

# e-Infrastructure for Climate Change Research in Sub Sahara Africa

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# Outline

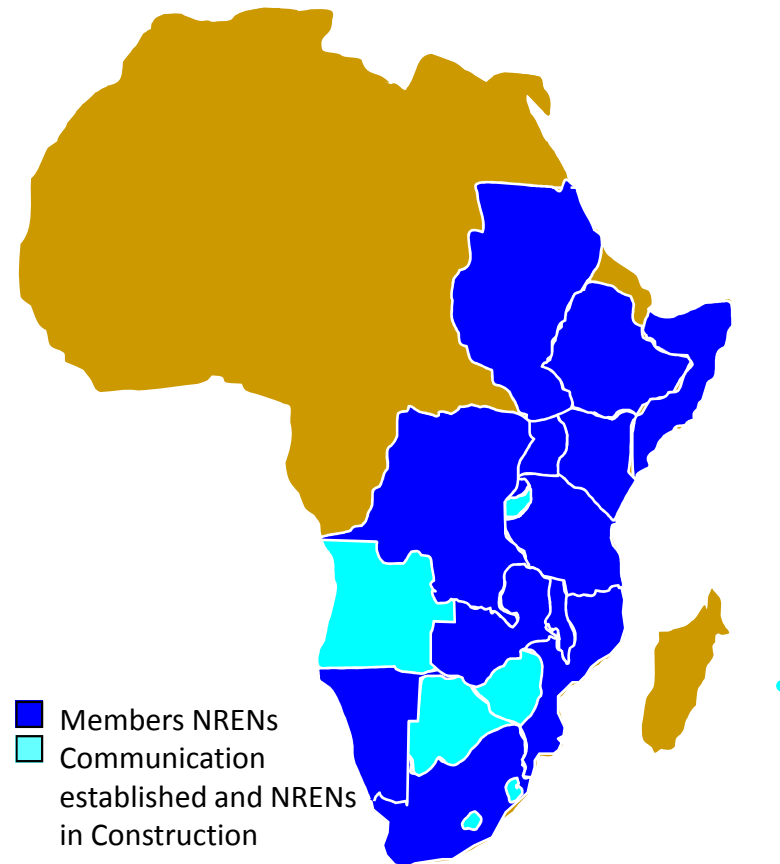
- UbuntuNet Alliance
- WACREN
- Connectivity status
- e-Infrastructure situation
- Climate change research
- Conclusion

# UbuntuNet Alliance

- Regional Research and Education Network for East and Southern Africa
- Aim is to interconnect all NRENs in the region and connect them other regional RENs of the world
- Registered as a not for profit Association of NRENs in 2006
- Five founding NRENs in Kenya, Malawi, Mozambique, Rwanda, South Africa
- Today, membership has grown to 13 NRENs, most recent one being Xnet of Namibia
- Secretariat in Lilongwe, Malawi
- We participate in EU FP7 projects: GLOBAL, ERINA4Africa, CHAIN

# NRENs in UbuntuNet Alliance

- Eb@le – DRC
- EthERNet - Ethiopia
- KENET – Kenya
- MAREN – Malawi
- MoRENet – Mozambique
- RENU – Uganda
- RwEdNet – Rwanda
- SomaliREN – Somalia
- SudREN – Sudan
- TENET – South Africa
- TERNET – Tanzania
- Xnet – Namibia
- ZAMREN – Zambia



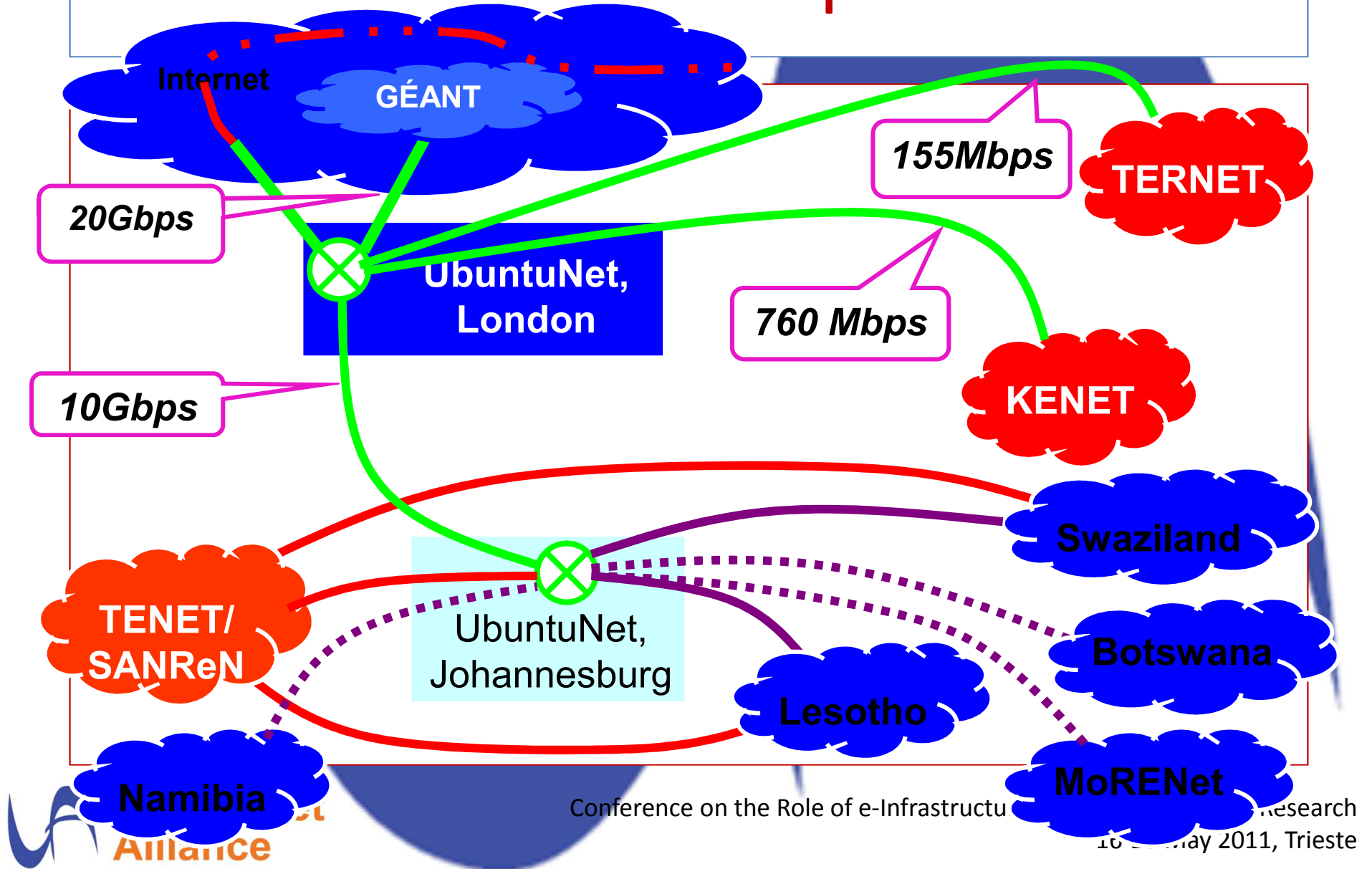
# WACREN

- West and Central African Research and Education Network
- Formerly registered in 2010, AAU REN Unit incubation
- Management Board elected in March 2011, President: Professor Tiemoman KONE (Cocody University, Cote d'Ivoire)
- Signed an MOU with SnRER (Senegal) to host NOC
- Participating Countries: Benin, Burkina Faso, Cameroon, Cote d'Ivoire, Gabon, Ghana, Mali, Niger, Nigeria, Senegal, Togo
- No operational NRENs yet
- Working with RENATER









# UbuntuNet Connected to GÉANT

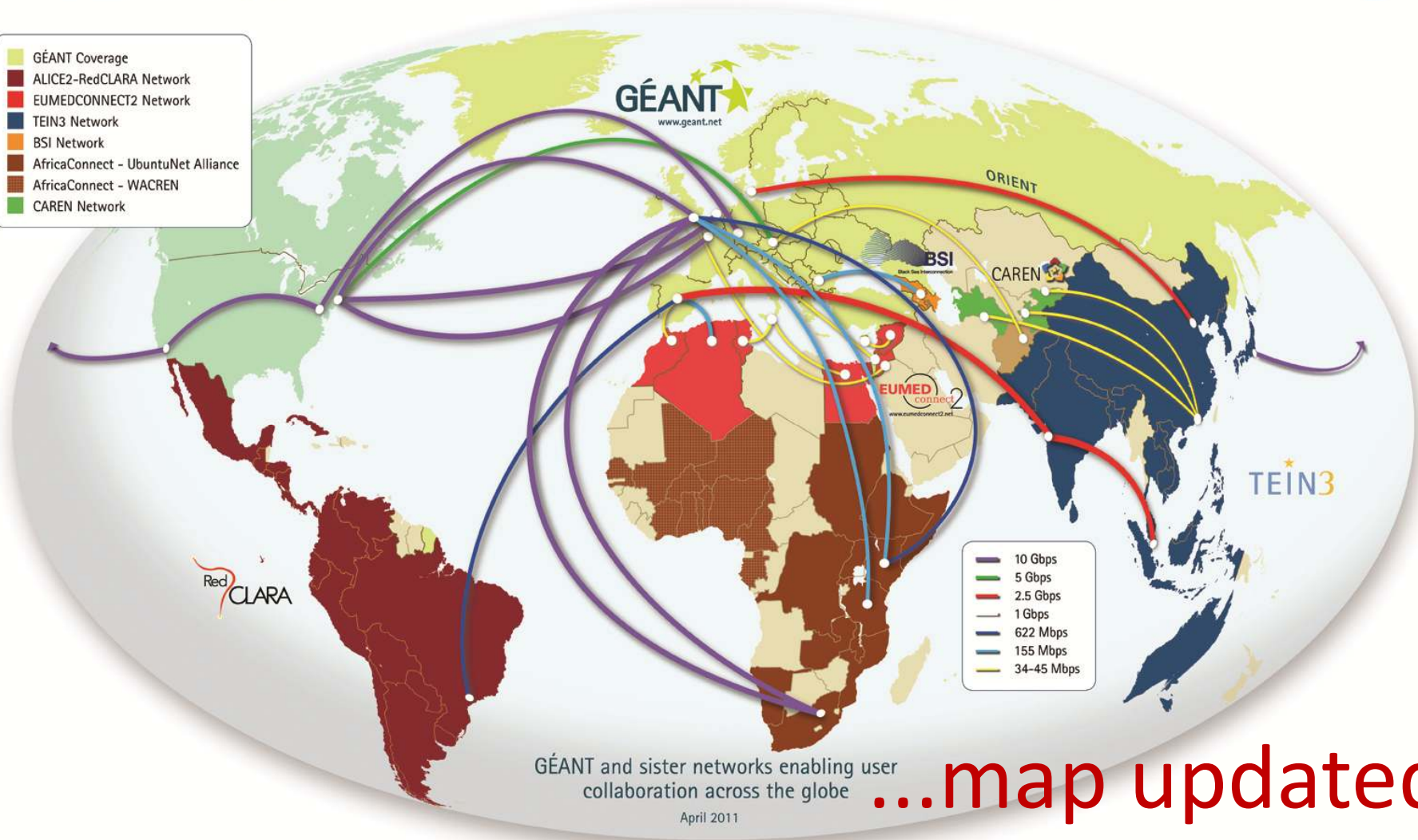
- In 2008 UbuntuNet set up a Routing Hub in London with 1Gbps connection to GÉANT
- The connection has recently been upgraded to 20Gbps, following increases in demand by the Hartebeesthoek Radio Astronomy Observatory in South Africa
  - Data is sent to to VLBI correlation centre in Netherlands
- NRENs connecting to the London Routing Hub:
  - TENET was the first to connect (January 2008)
  - KENET (2010)
  - TERNET (April 2011)
  - We hope next will be SudREN and EthERNet

# UbuntuNet Current Operations



# GÉANT At the Heart of Global Research Networking

-  GÉANT Coverage
-  ALICE2-RedCLARA Network
-  EUMEDCONNECT2 Network
-  TEIN3 Network
-  BSI Network
-  AfricaConnect - UbuntuNet Alliance
-  AfricaConnect - WACREN
-  CAREN Network





# e-Infrastructure situation

- Over the past 2.5 years FEAST and ERINA4Africa projects working with UbuntuNet Alliance have studied the African e-Infrastructure Landscape
  - Patches of isolated projects (Lighthouse Demonstrators)
  - Huge potential and demand for e-Infrastructure applications
- A number of regional collaborations involving human networks, e.g. RUFORUM, NAPRECA, Africa Adaptation Programme, etc
- South Africa has made significant investments in a wide programme of e-Infrastructure for science, TENET/SANReN, CHPC, VLDS, SAGrid
- Development of e-Infrastructures has been slow
  - cost of bandwidth
  - low level of regional and international connectedness
- Most of the region is an e-infrastructure greenfield

# Some e-Infrastructure applications

- ERINA4Africa found the following applications:

- Africa4all
- AgShare Planning and Pilot
- Baobab Health Trust
- CARENET
- Magnetic Resonance Imaging (MRI) in Malaria Research in Malawi
- Information System for risk management via remote detection - Cameroon
- Virtual-Land Computer System (VCS)
- WSN4WQM – WSN for Water Quality Monitoring
- Malawi College of Medicine CPD
- NAPRECA



- *More details at [www.erna4africa.eu/casestudies](http://www.erna4africa.eu/casestudies)*

# Initiatives

- Regional projects addressing broader e-Infrastructure issues have taken on board climate change research applications
  - Unesco BrainGain Initiative
  - HP Catalyst
  - EPIKH
  - ICTP
- SAGrid is very active and reaching out to other countries

# e-Infrastructures in the region

- South Africa
  - Centre for High-Performance Computing (CHPC)
  - Large Data Set Access, Storage and Curation (VLDS)
- HPC facilities (ICTP initiatives)
  - Tanzania
  - Ethiopia
  - Kenya
  - Nigeria
  - Benin
  - Cameroon
  - Ghana
  - Bukina Faso
- Grid computing sites
  - Countries participating in Unesco BrainGain Initiative

# Climate Change Research

- Cote d'Ivoire - University of Cocody
  - Project MOCCAD (Climate modelling and distributed computing)
- Cameroon - University of Douala
  - Strengthening local capacities for the study of climate change and consequences through distributed computing
- Ethiopia - Mekelle University
  - Distributed Grid Computing for Climate Change Adaptation and Biological Modelling/Simulation
- South Africa – University of Cape Town
  - Climate Systems Analysis Group, <http://www.csag.uct.ac.za/>

# Cameroon: Douala University

- Strengthening local capacities for the study of climate change and consequences through distributed computing
- Highlights:
  - Mobilize researchers in climate, atmospheric physics, hydrology, hydrogeology, biodiversity, to attain a better understanding of the effects of global climate change nationally.
  - Ensure a better use of existing (global as well as regional) climate simulation models; establishment of new models to follow up on and foresee evolutions in malaria, water resources, water flows to hydroelectric dams, evolution in the surface of arable land, biodiversity.
  - Collect climate and hydrological data, test existing models, write computer programmes and models that are specific to the project, run the models and analyse results

# Côte d'Ivoire: Cocody University

- Climate modelling and distributed computing (MOCCAD)
- Highlights:
  - Mobilize the resources to support the development of a regional climate modelling tool and foster the emergence of a regional climate modelling centre.
  - Mobilize the resources to support the development of a Master's Degree on climate modelling and scientific computation, open to students in the sub region.
  - Hold training seminars and create distributed computing courses focused on themes that are relevant for the region.

# Ethiopia: Mekelle University

- Distributed grid computing for climate change adaptation and biological modelling/simulation
- Highlights:
  - Establish a grid computing facility to facilitate the operation of grid-computing powered research projects in the areas of Biological and Climate Change Adaptation Modelling and Simulation, for the benefit of academics and students, researchers, at the regional and national levels.
  - Train technical staff (server and operations management) and instructors and researchers in using the grid computing environment for science.
  - Conduct research in Modelling and Analysis Environment for climate change analysis and forecasting.
  - Conduct research in Modelling and Simulation Environment for biology, medicine and other natural sciences and engineering.



# South Africa: University of Cape Town

- Climate Systems Analysis Group
- Group of multi-disciplinary scientists with research projects linked to all aspects of the climate systems



The screenshot shows a web browser window with the URL [www.csag.uct.ac.za/active\\_research](http://www.csag.uct.ac.za/active_research). The page header features the CSAG logo and the text "Climate Systems Analysis Group", "START/PACOM Centre of Excellence", and "Regional node for climate modeling". A navigation menu includes "CSAG", "Climate Change", "Seasonal Forecast", and "Weather". The main content area is divided into two columns. The left column contains "Contact Details" (including contact information for CSAG at the University of Cape Town) and "Vacancies" (listing two post-doc positions and one PhD position). The right column contains "Home > CSAG", "Active Research" (with a news link), "Active Projects:" (listing CORDEX, Regional Climate Modelling and Downscaling, CSAG/UNITAR, Climate Information Portal (CIP), and CSIR/SAWS/CSAG), and a "Login" link.

<http://www.csag.uct.ac.za>

# To close the gap

- Situation is not uniform as countries (NRENs) are at different levels of development
  - Some have infrastructure and users
  - Others have interest, but no infrastructure
  - Yet others have infrastructure, but no users
- Our exciting challenge is to close the gap
- Since climate is regional, so must be approaches to it

# Africa ROC is ready



The screenshot shows a web browser window displaying the Africa ROC website. The browser's address bar shows the URL [roc.africa-grid.org](http://roc.africa-grid.org). The website header features a green banner with the text "Africa ROC Regional Operation Center" and logos for the African continent and the European Union. A navigation menu includes links for Home, User Pages, Site Manager Pages, Virtual Organisations, Grid Services, Monitors, User Support, and Contact Us. The main content area is titled "About Africa ROC" and contains the following text:

Last Updated on Thursday, 08 July 2010 12:25 Written by Roberto Barbera

The Africa Regional Operation Centre (Africa ROC) has been created as a coordination and support point for all sites in the Continent wanting to participate in the stimulating and challenging endeavour of creating a common Grid infrastructure to foster e-Science. Africa ROC is supported by many projects and initiatives. They are listed on the right frame of this page.

The dynamic map below shows both the sites belonging to the Africa ROC and those sites belonging to other ROCs but participating in common projects. Click the mouse on the sites to get more information on their status.

If you are interested in knowing more about Africa ROC, please visit the pages of this site and/or feel free to contact us.

The Africa ROC Managers

On the right side of the page, there is a "Africa ROC NEWS" section with two items:

- Africa-GRID GOCDB fully operational Available at <https://gocdb.africa-grid.org/>
- The Africa ROC User Support system has been moved to the new URL <https://support.africa-grid.org>. Please, update your bookmarks.

At the bottom of the screenshot, the URL <http://roc.africa-grid.org/> is displayed in a large font.

...now that AfricaConnect is signed



*“The initiative will dramatically accelerate the development of the Information Society in Africa, providing advanced data communications infrastructure and enabling African researchers to collaborate more easily in advanced international research projects.”*

# Conclusion

- Research opportunities are opening up Sub Sahara Africa as the communications infrastructure is improving
- With AfricaConnect rolling out, attention is focusing on applications to show case results
- Climate change research is increasingly becoming high on the agenda
- Now our exciting task is to build more **communities** in climate change research