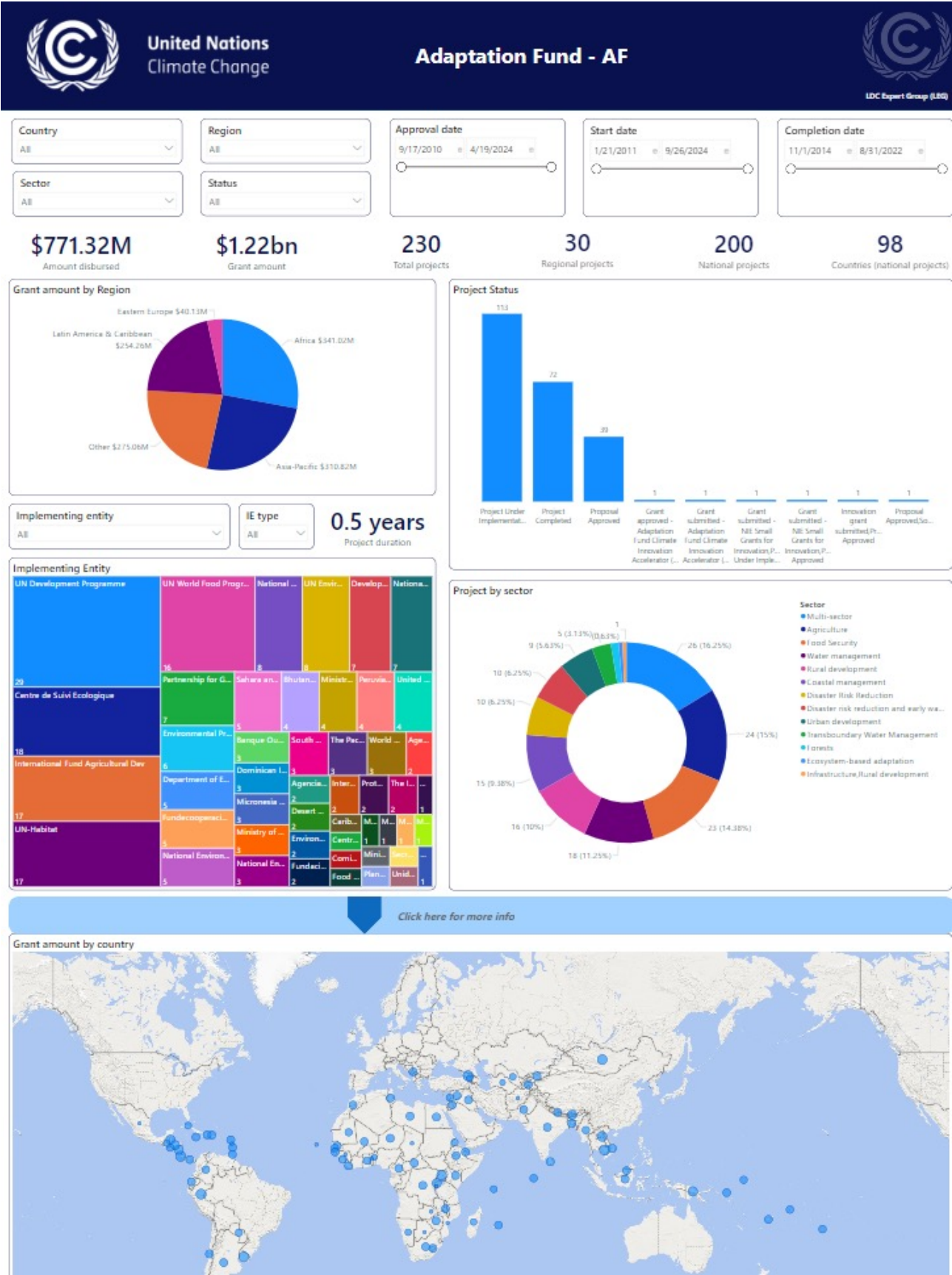
Figure 7 NAP Tracking Tool on NAP Central showing status of NAP formulation and submission, and subsequent status of implementation



13 See <https://www.napcentral.org/node/159>.



**Figure 8** Adaptation project tracker on NAP Central showing projects funded under each of climate funds (example shows a dashboard based on the Adaptation Fund)



# 5.



**Getting started and installing  
the relevant software packages**



You can set up the NAP Data Initiative kit by following the instructions below to set up the necessary software packages. A number of examples are given to help users get started and produce the main types of results.

First, install the R package followed by RStudio.

Then, set up an account online on <http://GitHub.com>, and then install GitHub Desktop on your local computer. This will help synchronize desktop versions of your files with the online collections/repositories under GitHub.com.

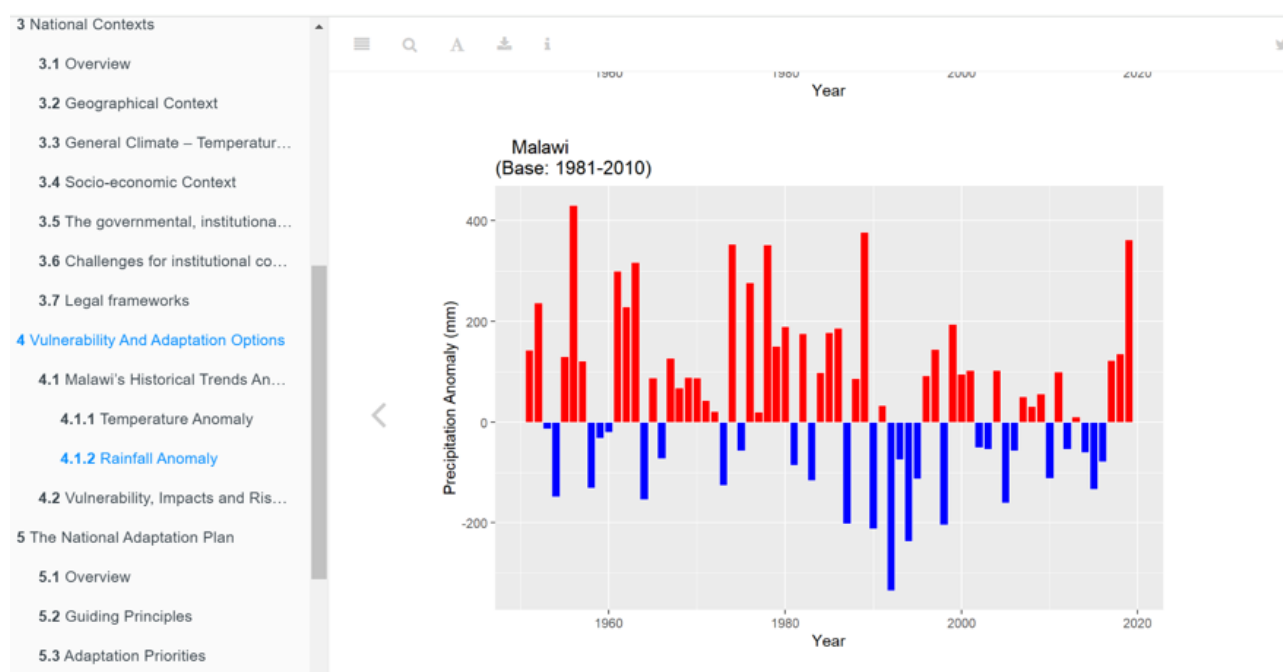
Next, download the NAPDown bundle/project containing the tools and routines needed for producing an online version of the NAP and conducting associated analyses.

**Detailed instructions on how to use NAPDown, as well as further detail on the steps above, have can be found at <https://napdown.github.io/NAPdown/>.**

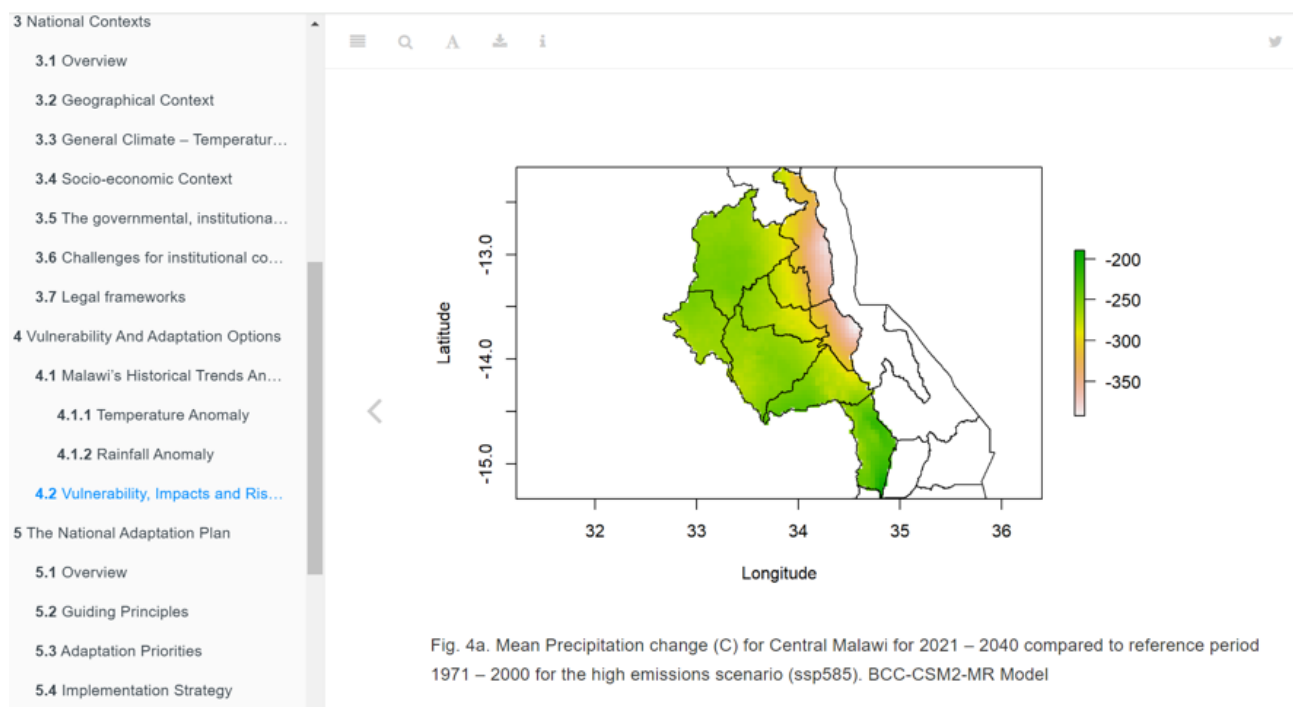
This introductory document gives a number of examples below to help users get started and produce the main types of results.

## 5.1 Co-producing a report as a live/dynamic document

**Figure 9** Live/Dynamic document example showing rainfall analysis directly embedded in a document

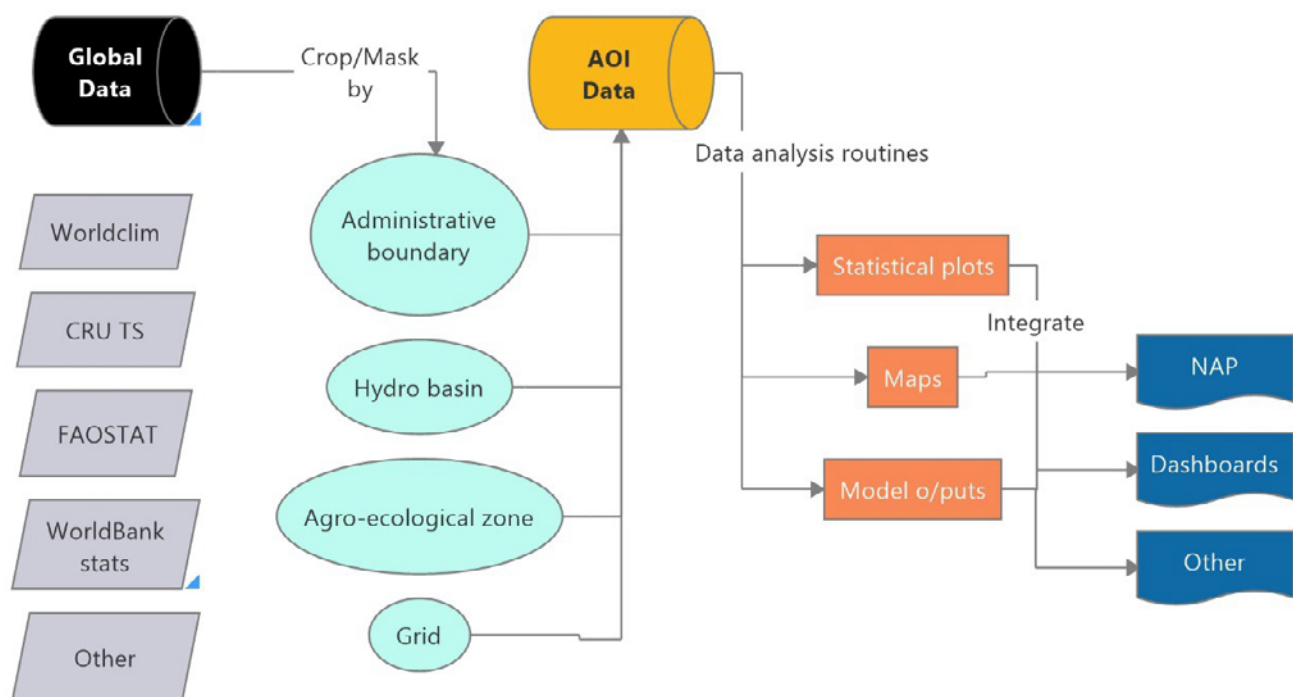


**Figure 10** Live/Dynamic document example showing a spatial analysis of rainfall change displayed as a map, and embedded in a document



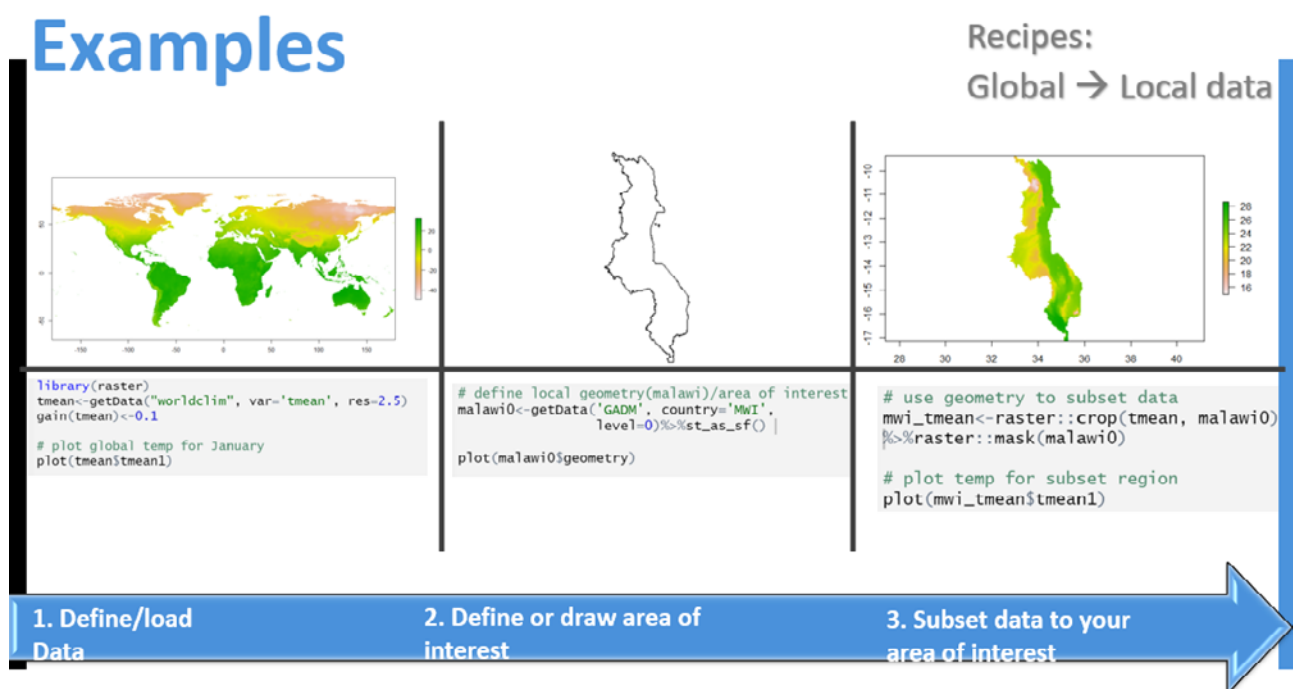
## 5.2 Extracting and displaying areas of interest from global data

**Figure 11** Process flow showing extraction of global data for an area of interest for processing and then integration into a variety of outputs

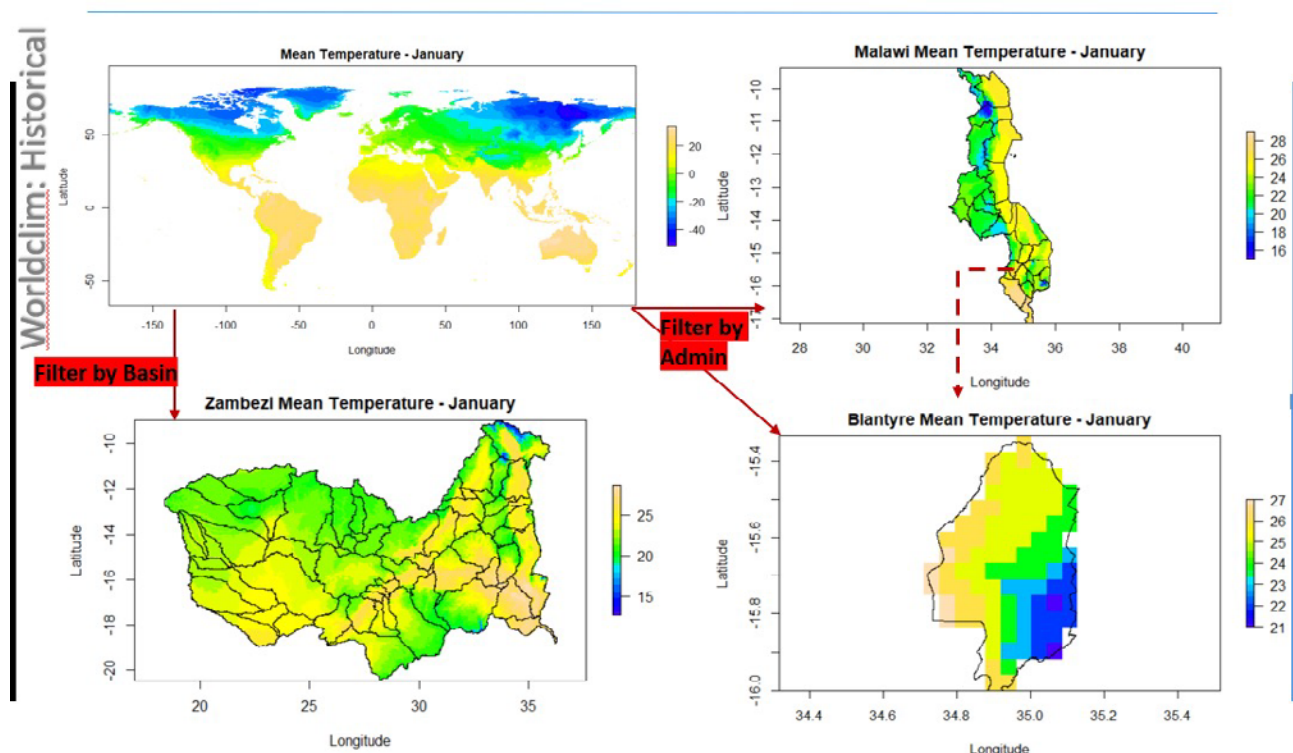




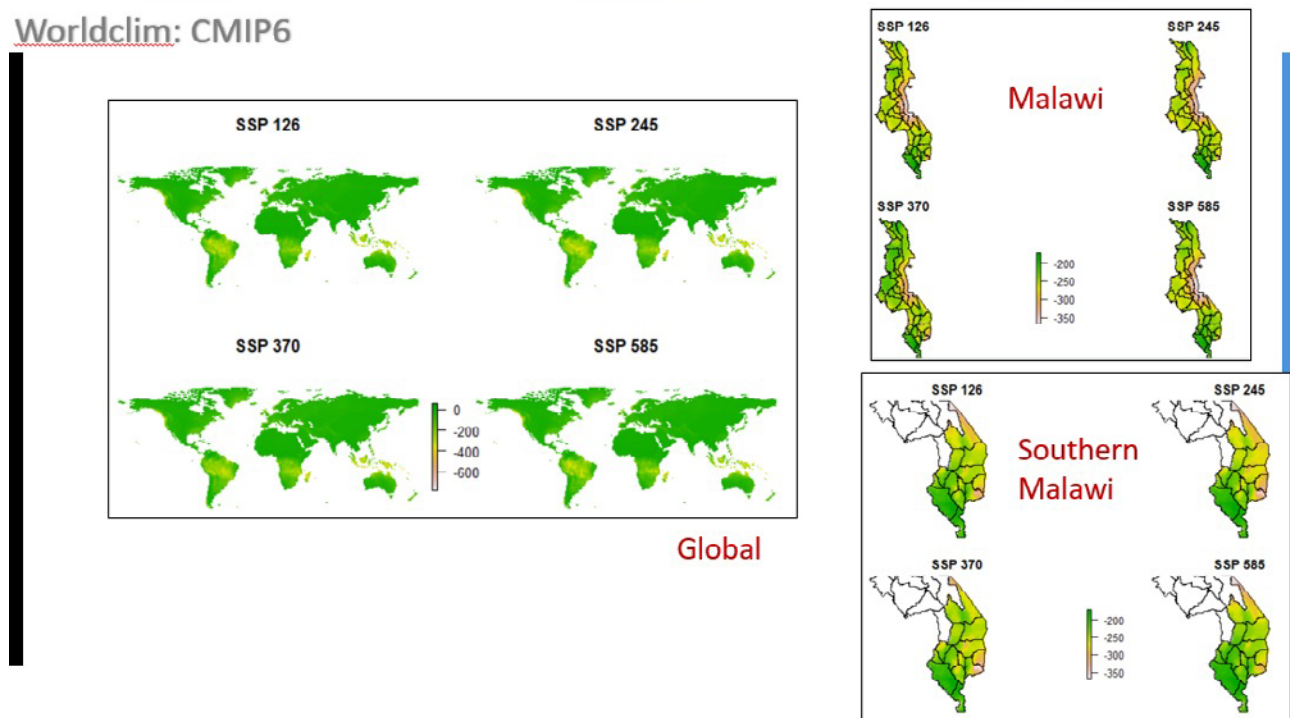
**Figure 12** A sample application of a country data subset from a global data file



**Figure 13** A sample application of different subsets from a global data by country, basin or district

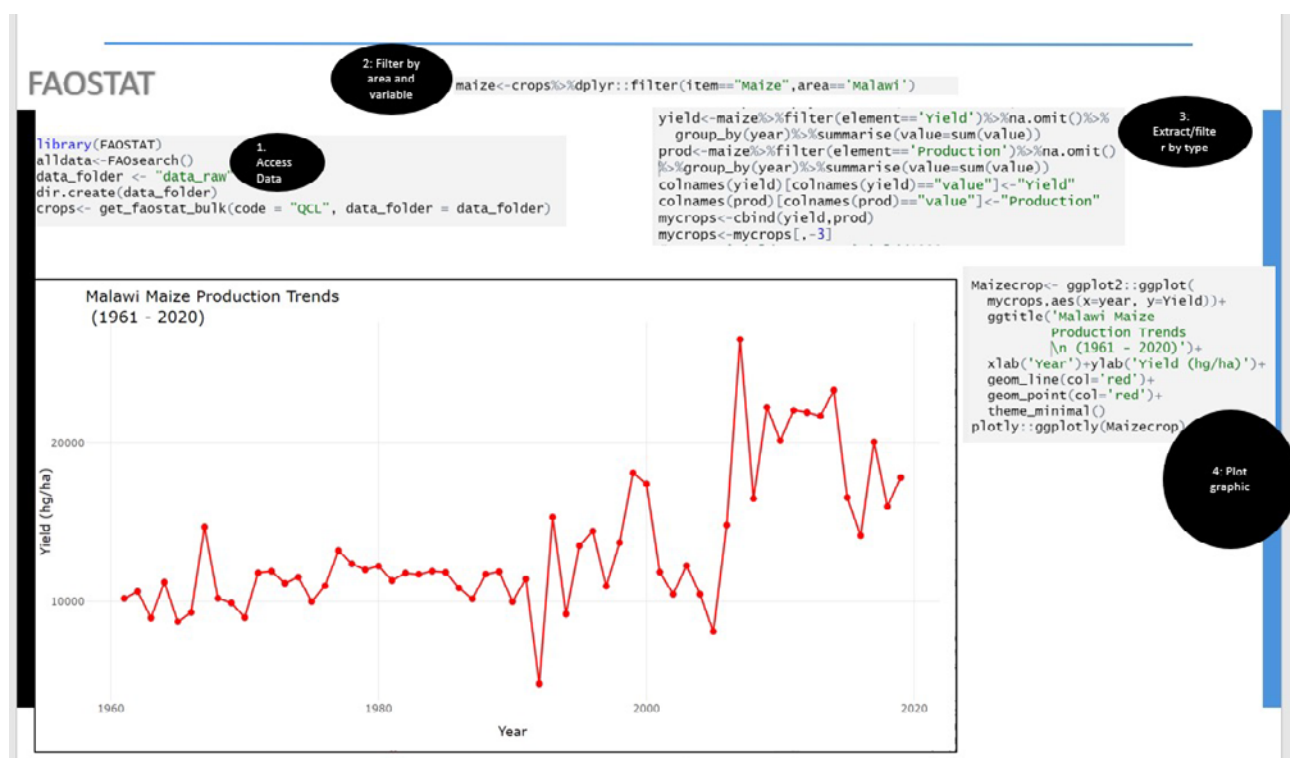


**Figure 14** A sample application of extracting national and regional subsets from multiple global datasets



## 5.3 Embedding online tabular data, such as Food and Agriculture Organization of the United Nations or World Bank statistics, in the document for automatic updates

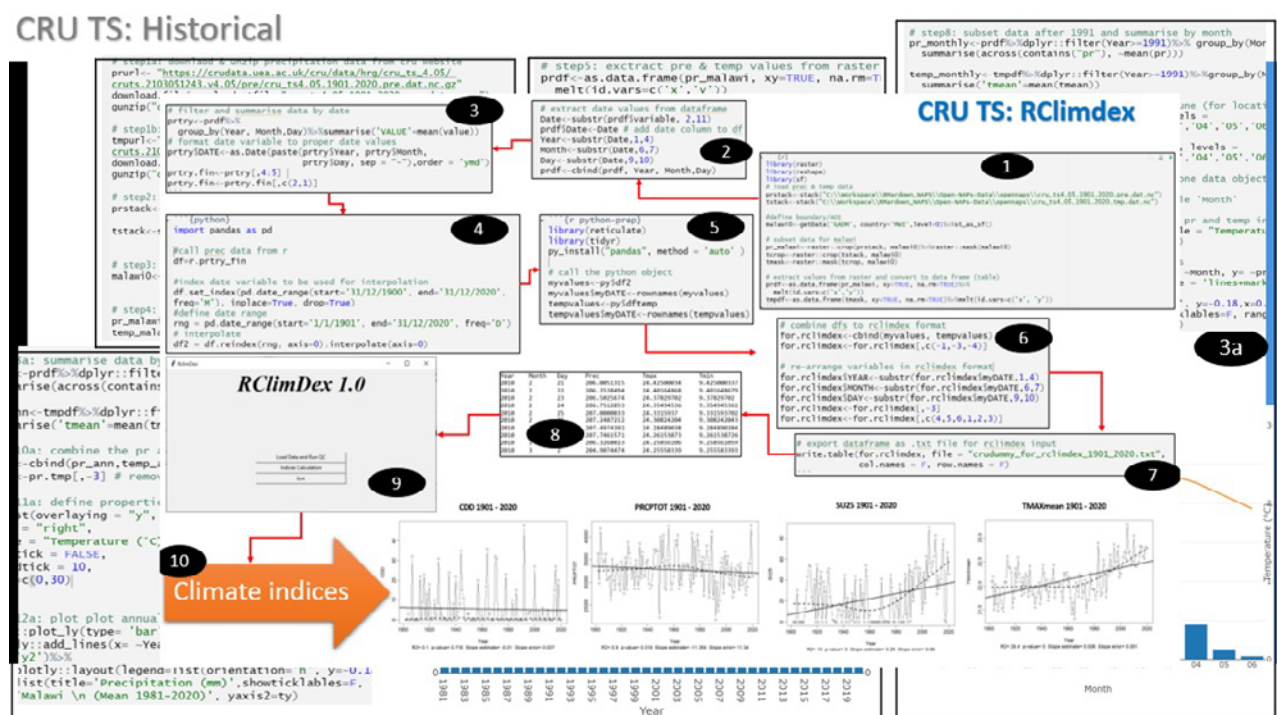
**Figure 15** Sample application of embedding a graph developed from online tabular data from the FAOSTAT library





## 5.4 Embedding analyses of climate data in documents and web pages

**Figure 16** Processing various climate indices from RClimdex using data from the CRU Time Series data

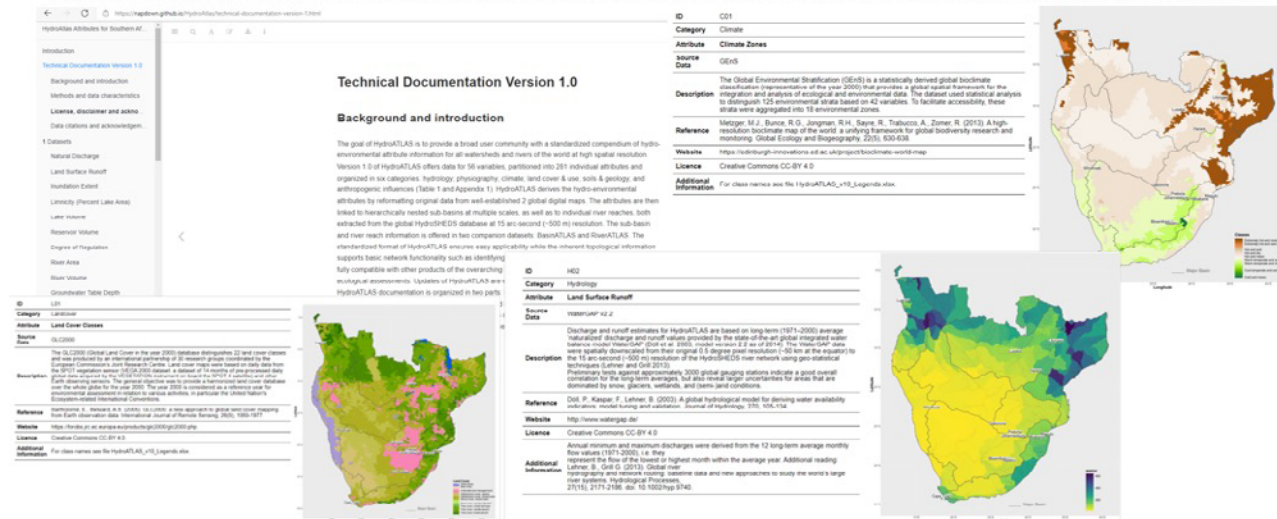


## 5.5 Embedding extracts from geospatial data bundles: example using HydroATLAS

**Figure 17** An extract of the global HydroATLAS data bundle to create a subset over Southern Africa for faster processing

HydroAtlas ([napdown.github.io](http://napdown.github.io))

HydroAtlas is a regionally customized compilation of standardized and readily-available hydro-environmental attribute information for all catchments and rivers in Angola, Botswana, Namibia, Lesotho, Malawi, Mozambique, South Africa, Swaziland, Zambia and Zimbabwe.



# 6.



**Working with GitHub collections  
from published studies**



## EXAMPLES USING A RECENT PUBLICATION

Using a collections of tools on GitHub (and other related platforms), which have been made available as part of peer-reviewed publications, is an efficient way to build up national tools without having to start from scratch. Most publications that describe data and models (some examples of which are given below) share their code and data for public use.

One recent example of such a publication is gridded temperature data set PISCOt v1.2<sup>14</sup> for **Peru**, constructed using the R (v3.6.3) and Python (v3.8.5) programming languages. The entire code used is freely available at figshare<sup>137</sup> and GitHub<sup>15</sup> under the GNU General Public License v3.0. It is a high spatial resolution (0.01°) data set of the daily air temperature for the whole of Peru from 1981 to 2020.

The PISCOt v1.2 package on GitHub is provided as a collection of R scripts but also uses some Python code. Step-by-step scripts are provided in the process directory for building and using a gridded air temperature data set for the country.

The package can be downloaded from GitHub and opened in RStudio, and re-run to produce results similar to those described by Huerta et al. (2023).<sup>16</sup> This offers a starting point for other countries wishing to develop similar national products.

Another example is the CLIMBra climate change data set<sup>17</sup> for **Brazil**. According to Ballarin et al. (2023),<sup>18</sup> the data set is based on an ensemble of 19 bias-corrected climate model projections from the World Climate Research Programme's Coupled Model Intercomparison Project (CMIP) Phase 6. These are projections for the Brazilian territory based on the Shared Socioeconomic Pathway (SSP) 2-4.5 and SSP 5-8.5 scenarios to give bias-corrected daily time series data for precipitation, maximum and minimum temperature, solar net radiation, near-surface wind speed and relative humidity. The bias-corrected data set is available for both historical (1980–2013) and future (2015–2100) simulations at a 0.25°×0.25° spatial resolution. Besides the gridded product, Ballarin et al. (2023) provide area-averaged projections for 735 catchments included in the Catchments Attributes for Brazil (CABra) data set. The data set provides important variables commonly used in environmental and hydroclimatological studies, paving the way for the development of high-quality research on climate change impacts in Brazil.

Other national-level studies include the development of a 10-km gridded data set<sup>19</sup> for **Viet Nam** for daily precipitation and temperature, at a high spatial resolution of 0.1°×0.1°, based on the outputs of 35 global climate models from CMIP6. A data set for **China** has similarly been created, also leveraging the output from 22 global climate models from CMIP6.<sup>20</sup>

14 See Huerta A, Aybar C, Imfeld N, et al. 2023. High-resolution grids of daily air temperature for Peru – the new PISCOt v1.2 dataset. *Scientific Data*. 10, 847. Available at <https://doi.org/10.1038/s41597-023-02777-w>.

15 See [https://github.com/adrHuerta/PISCOt\\_v1-2](https://github.com/adrHuerta/PISCOt_v1-2).

16 As footnote 15 above.

17 Ballarin AS, Sone JS, Gesualdo GC, et al. 2023. CLIMBra – Climate Change Dataset for Brazil. *Scientific Data*. 10, 47. Available at <https://doi.org/10.1038/s41597-023-01956-z>.

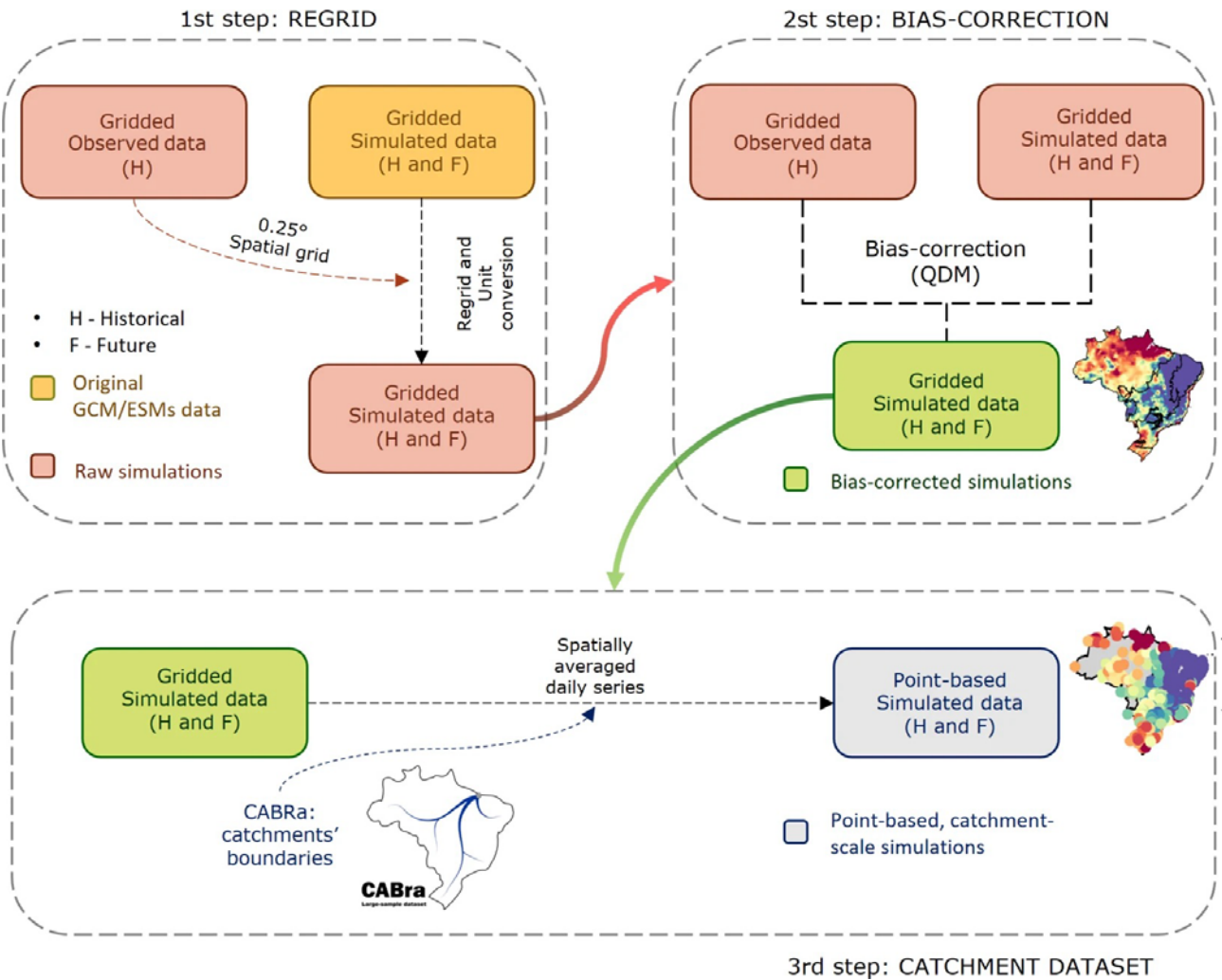
18 As footnote 17 above.

19 See Tran-Anh Q, Ngo-Duc T, Espagne E, et al. 2023. A 10-km CMIP6 downscaled dataset of temperature and precipitation for historical and future Vietnam climate. *Scientific Data*. 10, 257. Available at <https://doi.org/10.1038/s41597-023-02159-2>. The applicable code is available at: <https://github.com/quanta1985/Bias-Correct-and-Spatial-Dissaggregation>.

20 Yuan H, Ning L, Zhou J, et al. 2024. HiCPC: A new 10-km CMIP6 downscaled daily climate projections over China. *Scientific Data*. 11, 1167. Available at <https://doi.org/10.1038/s41597-024-03982-x>.



**Figure 18** Flowchart representing the core steps used to generate the CLIMBra’s products. Step 1 and 2 represent the regrid and bias-correction tasks, respectively. Step 3 represents the framework required to rescaled the gridded dataset to the CABra’s catchments (Source: <https://www.nature.com/articles/s41597-023-01956-z/figures/1>).



Note: Flowchart representing the core steps used to generate CLIMBra products. Steps 1 and 2 represent the re-grid and bias-correction tasks, respectively. Step 3 represents the framework required to rescale the gridded data set to the CABra catchments. Source: <https://www.nature.com/articles/s41597-023-01956-z/figures/1>.

7.



**Future work**



There are many possibilities for supporting the successful implementation of the NAP 3.0 initiative. The following are some of the ideas that the LEG is considering or pursuing:

- Supporting countries in creating **national data bundles** to supplement national data sources by subsetting data from relevant global data sets. The bundles would also be enhanced by data from different ministries and national entities, including main data managed by national statistical offices. These data bundles would support the whole adaptation cycle, and provide detailed inputs in addressing the thematic targets of the global goal on adaptation;
- Expanding the collection of tools to include **essential models for assessment and planning** for NAPs, especially in connection with the global goal on adaptation target areas and relevant components and subsystems. Sample applications would then be shared through GitHub for use by country teams;
- Developing **live documents** for those elements commonly found in the reports/communications to be used in subsequent submissions, with embedded graphics. Similar to Wikipedia entries, such documents would be updated as new data and information emerge, and would be used as part of different formal reports, providing consistent coverage of material that is currently re-produced many times over in different reports;
- Developing NAPs as **Open NAPs** by collaborating with contributors globally to produce best-possible NAPs that combine local and global knowledge on adaptation;
- Developing an **archive of model assessments and appraisals** that give examples of previous users' experience, contributing significantly to the 'learning' aspect of the adaptation cycle. Such model cases would combine science and policy to produce best adaptation practices for addressing common needs;
- Displaying the **results of risk and vulnerability assessments** in data portals and dashboards to support investment planning, as a government service to all stakeholders, including private sector actors.





## For data producers: how to contribute data and tools

Data producers that have made their collections available for open and public use can contact the LEG to have their data included in the data navigator. Country teams that would like their data to be added to a global archive of NAP data can also contact the LEG through the secretariat to discuss next steps.

## For country NAP teams: how to use the NAP Data Initiative

Country NAP teams can request technical assistance in applying the NAP Data Initiative tools by writing to the LEG through the secretariat (at [leghelp@unfccc.int](mailto:leghelp@unfccc.int)).



## Annex: Initial collection of data sources

CATEGORY	VARIABLE	DESCRIPTION	LINK	SOURCE RESOLUTION (G: GRID V: VECTOR)	YEAR(S)
Climate	Precipitation	The University of East Anglia Climatic Research Unit gridded Time Series is a widely used climate data set on a 0.5° latitude by 0.5° longitude grid over all land domains of the world except Antarctica. It is derived from the interpolation of monthly climate anomalies from extensive networks of weather station observations. It has been updated to cover 1901–2020 by including additional station observations, and is updated annually.	<a href="#">CRU.TS.4.05. HighResolution. Gridded</a>	0.5°	1901–2020
Hydrology	Surface water	The Global Surface Water Explorer is a simple web-mapping tool that shows all water data sets worldwide and allows users to use those data sets to navigate the globe without installing any software. It also allows users to view the complete history of water detections over the 37-year period by clicking on the map.	<a href="#">Global Surface Water - Data Access (global-surface-water.appspot.com)</a>		37 years
Hydrology	Run-off	The Global Run-off Database is built on an initial data set built in the early 1980s on the basis of the responses to a request by the World Meteorological Organization to its member countries to provide a global hydrological data set to complement a specific set of atmospheric data in the framework of the first Global Atmospheric Research Program experiment. The initial data set of monthly river discharge data over a period of several years around 1980 was supplemented with the United Nations Educational, Scientific and Cultural Organization's monthly river discharge data collection from 1965 to 1985. Today the Database comprises discharge data of well over 10,000 gauging stations from all over the world.	<a href="#">GRDC Data Portal (bafg.de)</a>		1931–2020
Hydrology	Multiple	HydroATLAS is a comprehensive database gathering and presenting a wide range of hydro-environmental attributes from existing global data sets in a consistent and organized manner. HydroATLAS is divided in three data sets, BasinATLAS, RiverATLAS and LakeATLAS which represent sub-basin delineations (polygons), the river network (lines) and lake shorelines (polygons) respectively. HydroATLAS offers attributes grouped into the following categories: hydrology; physiography; climate; land cover and use; soils and geology; and anthropogenic influences. In its first version, HydroATLAS contains 56 hydro-environmental variables, from which 281 individual attributes were derived.	<a href="#">Global HydroAtlas</a>		37 years

CATEGORY	VARIABLE	DESCRIPTION	LINK	SOURCE RESOLUTION (G: GRID V: VECTOR)	YEAR(S)
Multiple	Multiple	The United States Geological Survey (USGS) Famine Early Warning Systems Network Data Portal provides access to geospatial data, satellite image products and derived data products in support of the Network's drought monitoring efforts throughout the world. This portal is provided by the USGS Famine Early Warning Systems Network Project, part of the Early Warning Focus Area at the USGS Earth Resources Observation and Science Center.	<a href="#">Data Downloads   Early Warning and Environmental Monitoring Program (usgs.gov)</a>		2001–2021
Land cover/use	Crop genebank	Genesys is an online platform offering information about plant genetic resources for food and agriculture conserved in genebanks worldwide.	<a href="#">Genesys PGR (genesys-pgr.org)</a>		
Climate	Surface reflectance	The Moderate Resolution Imaging Spectroradiometer Surface Reflectance products provide an estimate of the surface spectral reflectance that would be measured at ground level in the absence of atmospheric scattering or absorption. Low-level data are corrected for atmospheric gases and aerosols, yielding a level-2 basis for several higher-order gridded products. In the eight-day product, each surface reflectance pixel contains the best possible L2G observation during an eight-day period as selected on the basis of high observation coverage, low view angle, the absence of clouds or cloud shadow and aerosol loading.	<a href="#">MODIS Land Team Home Page (nasa.gov)</a>	Varying	
Anthropo-genic	Economic	The World Development Indicators is the primary World Bank collection of development indicators, compiled from officially recognized international sources. It presents the most current and accurate global development data available and includes national, regional and global estimates.	<a href="#">World Development Indicators (WDI)   Data Catalog (worldbank.org)</a>	Unspecified	1960–2020
Climate	Multiple	WorldClim version 2.1 climate data for 1970–2000. This version was released in January 2020. There are monthly climate data for minimum, mean and maximum temperature, precipitation, solar radiation, wind speed, water vapor pressure and total precipitation. The data are available at four spatial resolutions, between 30 seconds (~1 km <sup>2</sup> ) to 10 minutes (~340 km <sup>2</sup> ). Each download is a .zip file containing 12 GeoTiff (.tif) files, one for each month of the year (January is 1; December is 12).	<a href="#">Worldclim historical, monthly and future data</a>	30 seconds	1970–2100



CATEGORY	VARIABLE	DESCRIPTION	LINK	SOURCE RESOLUTION (G: GRID V: VECTOR)	YEAR(S)
<b>Climate</b>	Air temperature, precipitation	‘Ensemble’ temperature and precipitation data are derived from multiple global circulation models. The ensemble data depict the range (10th percentile, median and 90th percentile) of model outputs run under two scenarios, A2 and B1, for four future time periods. The first listed download contains data aggregated to the country level; the remaining downloads are gridded data in shapefile format.	<a href="#">Climate Change Knowledge Portal: Ensemble Projections   Data Catalog (worldbank.org)</a>	Unspecified	2020–2080
<b>Anthropogenic</b>	Population estimates	This database presents population and other demographic estimates and projections from 1960 to 2050, covering more than 200 economies. It includes population data by age group, sex or urban/rural area, as well as fertility data, mortality data and migration data.	<a href="#">Population Estimates and Projections   Data Catalog (worldbank.org)</a>	Unspecified	1960–2050
<b>Multiple</b>	Multiple	The AQUASTAT database organizes and presents over 180 variables and indicators on water resources and their uses, including water withdrawal, wastewater, pressure on water resources, irrigation and drainage and a few components on environment and health. They can be searched and extracted, along with their metadata, for over 200 countries and different regions, from 1960 to 2017	<a href="#">AQUASTAT database (fao.org)</a>	Varying	
<b>Multiple</b>	Multiple	The statistical database of the Food and Agriculture Organization of the United States provides access to food and agriculture data for over 245 countries and territories and covers all of the Organization’s regional groupings from 1961 to the most recent year available.	<a href="#">FAOSTAT</a>	Varying	1961–2022
<b>Physiography</b>	Elevation	The NASA Shuttle Radar Topographic Mission 90 m digital elevation models have a resolution of 90 m at the equator and are provided in mosaiced 5° x 5° tiles for easy download and use. All are produced from a seamless data set to allow easy mosaicking. These are available in both ArcInfo ASCII and GeoTiff format to facilitate their use in a variety of image processing and geographic information system (GIS) applications. Data can be downloaded using a browser or accessed directly from the USGS FTP site.	<a href="#">SRTM 90m Digital Elevation Database v4.1 – CGIAR-CSI (cgiarcsi.community)</a>	Varying	
<b>Hydrology</b>	River Basin	This database provides the first-ever compilation of the world’s river basins developed specifically for corporate disclosure. It features a comprehensive list of river basins worldwide, including their names, boundaries and other helpful information.	<a href="#">Interactive Database of the World’s River Basins - Home (wateraction-hub.org)</a>	Unspecified	

CATEGORY	VARIABLE	DESCRIPTION	LINK	SOURCE RESOLUTION (G: GRID V: VECTOR)	YEAR(S)
Hydrology	Flood	The Aqueduct Global Flood Risk Maps provide current and future river flood risk estimates in urban damage, affected gross domestic product (GDP) and affected population by country, river basin and state.	<a href="#">Aqueduct Global Flood Risk Maps - Datasets - Data   World Resources Institute (wri.org)</a>	Unspecified	
Hydrology	River Basin	This data set contains data on the world's largest basins.	<a href="#">Major River Basins of the World   Data Catalog (worldbank.org)</a>	Unspecified	
Hazards	Fire	Active fire products from the MODIS (MCD14DL) and Visible Infrared Imaging Radiometer Suite 375 m (VNP14IMGTDL_NRT and VJ114IMGTDL_NRT) for the last 24-hour, 48-hour and 7-day period in shapefile, KML, WMS or text file format.	<a href="#">Active Fire Data   Earthdata (nasa.gov)</a>	Varying	>2002
Land cover/use	Multiple	The Copernicus Land Monitoring Service systematically produces a series of qualified bio-geophysical products on the status and evolution of the land surface, at the global scale and at mid- to low spatial resolution, complemented by the constitution of long-term time series. The products are used to monitor vegetation, the water cycle, the energy budget and the terrestrial cryosphere.	<a href="#">Home   Copernicus Global Land Service</a>	Varying	
Hazards	Fire	NASA Worldview offers global satellite imagery.	<a href="#">EOSDIS Worldview (nasa.gov)</a>	Varying	>1948
Hazards	Fire	The Global Fire Emissions Database contains three data sets, namely burned area, monthly emissions and fractional contributions of different fire types, as well as daily/three-hourly fields to scale the monthly emissions to higher temporal resolution. Each data file contains 1,440 columns and 720 rows and has a 0.25° latitude by a 0.25° longitude spatial resolution.	<a href="#">Data – Global Fire Emissions Database (globalfiredata.org)</a>	0.25°	>1997
Hazards	Fire	The Global Fire Atlas is a new, freely available global data set that tracks the daily dynamics of individual fires to determine the timing and location of ignitions, fire size and duration, as well as daily expansion, fire line length, speed and direction of spread. Data are available in easily accessible GIS-layers and can also be explored online.	<a href="#">Fire Atlas - Global Fire Emissions Database (globalfiredata.org)</a>	500m	2003–2016

CATEGORY	VARIABLE	DESCRIPTION	LINK	SOURCE RESOLUTION (G: GRID V: VECTOR)	YEAR(S)
Land cover/use	Multiple	Global Forest Watch is an online platform that provides data and tools for monitoring forests. By harnessing cutting-edge technology, Global Forest Watch allows anyone to access near-real-time information on where and how forests are changing around the world.	<a href="https://globalforestwatch.org/">Interactive World Forest Map &amp; Tree Cover Change Data   GFW (globalforestwatch.org)</a>		>2001
Land cover/use	Multiple	The Anomaly Hotspots of Agricultural Production system calculates average 10-day values of all key indicators for each ASAP Gaul 1 unit.	<a href="https://europa.eu/asap/">ASAP - EC (europa.eu)</a>		>1989
Climate	Precipitation	Climate Hazards Group InfraRed Precipitation with Station data is a 30+ year quasi-global rainfall data set. Spanning 50°S–50°N (and all longitudes), starting in 1981 and continuing to the near-present, the data incorporate 0.05° resolution satellite imagery with in-situ station data to create gridded rainfall time series for trend analysis and seasonal drought monitoring.	<a href="https://climate.geog.udel.edu/data-sets/">Data Sets   Climate Hazards Center - UC Santa Barbara (ucsb.edu)</a>	0.05°	>1981
Climate	Drought	The European Drought Observatory contains drought-relevant information such as maps of indicators derived from different data sources (e.g. precipitation measurements, satellite measurements and modelled soil moisture content). Different tools, like 'graphs' and 'compare layers', allow for displaying and analysing the information to give an overview of the situation in case of imminent droughts.	<a href="https://europa.eu/euro-drought-observatory/">Timeseries Graphs - European Drought Observatory - JRC European Commission (europa.eu)</a>		
Physiography	Earthquakes	Contains data about location, magnitude and time of most recent earthquakes.	<a href="https://www.usgs.gov/data/earthquake-data/">Latest Earthquakes (usgs.gov)</a>	Unspecified	
Physiography	Earthquakes	Global Active Faults is a comprehensive, global data set of active fault traces of seismogenic concern, run by the Global Earthquake Model Foundation. It comprises GIS files of fault traces and small amounts of relevant attributes or metadata (fault geometry, kinematics, slip rate, etc.) useful for seismic hazard modelling and other tectonic applications. The data set is being assembled primarily as a part of the Foundation's global probabilistic seismic hazard modelling efforts.	<a href="https://github.com/GEMFoundation/global-active-faults">GEMScienceTools/gem-global-active-faults: A global homogenized database of active faults maintained by the GEM Foundation (github.com)</a>	Unspecified	
Physiography	Tsunami	The National Centers for Environmental Information/World Data System Global Historical Tsunami Database contains tsunami source information. The tsunami source data are related to tsunami runup data, which contain information on locations where tsunami effects were observed.	<a href="https://www.noaa.gov/data/ncdc/historical-data-repository/global-historical-tsunami-database/">NCEI Hazard Tsunami Search (noaa.gov)</a>	Unspecified	>1900



CATEGORY	VARIABLE	DESCRIPTION	LINK	SOURCE RESOLUTION (G: GRID V: VECTOR)	YEAR(S)
<b>Physiography</b>	Tsunami	The Global Historical Tsunami Database provides information on over 2,400 tsunamis from 2100 BC to the present in the Atlantic, Indian and Pacific Oceans and the Mediterranean and Caribbean Seas. The database includes two related files. The first file includes information on the tsunami source, such as the date, time and location of the source event; cause and validity of the source, tsunami magnitude and intensity; maximum water height; the total number of fatalities, injuries, houses destroyed and houses damaged; and total damage estimate (in USD).	<a href="#">Dataset Overview   National Centers for Environmental Information (NCEI) (noaa.gov)</a>	Unspecified	>2000
<b>Anthropogenic</b>	Multiple	Contains data about registered hazard events around the globe.	<a href="#">HDDSExplorer (usgs.gov)</a>	Unspecified	>2004
<b>Climate</b>	Sea level rise	This data set is an internationally collected, standardized data set on changes in glaciers (length, area, volume and mass), based on in-situ and remotely sensed observations, as well as on reconstructions.	<a href="#">database versions – world glacier monitoring service (wgms.ch)</a>	Unspecified	1535–2019
<b>Hydrology</b>	Flood	Aqueduct analyses flood risk under current and future climate conditions; assesses (large) flood risks by country, river basin, state or city (120), by population, GDP or urban damage; and evaluates risks for 2010 and 2030 under three scenarios (RCP 4.5 with SSP2, RCP 8.5 with SSP2 and RCP 8.5 with SSP3).	<a href="#">Aqueduct Global Flood Analyzer</a>		
<b>Climate</b>	Greenhouse gas (GHG) emissions	ClimateWatch is a platform that visualizes and compares national emissions, climate commitments and performance as well as national summaries of climate vulnerability and readiness, climate risk indexes (Germanwatch) and associations between nationally determined contributions and the Sustainable Development Goals.	<a href="#">ClimateWatch</a>		1990
<b>Hydrology</b>	Flood	Global (near-) real-time archive of large flood events based on news, government, surface and satellite sources. It is available as an online table or can be downloaded as an Excel spreadsheet. Each entry includes the country or area affected, main causes, number of fatalities and/or persons displaced and a severity score.	<a href="#">Dartmouth Flood Observatory</a>		1985
<b>Anthropogenic</b>	Multiple	Country disaster loss: covers all disaster types (including non-climatic) occurring in 1970–2013. Raw data are accessible in a spreadsheet file. It has searchable archives.	<a href="#">DesInventar-Sedai</a>	Unspecified	1970–2013

CATEGORY	VARIABLE	DESCRIPTION	LINK	SOURCE RESOLUTION (G: GRID V: VECTOR)	YEAR(S)
<b>Anthropo- genic</b>	Multiple	International disaster database for vulnerability assessment and priority-setting that provides core data on the occurrence and impacts of more than 22,000 mass disasters since 1900. The archive is searchable by period, country, disaster type and impact. Climate-related disasters include wildfire, drought, mass movement, landslide, flood, fog, extreme temperature and storms. Output is in reference maps, CSV files and time series plots.	<a href="#">Emergency Events Data-base</a>	Unspecified	
<b>Hydrology</b>	Run-off	Gridded storm surface run-off and groundwater baseflow products based on satellite observations and land surface modelling.	<a href="#">Land Data Assimilation System</a>	Varying	>1948
<b>Anthropo- genic</b>	Water, sanitation and hygiene	The Joint Monitoring Programme for Water Supply, Sanitation and Hygiene provides global data on water, sanitation, and hygiene , including annual country-level indicators showing status and trends toward Sustainable Development Goals; standard classification and estimation methods applied across countries; and downloadable country files with graphics and raw data. Data are searchable at the rural, urban, socioeconomic and service level.	<a href="#">Joint Monitoring Programme</a>	Unspecified	2000–2015
<b>Anthropo- genic</b>	Multiple	National indexes of climate vulnerability and readiness to adapt –45 indicators of climate change related vulnerability and readiness for 192 United Nations countries since 1995; vulnerability scores for water, agriculture, health, infrastructure, food and ecosystems; component scores for climate exposure, sensitivity and adaptive capacity; readiness scores based on economic, governance and social indicators; and GDP-adjusted scores.	<a href="#">Notre Dame Global Adaptation Initiative (NDGAIN) Country Index</a>		>1995
<b>Physiogra- phy</b>	Glacier extent	A global inventory of glacier outlines (ice covered areas) at the beginning of the 21st century; includes topographic and hypsometric attributes for most glaciers; data available as ESRI shapefile or KML.	<a href="#">Randolph Glacier Inventory</a>		>2000
<b>Hazards</b>	Multiple	Inventories of river and urban flooding, earthquake, landslide, wildfire, water scarcity, extreme heat, coastal flood, cyclone, tsunami and volcano hazards.	<a href="#">ThinkHazard!</a>		
<b>Hazards</b>	Multiple	National disaster risk profiles and loss estimates.	<a href="#">Preventionweb</a>		

CATEGORY	VARIABLE	DESCRIPTION	LINK	SOURCE RESOLUTION (G: GRID V: VECTOR)	YEAR(S)
<b>Anthropo- genic</b>	GHG emissions	GHG and socioeconomic data: portal provides links to 20 external sources of primary data covering emissions, development indicators, energy production and prices, sector and environmental indicators.	<a href="#">United Nations Climate Change portal</a>		
<b>Anthropo- genic</b>	Economic	Human development indicators.	<a href="#">United Nations Development Programme</a>		1990–2015
<b>Anthropo- genic</b>	Multiple	Global international trade, national accounts, energy, industry, environment, demographic and social statistics.	<a href="#">United Nations Statistics Division</a>		>2000
<b>Climate</b>	Precipitation	Various remotely sensed precipitation products with spatial resolutions of 0.04° (2003–present) and 0.25° (1983–2017) for the domain 60° S to 60° N; online data visualization tool and FTP download.	<a href="#">Precipitation Estimation from Remotely Sensed Information using Artificial Neural Networks</a>	Varying	>1983
<b>Multiple</b>	Multiple	Searchable repository for the Asia-Pacific region providing links to resources (e.g. Asian Precipitation – Highly-Resolved Observational Data Integration Towards Evaluation; Southeast Asian Climate Assessment and Dataset; Precipitation Estimation from Remotely Sensed Information using Artificial Neural Networks). Data are accessible for points and areas and are easily downloadable.	<a href="#">Regional Climate Consortium for Asia and the Pacific</a>		
<b>Multiple</b>	Multiple	Searchable archive by domain, date range, spatial and temporal resolution; output as maps, time series and other formats.	<a href="#">Tropical Rainfall Measuring Mission</a>	0.25°	1998
<b>Multiple</b>	Multiple	User interface with searchable map providing access to forecast, model, radar, reanalysis and station weather variables.	<a href="#">Planet OS</a>		
<b>Multiple</b>	Multiple	Searchable archive by city, state, zip code or airport; coverage tends to be post-2000; variables include maximum, minimum and mean daily air temperature, dew point temperature, relative humidity, air pressure, visibility and wind speed, precipitation, cloud cover and wind direction; data up to date.	<a href="#">Weather Underground</a>		>2000



CATEGORY	VARIABLE	DESCRIPTION	LINK	SOURCE RESOLUTION (G: GRID V: VECTOR)	YEAR(S)
Climate	Precipitation	High density and quality rain gauge network covering 1950–2011.	<a href="#">Asian Precipitation – Highly Re-solved Observational Data Integration Towards Evaluation of Water Resources</a>		1950–2011
Climate	Multiple	Daily, monthly and seasonal re-analysis products (including precipitation rate, air temperature, zonal wind and sea level pressure).	<a href="#">Earth System Research Laboratory (ESRL)</a>		
Climate	Multiple	Daily data for standard meteorological variables.	<a href="#">Global Summary of the Day</a>		
Climate	Multiple	Daily and monthly weather variables (including maximum and minimum temperature, total precipitation, snowfall and snow depth) for land surface stations.	<a href="#">Global Historical Climate Network</a>		
Climate	Multiple	Daily atmospheric predictor variables (for downscaling).	<a href="#">SDSM Portal</a>	2.5°	<1948
Hydrology	Multiple	Weekly and monthly water and environmental data for Central Asia. Various data sets accounting for land and water resources in the Aral Sea basin.	<a href="#">CAWater-Info</a>		>1980
Climate	Drought	Monthly Palmer Drought Severity Index for global land areas.	<a href="#">ESRL</a>	2.5°	1850–2012
Climate	Multiple	Monthly rainfall, temperature and potential evapotranspiration.	<a href="#">Global Climate Monitor</a>		<1901
Hydrology	Ice	Monthly ocean, ice and hydrology equivalent water height. Global water storage anomalies relative to time-mean of monthly mass, applicable to ocean, ice and hydrology; expressed as equivalent water thickness (in cm).	<a href="#">Gravity Recovery and Climate Experiment</a>	0.25°	
Climate	Multiple	Monthly precipitation, temperature and air pressure.	<a href="#">KNMI Climate Explorer</a>		
Climate	Sea level rise	Monthly and annual sea levels.	<a href="#">Permanent Service for Mean Sea Level</a>		>1980

CATEGORY	VARIABLE	DESCRIPTION	LINK	SOURCE RESOLUTION (G: GRID V: VECTOR)	YEAR(S)
Climate	Multiple	Seasonal teleconnection patterns: tool for analysing seasonal mean correlation fields for National Centers for Environmental Prediction re-analysis variables versus specified teleconnection and ocean indexes; exploring coincident and lagged relationships; importing user-created time series; and exploring versatile plotting options.	<a href="#">ES</a>		>1948
Multiple	Multiple	Various time scales of remotely sensed Earth observations for aerosols, atmospheric chemistry, atmospheric dynamics, cryosphere, hydrosphere, ocean biology, oceanography, water and energy cycles.	<a href="#">Giovanni</a>		>1948
Anthropo- genic	Multiple	Maps covering a wide range of climate variables, indicators of food security, agriculture, teleconnection indexes, human health, fire risk, water management; data can be downloaded for user-specified domains, time periods and formats; interactive maps to plot time series of indexes at selected locations.	<a href="#">IRI Climate and Society Map Room</a>		
Climate	Multiple	Global weather and climate extremes archive.	<a href="#">World Meteorological Organization</a>		
Climate	Multiple	Hourly to seasonal regional climate model output.	<a href="#">Coordinated Regional Coupling Downscaling Experiment</a>		2050
Climate	Multiple	Daily bioclimatic, precipitation, solar radiation and temperature variables. Bias-corrected and spatially downscaled data derived from CMIP3 and CMIP5 output, available at spatial resolutions of 30 seconds to 20 minutes, and intended for agricultural applications.	<a href="#">Climate Change, Agriculture and Food Security</a>	Varying	
Climate	Air temperature, precipitation	Daily weather generator of precipitation, solar radiation, maximum and minimum temperature. Site-specific synthetic data are obtained by entering location name or coordinates; simulations are conditioned by CMIP5 model(s) and RCPs for target years in 2010–2095; variables are intended for agricultural applications, but may have wider utility; and outputs are provided as text file, histogram or polar charts.	<a href="#">MarkSim Weather Generator</a>		2010–2095

CATEGORY	VARIABLE	DESCRIPTION	LINK	SOURCE RESOLUTION (G: GRID V: VECTOR)	YEAR(S)
Climate	Air temperature, precipitation	Daily bias-corrected precipitation, maximum and minimum temperature. High-resolution (~25 km) global historical and climate change scenarios for 21 GCMs, RCP 4.5 and RCP 8.5 for 1950–2100.	<a href="#">NASA Earth Exchange Global Daily Downscaled Projections (NEX-GDDP)</a>	~25 km	1950–2100
Climate	Multiple	Daily weather as well as exotic variables (such as storm surge, air quality and heat island indexes). Globally applicable statistical downscaling model that can reconstruct and synthesize site-specific weather series and exotic variables on the basis of re-analysis predictors covering 1948–present; useful for infilling missing data or generating synthetic scenarios for stress testing impact models and adaptation options.	<a href="#">Statistical Downscaling Model-Decision Centric</a>		>1948
Climate	Multiple	Monthly global climate model output (various Historic and CMIP experiments; produces maps and time series; searchable by domain, country, point; output for standard climate variables; raw data available in TXT format.	<a href="#">KNMI Climate Explorer</a>		
Climate	Air temperature, precipitation	Decadal mean projections and changes in precipitation, maximum and minimum temperature for Southeast Asia from the 2010s to the 2090.	<a href="#">SEA START RC Data Distribution System</a>		2010–2090
Climate	Multiple	Global climate model output (CMIP3 and CMIP5)– Snapshots of the CMIPs that underpinned the IPCC Fifth Assessment Report; archive of 952 simulations provided by 58 models from 24 institutes.	<a href="#">IPCC Data Distribution Center</a>		
Climate	Multiple	Global climate model projections (CMIP5): An atlas of global and regional climate projections from the IPCC Fifth Assessment Report; a point of reference for projected seasonal and annual precipitation and temperature changes relative to 1986–2005; maps show the 25 <sup>th</sup> , 50 <sup>th</sup> and 75 <sup>th</sup> percentiles of the collection for 2016–2035, 2046–2065 and 2081–2100; maps cover SREX regions as well as the Caribbean, Indian Ocean, and Pacific Island States and land and sea areas of the two polar areas; hatching denotes areas with weak signals relative to model variability.	<a href="#">IPCC AR5 Annex1</a>		1986–2100



CATEGORY	VARIABLE	DESCRIPTION	LINK	SOURCE RESOLUTION (G: GRID V: VECTOR)	YEAR(S)
Climate	Multiple	Global climate model change factors (CMIP3, CMIP5) and downscaled scenarios (CMIP3) – CMIP3 (SRES A2, B1) and CMIP5 (RCP 2.6, 4.5, 6, 8.5) projections for standard and sector-specific climate indicators (e.g. days with heavy rain, hot and cold days, days below freezing) for 2020–2039, 2040–2059, 2060–2079 and 2080–2099; change factors available as spreadsheet files; downscaled global daily scenarios for some CMIP3 models and climate indexes.	<a href="#">World Bank Climate Change Knowledge Portal</a>		
Anthropo- genic	Climate risk	National indicators of climate impacts and vulnerability. National vulnerability levels shown for 2010 and 2030 with indicative economic costs; results in tabular and map format.	<a href="#">DARA Climate Vulnerability Monitor</a>		
Anthropo- genic	Climate risk	Regional and country-specific climate risk profiles: high-level summaries of expected sector impacts for agriculture, water energy, coastal ecosystems, infrastructure and human health; useful links to supporting information on institutional context, national strategies, key reports and donor programmes; annexes contain forms of language for sector contracts.	<a href="#">United States Agency for International Development Fact Sheets</a>		
Climate	Multiple	Portal for accessing agriculture, water, energy and health sector climate indexes: 38 climate variables accessed by the Climate for Sectors Dashboard; available in graphical and Excel formats, by Global Climate Model and emissions scenario, for CMIP3 and CMIP5; some future downscaled scenarios.	<a href="#">World Bank Climate Change Knowledge Portal</a>		2020–2100
Anthropo- genic	Health	Country-specific evaluations of present and future climate impacts on human health: first round (2015) profiles cover 40 countries, second set (2019) will expand to ~80 countries; each shows burden of climate change on human health, with opportunities for health co-benefits from climate mitigation actions, and analysis of policy responses at the national level.	<a href="#">World Health Organization Health and Climate Change Country Profiles</a>		>2015
Climate	Air temperature, precipitation	TerraClimate is a global gridded data set of meteorological and water balance variables for 1958–present, available on a monthly timestep. Its relatively fine spatial resolution, global extent and long duration are a unique combination that fills a void in climate data. TerraClimate combines spatial climatology from WorldClim with time-varying information from the coarser resolution CRU TS4.0.	<a href="#">Terraclimate</a>		>1958

# About the Least Developed Countries Expert Group

The LEG was established in 2001 as part of the support offered to the LDCs under the United Nations Framework Convention on Climate Change. As a result of its mandate, the Group has developed and implemented a wide range of adaptation-related activities over the years to provide technical guidance and support to the LDCs. Its mandate also includes providing the LDCs with technical guidance and advice on the process to formulate and implement NAPs, as well as on preparing and implementing national adaptation programmes of action and implementing the LDC work programme under the UNFCCC. The LEG is also mandated to provide technical guidance and advice on accessing funding from the GCF for the process to formulate and implement NAPs, in collaboration with the GCF secretariat.

The work programme of the LEG is implemented in a variety of ways, such as through provision of technical guidance and advice, preparation of technical guidelines, technical papers, training activities and workshops, conduct of expert meetings, organization of NAP Expos, conduct of case studies, capturing and sharing of experience, best practices and lessons learned, maintenance of NAP Central, monitoring of progress, effectiveness and gaps, collaboration with other bodies, programmes and organizations, and promotion of coherence and synergy in adaptation planning and implementation. The LEG is composed of 17 members: 13 from LDC Parties and 4 from developed country Parties.

More information about the LEG, including its work programme, is available at <https://unfccc.int/LEG>.

