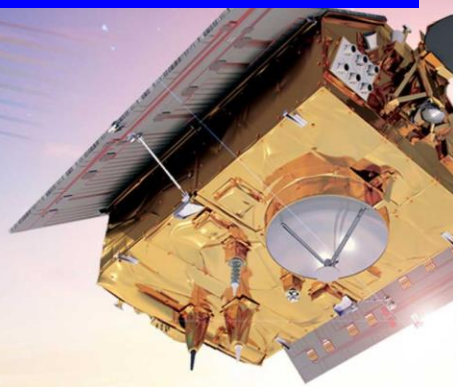
African Centre of Meteorological Applications for Development (ACMAD)

https://acmad.org/

SIDE EVENT ON URBAN RESILIENCE
Dec xx, 2023

- COP 28 xxx Pavilion , DUBAI, ABU DABI



CLIMATE SERVICES FOR URBAN RESILIENCE IN AFRICA: CASE OF NIAMEY CITY AT THE HEART OF SAHEL IN WEST AFRICA

Prepared by: ACMAD Team

Presented by : Andre KAMGA FOAMOUHOUE / DG

ClimSA
INTRA-ACP CLIMATE SERVICES AND RELATED APPLICATIONS PROGRAMME
An initiative of the Organisation of African, Caribbean and Pacific States funded by the European Union

OUTLINE

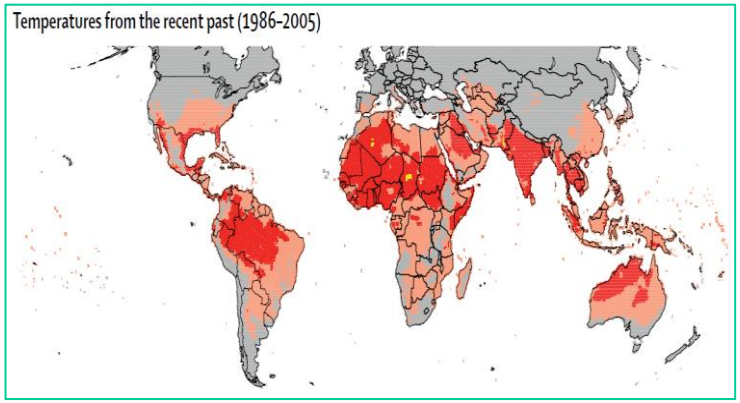
I CONTEXT AND PROBLEM

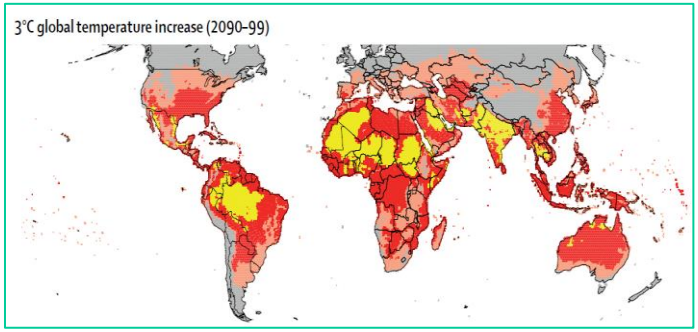
II *LOCAL CITY CLIMATE OBSERVATION INFORMATION SYSTEM*

III *LESSONS LEARNT and WAY FORWARD*

BACKGROUND

Much of Niger including the capital City of Niamey is currently under high risk of high temperatures and heat wave. This risk is expected to become extreme by the end of the 21st century. Early warning and Early Action and adaptation for heat wave is therefore a priority for the city council





Low risk Moderate risk High risk Extreme risk

Rohat et al., 2019. Projections of human exposure to dangerous heat in African cities under multiple socio-economic and climate

In 2010, a severe heat wave builds and, days later, people die in the City most of which were vulnerable elderly section of the population. Recent analysis of the state of climate for Africa highlighted high temperatures more frequent in summer over North Africa,

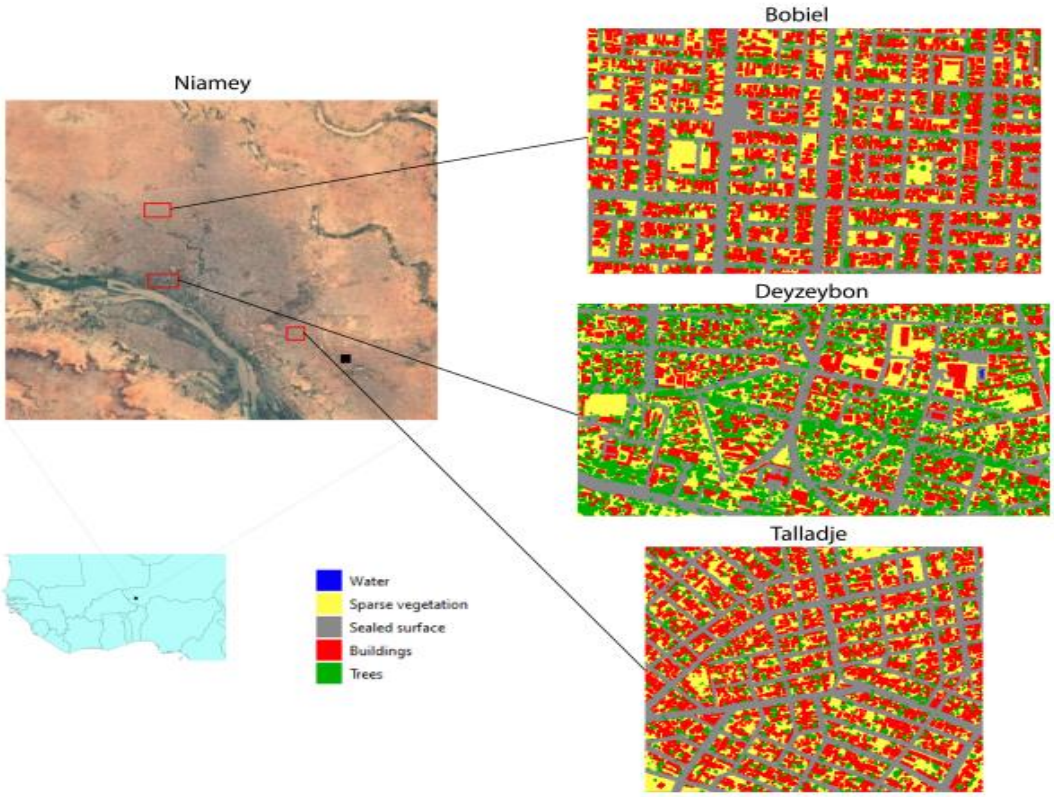
Now, Climate negotiators, legislators, scientists and think tanks on Multi Hazards early warning in Africa are to convene to strengthen resilience and better adapt to one of the most lethal weather phenomenon for children and elderly people in cities near desserts and north of Africa.

— Better categorization based on impacts and naming of the phenomenon in African cities is our pririty to improve heat early warning

THE PROBLEM

- Early warning and adaptation to high temperatures at city scale is a ***challenge requiring high resolution observations and modeling systems***

- ***Meter scale observations and Models***



Black dot is the single meteorlogical station . With the city council measurements across quarters of the city were organized

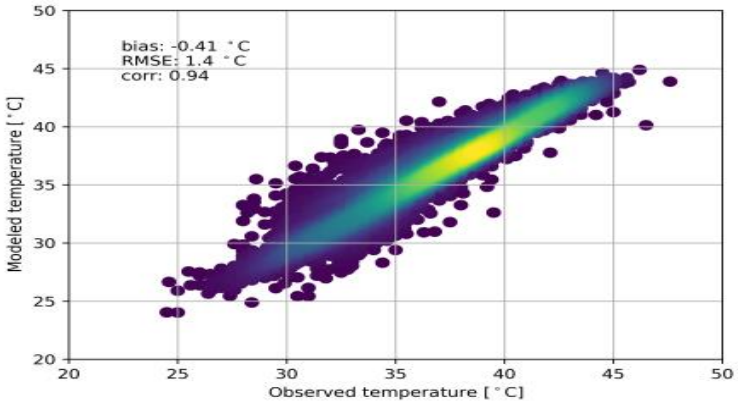
NIAMEY CITY HIGH RESOLUTION OBSERVATION SYSTEM

- **Under the leadership of the city community and technical support of ACMAD and VITO, a`high resolution observing field campaign was organized in May 2022 for 3 city districts .**

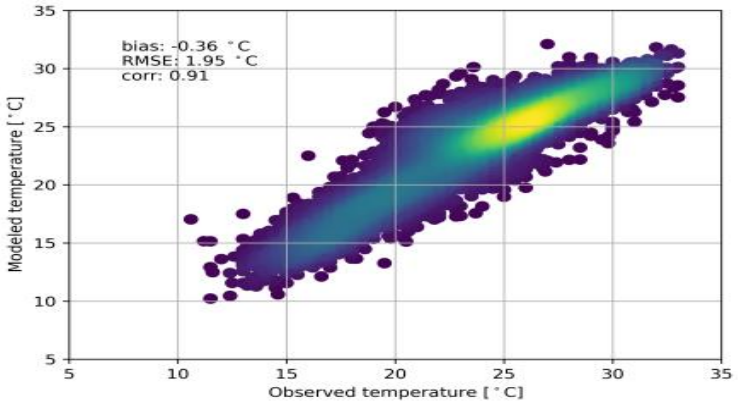
(a) Sun

(b) Shade

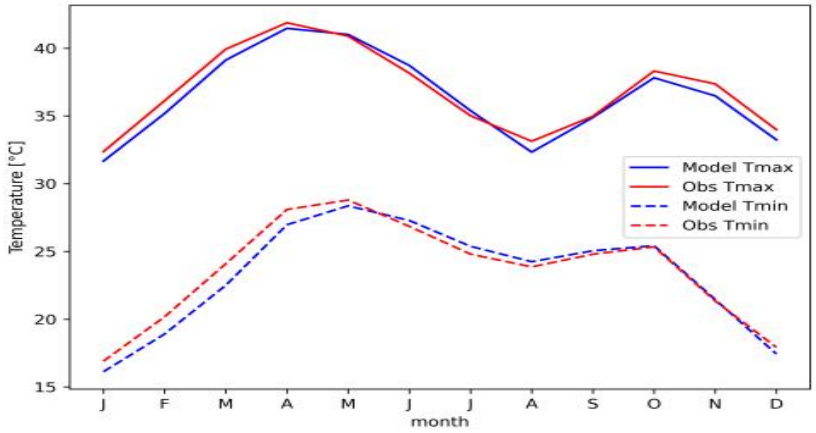
EVALUATION OF OBSERVED AND Urban CLIMATE MODEL PROJECTION OF Max and Min Temperature in Niamey from 2001-2020



(a) Maximum daily temperature

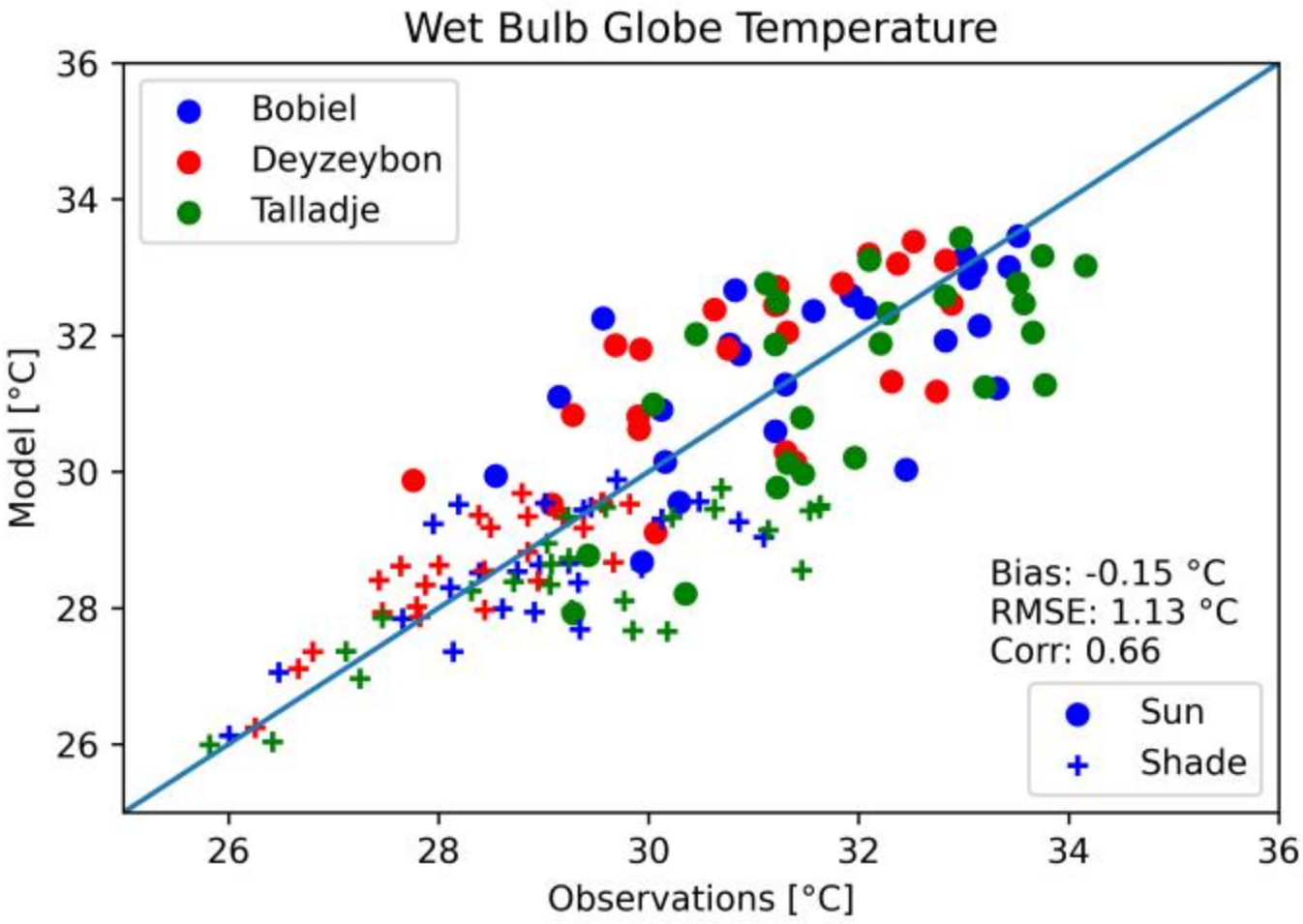


(b) Minimum daily temperature



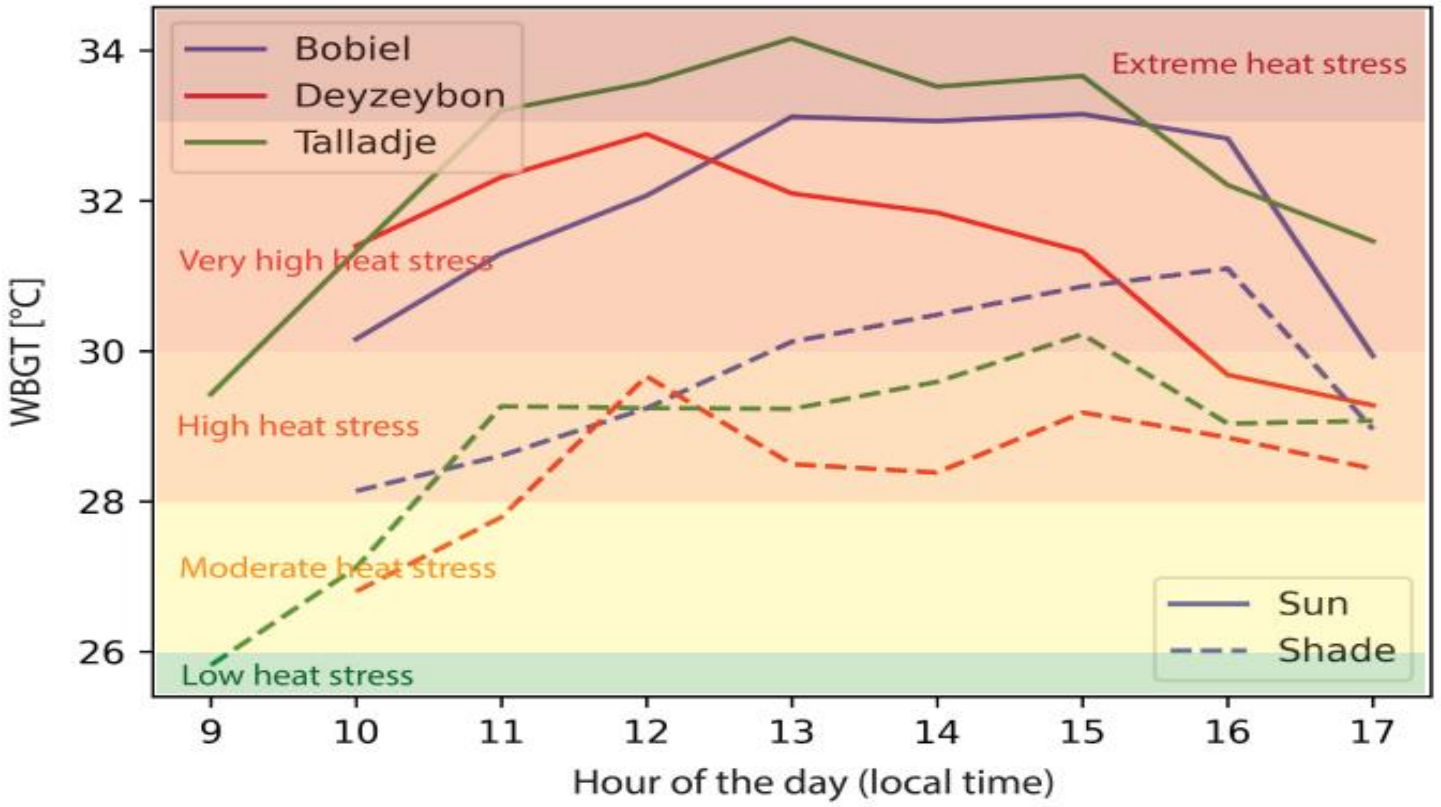
(c) Average monthly temperature

COMPARISON OF MODELLED AND OBSERVED HEAT INDEX IN 3 DISTRICTS



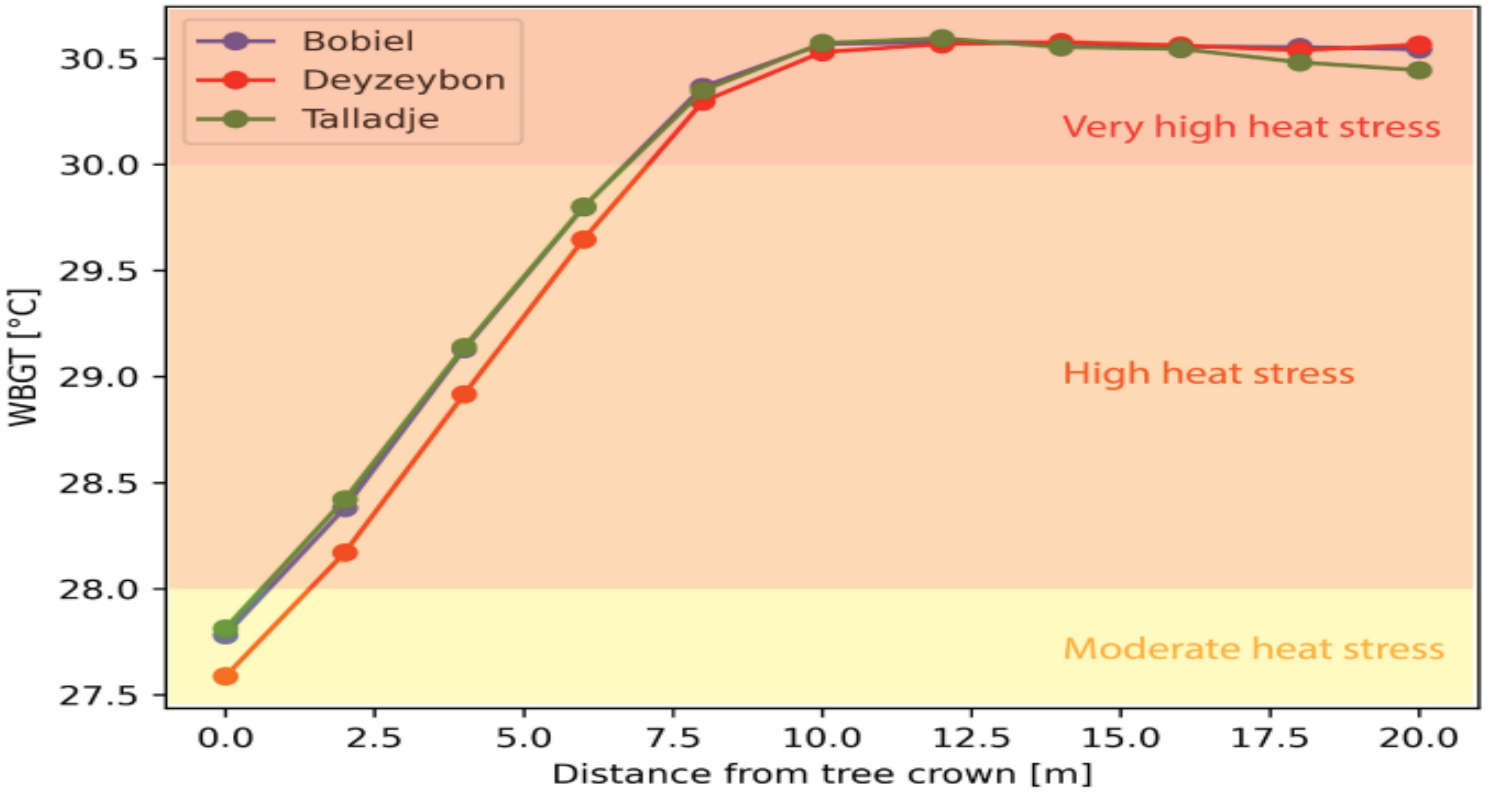
OBSERVED HEAT STRESS INDEX IN THE SUN AND UNDER THE SHADE WITH TREES ON MAY 19 2022. TALLADJE HAS A HIGH NUMBER OF HOURS DURING THE DAY WITH EXTREME HEAT STRESS ON THE SUN .

IT NEEDS MORE TREE PLANTING PROJECTS

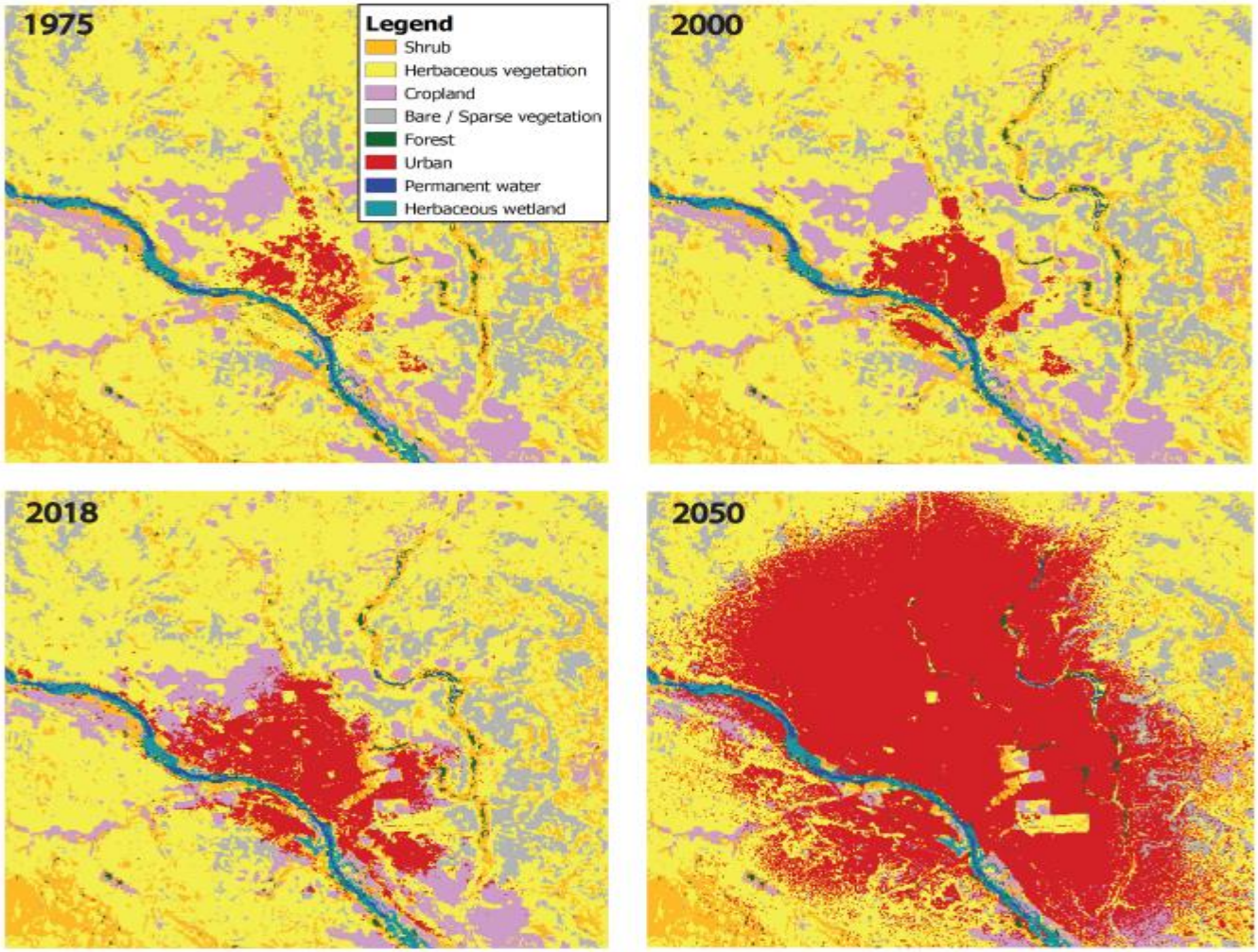


Cooling effect of trees visualised w.r.t. distance of the tree crown during March-April-May for three city districts in Niamey.

Planting trees every 3 m substantially reduce heat stress



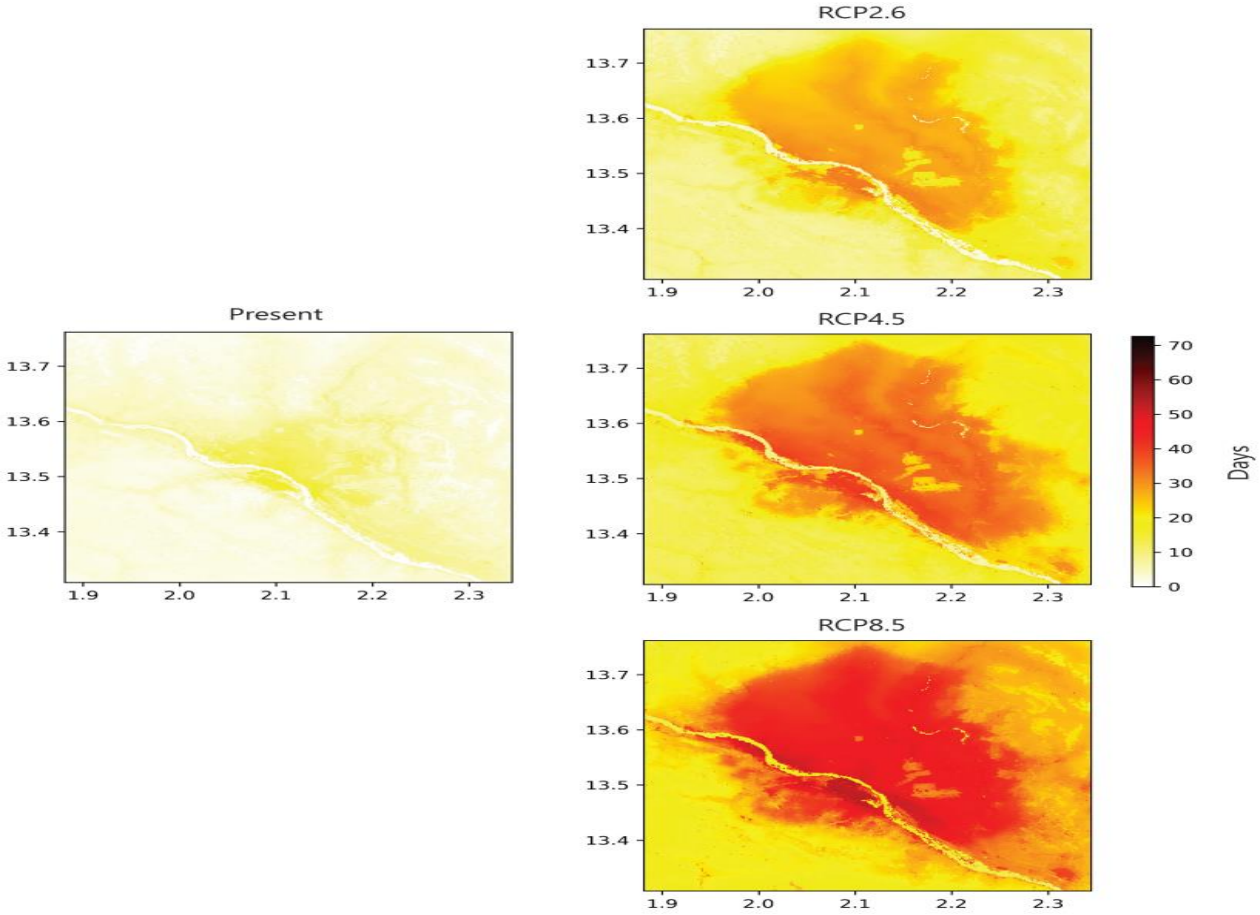
Historical evolution of the city and projection for 2050 . Significant increase in urban area extent. The city council to adjust land management to reduce vulnerability of population to heat stress



Number of heatwave days per year over Niamey in a present (2001-2020) and future scenarios (2041-2060)

ELECTRICITY DEMAND FOR THE CITY DUE TO HIGH TEMPERATURE EXPECTED TO DOUBLE OR QUADRUPLE DEPENDING ON THE SCENARIO.

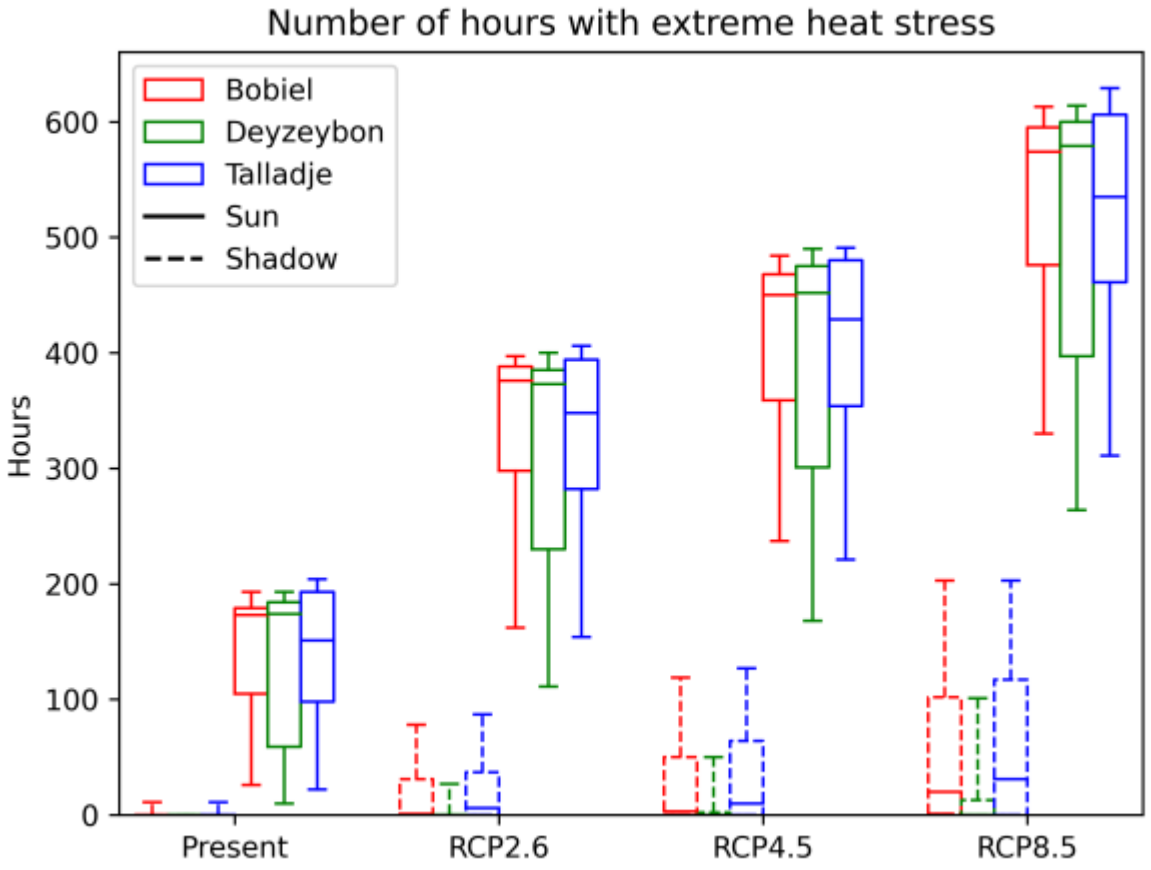
CITY DEVELOPMENT PLAN FOR ENERGY TO MAINSTREAM THIS FACT IN THE SUSATAINABLE AND RESILIENT PLAN FOR 2050 TIME HORIZON



Number of hours per year with extreme heat stress for present (2001-2020) and future scenarios (2041-2060)

UNDER TREES NUMBER OF HOURS WITH EXTREME HEAT STRESS IS LIMITED REDUCING UNPRODUCTIVE WORKING HOURS SCENARIO.

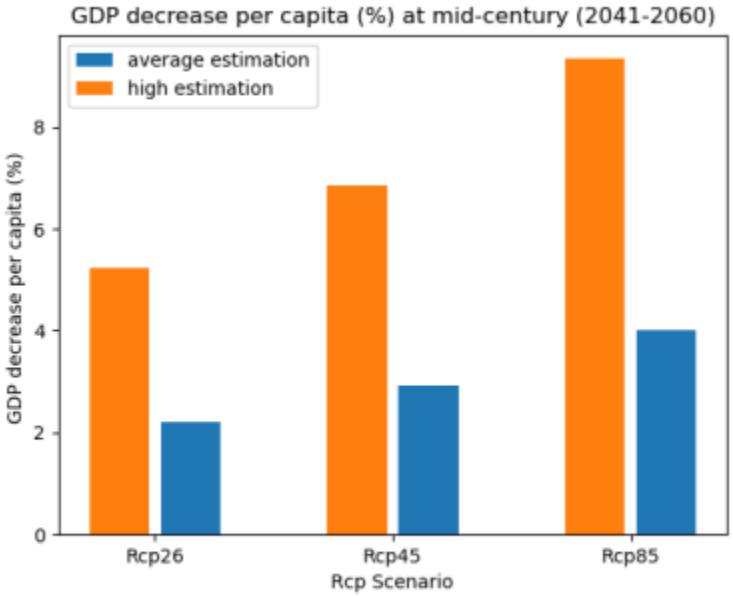
CITY DEVELOPMENT PLAN TO INCREASE TREE PLANTING GIVEN THE IMPACT ON GROSS DOMESTIC PRODUCT



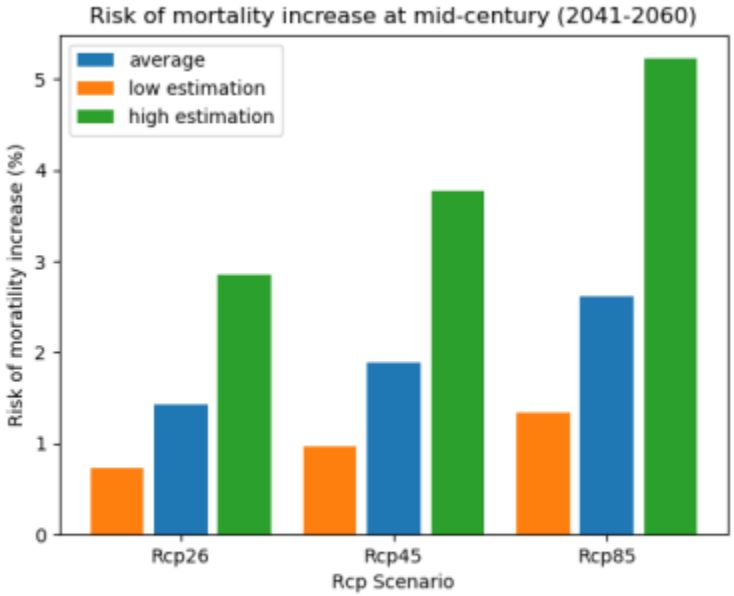
Socio-economic impacts of climate change in the city of Niamey in future scenarios (2041-2060)

DECREASE OF AT LESS 2% OF GROSS DOMESTIC PRODUCT OF THE CITY .

CITY DEVELOPMENT PLAN TO PRIORITISE TREE PLANTING GIVEN THE IMPACT ON GROSS DOMESTIC PRODUCT



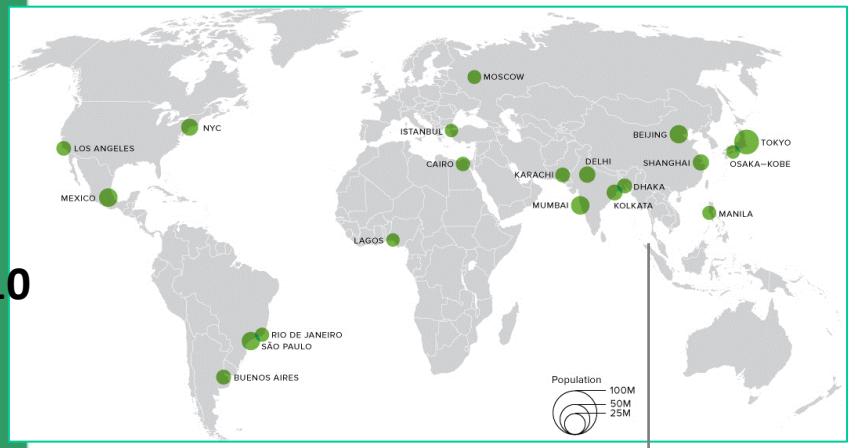
(a) Gross Domestic Product



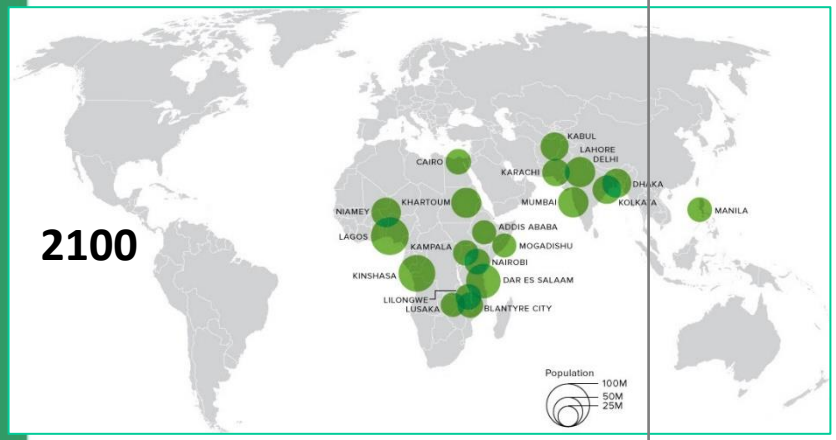
(b) Mortality

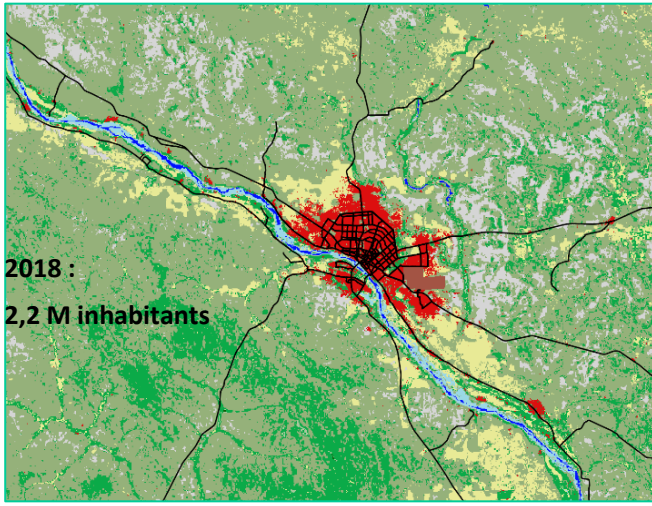
Urban population increase

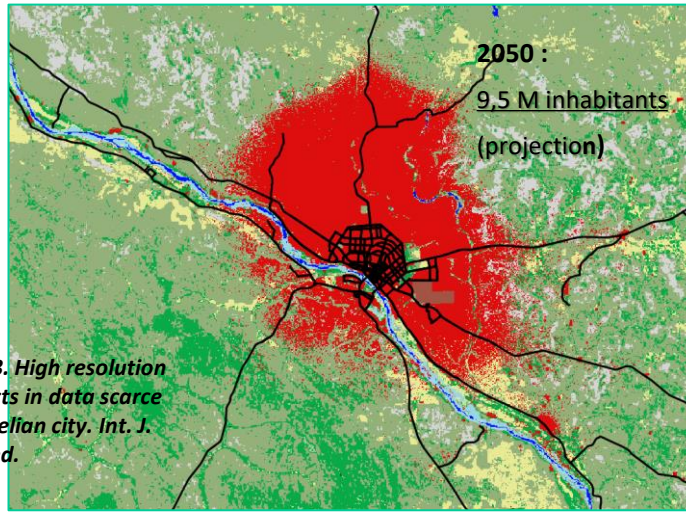
2010



2100







Hoornweg, D. and K. Pope, 2017. Population predictions for the world's largest cities in the 21st century. Environment and Urbanization, 29, 195–216.
https://www.visualcapitalist.com/animated-map-worlds-populous-cities-2100/

Souverijns et al., 2023. High resolution heat stress and impacts in data scarce conditions over a Sahelian city. Int. J. Climatology, published.

SUMMARY-CONCLUSION-WAY FORWARD

1. *TALLADJE DISTRICT IS A PRIRITY FOR TREE PLANTING BY THE CITY COUNCIL*

2. *3 m is an optimal distance between tree in the city*

3. *Trends on urban and crop lands as well as projections are available to support sustainable urban planning by the city council*

4. *CITY DEVELOPMENT PLAN TO INCREASE TREE PLANTING GIVEN THE IMPACT ON GROSS DOMESTIC PRODUCT*

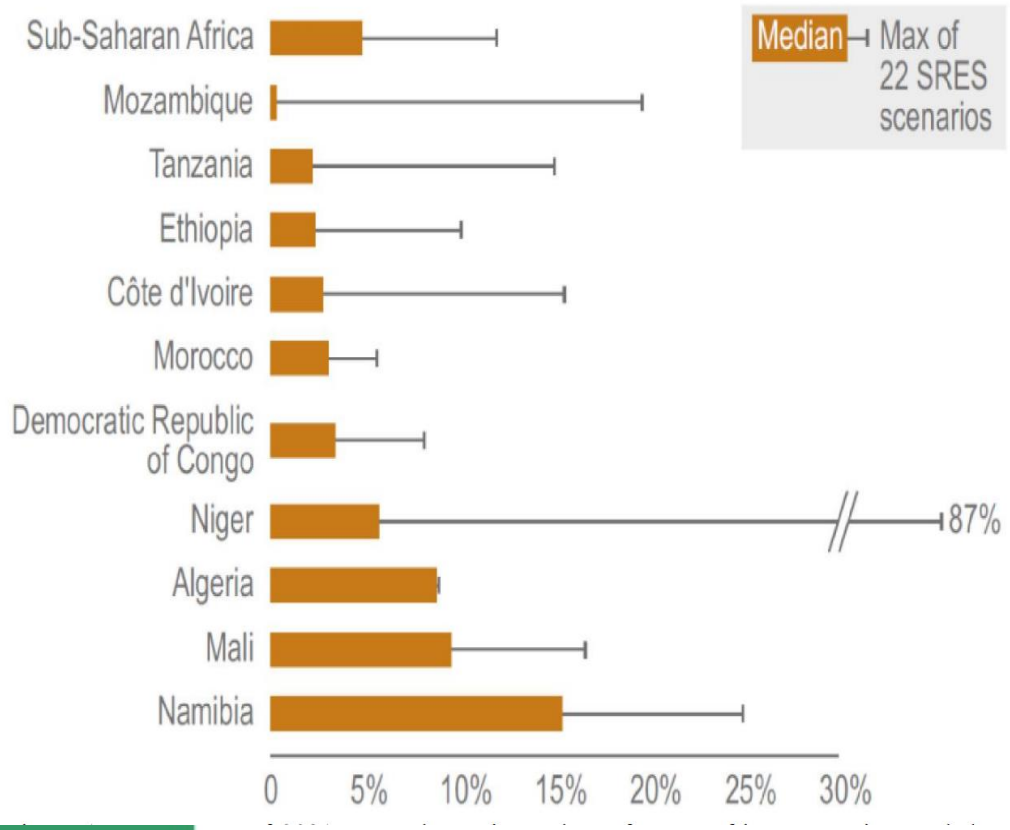
HEAT RISK MANAGEMENT AND ADAPTATION OPTIONS TO BE MAINSTREAM IN NIAMEY CITY SUSTAINABLE DEVELOPMENT PLANNING

- Tree planting and greening the city districts
- Awareness raising on heat and health
- Community gardens
- Protection of workers with heat warning systems
- protection of infrastructure to exposure to high temperature

Promote youth associations for protection of city environment

- Develop climate information systems for climate adaptation planning in the city

A significant percentage of the Gross Domestic Product (GDP) is expected to be required to maintain and repair road infrastructure due to future climate change impacts.



Rising waters in coastal cities, stronger storms, droughts and floods projected combined with population growth in cities or low-lying settlements are putting high pressure on infrastructure initially not prepared to withstand such pressure.

Percentage of 2021 Gross Domestic product of some African countries needed to repair and maintain road infrastructure in future changing climate (Source IPCC, Trisos et al., 2022)

THANK YOU