

French-German Cooperation in Africa
in the field of climate change, food security and
water resources

1/2 June 2015 – Berlin – Embassy of France



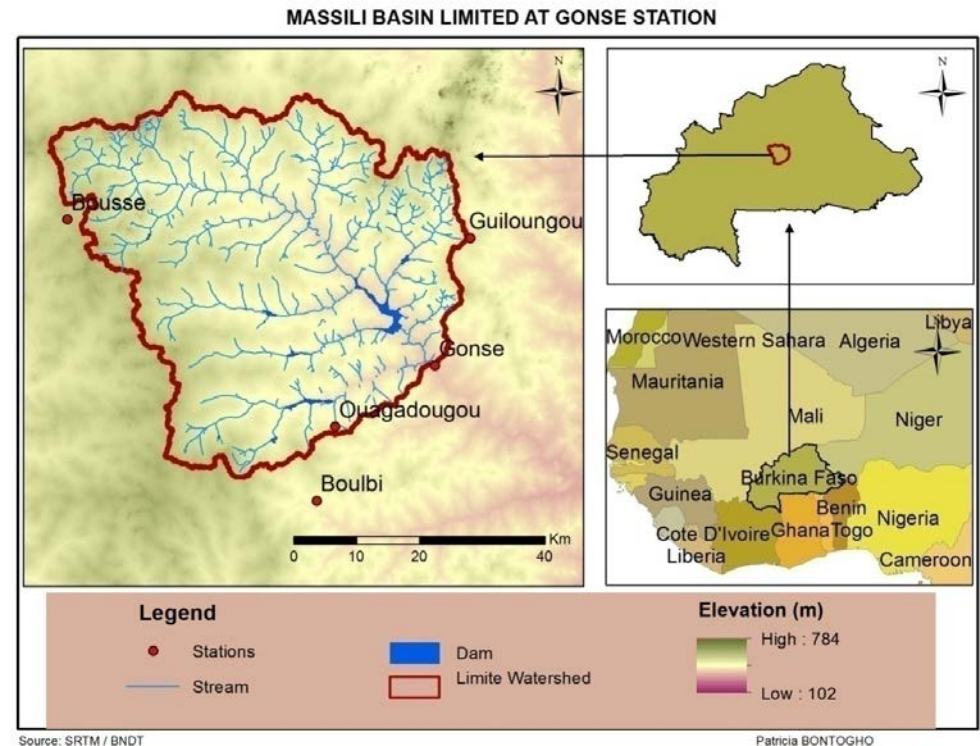
**Integrated water research to assess and
secure current and future water resources for
regional development in Sub-Saharan Africa**

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Motivation

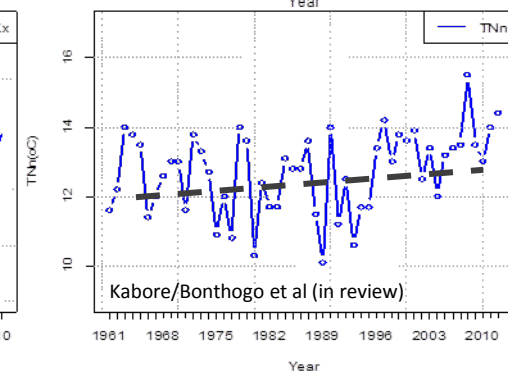
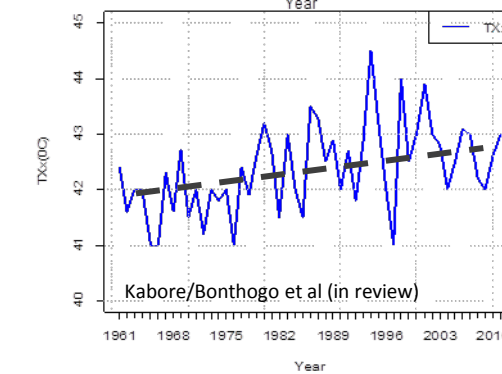
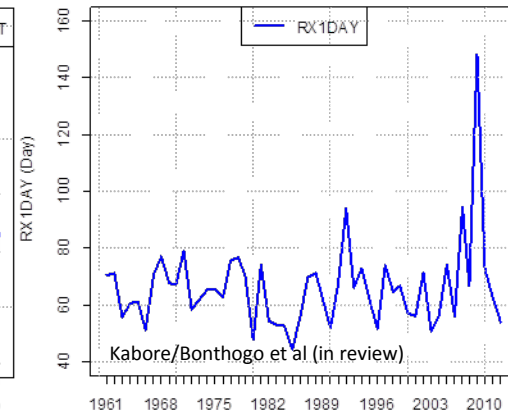
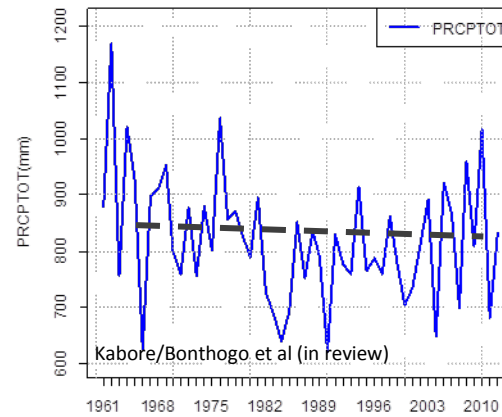
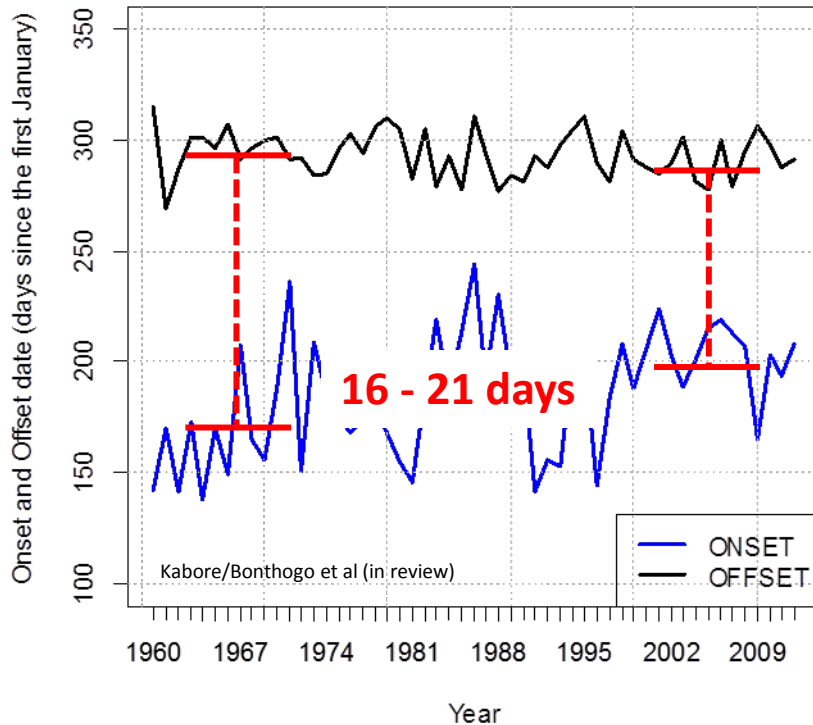
- Awareness of more extremes (droughts and floods) in Western Africa
- Notable land use change takes place (savannah → agricultural fields)
- No existing adaptation plans
- Need for adapting land management in accordance to markets and expected changes



Kabore/Bonthogo et al (in review)

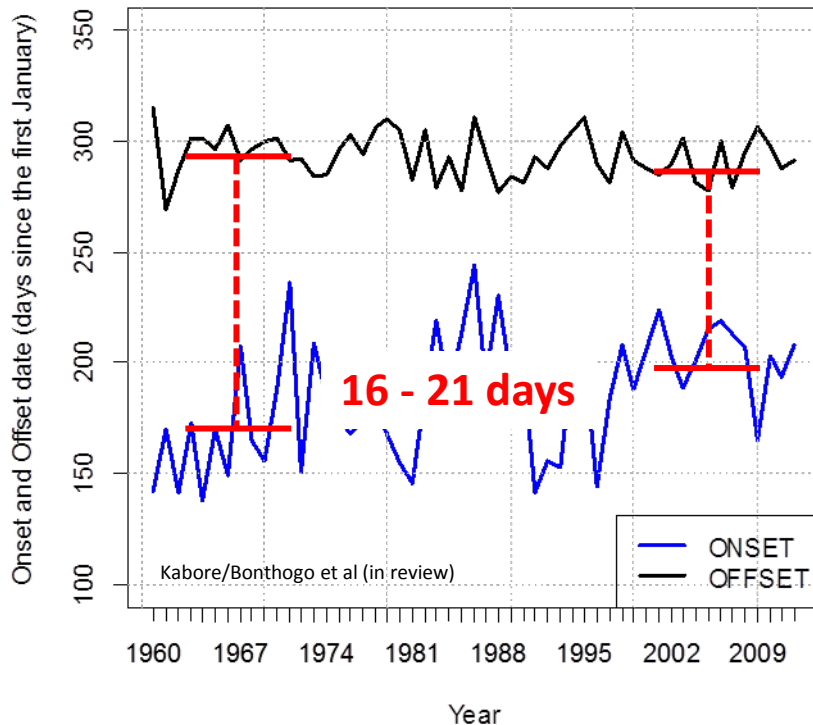
Climate change analysis

- Delineation of climate indices to assess changes in BF



Climate change analysis

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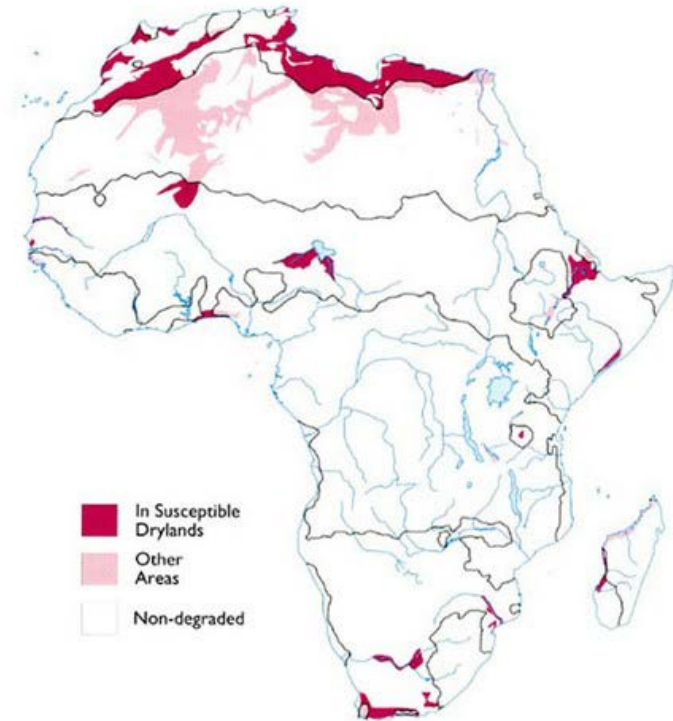
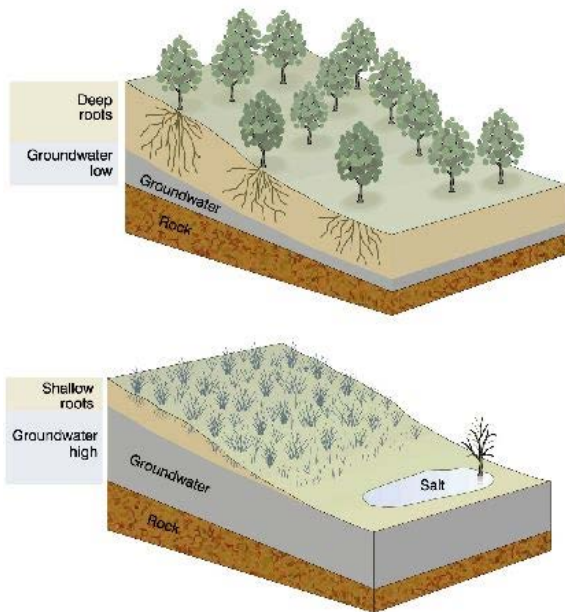


Consequences

- Increase in extreme events (floods/droughts → erosion, yield losses, crop failure)
- Better forecast tools required
- Adaptation needs (agricultural management, water availability)
- Assessment of economic impacts (seed markets)
- Policy advice needed

Dryland Salinity

Salinity is a phenomenon in semiarid areas of Africa, Australia, North and South America occurring when salt is mobilised and transferred through surface/subsurface runoff mechanisms to streams.

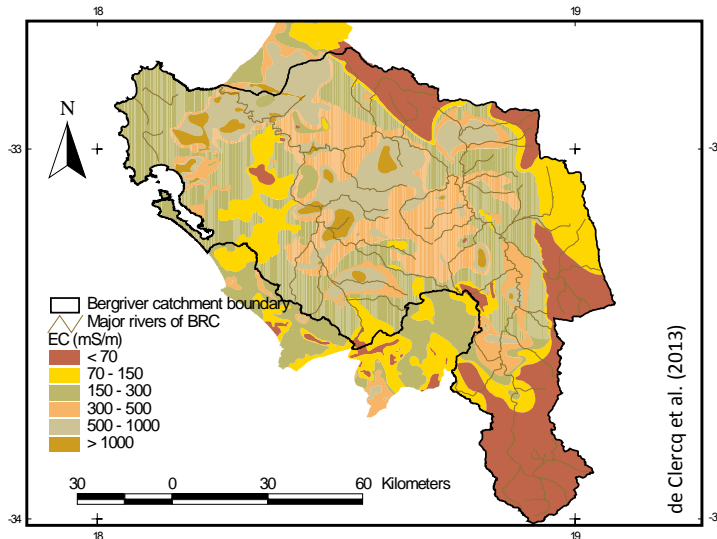
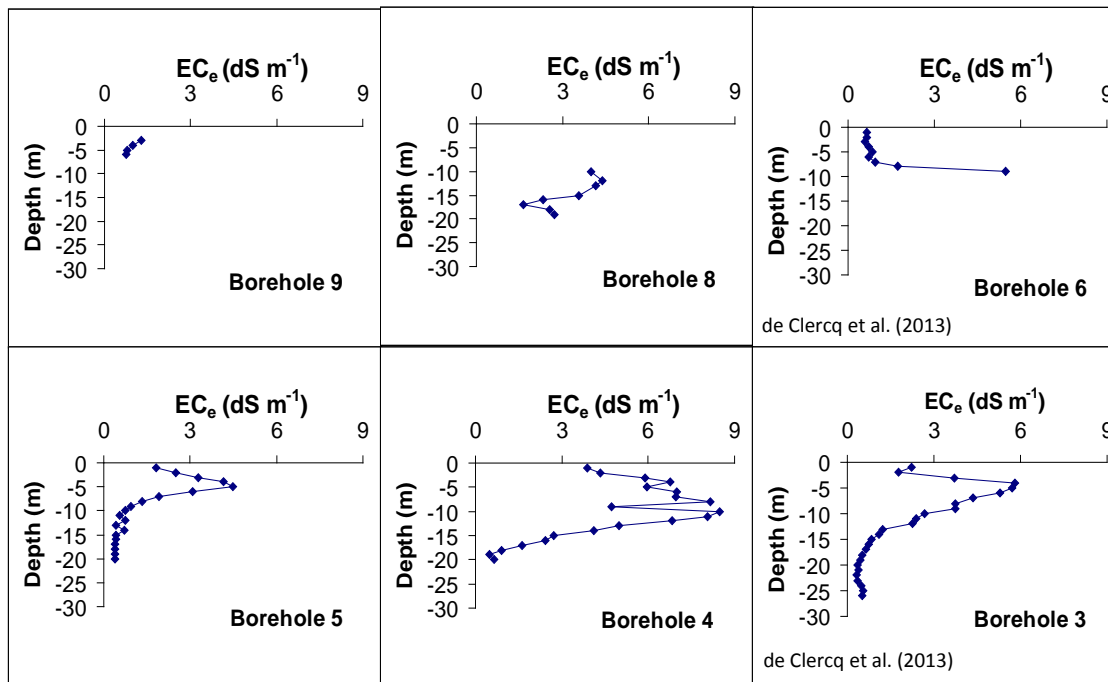


Source: UNEP/ISRIC, CRU/UEA
Approximate equatorial scale 1:81 million

Figure: Salt mobilization resulting from land management change and increasing groundwater levels (DERM, 2004)

Human impacts: Dryland Salinity

Dryland salinity in the Western Cape, South Africa Case study: Berg and Sandspruit catchments

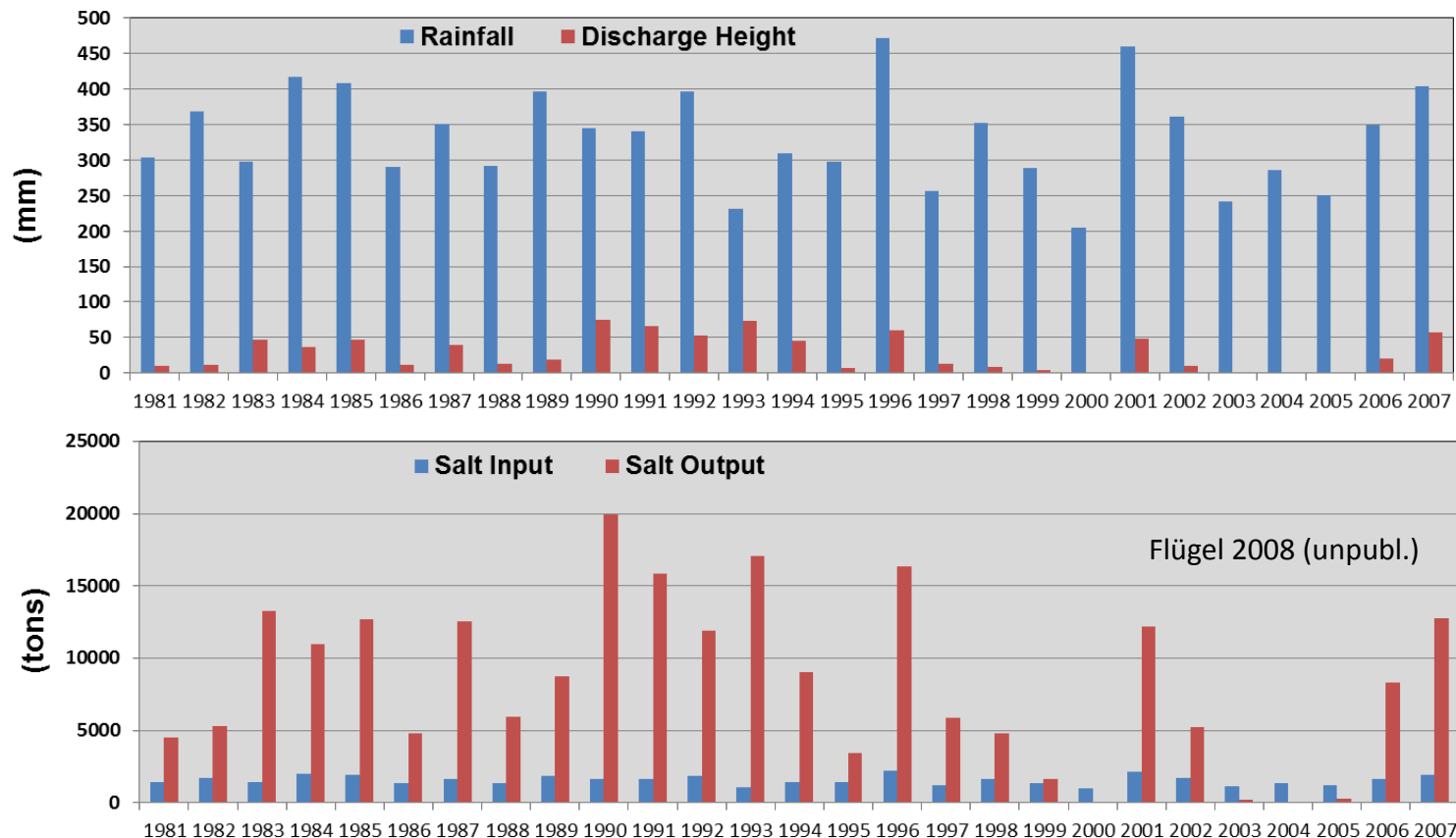


- **Notable salt storages in the soils**
- **Mobilisation through land management change**

Regolith salinity profiles from saturated paste extracts of samples from 1m sections of six boreholes drilled on the Goedertrou catchment. For reference purposes an EC_e value of $1\ dS\ m^{-1}$ represents a soluble salt content of about $6\ tons\ ha^{-1}\cdot m$.

Dryland Salinity

Salt mobilization in the Western Cape, South Africa Case study: Sandspruit catchment



Salt mobilization in the Western Cape, South Africa Case study: Sandspruit catchment

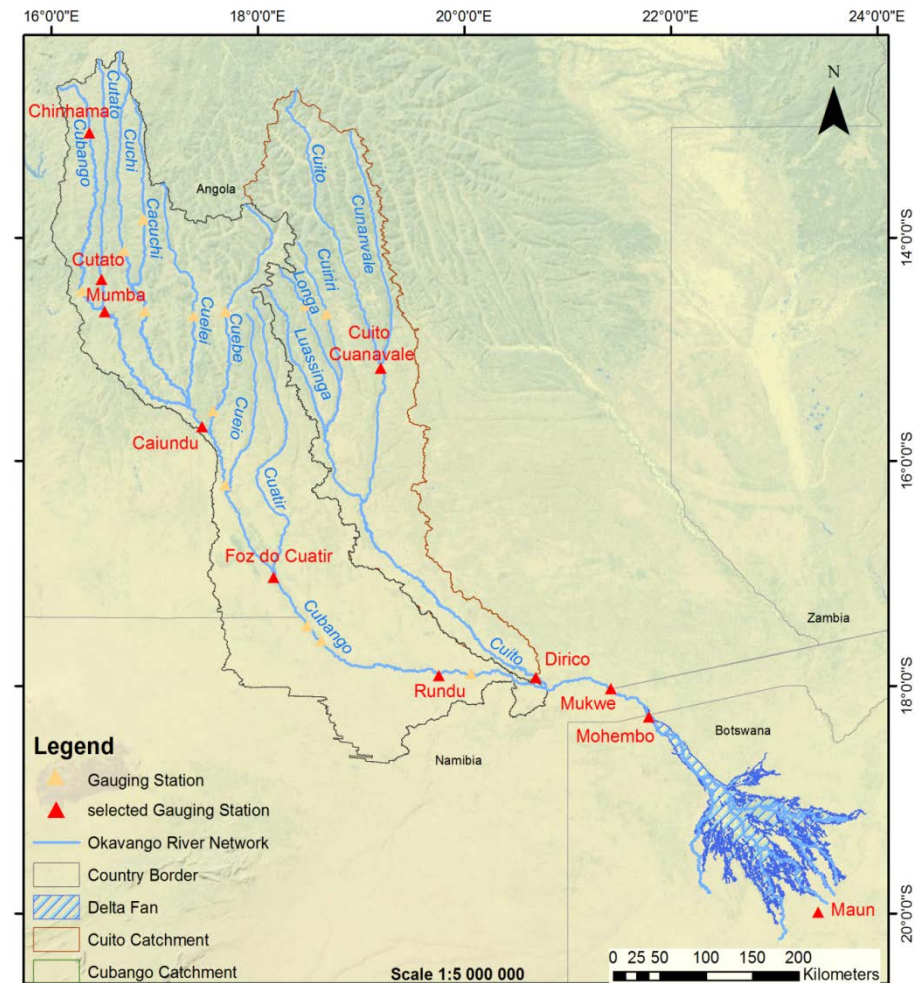
- **Given the actual conditions, salt will be mobilised and laterally transferred for the next several hundred years and thus will dramatically affect water quality in the Western Cape.**
- **Increase of irrigation agriculture may even further reduce water quality (secondary salinity).**

More information: de Clercq, W., Jovanovic, N., Bagan, R., Mashimbye, D., du Toit, T., van Niekerk, A., Ellis, F., Wasserfall, N., Botha, P., Steudel, T., Helmschrot, J., Flugel, W. (2013): Management of human-induced salinisation in the Berg River catchment and development of criteria for regulating agricultural land use in terms of salt generating capacity. Research Report: 1849/1/13. South African Water Research Commission, Pretoria, South Africa.

Climate vs. Human impacts

Motivation

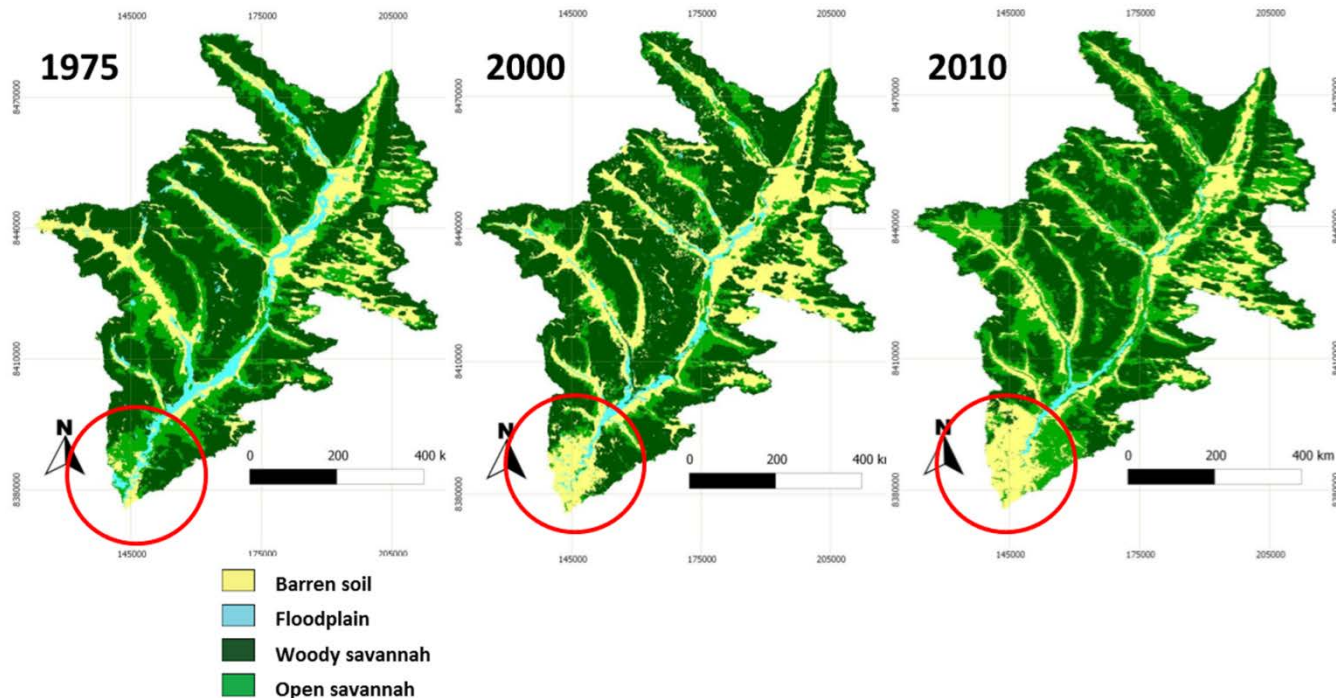
- Analysing the impact of land management change (deforestation) and ongoing expansion of irrigation area – scale-crossing
- Hydrological system analysis
- Runoff generation mechanisms
- Modelling of the hydrological system and change assessments



Climate vs. Human impacts

Land use/cover change analysis

- based on the analysis of temporal Landsat images, validated with field data and MODIS
- Increase of urban areas, bush encroachment, soil degradation



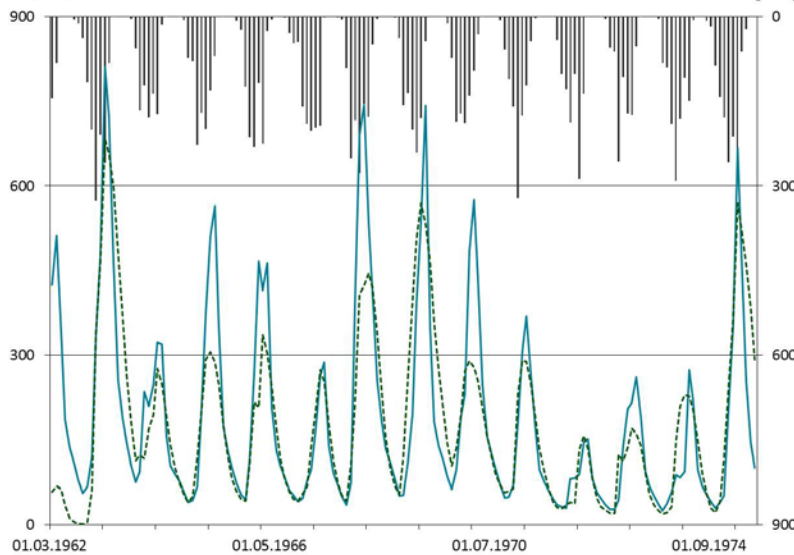
Climate vs. Human impacts

Hydrological modelling and runoff components analysis

Cubango:

rapid runoff, high peak flows, low baseflow, direct runoff)

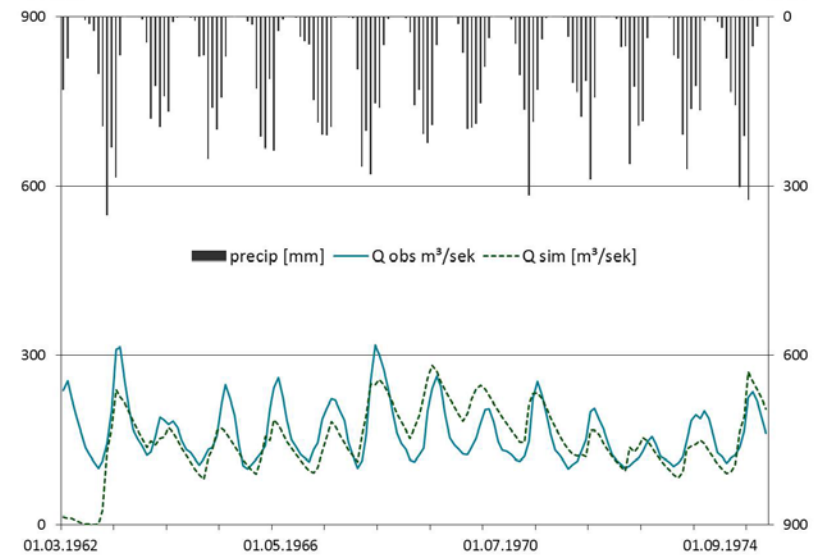
- runoff mostly generated in headwater region
- higher elevation → increasing precipitation
- crystalline bedrock → low infiltration
- steep, v-shaped valleys in headwater region → low storage capacity, rapid runoff



Cuito:

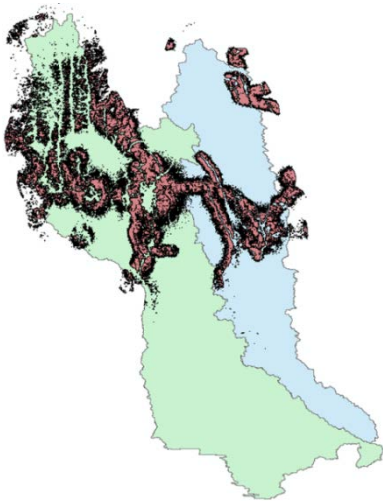
moderate runoff dynamics, lower peaks, higher baseflow, higher water storage

- runoff mostly generated in headwater region
- thick sand layers → infiltration
- gentle slope → decreasing flow velocity
- wide, flat valleys with floodplains, meanders, alluvial swamps → runoff attenuation

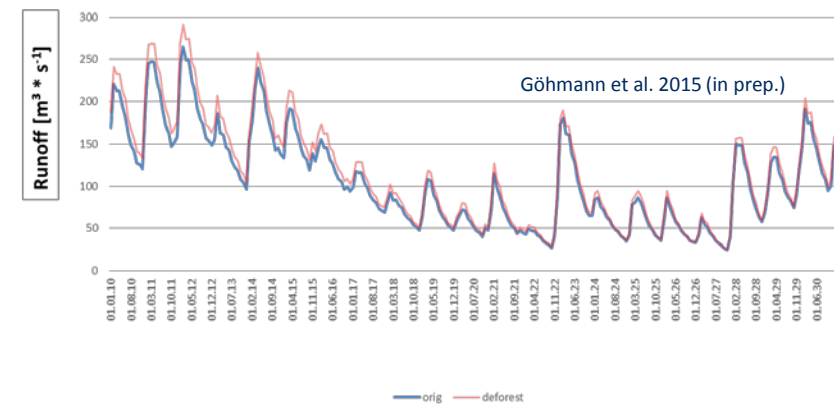
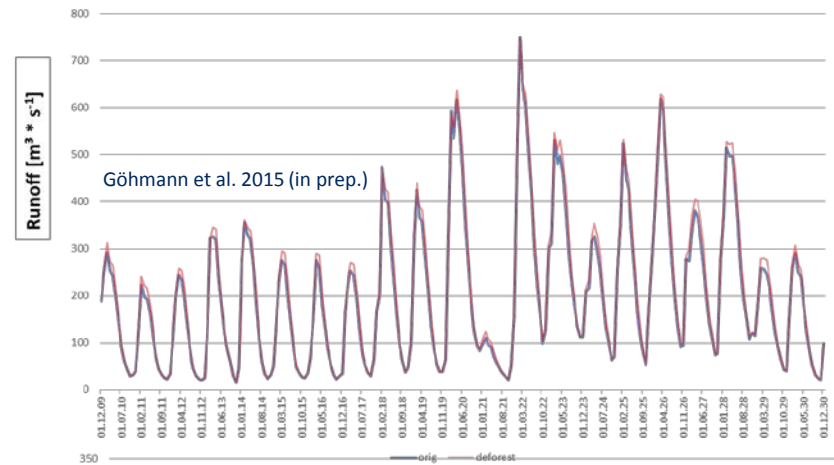


Climate vs. Human impacts

Scenarios – Deforestation, Increasing irrigation



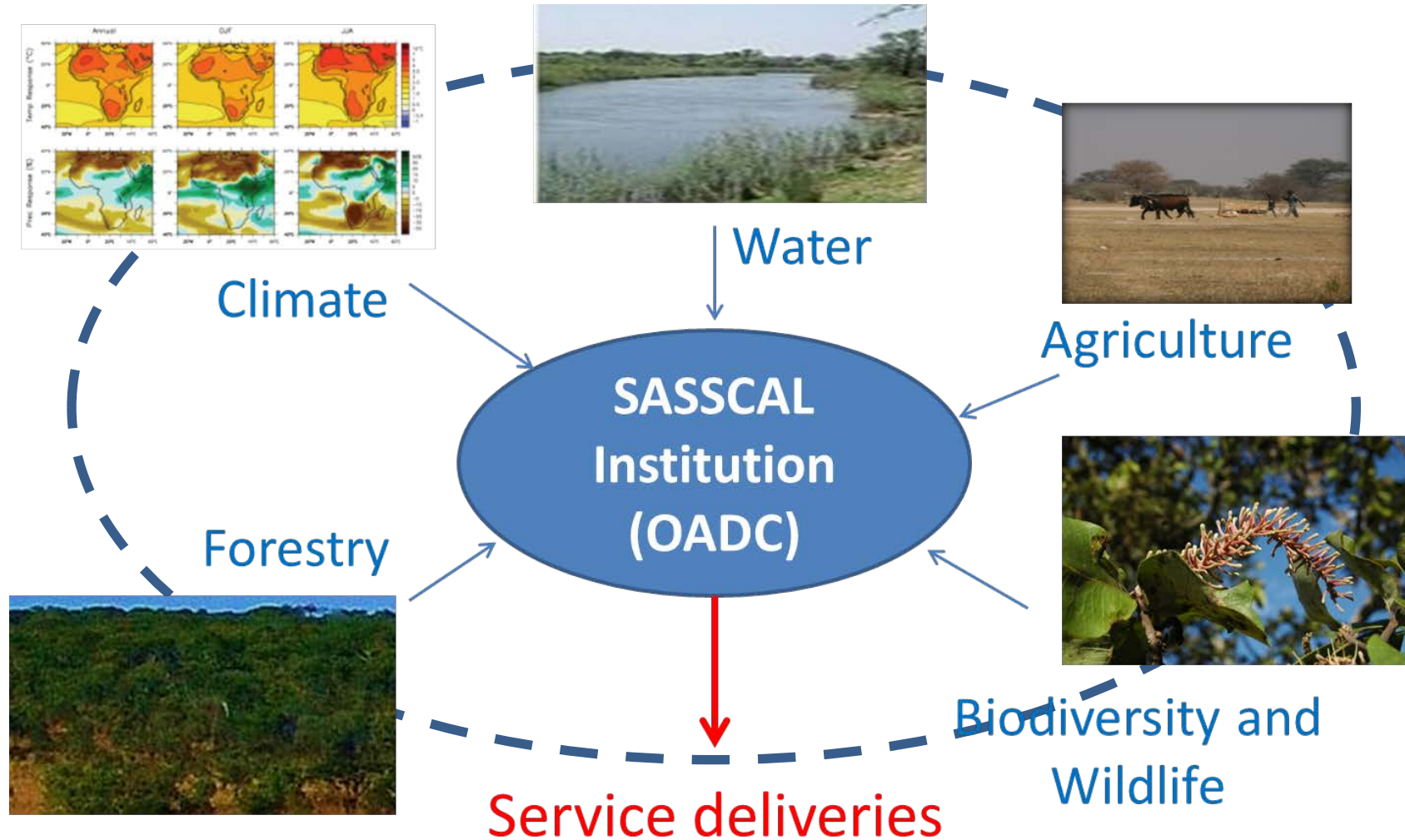
- impact of land management change on Cuito system when irrigation systems will expand → slight increase of runoff peaks
- overarching impact of climate change
- Outlook: impact of reservoirs and groundwater extraction



“SASSCAL is the **REGIONAL** driver for innovation and knowledge exchange to enhance adaptive land use and sustainable economic development in a highly vulnerable region of Southern Africa under global change conditions.”



SASSCAL Themes



SASSCAL Status

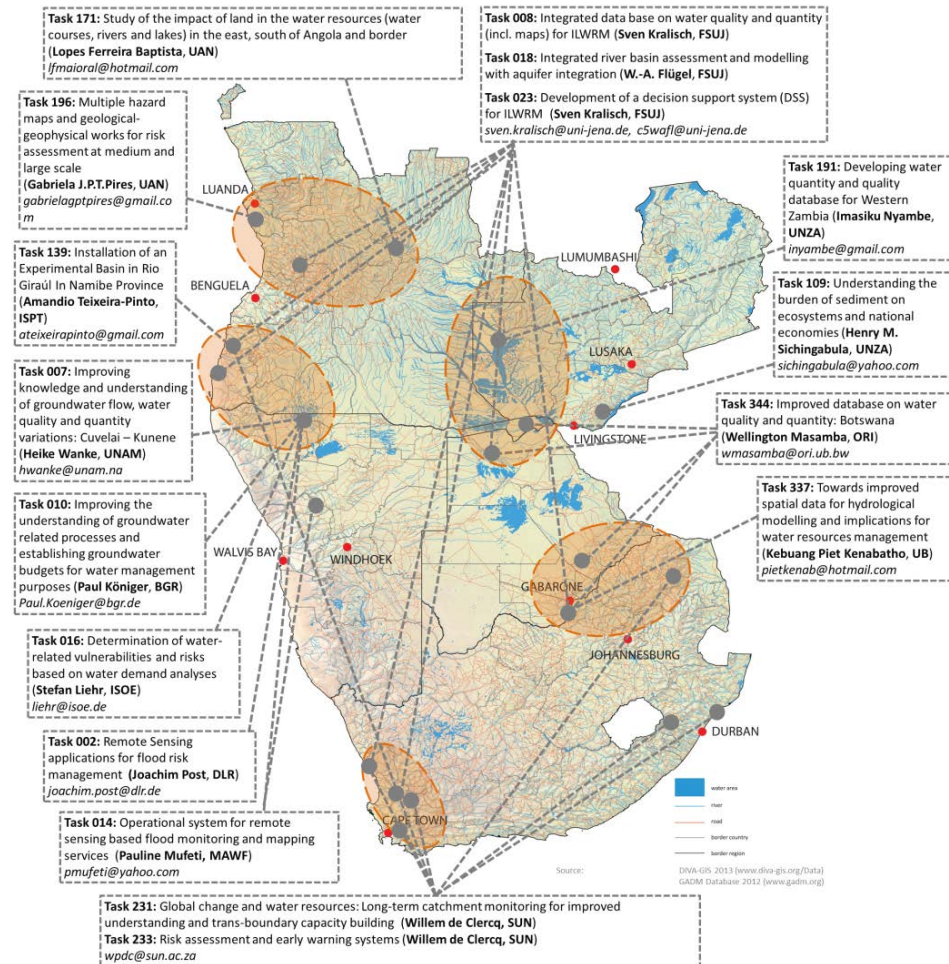
Thematic area	Angola	Botswana	Germany	Namibia	South Africa	Zambia	Total
Climate	1	3	3	2	1	1	11
Water	3	2	6	3	2	2	17
Forestry	1	2	2	3	1	3	12
Agriculture	3	2	8	3	1	4	21
Biodiversity	4	3	2	6	1	2	18
Cap-Dev	1	2	1	2	0	2	8
Total	13	14	22	19	6	14	88

SASSCAL Water Research

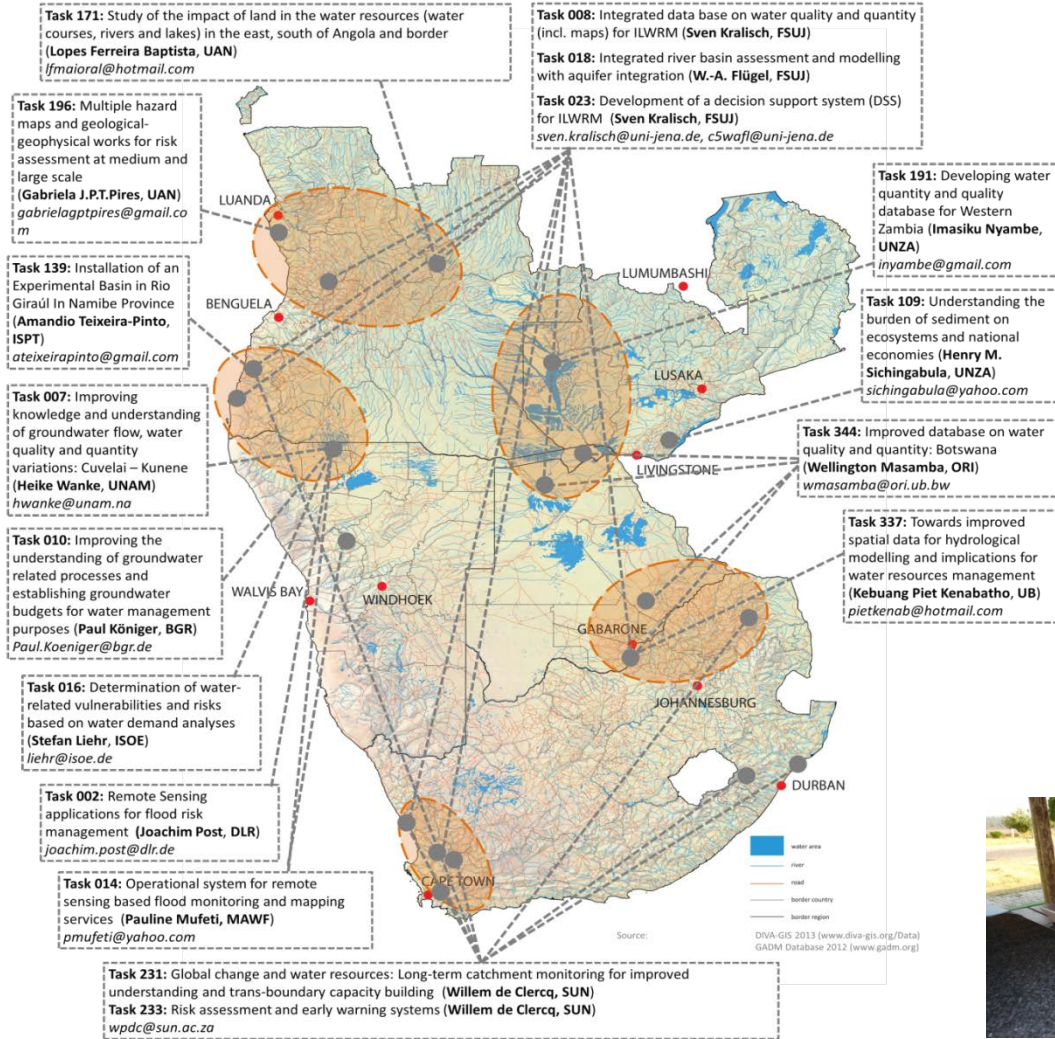
- Five 'hot spot' areas
- Monitoring, analysis, modelling, change assessments
- Basic to frontier research

Integration with research in other thematic fields, e.g.

- Macro-/micro-economic research
- Land cover/use change
- Regional climate and change assessment
- Biodiversity studies (regional)
- Agricultural impact studies (KAZA)
- Socio-economic studies
- Fire impact studies
- Wildlife/Human conflict
- Hydropower potential
- Migration studies, urbanization

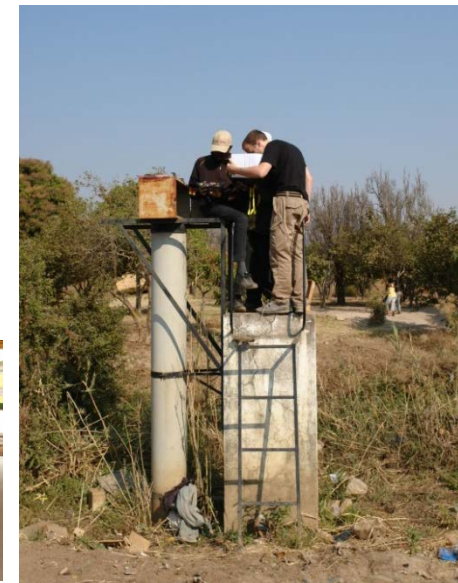


SASSCAL Water Research

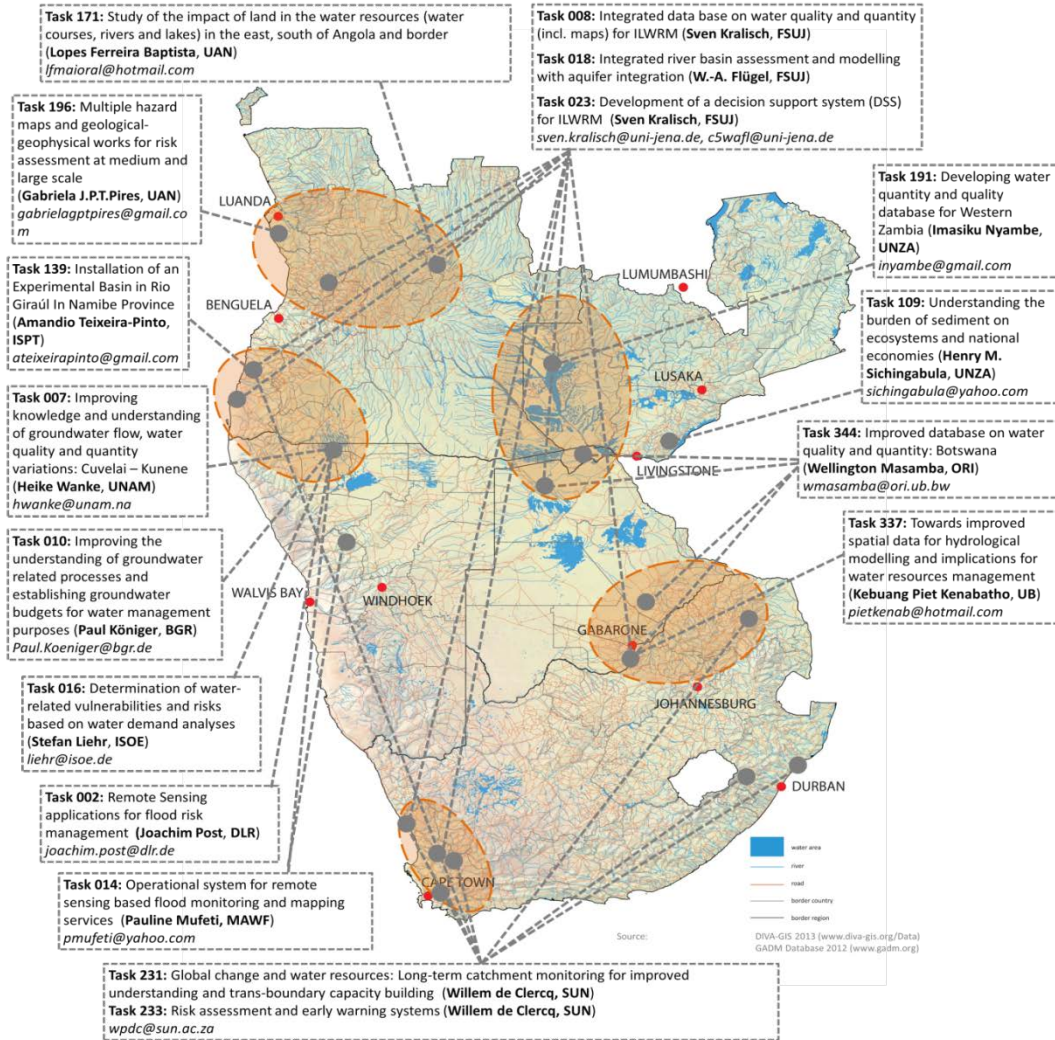


Monitoring

- Technical infrastructure
- Data management
- Advise/decision support
- Training



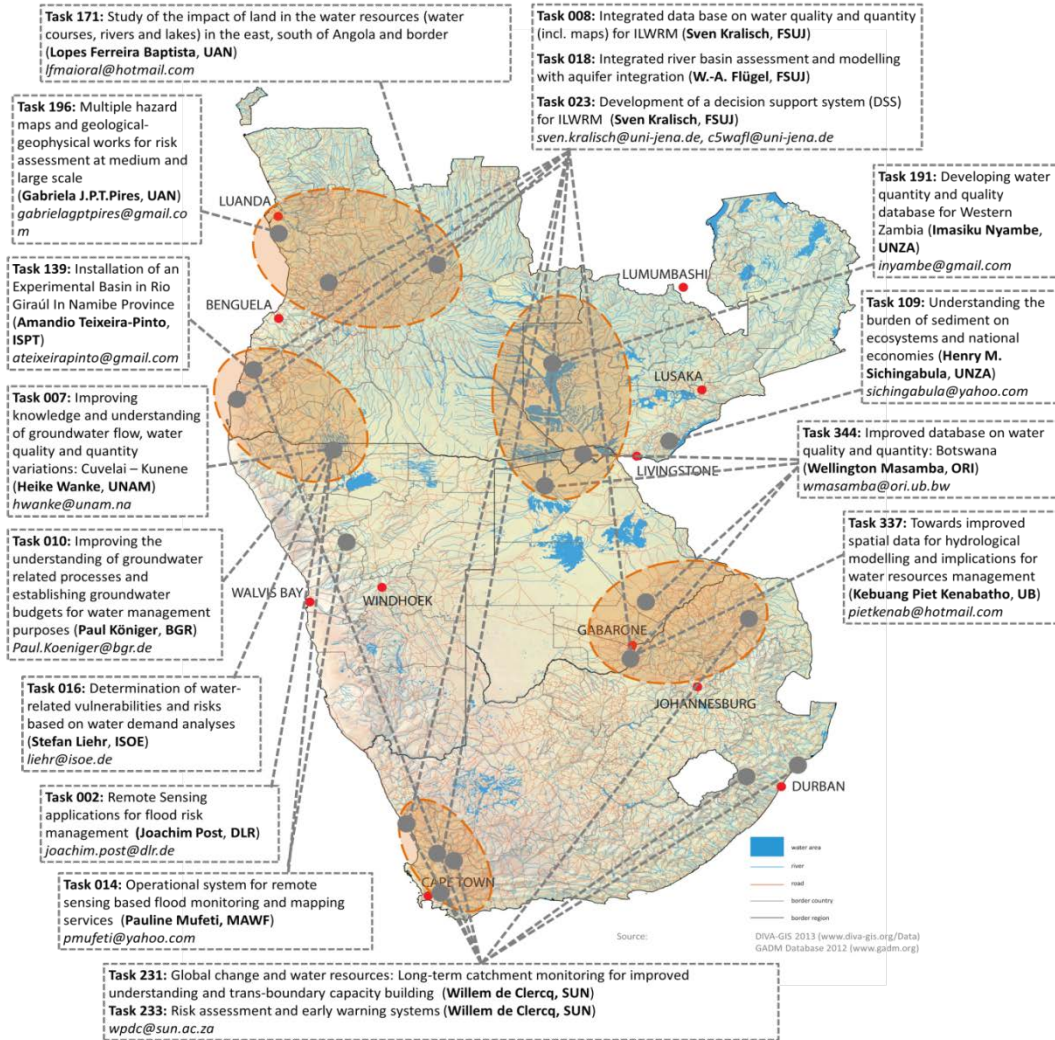
SASSCAL Water Research



Groundwater

- Origin
- Quantity/quality
- Distribution
- Groundwater use/needs
- Resources assessment
- Management



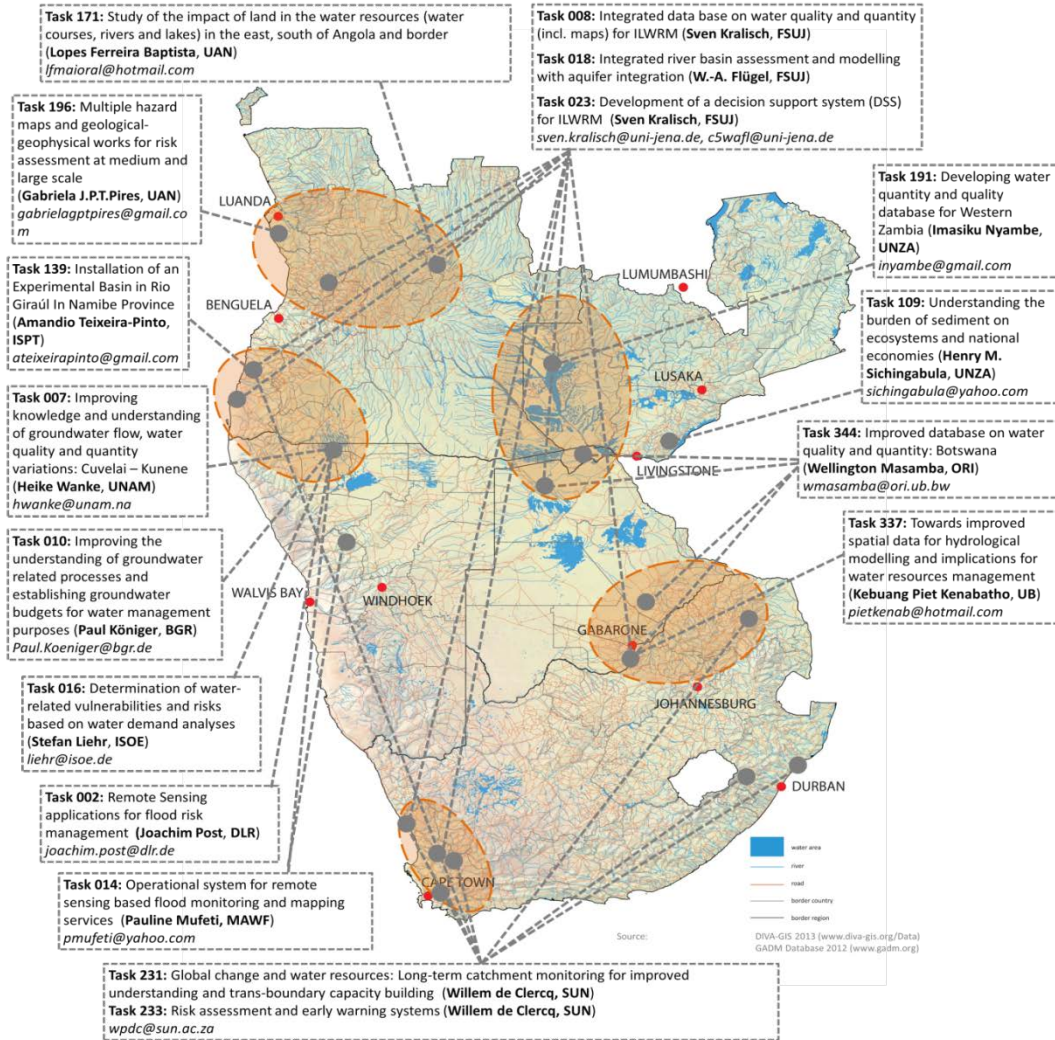


Floods

- Operational mapping (extent, depth)
- Real-time monitoring
- Damage assessment
- Risk mapping
- Forecasting



SASSCAL Water Research

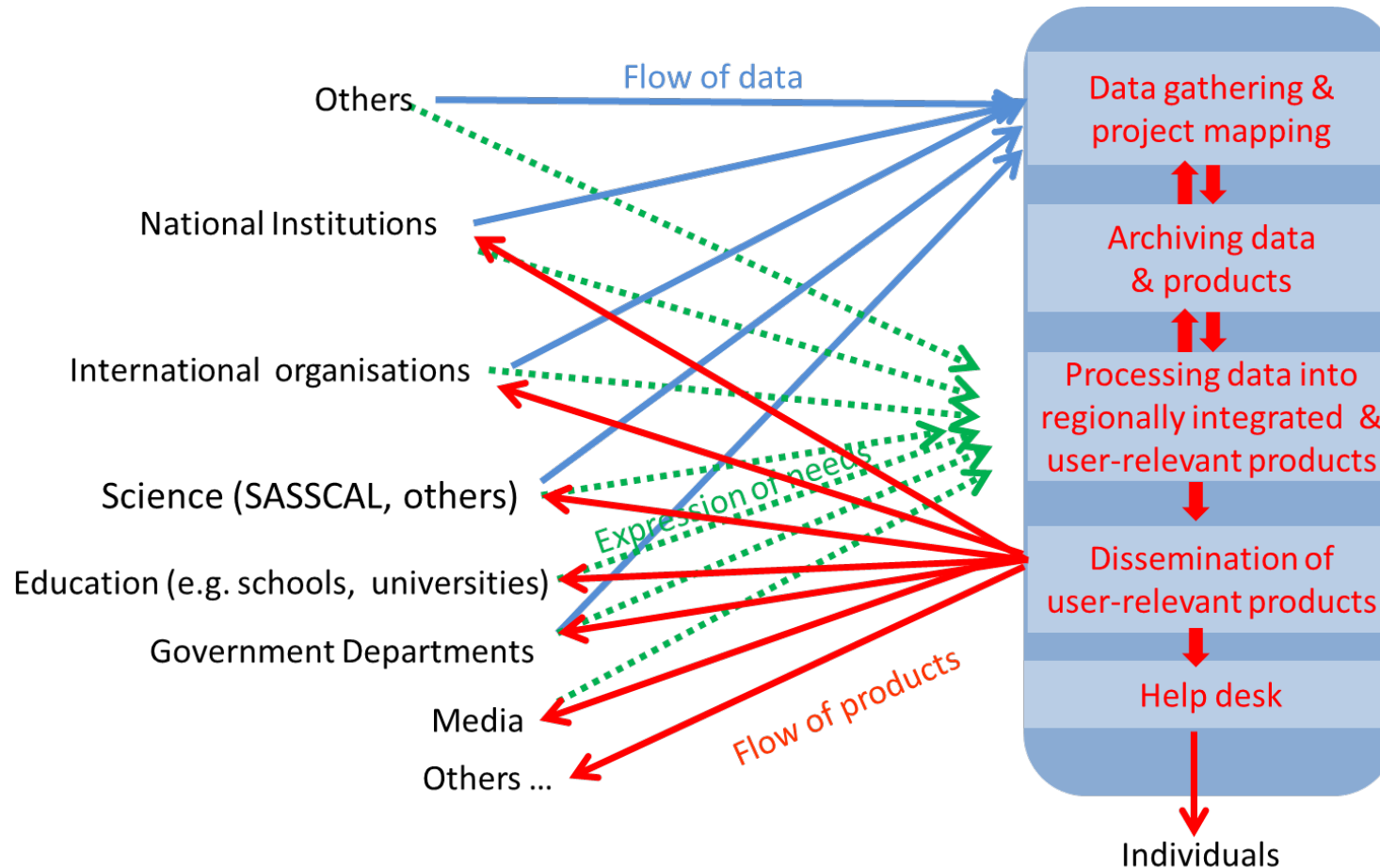


Erosion/Sedimentation/Salinity

- Drivers and processes
- Monitoring
- Impact assessments
- Management (eg. dams)
- Adaptation strategies
- Decision support/training



Open Access Data Centre

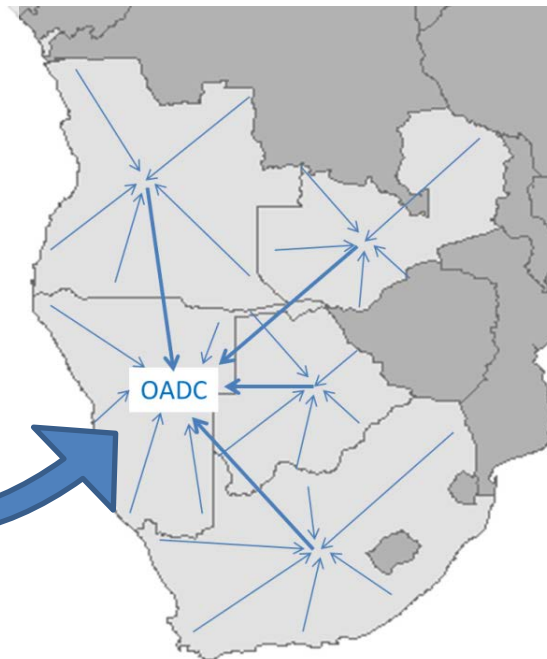


Open Access Data Centre

Collation of existing and newly generated data

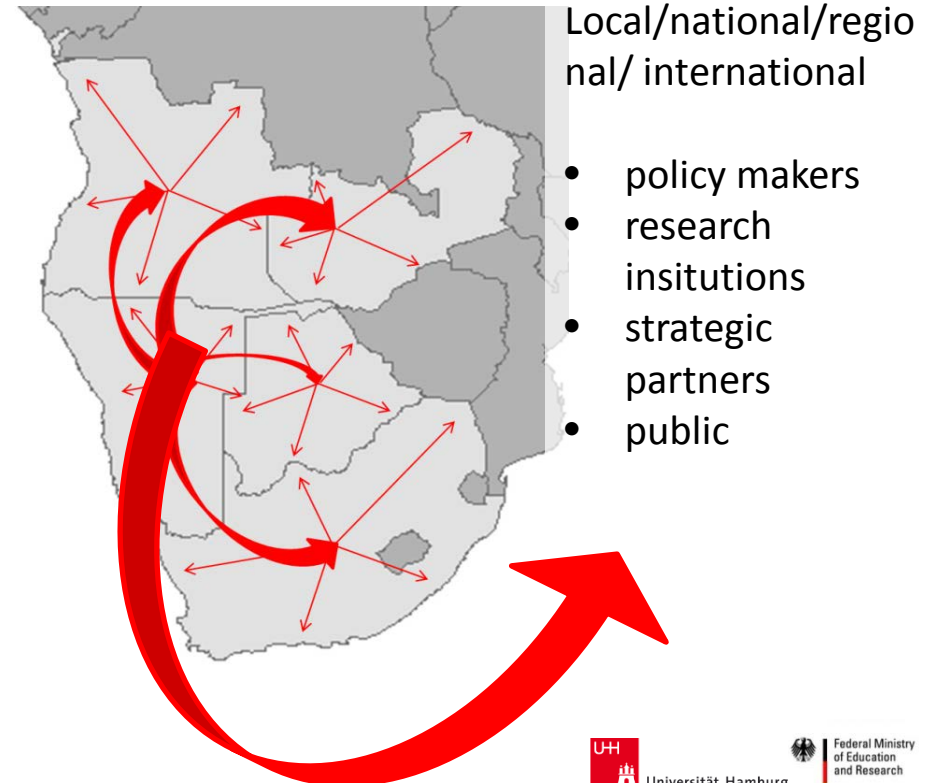
(e.g. national soil & forest maps, catchment information, station data ...)

- Existing archives (OBIS, GRDC ...)
- cooperation with global initiatives (FAO, UNEP, NASA, USGS ...)



Distribution of regionally integrated data

(e.g. regional map on soil or forest resources, rainfall pattern, climate scenarios...)

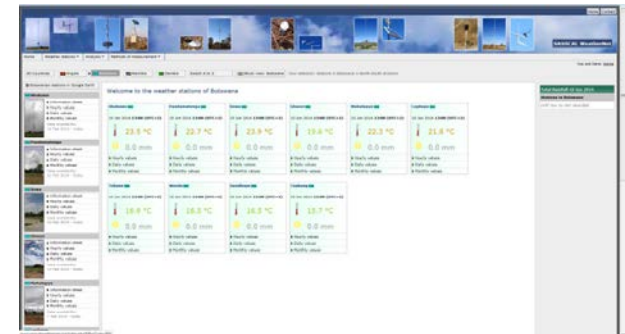
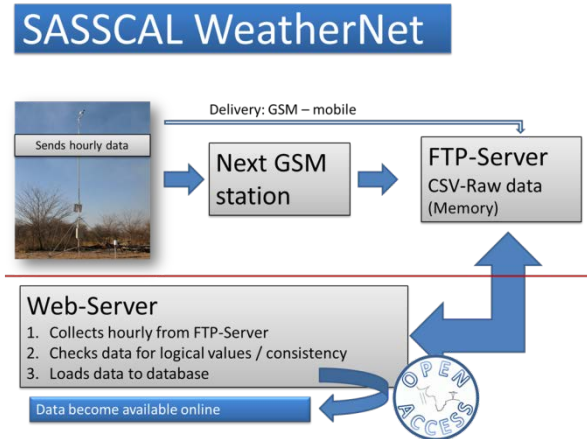


Local/national/regional/international

- policy makers
- research institutions
- strategic partners
- public

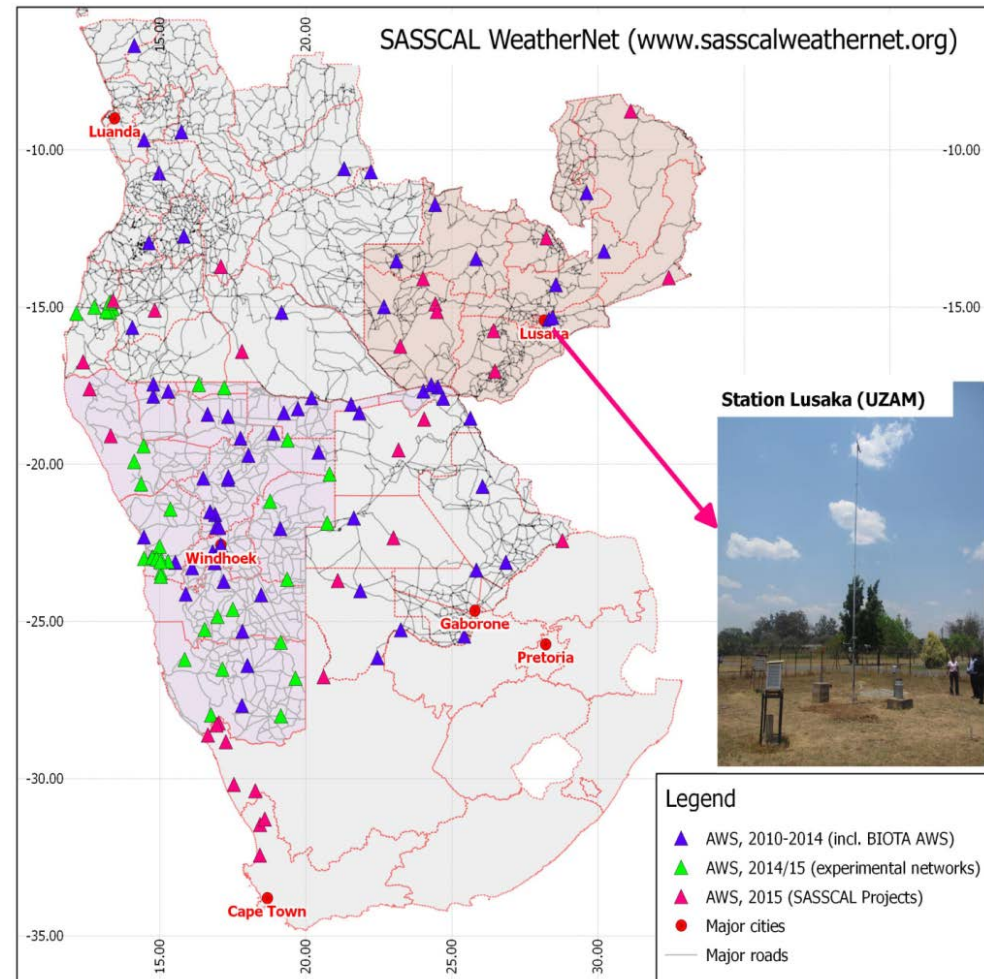
SASSCAL WeatherNet

- contribution to national weather monitoring efforts
- support for research tasks
- May 2015: 105+ AWS in operation and online
- 8 standard variables + optional var's
- WMO standards and registration
- Nearly real time availability on www.sasscalweathernet.org
- Aug 2015: 147 AWS in operation



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SASSCAL Services

SASSCAL WeatherNet

Home Weather stations * Analysis * Methods of measurement *

All Countries Angola Botswana Namibia Zambia Switch A to Z Block view: All Countries Your selection: All Stations in North-South direction

Quick jump: Weather stations hourly data

All stations in Google Earth

Weather stations in Angola, Botswana, Namibia and Zambia

Station	Time	Temp (°C)	Precip (mm)
Damba	22 Jan 2015 13:00 (UTC+1)	25.8	0.0
Cacuso	22 Jan 2015 13:00 (UTC+1)	28.3	0.0
Alto Dondo	21 Jan 2015 18:30 (UTC+1)	32.1	0.0
Muconda	22 Jan 2015 13:00 (UTC+1)	23.3	0.0
Kibala (Catofe)	22 Jan 2015 13:00 (UTC+1)	25.4	0.0
Samfyo	22 Jan 2015 13:00 (UTC+2)	25.3	0.0
Hwinilunga	22 Jan 2015 13:00 (UTC+2)	22.3	0.0
Chianga (Huambo)	22 Jan 2015 13:00 (UTC+1)	24.6	0.0
Ganda	No data available	-	-
Serenje	22 Jan 2015 13:00 (UTC+2)	24.6	0.0
Kasempa	22 Jan 2015 12:45 (UTC+2)	27.3	0.0
Zambezi	22 Jan 2015 12:15 (UTC+2)	21.1	0.0
Kabwe Hulungushi	22 Jan 2015 12:45 (UTC+2)	26.3	0.0
Kalabo	22 Jan 2015 12:45 (UTC+2)	26.1	0.0
Cuito Cuanavale	22 Jan 2015 13:00 (UTC+1)	25.7	0.0
Lusaka Int. Airport	22 Jan 2015 12:45 (UTC+2)	25.7	0.0
Lusaka University of Zambia	22 Jan 2015 13:00 (UTC+2)	25.1	0.0
Gambos	22 Jan 2015 13:00 (UTC+1)	29.0	0.0

Total Rainfall 22 Jan 2015

Stations in All Countries

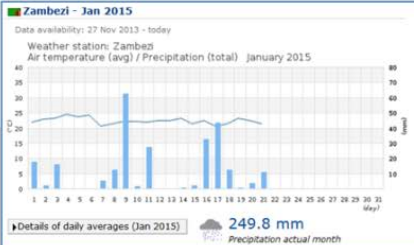
- Hwinilunga 30.0 mm [13:00]
- Zambezi 23.8 mm [12:00]
- Kasempa 17.2 mm [12:00]
- Okapyra 2.8 mm [13:00]
- Ogongo 1.2 mm [13:00]
- Shakawe 1.2 mm [14:00]
- Cuito Cuanavale 0.5 mm [13:00]
- Kibala (Catofe) 0.5 mm [13:00]
- John Pandeni 0.4 mm [13:00]
- Mashare 0.3 mm [13:00]
- Garnet Koppie 0.2 mm [10:00]
- Muconda 0.2 mm [13:00]
- Samfyo 0.2 mm [13:00]
- Gellap Ost 0.1 mm [13:00]

Zambezi - Jan 2015

Data availability: 27 Nov 2013 - today

Weather station: Zambezi

Air temperature (avg) / Precipitation (total) January 2015




249.8 mm
Precipitation actual month

Zambezi (No.: 856126) - Monthly values

Year: 2014

Diagrams (Number of diagram types): Air temp, Precipitation, Rel. Humidity

Hourly values - 1 Jan 2014 | Daily values - Jan 2014 | Monthly values - 2014 | Information sheet



Month	Year	Air temp. [avg]	Air temp. [max]	Air temp. [min]	Soil temp. [max]	Precip. [total]	Wind Speed [ic avg]	Wind direction [ic avg]	Wind Speed [max]	Max. speed wind dir. [avg]	Humidity [%]
Jan	2014	22.3	17.1	32.2	26.4	224.3	1.5	353	9.5	134	84.6
Feb	2014	22.3	17.3	32.3	26.8	197.8	1.2	1	8.6	323	84.8
Mar	2014	22.0	16.3	31.2	26.1	140.2	0.9	74	9.4	40	87.0
Apr	2014	21.3	12.7	31.0	25.5	107.2	2.4	112	7.4	96	81.2
May	2014	19.2	8.5	30.2	25.2	0.0	2.9	113	8.8	81	70.4
Jun	2014	17.5	6.1	30.7	22.9	0.0	2.7	117	9.0	97	65.8
Jul	2014	16.8	3.1	29.7	21.7	0.0	2.7	117	8.7	102	59.7
Aug	2014	19.9	3.2	34.2	23.6	0.0	2.7	117	9.7	71	47.4
Sep	2014	23.6	9.2	37.0	27.2	0.0	2.3	101	10.6	62	39.8
Oct	2014	25.6	12.7	36.8	30.0	24.4	0.8	44	12.5	81	50.8
Nov	2014	23.7	15.6	36.9	28.4	39.4	0.3	49	15.5	72	72.7
Dec	2014	22.7	17.3	31.3	27.0	222.0	1.2	6	9.1	88	83.3

Integrated Research

- Interdisciplinary research addressing a wide range of global change aspects
- Linking basic research (observation & system understanding) and frontier science (modelling and (change) assessments)
- Improving data situation (incl. data rescue), developing innovative tools and new knowledge

Services and Capacity Development

- Stakeholder-oriented services (OADC, climate information, data rescue, vegetation maps, policy briefs)
- Technical infrastructure and human resources development

SASSCAL: Platform to link integrated research, service provision and capacity development for problem-oriented solutions according to regional needs

Thank you! Merci beaucoup! Danke!

SASSCAL Scientific Coordination

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