



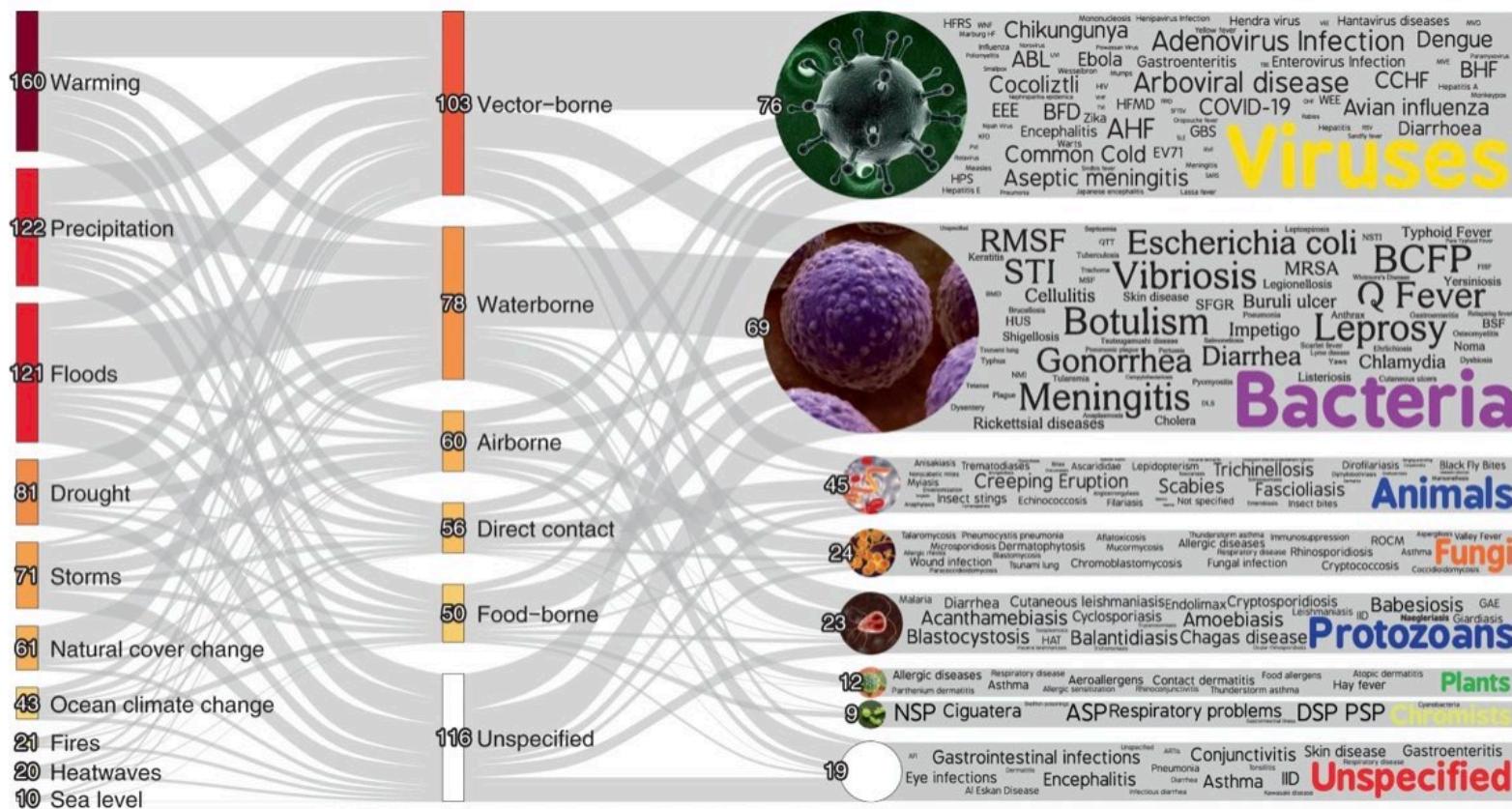
Update for the first quarter (3 months) of the Climate Amplified Diseases and Epidemics (CLIMADE) program

Stellenbosch University: 30 May 2023

Prof Tulio de Oliveira

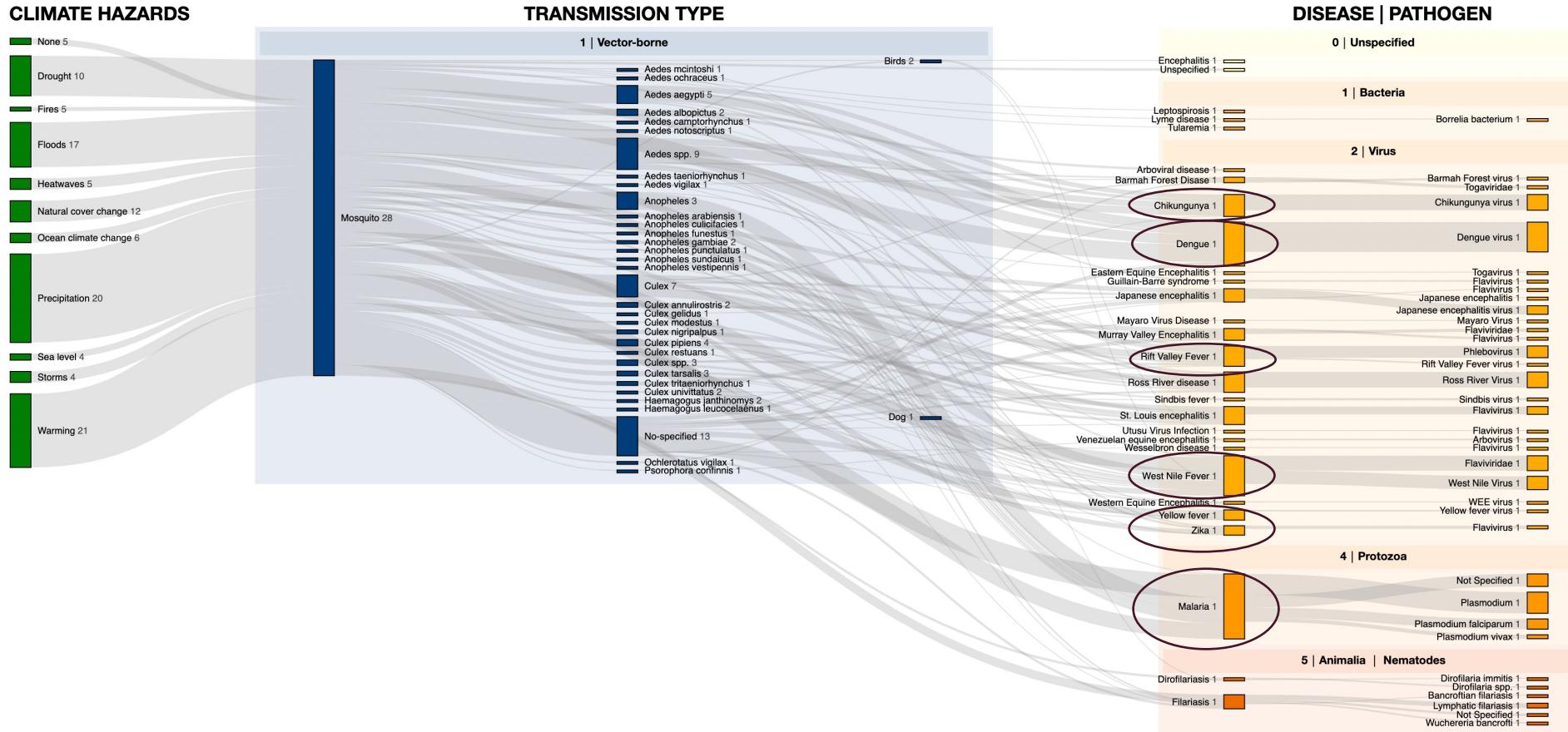
Director of CERI, Stellenbosch University

Over Half of known pathogens outbreak will increase due to global warming.



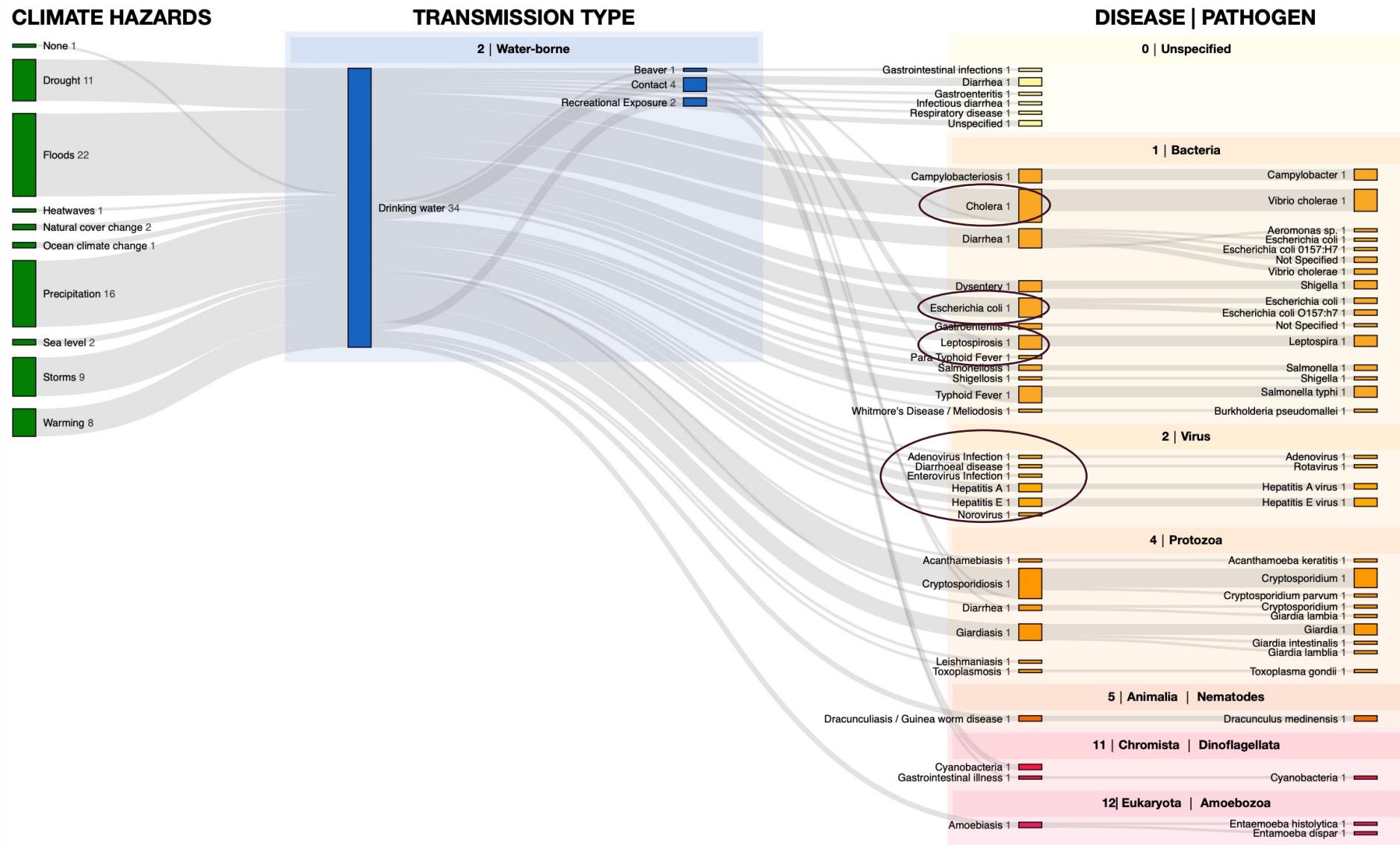
Over half of known human pathogenic diseases can be aggravated by climate change. Mora et al., 2022, Nature Climate Change

Mosquito Borne Diseases

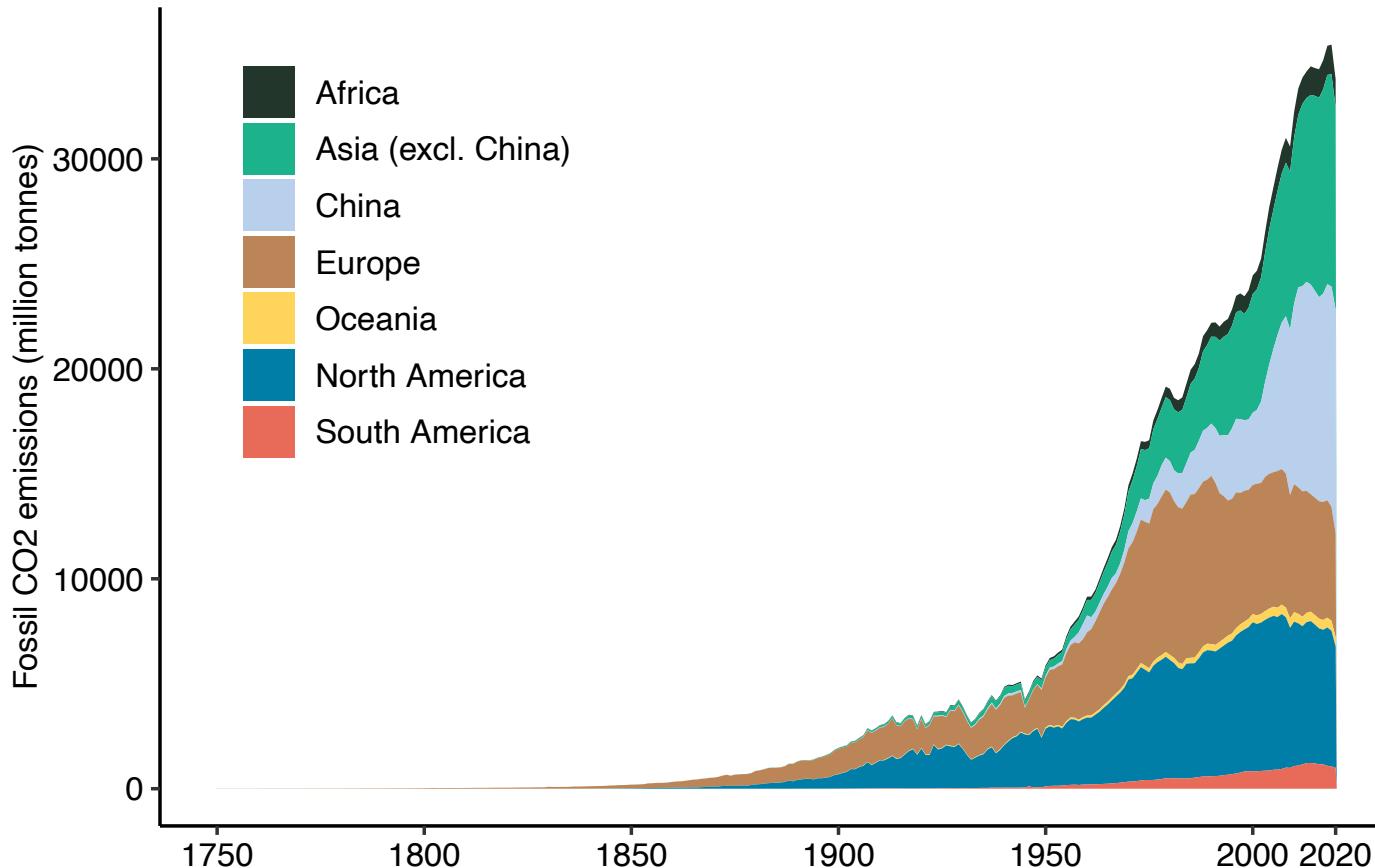


Over half of known human pathogenic diseases can be aggravated by climate change. Mora et al., 2022, Nature Climate Change

Water-Borne (Drinking Water) Diseases



Fossil CO₂ emissions over time



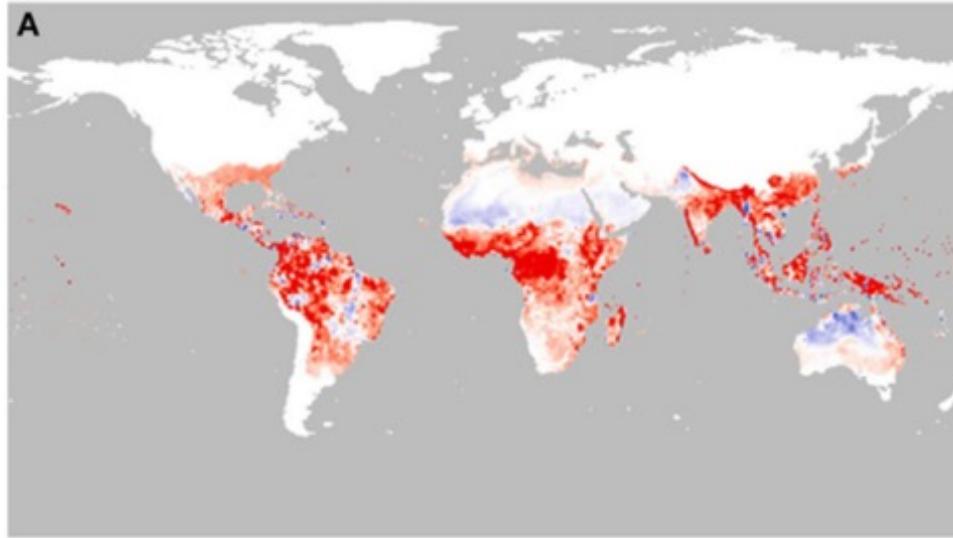
The three continents that least contribute:

- Africa
- Oceania
- South America



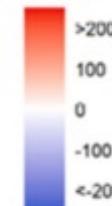
A. aegypti

Projected change in vector populations and suitability ranges

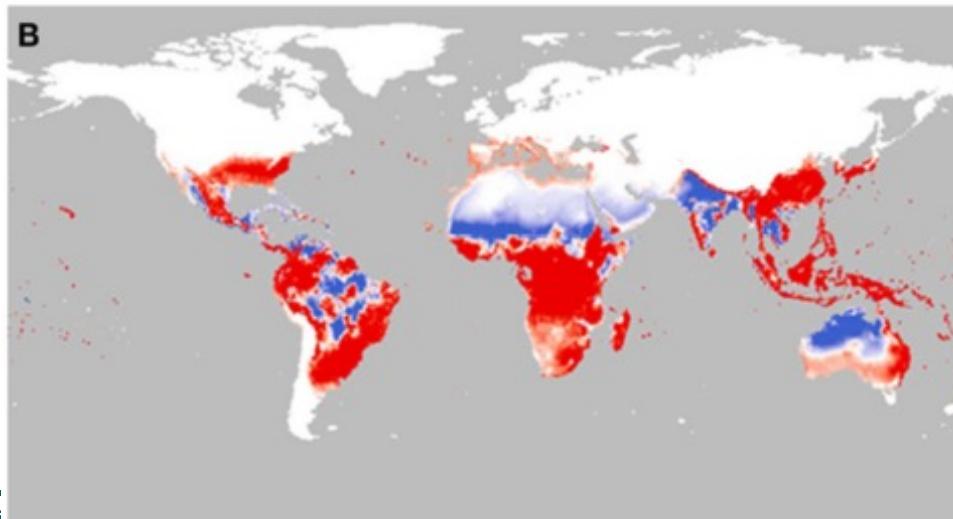


RCP2.6

Potential abundance change
(2090-2099) - (1987-2016)

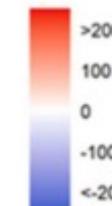


Most optimistic climate change pathway



RCP8.5

Potential abundance change
(2090-2099) - (1987-2016)



Most severe climate change pathway



CLIMATE AMPLIFIED DISEASES AND EPIDEMICS (CLIMADE):

Vision



To create a global consortium to generate knowledge, develop tools and interventions to predict, track & control diseases and epidemics amplified by climate change.

To use these advances to prevent the global spread of epidemics & pandemics



Experience & partners

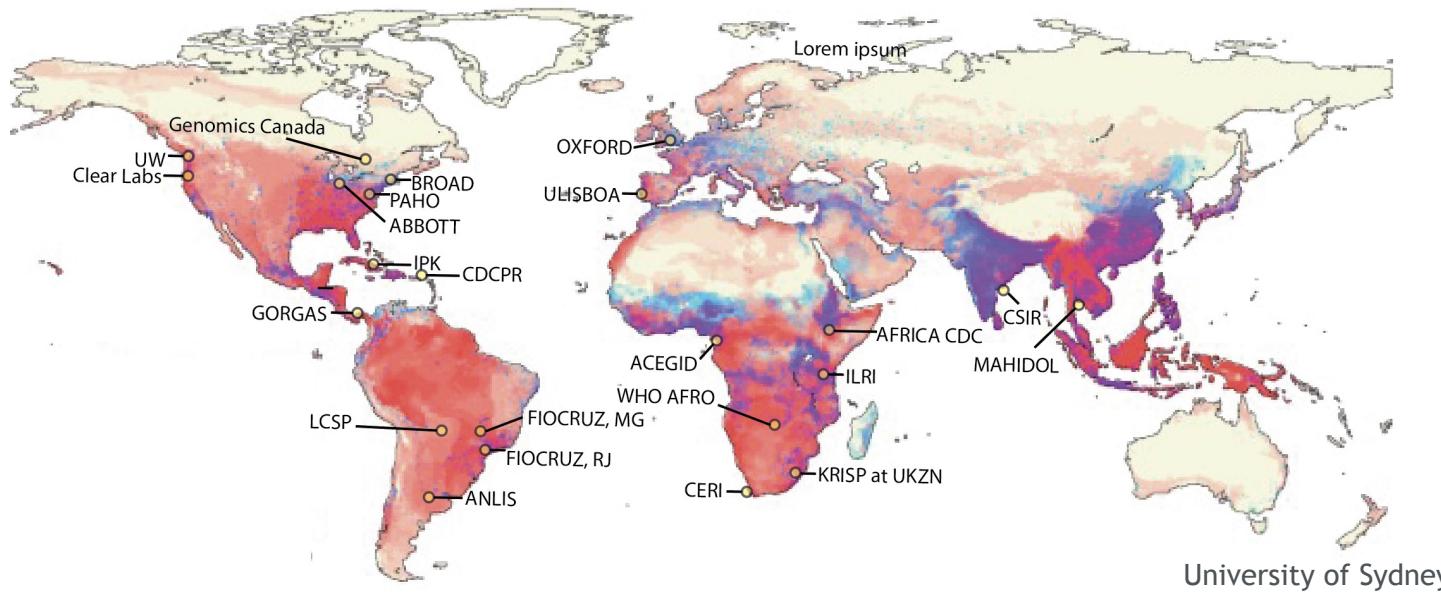


**LONG TERM
EXPERIENCE WITH
EPIDEMICS &
IMPACTFUL
COLLABORATION**

The CLIMADE consortium will bring together partners around the globe that have long term experience working with climate amplified epidemics and pathogens.

Partners include public health agencies, academic organizations, and the industry.

Flagship II: Climate Amplified Diseases & Epidemics (CLIMADE) Consortium



Over half of the pathogens will be amplified by global warming (Arbovirus, Malaria, AMR, Hepatitis, Cholera, Maburg, Flu, RVF, etc).

CLIMADE: Global program lead by Global South with European, American and Oceania partners.
Rockefeller, Abbott, EC2020
(Initial and engaging with other funders)



In 2023, **CLIMADE Africa** is working to train and support African laboratories to diagnose and sequence climate associated pathogens

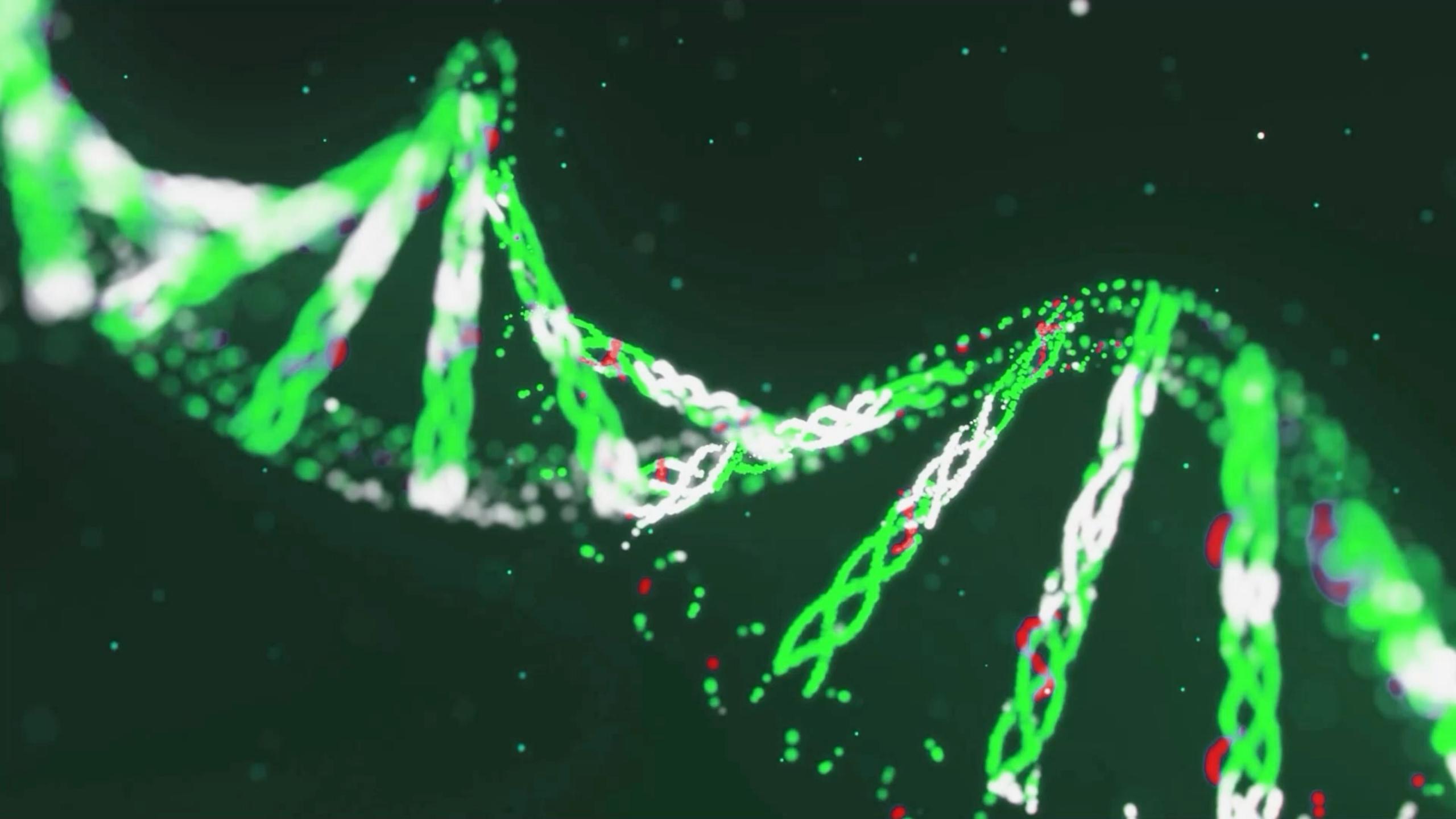
The first activities in 2023:

- 1) Capacity Building and Training of African and Latin American partners (in person & remotely) and provision of protocols and guidelines for country sequencing.
- 2) Provide rapid genomic sequencing of pathogens by sending reagents and people to support capacity to sequence locally.
- 3) Providing sequencing for African countries with the three specialized genomics facilities of Africa CDC and WHO AFRO in Kenya, Nigeria and SA.

Capacity Building and Training:

- Genomics Africa Fellowship program: 36 Fellows from 18 African Countries at CERI (10-21 April 2023)
- Trained in how to adapt COVID-19 protocols to sequence other viruses (e.g., Dengue, CHIKV, Yellow Fever, etc) and TB protocols to sequence other bacteria (e.g., Cholera)







Next Capacity Building and Training:



- 27th International Virus Evolution and Molecular Epidemiology Workshop – 200 participants from > 60 countries (fellowships to 50 Africans – looking for more funding).
- Hands-on training program in October at CERI in SA for 30-40 fellows from Africa.
- Topics to be defined by CLIMADE African team:
- Some suggestions: qPCR panels for pathogens & metagenomics



14 online meetings (every Tuesday)



7 Feb	T de Oliveira	Introduction to CLIMADE, meeting participants, & field of work
14 Feb	M Moir & H Tegally	Landscape of prevalence & surveillance of climate sensitive vector-borne diseases in Africa
21 Feb	M Moir	CLIMADE Africa: Accelerating genomics in Africa (list of labs to facilitate sequencing, set up MTA, showcasing github page with protocols, advertising training opportunities)
28 Feb	M Giovanetti & L Alcantara	Genomic monitoring of arboviruses in South America
7 Mar	S Grobler	Requirements and details for drawing up a Material Transfer Agreement with the regional laboratories in Africa (CERI, ACEGID, and ILRI)
14 Mar	H Tegally	Preliminary phylogenetics and transmission dynamics for arboviruses in Africa
28 Mar	M Moir & H Tegally	Progress report on the prevalence and surveillance of climate sensitive vector-borne diseases in Africa, advertising upcoming training opportunities
4 Apr	J Juma	Genomic classification for Rift Valley Fever Virus
25 Apr	C Mavian	Cholera introduction and spread across the African continent
2 May	J Juma	Tutorial: Use of Rift Valley Fever Virus typing tools on web-based Genome Detective and command line based Nextflow language
9 May	L Chabuka	Adaptive protocol for Cholera whole genome sequencing during the Malawi epidemic
16 May	T de Oliveira	Pipelines for viruses: Bioinformatic analysis and viral typing tools
23 May	W Choga	Workflow for Genomic Analysis of Vibrio Cholera: Application for recent outbreak



Train the trainer:
Dr. Houriiyah Tegally (MU)
Dr. Monika Moir (SA)
Dr. John Juma (KE)
Wounderful Choga (BW)
Luscious Chabuka (ML)



Open Protocols, open data analysis scripts

README.md

CLIMADE

Climate-Amplified Diseases and Epidemics (CLIMADE)

<https://climade.health/>

This repository is under development and will contain all epidemiological/genomic data, analysis scripts and diagnostics/sequencing protocols related to climate-sensitive infectious diseases.

As a first stage, pathogens of interest are currently vector-borne viruses (e.g. Dengue, Chikungunya, Zika, West Nile, Rift Valley Fever, Crimean-Congo Hemorrhagic Fever) and water-borne infections (e.g. Cholera) in Africa.

<https://github.com/CERI-KRISP/CLIMADE>

CLIMADE AFRICA WORKING GROUP MEETING MINUTES – WEEK 11

Host: Centre for Epidemic Response and Innovation (CERI)

Date: May 9, 2023

Time: 12:00 – 13:00 p.m. (SAST)

Facilitators: Dr Eduan Wilkinson, Dr Monika Moir and Dr Yeshnee Naidoo

Attendance/ No. of Participants: 83

Start time: 12:03p.m. (SAST)

Purpose of the meeting

Sequencing methods for Cholera

Agenda Items

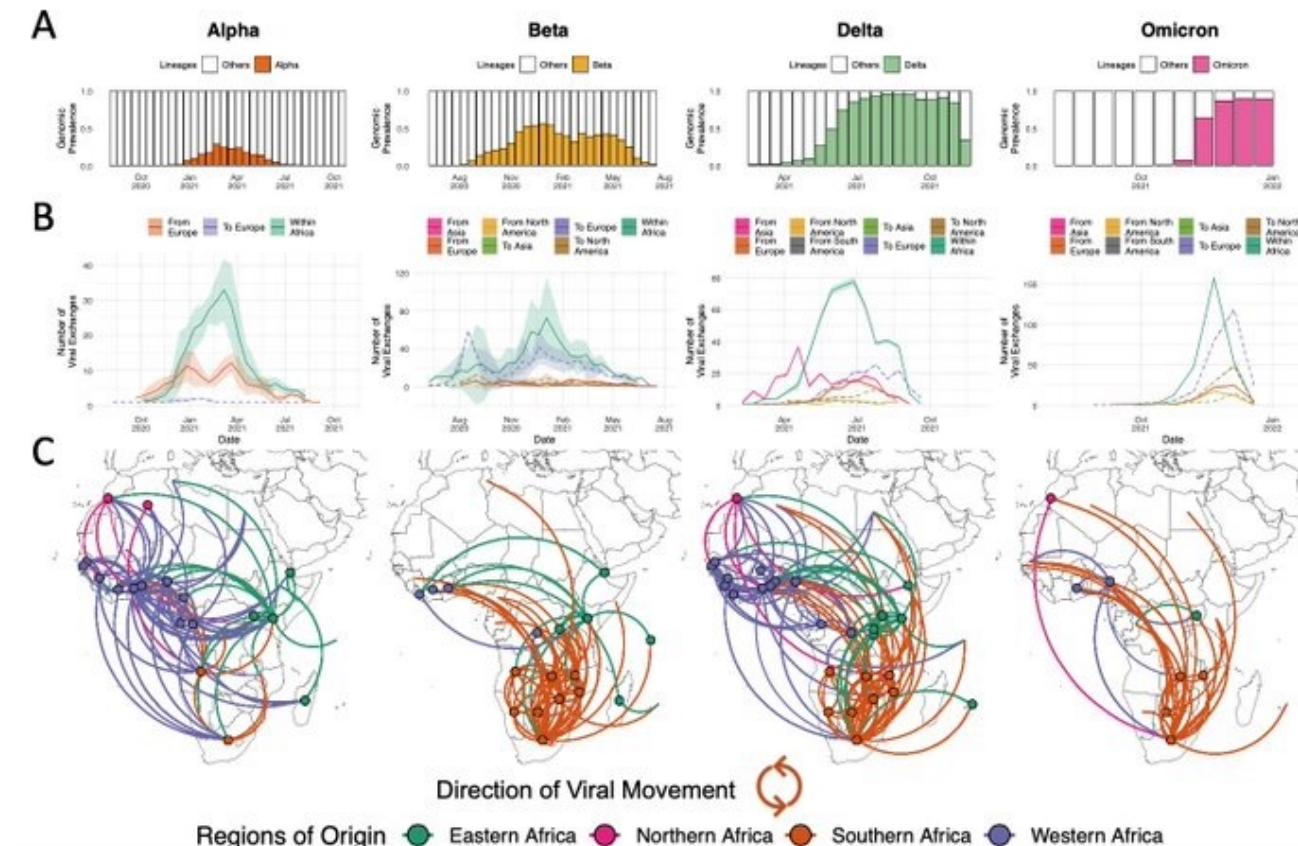
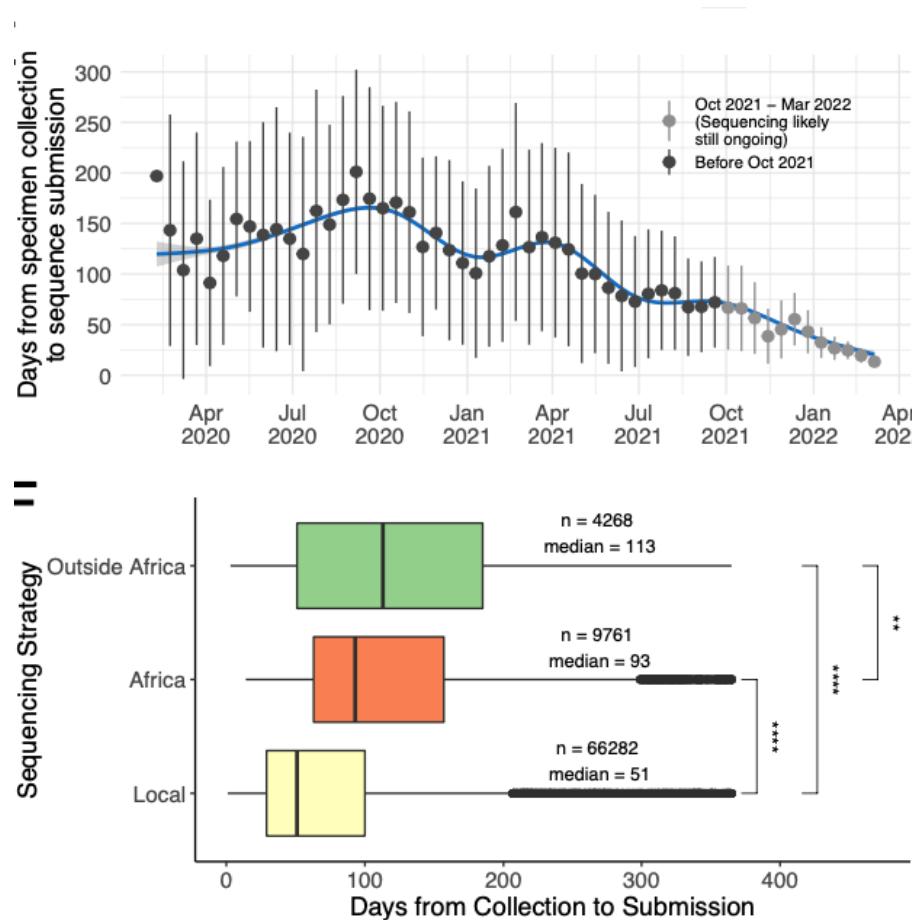
1. Welcome and update by Dr Monika Moir.
2. Introduction to the presentation by Dr Yeshnee Naidoo and Presentation by Lucious Chabuka from the Public Health Institute of Malawi and an MSc fellow at CERI Tygerberg laboratories.
3. Questions and Discussion

Discussion points and questions

1. Mr. Chabuka discussed the adaptive protocol for Cholera whole genome sequencing during the Malawi epidemic which included:
 - The history and comparison of cholera outbreaks in Malawi
 - The geographical range of outbreaks and specimen collection.
 - Sample preparation

2) The evolving SARS-CoV-2 epidemic in Africa

Insights from rapidly expanding genomic surveillance – Tegally et al. **Science** 2022





2) CERI fellow Lucious Chabuka from Malawi



- On **6th March 2023**, CERI received a communication that Lucious could come to Malawi.
- On **7th March 2023**, Lucious was tasked with preliminary assessment for the availability of reagents
- CERI shipped to Malawi, DNA extraction, DNA library preparation reagents, Nextera CD indexes, P2 cartridges and P2 flow cells.
- On **14th March 2023**, Seventy cholera samples were successfully cultured and available. Lucious arrived in Malawi on **17th March 2023** with the DNA extraction kit.
- **20th March 2023**, all 70 samples had been extracted.
- **22nd March 2023** shipped reagents arrived. Library preparation was then done on Thursday (**23rd March 2023**), followed by normalization and loading of the library on Friday (**24th March 2023**). On Saturday (**25th March 2023**), Lucious travelled back to South Africa.

Acknowledgements



Malawi PHIM (Who did the work)

- Dr Samson Mndolo Principal secretary-Ministry of Health
- Dr Queen Dube Chief secretary -Ministry of Health
- Dr Mathew Kagoli = Head of Public Health Institute of Malawi
- Mr Joseph Bitilinyu Head of Public Reference Laboratories
- Dr Mirriam Nyenje- Head of Genomics Lab at PHIM
- Yollamu Chavula –Deputy of Genomics Lab at PHIM
- Mphatso Bukhu -Lab Tech of Genomics Lab at PHIM
- Happy Manda -Lab Tech of Genomics Lab at PHIM
- Moses Chitenje -Lab Tech of Genomics Lab at PHIM

CERI team and CERI fellows:
Wonderful Choga (Botswana
Harvard)
Dr Carla Mavian (University of
Florida Gainesville)
Dr. Houryiah Tegally (Mauritius)
Dr Monika Moir (South Africa)
Dr TJ Sanko (South Africa)
Dr. Richard Lessells (South
Africa)



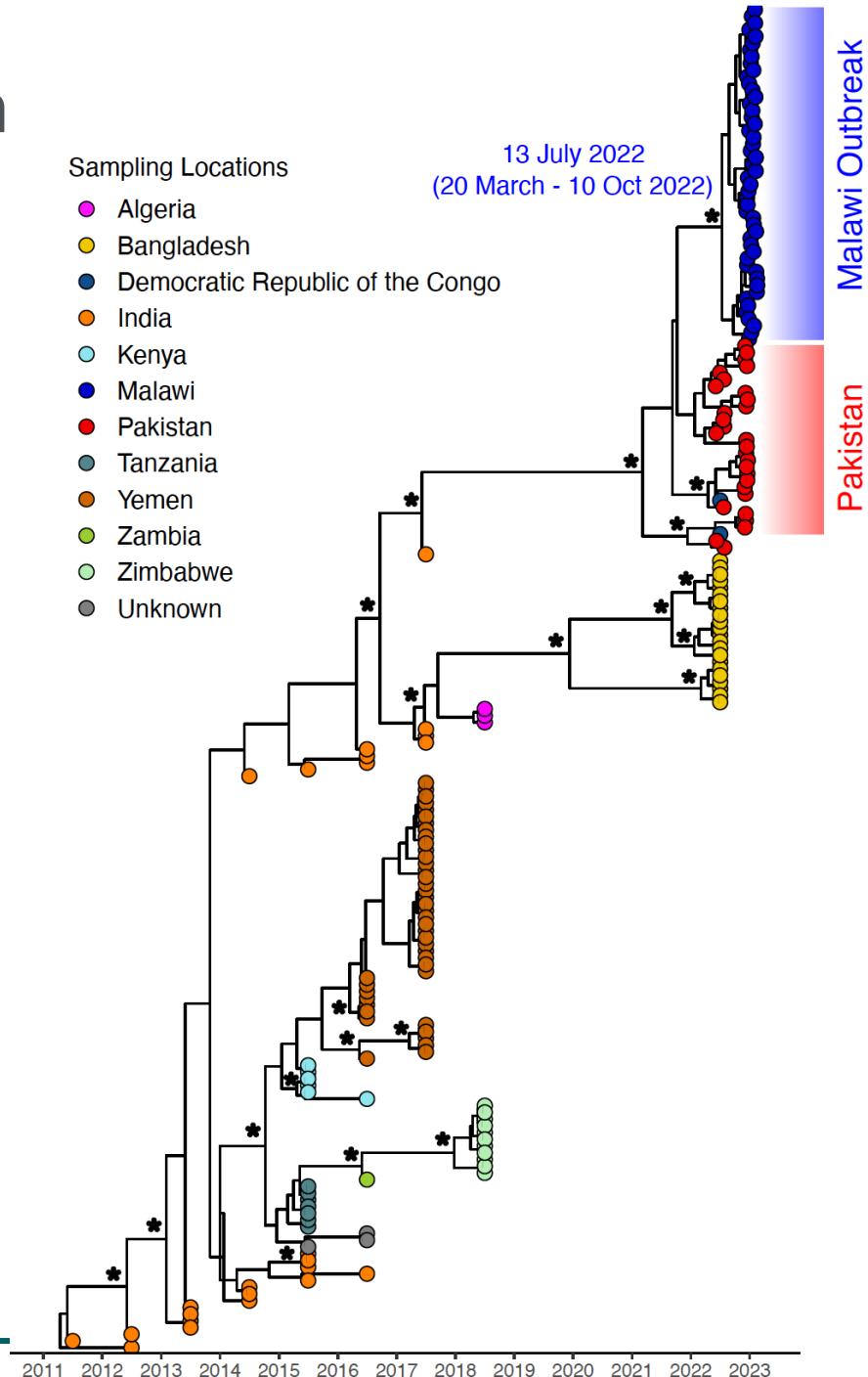
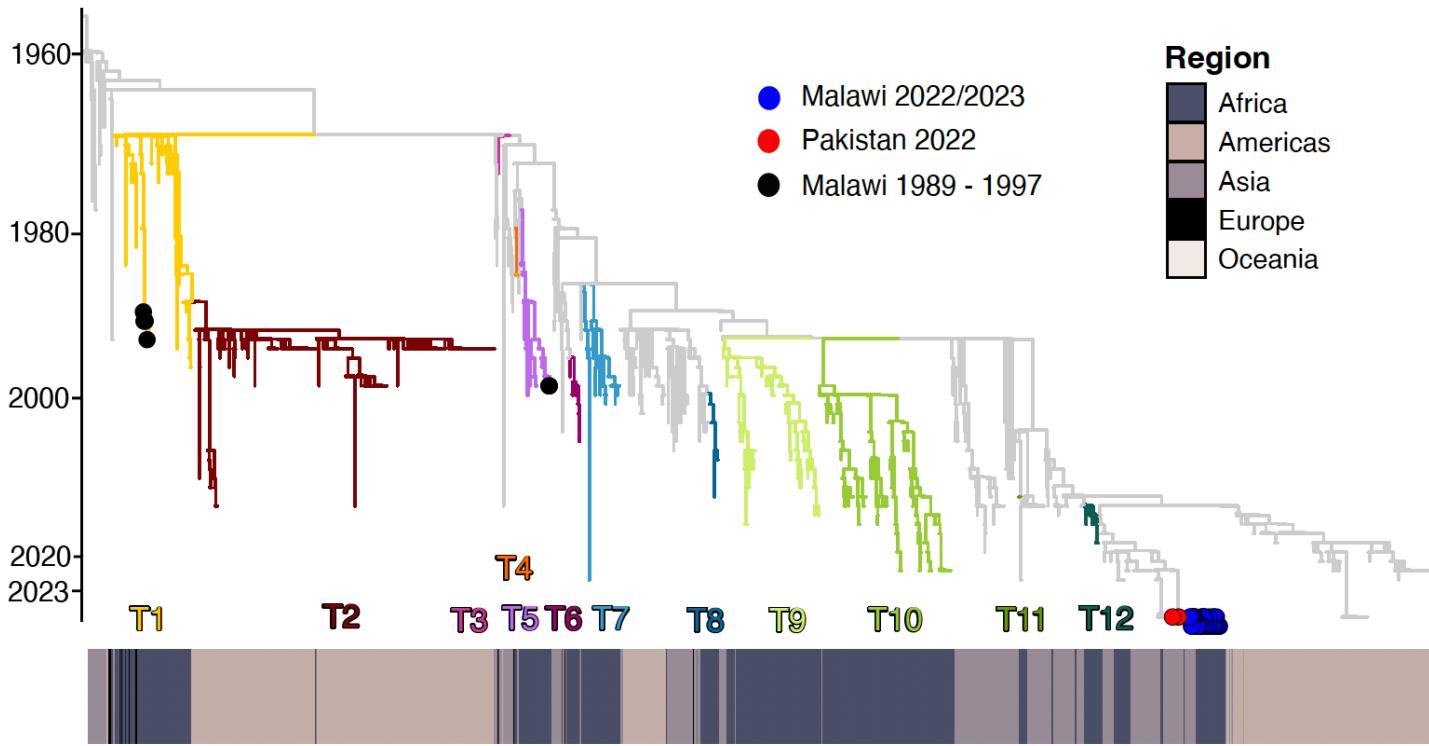
Cholera – Malawi

Comparison with previous outbreaks



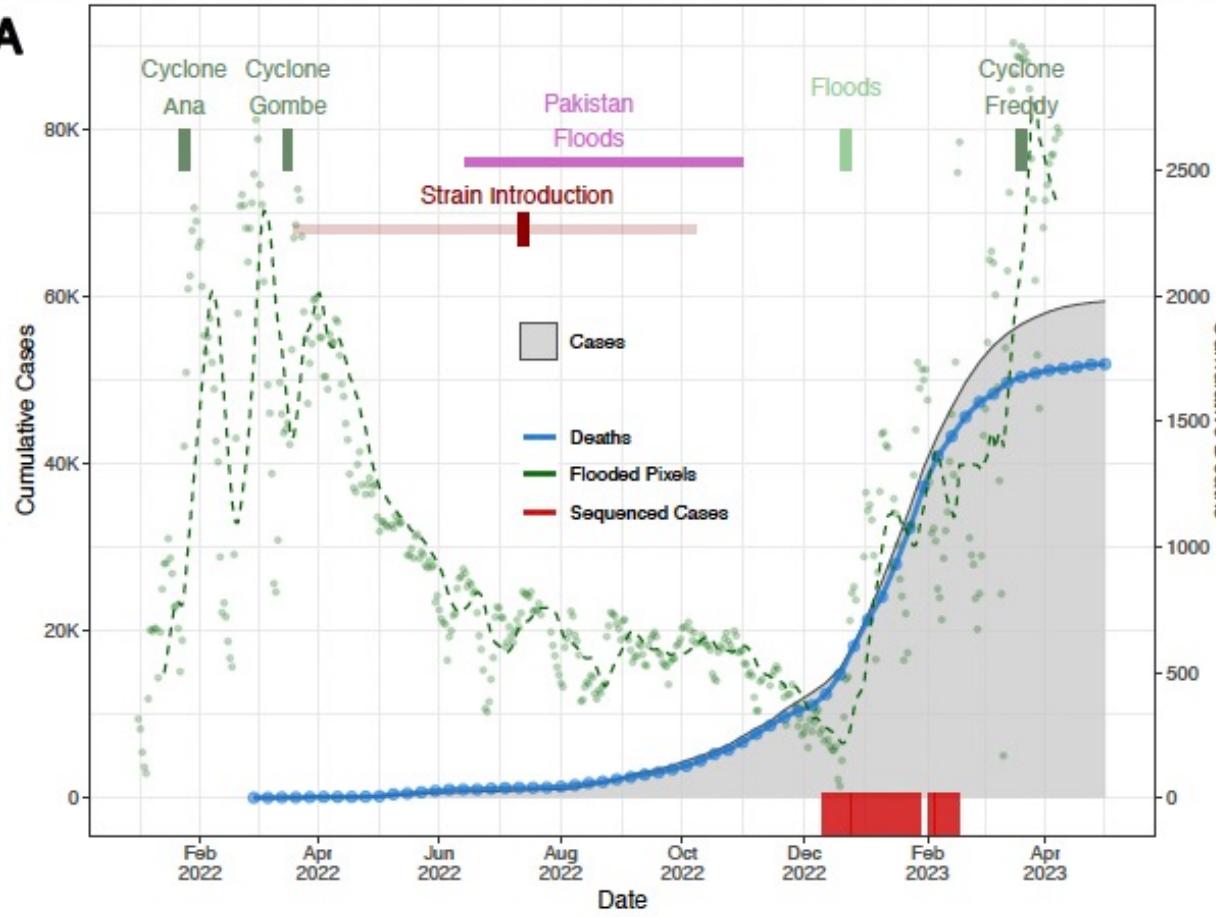
Years	Cases	Deaths	CFR
1998-1999	25 000	860	3.4%
2001-2002	33 546	968	2.3%
2008-2009	5751	125	2.2%
2022-ongoing	56 968	1727	3.0%

Clear Introduction from Pakistan



Amplification during the 2022-2023 Floods

A



C



I) Cholera Genomics Support requested

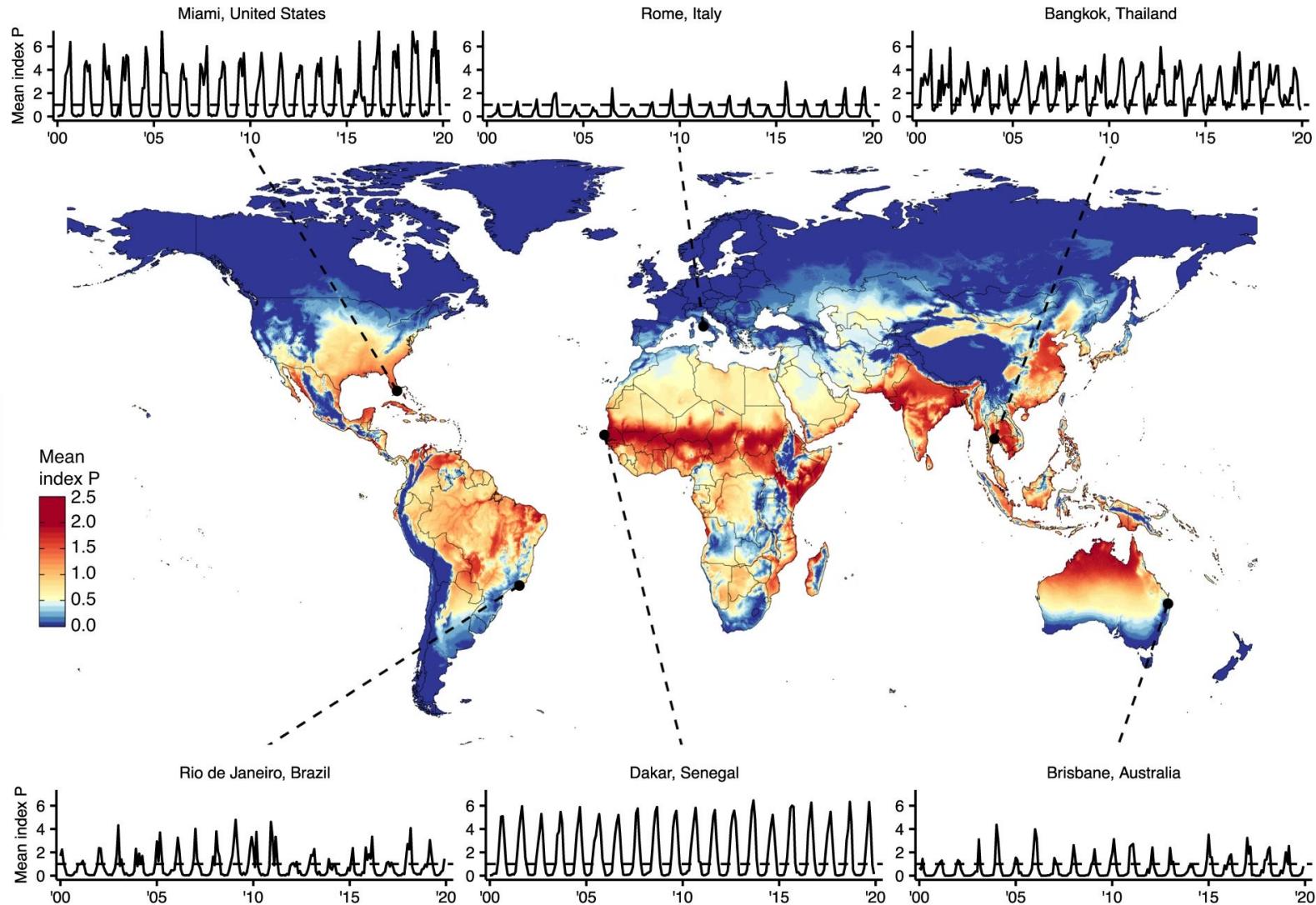
- Mozambique – Protocols and reagents and support to sequencing locally.
- Burundi and DRC – Discussing needs to sequence locally (i.e. protocols, reagents, support)
- Tanzania – Assembly and data analysis of genomes

2) In country sequencing - Dengue in Senegal

- Now, we have a team in Senegal. This team was supported by sending all protocols and reagents to characterize the increasing Dengue outbreaks and lineages.

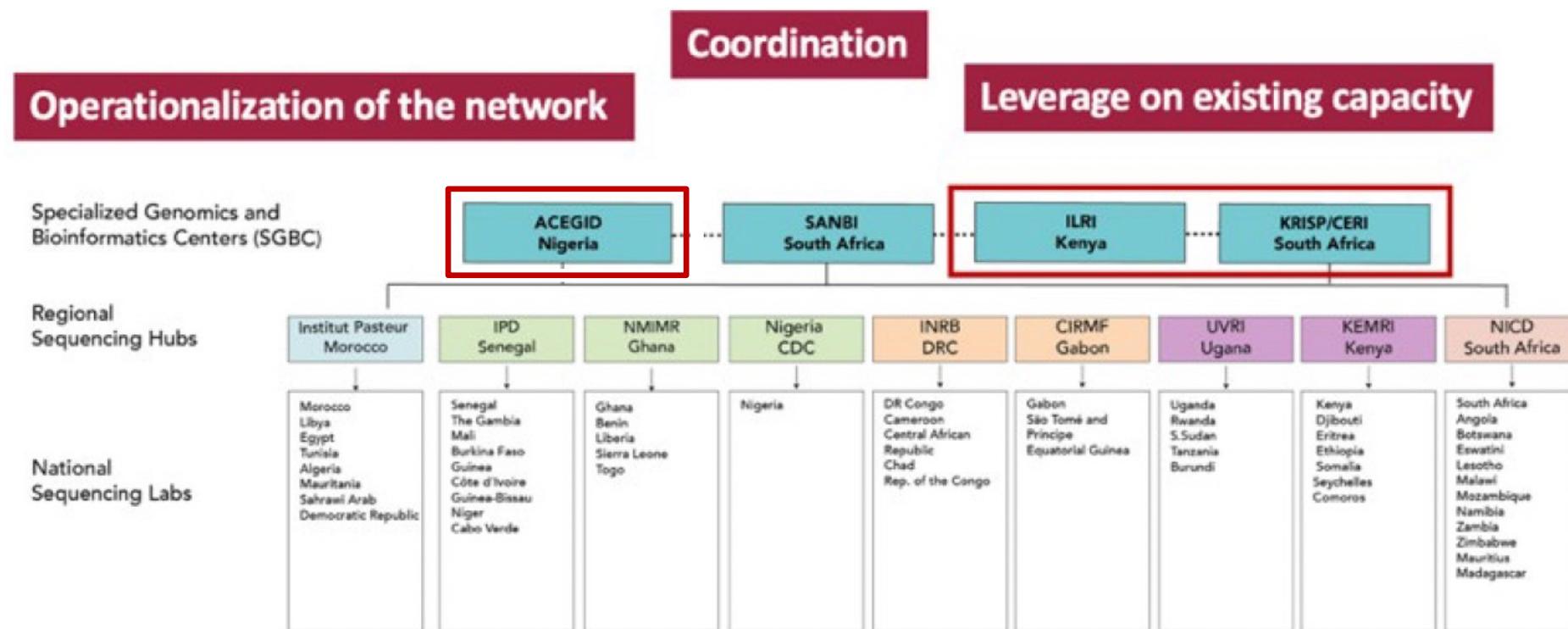


Dr. Abdou Padane



Nakase, Giovanetti, Obolski & Lourenço.
Nature Scientific Data 2023

3) Building on the expertise of the specialized Genomics facilities in Africa (as recognized by Africa CDC and WHO)



Outputs = Collaborative paper and COP28 report

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A year of genomic surveillance reveals how the SARS-CoV-2 pandemic unfolded in Africa

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Network of African collaborators during pandemic

Wilkinson et al. Science 2021

Tegally et al. Science 2022

Group Discussion & Feedback Session



I) Training and Capacity Building

(Protocols, Hands-On, Data analysis)

- How can be improved? What we need next?

2) In country sequencing

- Requests? Improvement on report to NPHIs, DoHs, Africa CDC/WHO AFRO?

3) Continental sequencing in Africa in specialized facilities (NG, KE, SA)

- How can be improved? Virus, Bacteria and vectors?

Report for COP28 - Nov 2023



COP28 UAE

- In order to raise awareness and political and potential funding support, we would like to work together to write a comprehensive report for the COP28 meeting, highlighting:
- Modeling and estimation of epidemic impact and climate change in Africa
- Preliminary results of CLIMADE (training, response, public health effect)
- Strategy of CLIMADE going forward.