Deliverable 5.1 Data Management Plan

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Consortium Members:

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Cardiff University	CU	United Kingdom
University of Bristol	UoB	United Kingdom
Stichting VU	IVM-VU	Netherlands
Universiteit Gent	UGent	Belgium
University of East Anglia	UEA	United Kingdom
Aalborg Universitaet	Aalborg-PLAN	Denmark
IGAD Centre for Climate Prediction and Application	ICPAC	Kenya
Action Aid International Kenya	AA	Kenya
Food and Agriculture Organization of the United Nations FAO	FAOSWALIM	Italy
Climate Analytics GMBH	CA	Germany
BBC Media Action	BBC-MA	United Kingdom
Transparency Solutions Limited	TS	United Kingdom
University of Nairobi	UoN	Kenya
Addis Ababa University	AAU	Ethiopia

DMP Versions:

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1.0	08/03/2021	▪ Initial version

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Executive Summary

DOWN2EARTH is an EU Horizon 2020 project working on improving and translating climate information and policy for rural communities in the Horn of Africa Drylands. The project is an interdisciplinary, geographically widespread partnership, with consortium members from across Europe and East Africa. DOWN2EARTH has embraced the European Union requirement for open access publication of all research outputs as well as improving access of research data and encouraging re-use where possible.

Within the four year lifetime of the project, there will be nine key tasks that will produce new datasets and In order to outline how all data in by this project is ethically obtained, stored securely and published appropriately, we have produced this data management plan (DMP). This plan is 'Deliverable 5.1 – Data Management Plan' and is the first iteration. In brief the DMP describes the purpose and use of each dataset that will be produced along with methods of data accessibility and storage. A key message from the EU is that, where possible, data should be findable, accessible, interoperable and reusable (FAIR). Thus, it is made clear in this plan what datasets are able to be openly accessible and if that is not possible, what the reasoning is to keep certain data restricted. Key types of data have been identified through the process of writing this plan, such as the focus group discussion data, participatory action research with women and men, as well as the outputs of both agent based modelling and hydrological modelling.

The data management plan will serve as a living document to be updated at key intervals throughout the lifetime of the project as more information and data is produced and procedures are finalised.

Introduction

The purpose of this deliverable is to provide an overarching document that details the main datasets that will be produced by this project, as well as the accessibility, storage and ethical considerations of these datasets. Given that the lead institution of each task will be responsible for their own data security and storage processes, this document provides critical structure and cohesiveness across the consortium throughout the lifetime of the project.

In addition to this report, there is an appendix that provides supplementary information that is relevant to data management. Appendix 1 is the Participation and Publication Policy which serves as a project-wide agreement between all consortium members on open access publishing as well as the publication ethos and authorship requirements. In line with this document, any datasets that include sensitive personal information will be compliant with the General Data Protection Regulation (GDPR). GDPR is an important regulation intended to enhance protection for situations when an individual provides information that serves as data for any organisation.

The DMP itself is structured to ensure all elements required by the European Commission are fully addressed. Each task that will produce data has a data summary which includes the purpose and description, format and type of data being produced, the origin and size of the data, as well as the utility. If data is to be made open access, then the FAIR principals (findable, accessible, interoperable and reusable) are described for each dataset, including which repository is to be used and whether DOIs and metadata will accompany the dataset. Finally this DMP will describe the data storage process and ethical considerations of data management. As previously noted, this is the first iteration of the plan, and future iterations will provide more information on some elements which is currently unknown (these are highlighted throughout the document).

DOWN2EARTH will produce a wide diversity of datasets arising from nine key tasks. This data includes interview and focus group responses of rural communities and journalists, a number of model parameterisation and inputs as well remote sensing data and secondary data analysis. The tasks that will produce this data are listed below:

- Work Package 1/Task 1.1: Research in rural communities to understand gendered decision-making for climate adaptation. Partner Lead: University of East Anglia

- Work Package 1/Task 1.2: Identify existing water management and food security policies and their efficacy in HAD. Partner Lead: Climate Analytics GMBH

- Work Package 1/Task 1.3: Analyze interactions between climate and policy and their impacts on human society. Partner Lead: Stichting VU

- Work Package 2/Task 2.2: Track historical socio-economic/land use trends and their interaction with the water cycle within HAD. Partner Lead: Universiteit Gent

- Work Package 3/Task 3.1: Develop regional model to assess climate impacts on water and food over various planning horizons. Partner Lead: Cardiff University

- Work Package 3/Task 3.2: Improve regional seasonal forecasts to support warning systems on food security and water resources. Partner Lead: Cardiff University

- Work Package 3/Task 3.3: Simulate impacts of future climate change scenarios on water scarcity and food insecurity. Partner Lead: Cardiff University

- Work Package 4/Task 4.1: Enhance future preparedness and social resilience to climatic shocks through media communication. Partner Lead: BBC Media Action

- Work Package 4/Task 4.3: Expand remote sensing and in situ observation capabilities to improve preparedness to water scarcity. Partner Lead: IGAD Centre for Climate Prediction and Application (ICPAC)

Data Summary

All the data discussed in this section is created in line with the objectives of the DOWN2EARTH project. The data produced is diverse and is controlled and stored according to each of the leading partner institutions. Whilst we, as a project, are committed to ensuring as much data as possible is open access, this is not possible for some data and in these cases a short summary and justification is provided.

Work Package 1/Task 1.1: Research in rural communities to understand gendered decision-making for climate adaptation

Data Description/Purpose
The purpose of this data is to learn from community members within selected districts in Ethiopia, Kenya and Somalia about the challenges different social groups face in managing water scarcity and variability. The information will include their patterns of decision making and how this is socially differentiated, barriers and enablers to accessing knowledge and undertaking adaptation, and perspectives on the utility/delivery of information for adaptation (time frames of forecasts, representation of uncertainty etc).

Data Type and Format
The data referred to above will be primarily qualitative, in the form of interview transcripts and field notes, drawn from semi-structured individual and group interviews with community members and other key informants.

Data Re-Use
Data will not be re-used.

Data Origin
This is primary data, derived from interviews and other interactions with people. The data (interview transcripts) will be stored only in password-protected sites, and directly accessible only to those researchers directly involved in the data collection and analysis.

Data Size
We expect to have multiple sources, but the main dataset will be 96 interview transcripts per country (288 in total); each transcript will be approximately 1000-2000 words in length.

Data Utility
The data will be useful to many partners within the DOWN2EARTH consortium, and provides the basis for teams such as app development, policy development and model development. It may also interest other NGOs and projects looking to engage in co-production of climate services in the area.

Will the Data be Open Access?
No - We do not believe the data will be suitable for sharing for three main reasons: a) for ethical reasons of privacy we have to maintain strict anonymity of sources, which means any interview transcripts that are shared would have to be so heavily redacted as to lose meaning and content;

b) methodologically, it is important that we produce transcripts that faithfully follow the dialogue with interviewees, which means this qualitative data is not formally structured in a way that is readily usable by others; and c), the content of interviews is contextual to people's personal situation and to the flow of the dialogue such that it not readily transferable.

Work Package 1/Task 1.2: Identify existing water management and food security policies and their efficacy in HAD

Data Description/Purpose

The purpose of this dataset is to understand existing climate adaptation policies as well as determine the efficacy of these policies. Following on from this, the overall aim is to support the generation of robust climate policy frameworks as a method of ensuring a water and food secure climate future for communities in the Horn of Africa Drylands (HAD).

Data Type and Format

The data will consist of both secondary and primary data, which will be both numerical and categorical. The exact format is not yet known.

Data Re-Use

The data will be mostly used to inform the work under DOWN2EARTH. In the course of the project, re-use will be further discussed to inform other projects in Climate Analytics and other consortium partners. Furthermore, user-friendly public access will be evaluated particularly in the context of the sustainability of the data and the possibilities for regular updates beyond the project period of DOWN2EARTH.

Data Origin

Data will be drawn from the following sources:

- Government websites
- Ministries
- Peer-reviewed papers
- Reports, documents and media sources
- Other grey literature
- Interviews
- Existing databases/repositories

Data Size

This is not yet known (rather small in comparison to quantitative data sets in climate science), but will be elaborated upon in future iterations of the DMP.

Data Utility

Data will be of interest to policymakers, civil society, farmers, pastoralists, youth, women, persons with disability, researchers, academia, private sector, international organizations, NGOs, specialised government agencies and county/regional governments, indigenous and local communities, media and students among others.

Will the Data be Open Access?
Yes – see FAIR data section for details.

Work Package 1/Task 1.3: Analyze interactions between climate and policy and their impacts on human society

Data Description/Purpose
The data will be an analysis of interactions and feedbacks between climatic stressors, human behaviours, and policy implementation in order to evaluate the effectiveness of climate adaptation policies.

Data Type and Format
The data will consist of different modelled results from past and future policy and climate scenarios applied to the hydrological system, which will be generated as maps and time series.

Data Re-Use
Climatological, hydrological, terrain, socio-economic, water/land use management and impact data will be re-used. This is mostly open source data (ERA5, GloFAS. FAO, GRACE). We hope to obtain data from local offices as well.

Data Origin
The inputs into our Agent Based Model (ABM), requires survey and choice experiment data collected in the field, policy data, and past and future hydroclimatological data. The outputs of this data will consist of model results, and are primary data.

Data Size
This is not yet known and will be described in future iterations of the DMP. The size depends mainly on if and how many (raster) maps will be produced. When only the underlying code is being published, the data size will be much smaller.

Data Utility
Those interested in this data will include policy makers, local farmers, scientists and NGO's.

Will the Data be Open Access?
Yes – see FAIR data section for details.

Work Package 2/Task 2.2: Track historical socio-economic/land use trends and their interaction with the water cycle within HAD

Data Description/Purpose
FLEXPART is a Lagrangian parcel trajectory model that simulates the trajectories of air parcels, which allows for in-depth investigation of sources and sinks of water vapour and heat in the atmosphere. FLEXPART will be coupled to COSMO-CLM^2, a state-of-the-art regional climate model, often used to reproduce the effect of land surface perturbations on atmospheric processes. The coupling of FLEXPART and COSMO-CLM^2 (COnsortium for Small-scale

MOdeling, the Climate Limited-area Model community and the Community Land Model) will enable us to disentangle the effect of land use changes and agricultural drought on the precipitation patterns in the HAD region. Model outputs will be generated and stored.
Satellite observations will be used for three main purposes: (a) to reveal the drivers of vegetation variability in the HAD region by applying causal inference techniques, (b) to steer the estimates of CUWALID via data, (c) to provide machine-learning-based seasonal forecasts of monthly precipitation.

Data Type and Format
Data types include trajectories of 2-4 million parcels, 2D and 3D fields of land surface and atmospheric variables, model outputs, global synthesis of precipitation and global satellite-based fractional vegetation cover. The full explanation of each data type and format can be found in Appendix 2.

Data Re-Use
Part of the envisaged activities rely on existing data that has either been produced by Universiteit Gent, or already collected. The totality of the database is open access.

Data Origin
FLEXPART data - simulations have already been performed in a previous project (joined project with the University of Vigo, Ourense, Spain) and will be re-used in this project. Additional FLEXPART-ERA5 simulations may be performed if required.
FLEXPART–COSMO-CLM^2 data - model simulations will be performed in the project.
Satellite and other observational data will be taken from a range of different sources, which are listed in full in Appendix 2.

Data Size
FLEXPART data will be between 10-70TB
FLEXPART–COSMO-CLM^2 data is between 60-220 TB
Satellite and other observational data is mostly small but will be a maximum of 120TB.
Full details of data size can be found in Appendix 2.

Data Utility
Model simulations from FLEXPART and COSMO-CLM^2 may be reused in other projects. Most observational datasets are already part of the database from the Universiteit Gent research group, which is used for different projects. The datasets that will be collected during the project will become part of this data archive.

Will the Data be Open Access?
Yes – see FAIR data section for details.

Work Package 3/Task 3.1: Develop regional model to assess climate impacts on water and food over various planning horizons

Data Description/Purpose
The data produced will enable us to demonstrate the ability of the model to simulate regional water balance components and constrain the uncertainties in those simulations. The data will be input and output files from a regional model used to assess climate impacts on water and food over various planning horizons. The data will include outputs from evaluation runs, along with relevant metadata on parameter values and simulation details.

Data Type and Format
Data will be in the form of input text files and Python scripts and output netcdf and text files.

Data Re-Use
Existing data will be used only as model input to the models.

Data Origin
All data will come from computer model simulations.

Data Size
The output size will be very large (many TB) but this will be clarified in future DMP iterations.

Data Utility
This data will be of interest to scientists, government departments, NGOs and policy makers with an interest in East African water availability.

Will the Data be Open Access?
Yes – see FAIR data section for details

Work Package 3/Task 3.2: Improve regional seasonal forecasts to support warning systems on food security and water resources

Data Description/Purpose
The data produced will enable us to estimate how particular seasonal weather forecasts might affect water balance components such as soil moisture, streamflow and groundwater storage. The data will be input and output files from a regional model used to assess climate impacts on water and food over various planning horizons. These data will consist of example ensembles of input rainfall and potential evapotranspiration data for seasonal and sub-seasonal forecasts used to drive our regional model, as well as the corresponding outputs on water storage.

Data Re-Use
Existing data will be used only as model input to the models.

Data Origin
All data will come from computer model simulations. Over the lifetime of the project, we plan to shift the running of these simulations from Cardiff to ICPAC, so that these outputs become part

of their internal climate services generation process. As such, model outputs will be made available to the public or specific stakeholder communities according to existing agreements and practices within ICPAC (beyond the lifetime of DOWN2EARTH).

Data Size
The output size will be very large (many TB) but this will be clarified in future DMP iterations.

Data Utility
This data will be of interest to scientists, government departments, NGOs and policy makers with an interest in East African water availability.

Will the Data be Open Access?
Yes – see FAIR data section for details

Work Package 3/Task 3.3: Simulate impacts of future climate change scenarios on water scarcity and food insecurity

Data Description/Purpose
The data produced will enable us to estimate how particular climate change scenarios might affect water balance components such as soil moisture, streamflow and groundwater storage. The data will be input and output files from a regional model used to assess climate impacts on water and food over various planning horizons. These data will consist of example ensembles of input rainfall and potential evapotranspiration data for future climate scenarios used to drive our regional model, as well as the corresponding outputs on water storage.

Data Re-Use
Existing data will be used only as model input to the models.

Data Origin
All data will come from computer model simulations.

Data Size
The output size will be very large (many TB) but this will be clarified in future DMP iterations.

Data Utility
This data will be of interest to scientists, government departments, NGOs and policy makers with an interest in East African water availability.

Will the Data be Open Access?
Yes – see FAIR data section for details

Task 4.1: Enhance future preparedness and social resilience to climatic shocks through media communication

Data Description/Purpose

The data will allow DOWN2EARTH to develop an understanding of media consumption, knowledge, and attitudes by target rural communities and build the capacity of local radio station partners through training, mentoring and equipment donation, including supporting local radio stations to produce media content focusing on water scarcity, food insecurity, and climatic adaptation.

Formative research will be conducted to understand target audiences knowledge, attitudes and current practices in relation to issues related to water scarcity, food insecurity and general climatic adaptation issues. Partner journalists will also be interviewed to assess their current capacity to produce content covering these same issues. Additional interviews will also be conducted with water and food security experts to understand how they respond to food insecurity and water scarcity in their communities and how they share critical information related to those issues to different target groups.

Within the course of the project as part of monitoring activities, interviews will be conducted with programme listeners, journalists and the experts working with the journalists to produce the programmes. This will be aimed at tracking whether project objectives are being met and the data will be utilized to make adjustments/improvements in content/communications strategy on an ongoing basis.

At the end of the project, a qualitative end line evaluation consisting of interviews with audience members, journalists, experts and other relevant stakeholders will be conducted to assess whether the project achieved its intended objectives/impact.

Data Type and Format

Primary interviews with audience members, journalists and experts will be qualitative and the reports generated will be text files (MS Word or MS PowerPoint). Audio files of interview recordings as well as relevant videos/photographs will also be generated. Content tracking per station will be done via MS Excel.

Data Re-Use

Reference will be made to existing reports from a previous project (Weatherwise) that was largely similar in theme and implementation as this project. Insights on audience information needs as well as how weather experts can work well with journalists to effectively communicate weather/climate information to audiences, will also be utilized in this project as well to help craft content and improve the mentoring process. Additionally, existing research with partner stations previously engaged under Weatherwise will be utilized to design and improve the mentoring process.

Data Origin

Data are from primary interviews with audience members, partner journalists and experts, production reports gathered directly from the partner journalists/stations and existing reports generated under the ‘Weatherwise’ project.

Data Size
The exact data size is unknown, but it is anticipated that most generated reports will be small- each 10MB or less. Audio/video files may however be bigger- each 250 MB or less. Full information will be given in future iterations of this report.

Data Utility
Data will be used by us to inform the mentoring and help the partner stations to help them craft programming that responds to their audiences' information needs. It will also help the mentoring team to identify what suitable support to provide to the stations on an ongoing basis. Data can be made available more widely to the consortium on request.

Will the Data be Open Access?
No – due to the sensitive and specific nature of the data, we do not believe the data will be suitable for sharing (please see Task 1.1 open access information for further details).

Work Package 4/Task 4.3: Expand remote sensing and in situ observation capabilities to improve preparedness to water scarcity

Data Description/Purpose
Weather data from automated weather stations (AWS) will be collected. The purpose is to increase the geographical extent of in-situ rainfall and temperature data and to fill in gaps in the region. The data from remote sensing networks will be blended by ICPAC with the gridded data from CHIRPS or other rainfall products to improve overall regional coverage of actionable rainfall information. This task is relevant to DOWN2EARTH since it improves the network observations linking to water scarcity in the HAD region. The data will contribute to rainfall forecasts through the GHACOF to modelling efforts on WP3, the results of which will be included in the ICPAC website (e.g., with the East Africa Climate Hazards desktop app).

Data Type and Format
The project will generate surface observations from AWS in text format, .csv, Geotiff and netCDF or OGC standard formats.

Data Re-Use
We will use the pre-gridded CHIRPS data to supplement those from AWS in precipitation seasonal forecasting.

Data Origin
The data will come from AWS and other station observations. There are several sources for remote sensing, the origin of these types of data will be the different satellite data providers (including new products such as AgMerg). The data will be received by ICPAC via online downloads and also via the satellite receiving station at ICPAC - the Climate Station and the eStation (MESA station).

Data Size

While the .csv/text files from the AWS stations are relatively small in size (a few MBs at most) the gridded data is resource intensive and thus the size is expected to be up to several hundred GB.

Data Utility

The generated data will be useful to analysts and decision makers across many sectors. Some of the beneficiaries include national meteorological and hydrological agencies, key national ministries dealing with food security, water management, disaster risk management, climate change, private sectors utilizing climate data in provision of their services, research institutions, non-governmental organisations involved in water and food security monitoring/mitigation and the general public. The data will also be relevant to ICPAC, water and food security sectors, as well as internal researchers in DOWN2EARTH.

Will the Data be Open Access?

Yes – see FAIR data section for details.

FAIR Data

Seven of the nine datasets that will be produced by DOWN2EARTH will be open access in line with both EU policy as well as the DOWN2EARTH ethos. In the following section, the FAIR principals are discussed for each of these datasets, and where information is not yet known, this will be included in future iterations of the DMP.

Work Package 1/Task 1.2: Identify existing water management and food security policies and their efficacy in HAD

Findable Data

All data will have a unique DOI and search keywords (for example; adaptation, climate change, policy, water and food security) associated with it. Version numbers will be clearly indicated and metadata will be provided, although more details of this will be provided in future DMP iterations.

Open Access Data

Data from this task will be made available in an open access repository. The exact repository has not yet been finalized, but discussions have indicated that this may be Zenodo or the Climate Analytics own database. No specialized software will be needed and the users of the data will need to sign in and provide information about themselves and what they intent to use the data for, which ensures traceability.

Interoperable Data

Climate Analytics will endeavour to align our data to agreed formats to foster interoperability. Given the multitude of interlinking tasks, this has been agreed and discussed throughout the DOWN2EARTH consortium and standard vocabularies and lexicography has been established across all areas of the project to ensure interoperability. The final details of metadata methodologies are yet to be finalized and this will be added to future iterations of the DMP.

Reusable Data

Data will be available on open access platforms as soon as it is cleaned and suitable for publication. The data will remain available after the lifetime of the project in the repository, until such a time it is deemed to be outdated.

Work Package 1/Task 1.3: Analyze interactions between climate and policy and their impacts on human society

Findable Data

Data will be findable via a DOI link that will be provided containing the published data and meta-data. This will be linked to the scientific publications. Naming conventions will be consistently formatted with the following: YYYYMMDD_ description_VersionNr. YYYYMMDD represents the date of publishing. Keywords and version numbers will be provided to accompany the data and metadata will be provided using GitHub and CoMSES. Metadata includes location of the model results, the model name used to generate it, the input data used and the description of the scenarios run.

Open Access Data

The code of the ABM model and the output of that model will be made open-access. Also other codes developed in this research will be open-access, but only if all authors agree and after the research has been fully published. So data and code might be placed under embargo until publication. The Vrije Universiteit Amsterdam encourages to publish open-access as much as possible (see https://www.ub.vu.nl/en/university-library-for-researchers/open-access/index.aspx). Data, associated metadata, documentation and code will be deposited on Github and CoMSES and the software programme Python (programming language) will be needed to use the code, possibly through an API. Partly, README and documentation within the scripts will be provided (to follow what steps are done in the model).

Interoperable Data

Data will be interoperable via Github and all metadata standards of this platform will be followed. In line with the rest of the DOWN2EARTH project, standard ontogenies and lexicography will be used.

Reusable Data

Data will be made publicly available at CoMSES and Github once the model is published in a scientific journal and will remain in the 'cloud' of the repositories for as long as these platforms allow. Data preparation, processing and profiling will be described in the scientific paper whenever this is of considerable importance.

Work Package 2/Task 2.2: Track historical socio-economic/land use trends and their interaction with the water cycle within HAD

Findable Data

We follow the Climate and Forecast metadata convention (https://cfconventions.org), which was designed in the climate and forecasting community and is applied by the majority of data sets used in this project; thus making data identifiable and locatable (for details see below). Project-based outputs will be published in open-access repositories and will be assigned a Digital Object Identifier (DOI). Keywords will be provided to document the output data generated for internal and external dissemination and datasets that conform to project deliverables will be assigned specific version numbers.

Metadata details: The Climate and Forecast (CF) convention for metadata (https://cfconventions.org) builds upon the COARDS convention (convention for the standardization of netcdf files; https://ferret.pmel.noaa.gov/noaa_coop/coop_cdf_profile.html). The convention was framed for netcdf data sets, but is applicable to other data formats as well. The CF convention locates data in space and time and as a function of other independent variables, thus promoting processing, visualisation and sharing of data sets. The CF convention requires metadata to be self-describing (i.e. so that no external data tables are required) and readable by humans as well as parsable by programs.

Generic metadata is set in e.g. the global attributes of a (netcdf) file and contains

- the title ("What is in the file?"),
- the creating institution ("Where was the file produced?"),
- a source history ("How was the file produced?" incl. e.g. model versions and processing operations),

- references (link to publications and documentations), and
- comments (miscellaneous).

Metadata for every variable must include the following set of parameters:

- units,
- standard names, and
- long names (not standardised)

The dimension for each variable has to be described in the metadata and establish the index space of data variables. Coordinates are described in each file as independent variables. The CF convention requires dimension order tzyx (time, height, latitude, longitude).

Open Access Data

Project-outputs will be made open access per default and the datasets that conform to project deliverables will be made openly available via ftp sites or public data repositories – such as Zenodo, Figshare or Pangaea – and their access details will be provided in the corresponding scientific publications describing these data. The data will be easily accessible using standard ftp clients such as Filezilla or Winscp (ftp), or any web browser (Zenodo, Figshare, Pangaea). Relevant codes will be included in the Github repository of the research team, which can be linked to the public data repositories. Sensitive data will be shared only upon request and requires the name, email address and affiliation of the requesting person, as well as the purpose of the data request. The remaining data will be shared open-access to everyone.

Interoperable Data

As far as possible, the data and metadata standards from the CF convention will be followed; i.e. data will be disseminated in a standard netCDF format with the required metadata description. The format will follow the standards as well, thus allowing for re-combinations and comparability of various data sets. NetCDF formats are easily readable with a wide range of (open) software applications, such as Python and R. We will use standard vocabularies following the CF convention, which will make data identifiable, searchable and comparable.

Reusable Data

We will follow the ‘as open as possible, as closed as necessary’ paradigm for publishing and sharing data. Most data sets can be freely used, modified and shared by anyone for any purpose. Data and codes associated with the publication of scientific papers will be made accessible upon publication. Other procedures and data sets of interest may be shared after the end of the project. All data produced in the project can be reused after the end of the project and is not restricted and will be stored for reuse until it is outdated, e.g. through a newer version of the same data set. Data quality tests will be performed and validations will be described in publications.

Work Package 3/Task 3.1: Develop regional model to assess climate impacts on water and food over various planning horizons; Work Package 3/Task 3.2: Improve regional seasonal forecasts to support warning systems on food security and water resources; Work Package 3/Task 3.3: Simulate impacts of future climate change scenarios on water scarcity and food insecurity

All three of these tasks will produce similar data and are run by the same partner, and thus for the purposes of this section, can be treated similarly.

Findable Data

Data will be locatable via a unique DOI and will be accompanied by clear version numbers and search keywords, although the exact naming convention is yet to be decided upon. To produce metadata, we will archive ReadMe files with each dataset which clearly identifies its origin and links to its allied publication where appropriate for detailed methodological information.

Open Access Data

All output data associated with peer reviewed publications will be made openly available. This may be under temporary embargo depending on the requirements of the relevant publication route. Cardiff University is currently in the process of setting up an institutional instance of the Jisc Research Repository for data sharing (https://www.jisc.ac.uk/research-repository). This system will provide a fully-managed and interoperable data platform for the publishing and long-term preservation of research data, in line with EU requirements. The Preservica standards-based (OAIS ISO 14721) active preservation software also forms part of this system. Datasets will be assigned a Digital Object Identifier (DOI) and functionality for both open and restricted access to datasets will be available. It is anticipated that this project will make use of Cardiff's instance of the Jisc service for data sharing once the data is ready to be released. Files will be in standard ASCII text or netcdf formats and thus readable by standard open source software.

Interoperable Data

Standard vocabularies will be used in line with the DOWN2EARTH project and the field generally, but more information on this will follow in future DMP iterations.

Reusable Data.

As with other partners, we will follow the 'as open as possible, as closed as necessary' paradigm for publishing and sharing data, and so data will be open access where possible and will be useable by third parties after the completion of the project. Embargoes will only apply if publication of a dataset is pending or a publisher requires it. All data sets will be associated with peer-reviewed publications and associated methodologies.

Work Package 4/Task 4.3: Expand remote sensing and in situ observation capabilities to improve preparedness to water scarcity

Findable Data

The task leader ICPAC are revamping data management and data sharing principles and platforms to adhere to well established industry standards as well as standardising naming conventions across all datasets generated at ICPAC. More information on this will be written in future DMP iterations. Both clear version numbers and keywords will be used. Metadata will be created following the metadata guidelines provided by WMO. The metadata will be embedded within the data and also provided as separate text when the data is accessed via online platforms.

Open Access Data

Data generated by the project will be made openly available except for where sharing agreements between ICPAC and the providers stipulate otherwise. The data will be made available via online repository and will be accessible via OGC standards (WMS, WFS) which does not require any specific software. Documentation and code produced will be deposited in Github with public access. The data will be deposited in ICPAC servers and made available via the internet through the various ICPAC data dissemination platforms for public access.

Assess to the data will be via login credentials; in the case of restricted data, access will only be provided to authorised users. There is currently not a need for a data access committee, but might be necessary if we need to convince member countries to share more data, as at the moment countries share a limited number of observation data from a limited number of ground stations. Having access to a wider network coverage of ground stations will improve the accuracy of the interpolation products produced by ICPAC.

Interoperable Data

The data produced by this task are interoperable as they follow OGC formats and will not be software-dependent and thus can be re-used in different software packages. Standard vocabularies will be used for all data in this task.

Reusable Data

The data generated by the project except those restricted by contractual agreements will be shared under an open license and we do not foresee an embargo on the publication timeline, in the absence of such or any other restrictions, the data shall be made available as soon as it has met the quality assurance requirements. The data are usable by third parties and will remain usable after the project, this will be made possible by the fact that the data will be uploaded into the ICPAC repository which will continue to exist beyond the project life-time.

Data will also remain usable for as long as the data exists and remains relevant to the user's needs.

Allocation of Resources and Data Security

The project manager of DOWN2EARTH will have overall oversight of all data storage solutions, and a central project-wide document/portal will be produced and continuingly updated with the information, location and DOI of each dataset produced by the project. Given, however, the diversity of size and type of data produced for this project, each task leading consortium member will retain responsibility for the data they produce, with close consultation with the project manager and in line with the overall principals of DOWN2EARTH. All institutions responsible for data storage have long-standing institutional policies and GDPR systems in place which will also ensure data is handled in a secure and sensitive manor.
In summary, although there is not a central repository being used by DOWN2EARTH, data will be safely stored with associated metadata and DOIs in secure relevant repositories and all the relevant information on each dataset will be collated together in a DOWN2EARTH internal portal.

All publications relating to the work completed on DOWN2EARTH will be published in an open access manor, in line with the EU and DOWN2EARTH philosophy. The open access publishing costs will be claimed as part of the Horizon 2020 grant.

Ethical Considerations

Our ethical protocol sets out a detailed approach to data management and safeguarding. Below I include the key sections:

Policy Compliance

All primary research data will be handled in accordance with ActionAid International's Data Protection Policy, which is GDPR compliant. ActionAid International has a legal requirement to ensure compliance with the General Data Protection Regulation (GDPR), the Directive on Privacy and Electronic Communications and local legislation in-country pertaining to Data Protection. However, AAI, also believes in a strong duty of care to data subjects above that required by law. Our processes are designed to ensure legal compliance, but our subject centred approach means that there will be instances where we go beyond the minimum requirements in the legislation.

Further ActionAid International's 'Information Security Policy' provides the infrastructural foundation upon which it is possible to ensure data protection. We take a risk based approach to managing information, informed by an assessment of the: nature of the Information and therefore the consequence of the loss; probability of an Information loss occurring; Restrictions and controls are then determined according to the interplay of these factors. We use Microsoft Office365, which provides robust security measures to classify and label data stored in the Microsoft cloud. The classification adopted is General, Sensitive, Confidential and Highly Confidential. Additionally, Data Loss Prevention has been deployed and is used to protect sensitive information such as personally identifiable information from being shared externally.

The steps that will be taken in the DOWN2EARTH project:
i) Survey interviews and qualitative semi-structured interviews will be conducted in a private space, appropriate to the local social and cultural norms.
ii) Personal or contextual information (which could lead to identification) will be excluded or avoided whilst writing field notes. If interviews are audio-recorded they will not include participant's names and will be deleted after transcription.
iii) The focus group discussions content will be treated as confidential and all participants will be requested to agree and adhere to the confidential nature of the discussions.
iv) The research team will immediately apply 'code names' or numbers to participants while writing fieldnotes and audio-recording, e.g. Sabba Boru 1. Personal, contextual information and actual names will never be documented – because if data is lost or secured by citizens it could put them at risk. If interviews are audio-recorded they will not include participant's names and will be deleted after transcription.
v) This coded data will be held in a secure encrypted Office 365 database at ActionAid offices, only accessible by the Principal investigators, the RCs and RAs and their encrypted and password protected mobile and computer devices.
vi) Data shared with investigators internationally will be done through the secure (password protected) cloud system at Office365.
vii) After completion, data used in publications will be retained for at least 10 years in case the dataset needs to be referred to.

viii) When publishing, we will ensure not to disclose contextual details about participants, which could be revealing when looked at analytically (e.g. details about their family structure). We will ensure to always put the interests of participants ahead of our research interests.

Our research team will be extremely sensitive when interviewing all participants, but especially those impacted most by power relations, for example women, minoritized communities, people living with disabilities, in particular. Focus groups will be carefully curated, with a stratified sample of 6-8 people. We will ensure a safe and confidential space that cannot be heard or observed by other members of the community.

For individual or household interviews, it will be key to ensure that they are in a completely confidential environment, especially for those who may have experienced distressing situations related to climate change, livelihood issues, water insecurity, governance and community politics. All data will be anonymised, and this will be emphasized to the participants, to ensure there is no risk to them in participating.

When interviewing women and young people, the research will be carried out at strategic times of the day, during which the adult males of the household are often out of the house. This should help in providing a more comfortable environment for honesty. In this case though, only our female RAs would be conducting interviews/entering the house, because cultural norms may prevent women from interacting with non-familial males, especially when their male family members are not present.

Assurance

All staff employed by ActionAid (which includes the RCs and RAs who are the ones collecting primary data from communities) will undergo mandatory cyber security training upon induction, which outlines basic data protection requirements.

Passwords

In accordance with ActionAid International's Information Security Policy, all devices through which Information is accessed must be protected by user log out and or password protected screensavers when left unattended for any length of time, and outside of general office hours.

- ActionAid employees are responsible for the maintenance of passwords, used for all systems and devices through which ActionAid UK Information can be accessed, and to prevent their misuse. Passwords must be set and maintained in line with the standards set in the Information Security Guidelines.
- Unauthorised access of ActionAid Information including other people's email and other accounts may result in disciplinary action
- The owners of systems that are not domain integrated (i.e. which require additional passwords) are responsible that passwords are changed regularly and comply with the strong password policy.

Verbal information sharing

RCs and RAs will be trained not to discuss findings with anyone outside of the research team – because it may put them at risk, cause reputational damage to the project, or worse - incite existing grievances amongst citizens, government and other stakeholders.

The team will carefully discuss (and seek institutional advice) when/how to share this data in a conflict-sensitive manner in dissemination processes.
Lunn (2014) and Wood (2006)[1] offer insights on ensuring safety and security in researching contentious issues around land and resources – they suggest ensuring institutional and legal support is available should the research face difficulty with government or other actors. The institutions across the consortium have excellent linkages to institutions in Kenya, Ethiopia and Somaliland, as well as legal support – if needed.

Stakeholders' rights with regards to data processing
In accordance with ActionAid International's Data Protection and Information Security Policies, the rights of Data Subjects apply to the organisation as a whole and are not restricted to each / any individual function. The specific rights established under the GDPR are detailed below, along with AAI's approach to ensuring that these rights are fully protected and upheld.

1. Right to be informed
   Our privacy information outlined in paragraph 4.1 above ensures that data subjects are made aware of how we operate. Our AAI Privacy Policy is date stamped for transparency of last review and in the event of material update, we will also communicate changes to supporters.

2. Right of access
   ActionAid International has a Subject Access Request (SAR) Policy and Process, owned by our Data Protection Officer (DPO). Should any participant request to access their data, the DPO will work with the relevant members of the consortium to collate the information, for data subjects exercising this right. Reporting on Subject Access Requests is provided to the International Board on an annual basis at minimum.

3. Right to rectification
   As per Principle 4 (Accuracy), we take a strong stance on the accuracy of the data on our systems and use our AAI Privacy Policy to openly encourage individuals to advise us of any detail that they view as inaccurate. Since the data collected with community members on this research project is anonymised, it is highly unlikely that such an issue would ever arise with regards to their participation in the research. However, this could be a possibility in any direct attributions to other stakeholders (e.g. government stakeholders, for example).

4. Right to erasure / to be forgotten
   Our AAI process is to always clarify an individual's request to determine whether their intention is erasure, or restricted processing. Whilst the right to erasure is not an absolute right, AAI will always endeavour to honour the request of the individual. Where there are implications for AAI of us enacting this request (ie the risk to a Gift Aid audit if we delete information before the end of the audit period) we will explain these to the individual before going ahead.

5. Right to restrict processing
   We encourage individuals to discuss their right to restrict processing, so that we can understand their request and answer any concerns that they may have. Restrictions are likely to

[1] Lunn, J. (2014) *Fieldwork in the Global South: Ethical Challenges and Dilemmas.* Routledge: London and New York.; Wood, E.J. (2006) The Ethical Challenges of Field Research in Conflict Zones. *Qualitative Sociology,* 29: 373–386.

relate to supporter data, and as such are applied by our Supporter Admin and Data & Insight teams. Other requests are passed to the DPO to coordinate with appropriate teams on a case by case basis.

6. Right to data portability
   Individuals can obtain a copy and reuse their personal data for their own purposes. If a data portability request is received, then the DPO will coordinate this with the relevant department.

7. Right to object
   We offer the right to object wherever possible when we use Legitimate Interest as our legal basis for any processing. For Fundraising in particular we are unlikely to proceed with the processing where this cannot be offered.

8. Rights related to automated decision-making including profiling
   Automated decision-making is classified as a decision made by automated means without any human involvement. Currently, AAI does not conduct any automated decision-making.

Appendix 1: DOWN2EARTH Participation and Publication Policy

DOWN2EARTH (D2E) Meeting Attendance and Participation Policy

Attendance and participation goals

To ensure success, this multi-faceted interdisciplinary project will require frequent interactions amongst the project team both in person and virtually via video conferencing software. These interactions will proceed according to a schedule and membership on a set of boards and teams with a composition outlined within the original proposal and in the Description of Action (available for download on the EU Portal). It is important that all members of each board and team block out these scheduled meetings in advance within their calendars and attend the meetings regularly. Furthermore, it is expected that each member of boards and teams will actively participate in the discussions and that talkative members of each board/team will step back to enable less talkative members to contribute to conversations, in order to maximize the cross-consortium exchange of ideas. All boards and team meetings will have pre-drafted agendas, pre-circulated papers (where relevant), and a time limit.

All meetings will operate based on a simplified version of Robert's Rules of Order, which were developed to ensure that meetings are fair, efficient, democratic, and orderly. Such 'parliamentary procedure' ensures that all voices are heard and that all concerns are addressed and discussed by team meeting members before voting ensues. Voting within (or following) each team and board will be carried out based on simple majority, and all votes (including absentee participants) will be tallied before a final decision is made on any topic. Polling software may be used to tally votes. Meeting minutes will be taken that document consequential decisions and flag up concerns that should be noted by other teams/boards and major outcomes will be recorded and posted to a shared project drive for broader scrutiny amongst the D2E consortium. Membership on boards/teams is considered a privilege within the D2E consortium. If members of any board/team do not participate according to these expectations, they will be given warnings and a chance to improve. If the undesirable behavior continues, members of boards/teams may be replaced for other members, based on mutual consent from the Management Board. We see this option as a last resort, but we note that it is critical to the project success to have full engagement by all team members.

DOWN2EARTH (D2E) Authorship Criteria and Publishing Ethics

Publication goals

Since publications are the main 'currency' of research scholarship, we seek to maximize the number of publications produced from the project, while also maintaining high standards of quality and ethics. We expect to produce publications that are specific to a particular discipline or subject, and those which cross disciplinary boundaries. Discipline-specific publications might be led a graduate student or postdoc, as a contribution that will ultimately become part of their thesis/dissertation. Broader interdisciplinary publications (e.g., synthesis papers) will often require input from a larger number of researchers from across the team, resulting in synergies imparted to the outputs. The project PIs will work within the Management Board and other relevant boards to identify opportunities for synthesis papers and will invite relevant team members to participate. All planned and in-progress publications should be logged within a

Slack channel and on an online document that will be visible to the consortium and reported to the Management Board. This enables full transparency of institutional plans for publication, which can then be discussed in more detail within the Management Board. The Management Board will decide the project's publication strategy, in order to maximize the impact of project publications. In other words, the Management Board may rule that it is in the strategic interest of the project that some publications might need to be delayed so that data/analyses can better contribute to a higher profile publication down the road.
In all cases (discipline-specific and synthesis papers), a working author order will be established early (and logged on the online document), and relevant project consortium members will be invited to participate through a Slack channel, based on guidance from Thematic Teams and the Management Board. The author order may evolve during the development of any publication based on contributions from team members. We seek to engage various members of the project consortium in many project activities and therefore encourage active involvement in publications generated. This presents great opportunities for career advancement of project participants, as well as promotion of inclusivity and knowledge exchange about crucial project findings and interpretations. In order to achieve these goals while maintaining ethical standards for publication, we set out below a set of authorship criteria, publishing ethics, and research integrity principles (*modified from Proceedings of the National Academies of Science and Ecological Society of America Code of Ethics, May 2013*)

Authorship criteria

Researchers will claim authorship of a paper only if they have made a substantial contribution. Authorship may legitimately be claimed if researchers perform at least two of the following criteria

- Conceived the ideas or experimental design
- Participated actively in execution of the study
- Analyzed and interpreted the data
- Wrote and/or substantially edited/commented on the manuscript
- Substantially funded and/or managed the project

These guidelines note that authorship norms differ between disciplines, and the application of authorship criteria can take account of those differences. For example, authorship is normally more restricted in social science-oriented journals. In such papers, authorship may depend on fulfilling *both* of the following criteria: substantial contributions to 1) conception and design, or acquisition of data, or analysis and interpretation of data; and 2) to drafting the article or revising it critically for important intellectual content.

Authors' sequence

As a guide, the first named author should be the individual who has taken the leading role in writing and most likely also in coordinating the inputs of others. Other named authors should appear in an agreed order that reflects the relative strength of their contributions. In situations where this is difficult to ascertain or where co-authors have made an equal contribution, an alternative such as alphabetical order of surnames is acceptable and a statement of equal contribution may be included as a footnote in the author list.

Publishing ethics

1. The corresponding author must have obtained permission from all authors for the submission of each version of the paper and for any change in authorship.

2. Researchers will not add or delete authors from a manuscript submitted for publication without consent of those authors.
3. Researchers will not include as co-author(s) any individual who has not agreed to the content of the final version of the manuscript.
4. All individuals and organizations that facilitated the work and its publication, including funding sources, will be included in the paper's Acknowledgements.
5. In line with our overall project ethos, which includes an anti-colonial approach, we will be cognizant of the power dynamics and western normative bias' involved in scholarly knowledge production. Whose knowledge counts as substantive, or meaningful, will be carefully reflected upon to ensure the visibility of researchers and contributors from under-represented groups and countries in our publications. If there are capacity limits to ensuring meaningful contribution (e.g. lack of experience with scholarly journal writing; language constraints), we will reflect on what processes can be put in place to facilitate meaningful contribution and visibility of female scholars and those from the global south.[2]

Research integrity principles

1. All collaborators share some degree of responsibility for any paper they co-author.
2. The lead author is ultimately responsible for the veracity of the work presented, including methods, presentation, and interpretations. This person is also responsible for making relevant data available to co-authors and the broader research community.
3. Some co-authors have responsibility for the entire paper as an accurate, verifiable report of the research. These include co-authors who are accountable for the integrity of the data reported in the paper, carry out the analysis, write the manuscript, present major findings at conferences, or provide scientific leadership to junior colleagues.
4. Co-authors who make specific, limited contributions to a paper are responsible for their contributions, but may have only limited responsibility for other results.
5. While not all co-authors may be familiar with all aspects of the research presented in their paper, all collaborators should have in place an appropriate process for reviewing the accuracy of the reported results**.**

Non-academic outputs

Finally, it is expected that a range of non-academic outputs will be produced through D2E. As a principle, all such outputs should follow the same expectations of integrity as above, in the validity and robustness of research findings that they convey and in the responsibilities of authors about the information they report.

Internally published outputs such as reports, policy briefs, and videos should be formatted according to D2E house style, include the logos of contributing institutions and state clearly the details of the project and the funding. Normally, they should include names of appropriate team members as contributors (as above), unless the format makes this unwieldy.

For externally published non-academic outputs, including newspaper articles, blogs, webinars, and podcasts, it may be inappropriate to include longer lists of contributors, in which case only

[2] For more information, see https://blogs.lse.ac.uk/africaatlse/2019/05/29/decolonizing-scholarly-data-and-publishing-infrastructures/ ; https://theconversation.com/global-south-scholars-are-missing-from-european-and-us-journals-what-can-be-done-about-it-99570; https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0189136 ; https://link.springer.com/article/10.1007/s41109-019-0214-4 ; https://gh.bmj.com/content/4/5/e001853

those who directly work on the products need to be credited. However, all such outputs should refer to the project (and acknowledge the funding source) preferably in the body of the work or at least in bylines/credits.
Both internal and external non-academic outputs should be vetted prior to circulation and public consumption by the relevant Thematic Team and/or the Management Board, as appropriate.

Appendix 2: Data Information from Task 2.2 - tracking historical socio-economic/land use trends and their interaction with the water cycle within HAD

Data Type and Format

FLEXPART data

- FLEXPART-ERA-Interim
    a. type: trajectories of 2 million parcels (3h time steps)
    b. format: binary
- FLEXPART-ERA5
    a. type: trajectories of 4 million parcels (1h time steps)
    b. format: binary

FLEXPART–COSMO-CLM^2 data

- COSMO-CLM^2
    a. type: 2D and 3D fields of land surface and atmospheric variables (model outputs)
    b. format: netcdf
- FLEXPART-COSMO-CLM^2
    a. type: trajectories of 4 million parcels (1h time steps)
    b. format: binary

Satellite and other observational data

- ERA-Interim
    - type: global reanalysis
    - format: grib / netcdf
- ERA5
    - type: global reanalysis
    - format: netcdf
- MSWEP v2.2
    - type: global synthesis precipitation
    - format: netcdf
- GLEAM v3.4
    - type: global observation-based land evaporation (including soil moisture)
    - format: netcdf
- GRACE
    - type: global satellite-based total water storage changes
    - format: netcdf
- CHIRPS
    - type: quasi-global synthesis precipitation
    - format: netcdf
- CHIRTS:
    - type: quasi-global synthesis temperature
    - format: netcdf
- Heliosat (SARAH)

    - type: quasi-global satellite-based solar surface radiation
    - format: netcdf
- FVC GLASS
    - type: global satellite-based fractional vegetation cover
    - format: hdf

Data Size

FLEXPART data

- FLEXPART-ERA-Interim
    a. volume: 11 TB
- FLEXPART-ERA5
    a. volume: 66 TB

FLEXPART–COSMO-CLM^2 data

- COSMO-CLM^2
    a. volume: 220 TB (temporary); 60 TB (permanent)
- FLEXPART-COSMO-CLM^2
    a. volume: 66 TB

Satellite and other observational data

- ERA-Interim
    - volume: 5,1 TB
- ERA5
    - volume: 20 TB (120 TB temporary)
- MSWEP v2.2
    - volume: 170 GB
- GLEAM v3.4
    - volume: 182 GB
- GRACE
    - volume: 0.8 GB
- CHIRPS
    - volume: 87 GB
- CHIRTS
    - volume: 87 GB
- RSD Heliosat
    - volume: 42 GB
- FVC GLASS
    - volume: 79 GB

Data Origin

FLEXPART data

- FLEXPART-ERA-Interim:
- Simulations have already been performed in a previous project (joined project with the University of Vigo, Ourense, Spain) and will be re-used in this project.FLEXPART-ERA5:
    - Additional FLEXPART-ERA5 simulations may be performed if required.

FLEXPART–COSMO-CLM^2 data

- COSMO-CLM^2:
  - Model simulations with COSMO-CLM^2 will be performed in the project.
- FLEXPART-COSMO-CLM^2:
  - Model simulations with FLEXPART-COSMO-CLM^2 will be performed in the project.

Satellite and other observational data

- ERA-Interim
  - European Centre for Medium-Range Weather forecasts (ECMWF)
  - Origin: https://www.ecmwf.int/en/forecasts/datasets/reanalysis-datasets/era-interim
  - State: already available
- ERA5
  - European Centre for Medium-Range Weather forecasts (ECMWF)
  - Origin: https://www.ecmwf.int/en/forecasts/datasets/reanalysis-datasets/era5
  - State: to be collected
- MSWEP v2.2
  - Princeton University
  - Origin: http://www.gloh2o.org
  - State: already available
- GLEAM v3
  - Ghent University
  - Origin: https://www.gleam.eu
  - State: generated internally in previous projects
- GRACE
  - NASA Jet Propulsion Laboratory
  - Origin: https://grace.jpl.nasa.gov/data/get-data/jpl_global_mascons/
  - State: to be collected
- CHIRPS
  - Climate Hazards Group
  - Origin: http://data.chc.ucsb.edu/products/CHIRPS-2.0/global_daily/netcdf/p05/
  - State: already available
- CHIRTS
  - Climate Hazards Group
  - Origin: https://www.chc.ucsb.edu/data/chirtsdaily
  - State: already available
- Heliosat SARAH
  - European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT)
  - Origin: https://wui.cmsaf.eu/safira/action/viewDoiDetails?acronym=SARAH_V002
  - State: already available
- FVC GLASS
  - Beijing Normal University
  - Origin: http://www.glass.umd.edu/FVC/MODIS/0.05D/
  - State: already available