



Southern African Science Service Centre for Climate Change and Adaptive Land Management

PASSPORT

Regional Impacts















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SASSCAL is a joint initiative of Angola, Botswana, Namibia, South Africa, Zambia and Germany in response to the challenges of global change

Vision

To be a leading regional centre in integrated climate change and adaptive land management science services for improved quality of life in southern Africa

Mission

To strengthen the regional capacity to generate and use scientific knowledge products and services for decision making on climate change and adaptive land management through research management, human capital development and services brokerage

Objectives

- to conduct research in adaptation to climate change and for sustainable land management
 - to provide products, services and information for decision-making
 - to contribute to the creation of a knowledge-based society through academic and non-academic capacity development programmes



Luanda

ANGOLA

ZAMBIA

Lusaka

NAMIBIA

Windhoek

BOTSWANA Gaborone

Pretoria

SOUTH AFRICA

SASSCAL was initially established as the Regional Science Service Centre (RSSC) in Windhoek in 2010. By 2014, the SASSCAL Regional Secretariat was established in Windhoek and the Open Access Data Centre (OADC) was first instated .

SASSCAL-funded Research for the southern African Region

SASSCAL research addresses common climate change and land management challenges, beyond national borders. Consequently, SASSCAL contributes markedly to regional integration and addresses cross-border challenges, by providing regional solutions.

All SASSCAL-funded research aims to inform regional decision-making processes, albeit not all research produces products and services for the entire SASSCAL region. Eleven SASSCAL-funded research tasks (2012 to 2018) aimed at providing regional products. These tasks produced products that are of benefit to the entire SASSCAL region.

SASSCAL-funded tasks with regional focus aimed at producing three types of products, that are not mutually exclusive:

- SASSCAL-funded research to fill regional data gaps
- SASSCAL-funded research that aims at facilitating open access
- SASSCAL-funded research that aim at providing decision-support tools



SASSCAL-funded research that aims at filling regional data gaps are performed by consortia with national and international partners, under the leadership of the following institutions:

- Council of Scientific and Industrial Research (CSIR) (Task 131 & Task 205)
- Deutsches Zentrum für Luft- und Raumfahrt e.V. DLR in der Helmholtz-Gemeinschaft (DLR) (Task 002)
- Namibia University of Science and Technology (NUST) (Task 159)
- University of Trier (Task 032)
- University of Hamburg (Task 159)

These SASSCAL-funded tasks aimed at producing data sets with regional coverage.

Task 002 - DLR

Remote sensing application for floods and water resources

With this task, the DLR aimed at developing novel, applicable and transferable methodologies to provide information for effective flood management (flood monitoring or detection, emergency response and preparedness and prevention), based on remote sensing information and risk assessment.

A further core research finding of this task was the development of a Global Urban Footprint (GUF) product for the entire SASSCAL project area. The GUF aims at a global settlement classification with an improved spatial resolution of around 12 m, based on data from the TerraSAR-X / TanDEM-X satellite missions.

Ongoing efforts focus on the spatial disaggregation of population data onto urban footprint data, in order to improve local and regional flood risk and vulnerability assessment with more detailed population information.

A comparison of the GUF and the population density of southern Africa (map on *page 8*) clearly demonstrates the uneven spatial

SASSCAL-FUNDED RESEARCH TO FILL REGIONAL DATA GAPS









distribution of human settlements in the region. Areas displaying built environment and detected by remote sensing techniques, clearly correlate population densities and therefore also validate these data.

Task 032 - University of Trier

Improved Forest Resource Assessment

The University of Trier, together with regional partners from Namibia and Zambia, with Task 032 aimed at filling information gaps with respect to the characterization and spatial distribution of forest ecosystems, as well as a more specific inventory of forest resources in target areas. Such information is vital to address key issues such as estimation of biomass and productivity, forest fragmentation and the related impact on biodiversity, as well as current and potential carbon sequestration rates and associated opportunities from REDD (UN Collaborative Initiative on Reducing Emissions from Deforestation and Forest Degradation) mechanisms.

An important prerequisite for regional monitoring of ecosystems such as forests is the availability of a consistent data base of spatially and temporally explicit environmental variables.

Within Task 032, the work focussed on the development of operational key remote sensing variables that serve to enhance ecosystem monitoring and hold the potential for wall -to-wall-applications covering the entire SASSCAL area.

(left) Example of a large-scale Landsat composite with a pixel resolution of 30 m by 30 m for the year 2008 , for Angola, Botswana, Namibia and Zambia

(bottom) Number of processed Landsat images per tile. Redundant overlaps from the same path are excluded, whilst overlaps from neighbouring paths are visible as a striping pattern







25° E

30° E

400

Kilometers

35° E

0

25° E

30° E

35° E

20° E

10° E

5° S

10° S

15° S•

20° S

25° S•

30° S•

35° S-

15° E

Number of years with fire Data: MCD45A1

10° E

Method: Stellmes et al., 2013

1

20° E

15° E

At a coarse scale, the use of long-term MODIS time series with high temporal resolution provided seamless maps of functional vegetation types. Moreover, MODIS fire products were deployed to derive fire related metrics to provide essential information regarding the fire regime which is an important component of African ecosystems. The map of fire frequency shows that the fire frequency is higher in high grassland dominated ecosystems.

At finer scale, the major aim of this task was to exploit the full potential of the extensive Landsat archive to provide seamless data for Angola, Botswana, Namibia and Zambia. A successful derivation of essential variables on the regional scale is in need of an enhanced framework and this framework was developed to generate higher-level satellite products that can facilitate the implementation of highly detailed regional environmental monitoring systems and relieves the end-user from any form of pre-processing.

Task 159 - NUST and University of Hamburg

Strengthening a regional Biodiversity Observation Network in the region

The Namibia University of Science and Technology and the University of Hamburg lead a regional consortium with partners from Angola, Zambia and Namibia, for Task 159, aimed at sustaining and extending a biodiversity observation network in the region, in order to continually assess and monitor changes for the SASSCAL region's biodiversity. Standardized square "Biodiversity Observatories", one square kilometer in size, provide comparable information on status and trends, espe-

cially of vegetation, as baseline information for the planning of land and conservation management. A biodiversity observation network of 47 biodiversity *Tundavala observatory in Angola*

observatories and 10 auxiliary observatories, has been established throughout Angola, Namibia, Zambia and South Africa. Notably, some observatories in Namibia and South Africa have already been monitored for between 17 to even 30 years, providing invaluable insight into the complexity of these biodiversity systems.





Repeatedly photographing an observatory allows comparison over long periods of time and provides an insight into possible reactions to environmental changes and local land use.. Here a Welwitschia population near the Namibian Swakop River in 1884 (left) and 2016 (right) at the Welwitschia Vlakte Observatory.

The observatories are complemented by a large number of 1 000 m² relevés, for the mapping of vegetation. All these point data are also used for ground-truthing of remote-ly-sensed mapping and monitoring. In total, over 45.000 relevés have been recorded for the region.

Information on these observatories is available via a open online platform, the *SASSCAL ObservationNet* (see *page 15* of this booklet).

Task 205– CSIR

Adaptation strategies for the South African, Namibian and Zambian dryland forests and timber plantations to climate change

With this task, the CSIR, in collaboration with regional partners, aimed to model the risk of selected plantation forest species to climate change and to develop appropriate and practical adaptation strategies or interventions, and furthermore, to seek to assess large-scale earth observation (EO) tools and develop regional infrastructure for improved forest resource assessment and monitoring.

In the context of this task, the CSIR developed large-scale earth observation tools (including a woody cover map of southern Africa) for improved forest resource assessment and monitoring. In addition, appropriate and practical adaptation strategies or interventions to manage the threats and opportunities of climate change on plantation forests were developed, and plantation forest growth modelling and assessment of plantation species adaptable to dry areas or marginal areas beyond current commercial forestry areas was conducted.

In the context of the earth observation component of the task, a LiDAR database was set up and LiDAR data was collected from various regional organisations in Namibia, South Africa and Zambia (see map). Routines were set up to classify woody and ground cover from these LiDAR data, and further processed SAR datasets and integrating the LiDAR with semi-automated processes. For national mapping, national ALOS mosaics were ac-



quired for 2007, 2008, 2009, 2010 and 2015.

A close collaboration with Namibian colleagues ensures knowledge transfer of experiences gained and helped establish more insight into the Namibian bush encroachment challenges. Moreover, the field visits helped validate results obtained.

(top) LiDAR data sourced from various regional organisations, which in turn was used to derive detailed tree cover metrics, in order to derive the tree cover maps, together from Synthetic Aperture Radar (SAR) data; and (bottom) extract of map of woody cover fraction for Zambia, Namibia, and South Africa, derived using SAR and LiDAR data

SASSCAL-funded research that aims at facilitating open access to SASSCAL-funded research and deliverables, are performed under the leadership of the following partners:

- Deutscher Wetterdienst (DWD) (Task 123)
- Friedrich Schiller University of Jena (Task 008)
- Namibia University of Science and Technology (NUST) (Task 159)
- University of Hamburg (Task 159)

The aim of these open access, online platforms is to facilitate access to research data and information.

Task 123 - DWD

Historical and ongoing climate data management

Compared to other regions of the world, the availability and density of historic and present-day ground-based climate observations in southern Africa is still low. This task, performed closely in collaboration with national meteorological institutes in Angola, Botswana, Namibia and Zambia, aimed to support national meteorological services (NMS) in the region, to improve the availability of climate data through the implementation of an easy-to-use Climate Data Management System (CDMS), the collection and archiving of current and historical climate data, through improvements in quality control and through the support of climate data rescue activities.

During the SASSCAL climate Workshop in Windhoek in 2013, the delegates of the three NMS of Angola, Botswana and Zambia agreed to use CLIMSOFT as the main Climate Data Management System (CDMS), which is designed for storing climate data in a secure and flexible manner and allows for extracting information from the data. Moreover, CLIMSOFT is WHO compliant.

SASSCAL funding supported the development of CLIMSOFT into a free open-source project. Consequently, CLIMSOFT (version 3.2) has been installed in all the NMS, and training on how to manage the software has been carried out. The SASSCAL team has also developed an R tool to facilitate the quality control of the data stored in

SASSCAL-FUNDED RESEARCH THAT AIMS AT FACILITATING OPEN ACCESS



the CLIMSOFT database.

Support was furthermore provided in rescuing historical data collections. For instance, in Angola at INAMET (Instituto Nacional de Meteorologica e Geofisica de Angola), support was given to re-establish a data collection from international collections. In addition, in many NMS, physical and non-digital data are still occurring in great amounts and rescue activities are promoted by this task.

Task 008 - Friedrich Schiller University of Jena

Integrated data base on water quality and quantity (incl. maps) for ILWRM

The integrated data base on water quality and quantity for the integrated land and water resources management (ILWRM) task provides researchers, policy makers, end users, and more specifically water experts, with a range of services (data storage, data management, data exchange, modelling, and decision support) and data related to water and water management within the SASSCAL region. A wide range of spatio-temporal data, as well as supporting documentation and metadata, are provided in an easy-to-use, opensource, extensible information system, the SASSCAL-IS (SASSCAL Information System).

The system is based on open-source software, and both the data and system design comply with a range of international standards (e.g. ISO (International Standards Organisation) 19115, OGC CSW, WMS). The combination of modular, open-source software and international standard compliance results in an information system that is both extensi-

ble and adaptable, as well as robust and scalable to large data volumes, and has been under development in various forms for over a decade. As a result, the SASSCAL-IS provides SASSCAL, in general, and the regional Water experts in particular, with a comprehensive, accessible, and reliable data source. And consequently, the SASSCAL-IS was then further developed to become the *SASSCAL Data and Information System* (see *page 24* of this booklet).

> The powerful search functionality of the SASSCAL-IS is enabled by a metadata database, based on international metadata standards, as provided by ISO 19115



Task 159 - NUST and University of Hamburg

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access and the use of information on the existing biodiversity observation network of the SASSCAL countries, SASSCAL the online **ObservationNet** was created. This open online portal provides information on the location of the SASSCAL biodiversity observatories, a picture of each observatory. local climate information and near-by weather stations, soil information and vegetation regime information the on location.



SASSCAL ObservationNet Observatory sites being monitored, some for as long as 17 to even up to 30 years



Climate change is affecting the lives of millions of people across the globe and in particular, the vulnerable south African region is predicted to face dire challenges in the face of a growing population, warming temperatures and decreasing rainfall. Research offers proactive approaches for the region to deal with current and prepare for the expected challenges.

SASSCAL-funded research that aims at providing decision-support services are performed under the leadership of the following partners:

- Council of Scientific and Industrial Research (CSIR) (Task 203)
- Climate Service Center Germany (GERICS) (Task 004, 006)
- Friedrich Schiller University of Jena (Task 023)

Task 004 and Task 006 GERICS

Development of a user friendly regional climate modelling system and

Expanding the database for a robust regional climate change assessment and uncertainty analysis

In Task 004, a user-friendly regional climate model **REMO**, specifically adopted for applications within the SASSCAL region, was developed.

Regional climate models (RCMs) are widely used to downscale the coarse scale climate change projections from global climate models (GCMs) in order to provide climate change information on a regional to local scale, that can be used for regional to local climate change impact and adaptation studies. A major challenge with most of the RCMs, is that they are difficult to use, due to complicated

SASSCAL-FUNDED RESEARCH THAT AIM AT PROVIDING DECISION-SUPPORT SERVICES







configuration and steering with extensive scripts. Therefore, users, from non-climatemodelling disciplines, cannot use these models without an intensive introduction. To overcome this issue, a user-friendly version of REMO was developed.

The easy-to-use regional climate model **EasyREMO**, was developed as a graphical user interface and runs on standard PCs and laptops. With **EasyREMO**, climate change simulations can be conducted without in-depth programming knowledge and without access to high performance computing systems. It further provides the user with a smart solution to define the region to which the model is to apply its computations. The resolution of the model grid is 0.44 or 0.22 degrees. **EasyREMO** comes with three different forcing datasets covering the historical time period 1971 to 2000 as well as a low and a high emission scenario for the time period 2071 to 2100. Therefore, the user can produce own climate change projections for the region of interest. It also allows the user to define which variables will be kept during the simulation for later analysis. EasyREMO also includes an easy-to-use tool to visualize the output data and to create first plots.

In Task 006, five additional climate change projections from general circulation models (GCMs) were downscaled with the regional climate model REMO, to specifically expand the existing regional climate model projection ensemble of the CORDEX Africa initiative. These projections are supposed to fill existing gaps in the available database of regional climate change projections, in order to establish a database allowing for a robust regional climate change assessment. Furthermore, this task is conducting a series of workshops on the analysis and interpretation of regional climate change projections, with respect to uncertainty and robustness measures.



The REMO user interface

Task 023- Friedrich Schiller University of Jena

Development of a decision support system (DSS) for ILWRM

With Task 023, the University of Jena aimed to develop a user-friendly decision support system (DSS) for use in integrated land and water resources management (ILWRM) and related training and policy making. This task resulted in an indicator-based evaluation of possible development scenarios, pertaining to a wide-range of geographical areas and questions encompassing and related to ILWRM, ranging from water quality and quantity to governance.

The DSS is accessible through and uses the architecture provided by the SASSCAL-IS (Task 008), and is coupled with the hydrological modelling toolbox resulting from SASSCAL Task 018 (Integrated river basin assessment and modelling with aquifer integration). The combination of the web-based SASSCAL-IS information management system with service -based tools for pre-processing model input data and for model simulation functions, resulted in a data- and model-driven DSS. Results include the integration of model management and data extraction functions for the SASSCAL-IS, that make sure that modelling

applications are always transparent and their results reproducible. Another result is the automated and standardized export of SASSCAL-IS data in model-usable formats. In order to support and simplify the preprocessing of model input data and model setup in general, different geoprocessing services, with easily usable web interfaces were imple-



Access to online data and example model outputs from the JAMS/J2K hydrological model mented. The GRASS-HRU web tool supports users in the delineation of spatial modelling units, as they are required for spatially distributed modelling.

The MODIS Pre-processor web tool (WORF.GEOGR.UNI-JENA.DE) automatically downloads and interpolates MODIS-MOD16 evapotranspiration (ET) data for hydrological modelling applications. Consequentially, the use of MODIS-based ET data significantly reduces the data requirements of hydrological models, thereby simplifying the creation of distributed hydrological models for the SASSCAL region.

Another service in the context of distributed hydrological modelling is the JAMS Cloud, a web-based tool that allows remote processing of complex distributed models on high-performance computers. Using a so-called REST-interface, a software client can upload model input data and simulation routines to the server. trigger the start of a simulation, and download simulation results from the server. As the DSS develops, functions for the multi-criterial comparison of integrated land and water resources management scenarios based on environmental and socio-economic performance indicators will be incorporated. The set of indicators considered within the DSS is designed to be flexible and extensible to make sure that decision making is informed along varying thematic scopes and spatial scales.







In a collaboration with Task 018, Integrated river basin assessment and modelling with aquifer integration, Luanginga catchment's (top, catchment shared between Angola and Zambia) flood level projections (middle) and runoff projections (bottom)

Task 203– CSIR

Climate Change and Impacts

In the context of Task 205, an extensive operational seasonal forecast system has been established by the CSIR, with an associated CSIR Technology Demonstrator, completed for the sea-surface temperature prediction component of this forecast system.

The southern African region is particularly vulnerable to droughts, but ironically, also partly to extensive flooding. The well-being, water security and food security of millions of communal inhabitants are directly linked to the government's ability to make quick and informed decisions, that respond to impending climatic catastrophes.

Amongst others, the CSIR forecast system gave early warning of the 2015/16 drought conditions over Africa, and is currently providing guidance in terms of prospects of anomalous rainfall over the drought-stricken southwestern Cape.

This study co-funded the work on the 2nd edition of the "Climate Risk and Vulnerability Handbook for Southern Africa" which presents the latest available scientific knowledge on the nature of climate change and its implications for southern Africa. The handbook serves as an important guide for climate and development practitioners, researchers and students. An executive summary is targeted specifically at policy-makers.

Observed trends in annualaverage temperatures over Africa 1961-2010 suggest that big parts of the southern African region are becoming warmer. In particular, most of Zambia shows temperature increases of above 4 degrees Celsius. Central Namibia and the southwestern Cape show increases in temperature of at least 2 degrees Celsius.



(left) CSIR-CCAM projected change in annual average temperature (degrees C) over southern Africa for the period 2070-2099 relative to 1971-2000 under low mitigation, suggest that the entire southern African region will become warmer.

(bottom) CSIR-CCAM projected change in annual average rainfall (mm/day)*10 over southern Africa for the period 2070-2099 relative to 1971-2000 under low mitigation, suggest that almost all of southern Africa will become drier. In the worst case scenario, it appears that South Africa and Angola will be most

affected. Depending on the prediction model. Namibia and Zambia are also likely to become drier. The impacts are expected to affect vast agricultural areas and therefore suggest threads to the regional food security.

Moreover, in a region with great reliance on annual rains, to fill the numerous water supply dams, the thread of lower annual rainfall, coupled with higher temperatures and consequently aggravated evaporation losses, is likely to effect the water security of the region.

promoting science for sustainable development



rnd24 NorESM RCP8.5

7 6 4 3 2 1 0 1 -2 -3 -4 -6 -6 -7

rod24 MPI RCP8 5





tave MPI RCP8.5

4 3.5 2 2 1 0 -1 -2 -2 -2 -3 -3 -4 -5

6 4 3.5 -3 -2 -2 -1 -2 -2 -2 -2 -3 -3 -3 -4 -6

5 4 3.5 2 2 1 0 -1 -2 -2 -2 -1 -3 -3 -4 -5

tave GFDL RCP8.5





rnd24 GFDL RCP8.5





SASSCAL Research Publications

The SASSCAL Book, a culmination of six years of SASSCAL funded research, was launched at the SASSCAL Symposium in Lusaka in April 2018. The book is entitled "Climate change and adaptive land management in southern Africa – assessments, changes, challenges, and solutions", edited by Revermann, R., Krewenka, K.M., Schmiedel, U., Olwoch, J.M., Helmschrot, J. & Jürgens, N. and published in the book series Biodiversity & Ecology, Vol. 6, Klaus Hess Publishers, Göttingen & Windhoek.



The Book is freely available for download:

WWW.BIODIVERSITY-PLANTS.DE/BIODIVERS_ECOL/VOL6.PHP

Some 217 researchers contributed to the SASSCAL Book, that in hardcopy form weighs around 3 kg. The Book boasts 497 pages of research and is divided into the following chapters: Climate, Water Resources, Risk Management, Rangelands, Food Security, Forest Resources, Land Cover Dynamics and Biodiversity.

In addition to the SASSCAL Book, SASSCAL-funded researchers have produced in excess of 100 peerreviewed publications in the context of a research portfolio of some 88 research tasks.

Gridded maps of climate data for southern Africa, DWD



SASSCAL-funded Capacity Development for the region

The regional *Master programme in Earth Observation, Geographical Information Science and Remote Sensing* (Task 303) was officially launched on 1 November 2016 at NUST. It has already been implemented in Namibia, Zambia and Botswana and aims to meet the capacity limitations in field of earth observation, geographic information systems and remote sensing. Moreover, a total of 35 students, who are enrolled in this program, are benefitting from SASSCAL-funded scholarships. In addition to scholarships, SASSCAL also funded IT infrastructure for the programme.

SASSCAL also further significantly contributed to the implementation of the regional Master programme on 'Dryland Forestry' (Task 079) at the University of Stellenbosch (in cooperation with the University of Namibia and the University of Botswana), that aims to address the lack in capacity of forestry professionals with sufficient expertise to implement adaptive resource management strategies in the face of climate change.



The launch of the regional Master programme in Earth Observation, Geographical Information Science and Remote Sensing at the Namibia University of Science and Technology (NUST), November 2016

The first students to enrol and receive full scholarships for the Master in Earth Observation, Geographical Information Science and Remote Sensing (Task 303) in Namibia



SASSCAL Services & Products for the region



SASSCAL ensures that the research deliverables resulting from the SASSCAL-funded Research Portfolio, are made available openly and freely. In this line, to support the research agenda of SASSCAL, online and freely accessible data and information portals have been made available.

SASSCAL Data and Information Portal

All research publications and deliverables, from all SASSCAL-funded research, will be accessible via the SASSCAL Data and Information Portal.

The SASSCAL Data and Information Portal is an open online data and information portal that can be accessed freely using any web browser at

With this data portal, SASSCAL in collaboration with strong African and international partners from research, public service and private sector, will host, safeguard and make available data and information resources openly, yet ensure the integrity and ownership of the contributing parties.

The SASSCAL Data and Information Portal system architecture diagram

DATA.SASSCAL.ORG





The SASSCAL Data & Information Portal is jointly developed by SASSCAL and the Geographic Information Science Group of the University of Jena, Germany.

The SASSCAL Data & Information Portal is fully interoperable and user-friendly.

The SASSCAL Data and Information Portal allows for the management, analysis, visualisation, linkage and presentation of various types of data and resources, including time series data, geospatial data, space-time data, publications, documents and others.

The powerful search functionality of the Portal is supported and enabled by comprehensive metadata records for all resources, that the system makes available. The metadata model is based on ISO standards (e.g. ISO 19115) and further adheres to specifications of gazetted metadata standards in the SASSCAL countries.

SASSCAL WeatherNet

It remains challenging in the southern African region, to base knowledge-based decision -processes on research, that relies on inadequate weather observation networks.

The SASSCAL WeatherNet provides easy and open access to reliable climate information for over 150 Automatic Weather Stations (AWS) for southern Africa, about rainfall, air and soil temperature, humidity, wind speed and direction, barometric pressure, solar radiation, leaf wetness and other sensor data. This ensures the development of efficient management strategies for sustainable water and land resource management, as well as putting in place strategies for climate change preparedness.

The SASSCAL WeatherNet can be accessed at:

WWW.SASSCALWEATHERNET.ORG

The SASSCAL WeatherNet provides near real-time weather data, as well as hourly, daily and monthly values, as continuous time series, partly from 2010. It allows for data to be exported as MS EXCEL files.

The SASSCAL WeatherNet AWS transmit data via GSM/GPRS or Meteosat. The temporal resolution is either every 15 minutes or hourly. All data made available on the SASSCAL WeatherNet portal has been subjected to automated quality control. The SASSCAL WeatherNet data can also be accessed via the SASSCAL Data and Information Portal (data.sasscal.org).

Additional services provided by the WeatherNet include data repositories and backups at national weather services and SASSCAL, statistics and diagrams for selected variables and e-mail-based daily weather report.

The diagram on **page 27** gives an overview of the location of the SASSCAL WeatherNet Automated Weather Stations (AWS). All stations transmit weather data via GSM/GPRS/ Meteosat and are made available in near real-time on the SASSCAL WeatherNet online platform.

For every station, information is made available on the station specifications in terms of location and altitude, name, identification number, and when the station was installed and started transmitting data successfully. A picture is also available for every station, which gives hints of the vegetation regime that the station represents.

In the example on **page 27**, the AWS of Lusaka University in Zambia is represented. The diagram gives an idea of some of the information that is available on the SASSCAL WeatherNet website, for each station. The user may for instance view tabular data or graphs of timeline data. The user may however also view summary and comparative seasonal graphs.



95.8

96.1

95.8

96.3

96.3

872

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872

872

872

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0.00 6.51

0.00 6.43

0.00 6.43

ily averages (Feb 2017)

🜧 236.4 mm

Precipit

05:33

18:35

1:45

2:00

2:15

2:30

2:45

20.0

19.9

19.8

19.8

19.8

26.9

26.9

26.8

26.8

26.8

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0.7

0.2

0.2

0.4

0.2

75

227

194

140

3.4

1.7

1.7

2.8

1.2



Federal Ministry of Education and Research



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