Africa RiskView software suite

A collection of software tools for monitoring natural hazards and preparing for effective disaster response

Africa RiskView is the software used by the African Risk Capacity (ARC) to create national risk profiles through the analysis of historical drought response costs for countries participating or intending to participate in risk pool and, based on it, determine the terms of the insurance policy. The methodology used to conduct the risk profiling includes two components: the drought model, which translates satellite-based rainfall information into a drought index for each year from 1983 onwards and categorises the severity of the drought events, and the vulnerability profile, which enables the model to produce a first-order estimate of the affected population, and the associated response costs.

Drought index

Staple crop production in Africa is predominantly rainfed. Rainfall is therefore the main determinant of food security on the continent. The *Africa RiskView* model uses the Water Requirements Satisfaction Index (WRSI) as its main drought index. The WRSI estimates the extent to which the water requirements of the crop have been met from the time of sowing to the time of crop maturity. This requires several input datasets and parameters set by the user including sowing dates, rainfall estimates, soil water holding capacity, crop types and their water demand. To determine if there is a drought and categorise its severity at the end of a season, the seasonal WRSI is compared to a predefined benchmark.

WRSI = f (ppt, pet, WHC, Crop Type, SOS, EOS, LGP)

ppt = rainfall; pet = potential evapotranspiration; WHC = water holding capacity; SOS = start of season; EOS = end of season; LGP = length of growing period

Datasets and indexes used in *Africa RiskView*

Name	Type	Source	Satellite / Sensor	Resolution	Extent	Period	Time step
RFE2	Rainfall Estimate (mm)	NOAA	METEOSAT Second generation / HRIT, MSI	10km	Global	2000-present	Daily
ARC2	Rainfall Estimate (mm)	NOAA	METEOSAT Second generation / HRIT, MSI	10km	Global	1983-present	Daily
TAMSAT	Rainfall Estimate (mm)	Reading University	METEOSAT Second generation / HRIT, MSI	3km	Africa	1985-present	Dekadal
CHIRP	Rainfall Estimate (mm)	Climate Hazards Group	METEOSAT Second generation / HRIT, MSI	10km	Global		Daily
CHIRPS	Rainfall Estimate (mm)	Climate Hazards Group	METEOSAT Second generation / HRIT, MSI	10km	Global		Daily
BERM	Basin Excess Rainfall Map	USGS	METEOSAT Second generation / HRIT, MSI	10km	Africa	2001-present	Dekadal
NDVI	Normalized Difference Vegetation Index (NDVI) - a measure of Vegetation Greenness	USGS/NASA	MODIS / Aqua and Terra	250 meter	Africa	2000-present	16 day
Fapar	Photosynthetically Active Radiation - a measure of photosynthetic activity	Copernicus	Proba-V Spot	1-3km	Global	1999-present	Daily
ETA	Actual evapotranspiration (ETA) - representing crop water demand	USGS/NASA	Several platforms	3km	Africa	1983-present	Monthly
SWI	Soil Water Index (SWI) - a measure of Soil moisture	Copernicus	METOP, ASCAT / several sensors	10km	Africa	2007-present	Daily
SPI	Standardized Precipitation Index (SPI) - represents meteorological drought severity	USGS	METEOSAT Second generation / HRIT, MSI	10km	Africa	2001-present	Dekadal
FCOVER	Fraction of ground covered by green vegetation (fcover) - the spatial extent of vegetation	Copernicus	Proba-V & Spot	1km	Africa	1999-present	Dekadal

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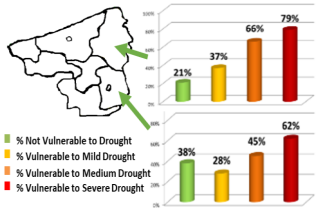
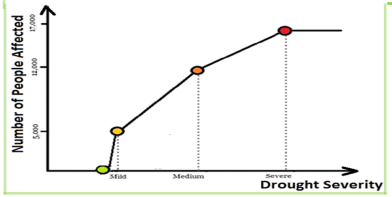
Vulnerability profile

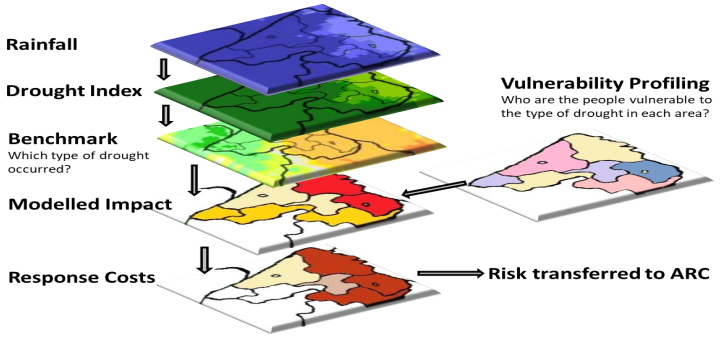
The vulnerability profile is determined based on available household survey data available from national governments and international organizations, which provide information on the income-generating activities and wealth of households living within each geographic area. Countries can choose their own methodology for carrying out their vulnerability profile as long as it provides a good representation of the population that would be affected in case a drought of a given level strikes. The statistical representativeness of the survey used, such as administrative level, livelihood zones or district clusters, define the so-called "vulnerability polygon" to which the drought index is aggregated for impact estimation.



Impact model

Multiplying the share of vulnerable people in the area for a given drought severity by the number of people living in the area, the model estimates the number of people affected by that specific level of drought. The same is done for all three levels of drought severity specified in the vulnerability profile and, for all deviations of the WRSI from its benchmark. The model then linearly interpolates the number of people affected between the closest two calculated levels. Analysis of historical data on drought impact on the population for different events allows the calibration of the model and the development of a risk profile for each country. The risk profile allows each country to consider different coverage options, possible payouts amounts and the corresponding premiums.





Risk Models under development

In collaboration with various research partners, ARC is developing the following models.

Rangeland model

A pastoral index to measure drought severity for rangeland areas using normalized difference vegetation index (NDVI) .

Flood Model

A flood risk model to be used for risk underwriting for riverine flooding. Flood severity will be determined by a flood index which represents a measure of the extent and duration of flooding. Flood depictions are based on the ARC River Flood Model which uses microwave satellite data.

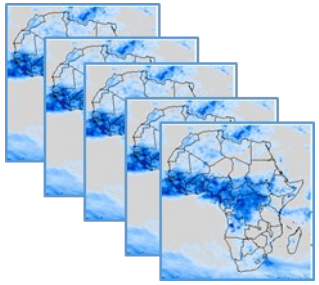
Tropical Cyclone model

The Tropical Cyclone model is intended to analyse possible damage and response costs in areas affected by cyclones, develop risk profiles and use this information for insurance underwriting, particularly for the South West Indian Ocean (SWIO).

Africa RiskView software suite can support early warning and research initiatives in several ways

Manage time-series data effectively

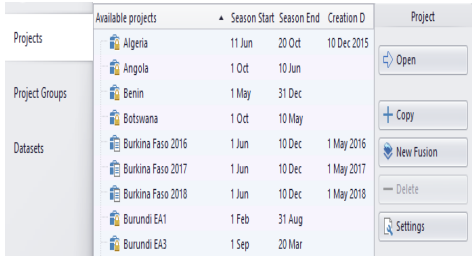
Early warning analysists can use *Africa RiskView* to manage time-series datasets, particularly rainfall and vegetation performance maps, which allow them to track the progression of the crop growing season. They can download, view and export reports of this data to various formats in a user-friendly manner.



All datasets available in *Africa RiskView* are automatically updated and analytical functions in the software use the latest data available. The software provides robust data management and takes away the hustle of having to manually download, process and analyse these datasets.

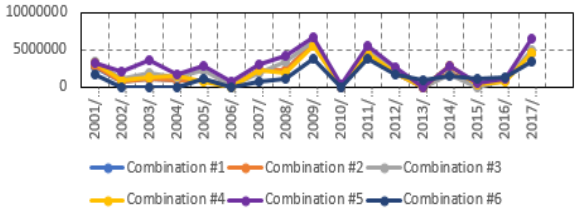
Manage country projects

Africa RiskView offers default country projects which can be customized by users to their own country risk profiles. The parameters in the default projects are placeholders that the user needs to replace with the country specific and updated data and perform all due analysis to determine which set of input data best fits the country context. The customization allows users to calibrate the settings for the drought index modelling, including the choosing the right crop types, season start and end dates, criteria for determining sowing dates and length of the growing cycle. The vulnerability profiles and the risk transfer parameters for each country can also be configured through these country projects. The customised projects can be easily exported and shared with other users. Different country projects can be linked together into project groups and monitored together.



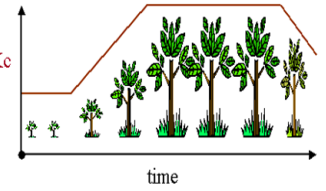
Simulate different scenarios with *Africa RiskView*

Risk analysts can use *Africa RiskView* to simulate various scenarios and advise national governments on how to calibrate their risk profile which will be the basis of the insurance policies. Multiple scenarios can be processed with different parameters and input data, i.e. rainfall datasets, crop-types, different sowing date estimation criteria, different drought benchmarks and vulnerability profiles. This process is used to identify sets of parameters which produce results which best represent the reality on the ground as per the country's historical data on yield and population affected by droughts. The customisation of the *Africa RiskView* model is the first condition for each country expressing interest in participating in the ARC risk pool.



Early warning for food security with *Africa RiskView*

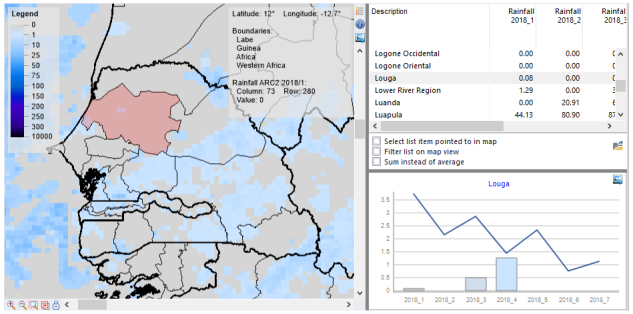
For early warning purposes, Africa RiskView can be used to monitor the growing season from crop sowing time to maturity. The various outputs indicate which areas in a region, country or province have received minimal rainfall, water deficits, excess water at the various stages of crop growth as these affect yield ultimately. As input data is on a dekadal basis, such information can also be obtained at the same intervals and when persistent water deficits or indeed excess water are experienced, this may lead to poor crop yields, resulting in poor production and food insecurity.



Perform GIS operations with *Africa RiskView*

Africa RiskView offers basic GIS functionality for grid (raster) and vector datasets. These include the following:

- Visualization of raster data (e.g. satellite-based rainfall estimates) overlaid with vector data (e.g. administrative regions)
- Creation and editing of raster datasets
- Spatial aggregation of raster pixel data for areas of interest.



Compare satellite-based rainfall estimates with ground station data

Researchers and other users can use *Africa RiskView* to study correlations between various types of satellite-based rainfall estimates and rain gauge datasets. This allows an understanding of how these estimates perform in given contexts and allows informed choices of which datasets to use operationally.

Select Rainfall Station:	Banket	Year	Dekad
Location:	Banket	2001	1
Latitude:	-17.32	2001	2
Longitude:	30.4	2001	3
Correlation ARC2:	0.4864	2001	4
Correlation RFE1:	0.612	2001	5
Correlation RFE2:	0.5366	2001	6
Correlation TAMSAT:	0.5192	2001	7

How to obtain *Africa RiskView* software

To obtain access to the software, interested users need to register online on the *Africa RiskView* website, *http://www.africariskview.org/register.aspx*. Note that *Africa RiskView* is accessible only to ARC Member States and ARC partners. Requests for access are evaluated against these criteria. Once access has been granted, *Africa RiskView* can be downloaded at *http://www.africariskview.org/download.aspx*.

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