Greenhouse Gas Observation & Climate-Smart Agriculture

Funded by the European Comission under the Horizon2020 Work Programme

Gaps, needs and options – A design study for long-term greenhouse gas observation in Africa

V. Jorch[1], M. Acosta[2], J. Beck[3], A. Bombelli[4], C. Brümmer[1], K. Butterbach-Bahl[5], B. Fiedler[6], E. Grieco[4], J. Helmschrot[3], W. Hugo[7], T. Johannessen[8], A. Körtzinger[6], W. Kutsch[9], A. López-Ballesteros[10], L. Merbold[11], E. Salmon[9], M. Saunders[10], B. Scholes[12]

1 Thünen Institute of Climate Smart Agriculture, 2 Global Change Research Institute, CAS (CZG), 3 Southern African Science Service Centre for Climate Change and Adaptive Land Management (SASSCAL), 4 Foundation Euro-Mediterranean Centre on Climate Change (CMCC), 5 Karlsruhe Institute of Technology, 6 Geomar Helmholtz Centre for Ocean Research Kiel (GEOMAR), 7 South African Environmental Observation Network (SAEON), 8 University of Bergen, Integrated Carbon Observation System (ICOS ERIC), 10 Trinity College of Dublin (TCD), 11 International Livestock Research Institute (ILRI), 12 University of the Witwatersrand Johannesburg (WITS)

Background

Climate change is threatening ecosystems and societies in Africa. At the same time, population growth causing a higher food demand and land-use change, increased energy demand and the development of industry and transport infrastructure contributes to increasing greenhouse gas (GHG) emissions.

In global comparison carbon (C) emissions of Africa from fossil fuel and cement production are still very low (3.6% in 2014; Boden et al 2017). Regarding the African continent emissions from land use change and forestry account for more than one third of the total emissions (Valentini et al 2014).

For scientific analysis and advice, sufficient qualitative and quantitative data about GHG sources and sinks are essential.

The essential Set of Variables to be monitored

For the design of an efficient observation system for Africa the interoperability with other networks we identified the essential set of variables which need to be monitored in Africa. The set of variables, including all climatic, oceanic and biodiversity. 210 experts were consulted to rate the variables on their 'relevance', 'feasibility' and 'costs', in the African context. 42 variables were identified as 'essential'. Apparent variables connected to land-use change and agriculture are prominent underneath those.

Figure 1-3 taken from Lopéz-Ballesteros et al (2018)

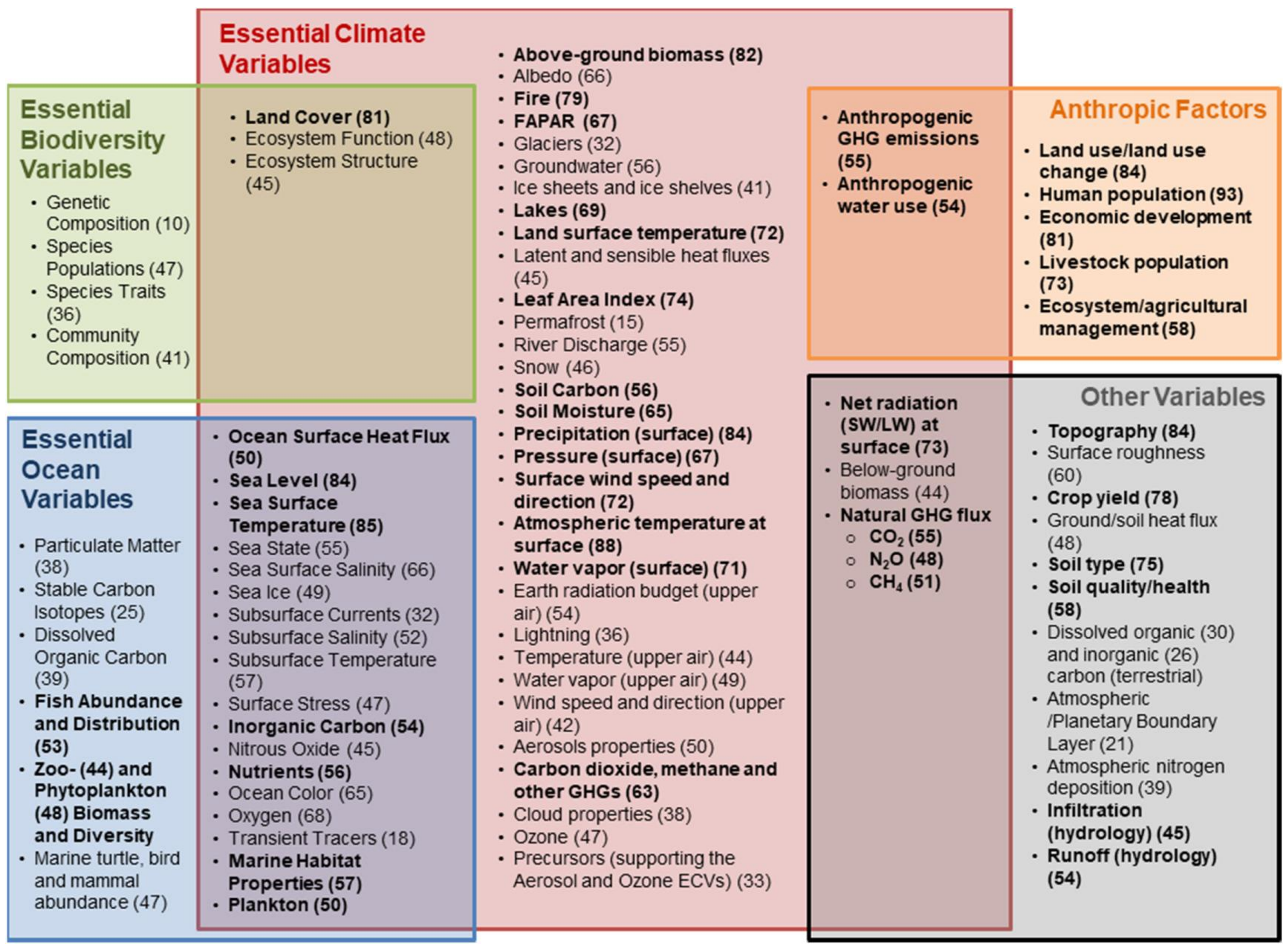

Figure 1: Indicative list of all candidate variables proposed and their assessment score (in parentheses) resulting from the consultative rating process. The preliminary set of 'essential variables' is highlighted in bold font.

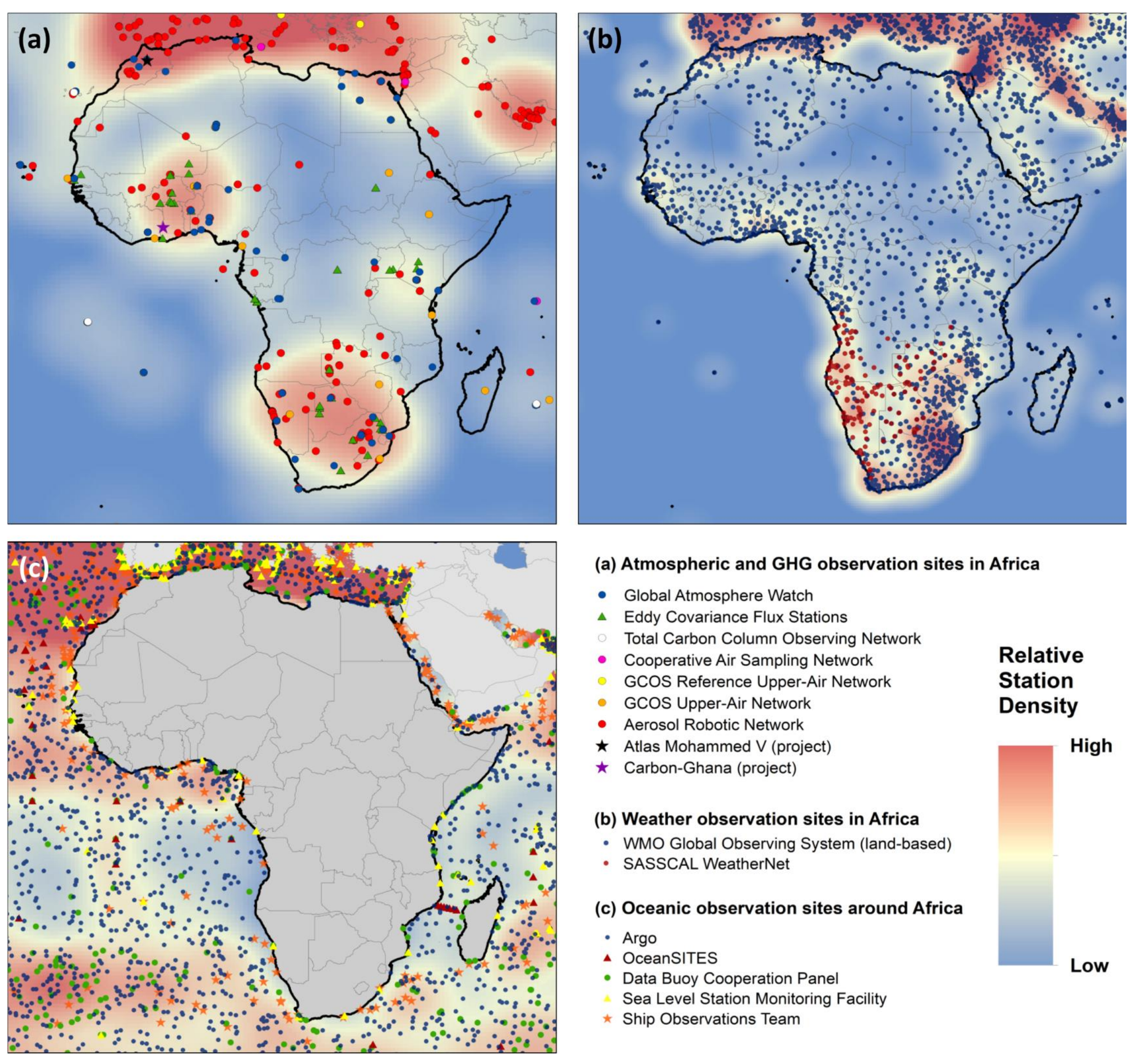

Figure 2: Observation stations and density of selected networks.

Inventory of RIs across Africa

We compiled an inventory of the environmental observation stations, measuring any of the identified variables, through literature search and consulting relevant projects and experts. 47 observation infrastructures were identified. The density of stations is relatively high in parts of Northern, Western and Southern Africa, but still does not reach the level of other continents. We show that smaller biomes, such as mangroves are underrepresented. Moreover a significant correlation of population and station density was found.

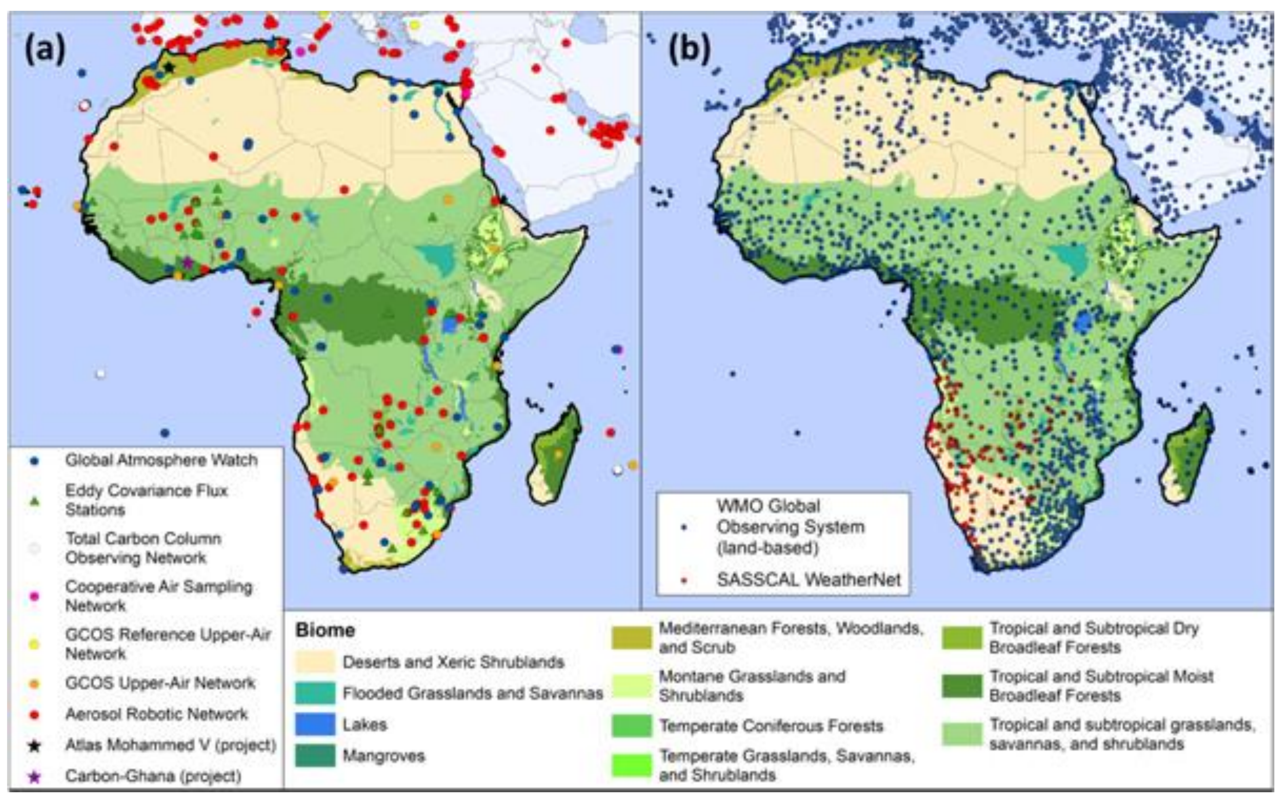

Figure 3: Observing stations of selected networks for (a) GHG and aerosols and (b) weather observation against the major biomes (Olson et al 2001) of the African continent.

Contact Veronika Jorch (Coordinator), Thünen Institute of Climate-Smart Agriculture, Bundesallee 68, 38116 Braunschweig, Germany
Email veronika.jorch@thuenen.de
Web www.seacrifog.eu
@SEACRIFOG

Literature:

Boden T A, Marland G and Andres R J 2017 Global, Regional, and National Fossil-Fuel CO2 Emissions (Carbon Dioxide Information Analysis Centre (CDIAC), Oak Ridge National Laboratory, US Department of Energy, Oak Ridge, Tenn., USA) (http://cdiac.ess-dive.lbl.gov/trends/emis/meth_reg.html)(Accessed: 28th August 2018)

Lopéz-Ballesteros et al 2018 Towards a feasible and representative pan-African research infrastructure network for GHG observations Environmental Research Letters 13 8

Olson D M et al 2001 Terrestrial ecoregions of the world: a new map of life on Earth

Valentini R et al 2014 A full greenhouse gases budget of Africa: synthesis, uncertainties, and vulnerabilities Biogeosciences 11 381–407

Lund University · Mazingira Centre · ILRI International Livestock Research Institute · ICOS Integrated Carbon Observation System · INDP · Universitas Bergensis · cmcc · WASCAL West African Science Service Centre on Climate Change and Adapted Land Use · University of the Witwatersrand, Johannesburg · Thünen · CzechGlobe Global Change Research Institute CAS · GEOMAR · SASSCAL Southern African Science Service Centre for Climate Change and Adaptive Land Management · NRF National Research Foundation · SAEON South African Environmental Observation Network · Trinity College Dublin · TROPOS Leibniz Institute for Tropospheric Research · uni Research