Climatological Analysis and Early Warning System in the Sirba basin

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ANADIA Projects

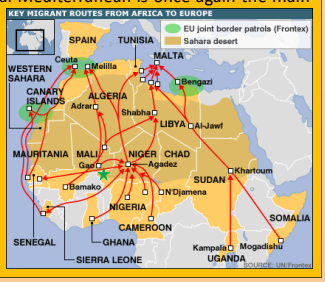
ANADIA is an International Cooperation project which operates in **Niger** founded by AICS (Agenzia Italiana per la Cooperazione allo sviluppo).

It has as main objective to contribute to sustainable agriculture through the adaptation to Climate Change in order to reduce vulnerability and strengthen food security.
As know, the poorer rural population are more vulnerable to climate extremes due to lack of effective strategies of risk minimization. In relation to this, ANADIA Projects developed as follow:

ANADIA 1 (2013-2015): Supporting decision makers in territorial planning and management
ANADIA 2(2017-2020): Creation of an early warning system against floods and training on climatic risks (droughts and floods).

Migrant routes to Europe transit through Niger

Before March 2016 migrants were able to reach Europe via Turkey and Western Balkans. After the closing of the Balkans' borders, the Central Mediterranean is once again the main entry point for thousands of migrants.
The migrant routes to Europe transit through Niger which can be considered the main transit country for large-scale smuggling activities across the Sahara desert. The city of Agadez is the most important hub, along with many others in the country; here there are numerous well organised networks capable of providing the infrastructure and facilitation services for transiting migrants (Africa- Frontex Intelligence Community Joint Report 2016).

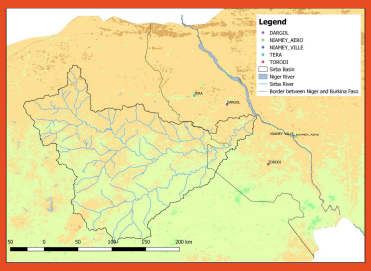


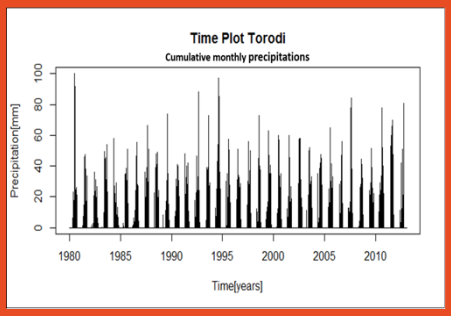
Climatological Analysis on the Sirba basin as preparatory study for the Early Warning System

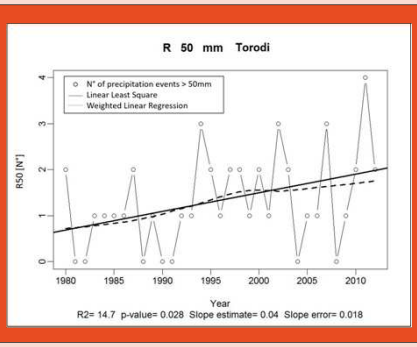
The Climatological Analysis on the Sirba basin have taken into account the nigerien part as far as the precipitation time series have been made available only by the Nigerien Department of Meteorology (DMN). In this area, only 5 out of 32 rainfall monitoring stations are complete and continuous in time. From north to south, those stations are: **Téra**, **Dargol**, **Niamey Aéro**, **Niamey Ville** and **Torod**i.

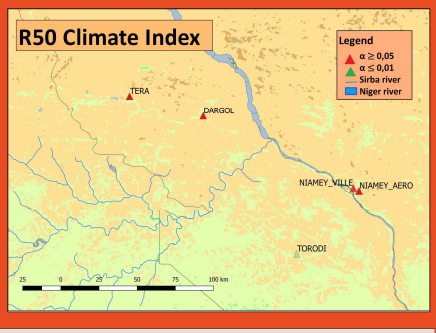
The time series have undergone a **descriptive and exploratory data analysis** as well as a **Quality Control** and a **Data Homogenization**. As conclusion, the available rainfall monitoring stations are complete and continuous in time, the QC didn't underline outliers and no changepoints were found during the Homogenization test.

After those control phases, follows the elaboration of the WMO Climate Indices throughout **Rclimdex** and creation of Climate Indices' charts.









Analysis Conclusions

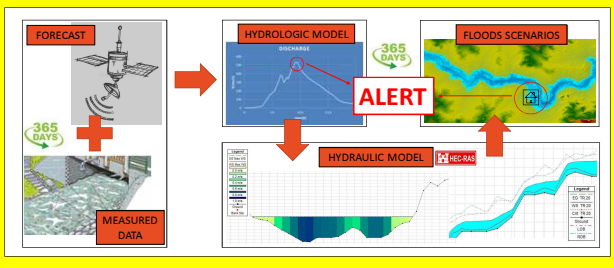
- The dry season gets longer, since the consecutive dry days (CDD) are increasing, at least in the southern part of the basin;
- The 1990's have been the wetter decade since the end of the Great Drought (1968-1985); nevertheless the years 2000 are wetter than the 1980's (R10, CWD, Prcp Tot). This implies that the precipitation regime hasn't returned to the drought level.
- Total precipitation (Prcp Tot) is increasing due to an increase of extremely heavy precipitation above 50 mm (R50);
- Therefore the daily precipitation intensity increases (SDII).
  - ⟹ Increase in high intensity events (R50)
  - ⟹ Slight increase in precipitation intensity (SDII)

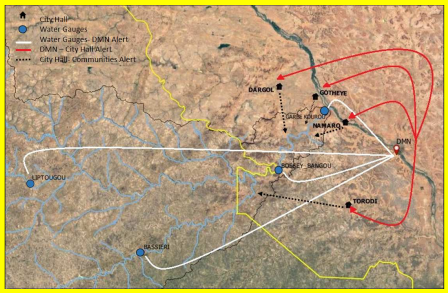
Future development/1: an Early Warning System (SLAPIS – Système Locale d'Alerte Précoce pour les Inondations de la Sirba)

The Early Warning System (EWS) will be set in place in the nigerien part of the Sirba basin (from the border with Burkina Faso to the confluence with the Niger river).

Forecasts provided by an **Hydrologic model** (casting Test are now ongoing on two models: GloFAS, Niger HYPE) will be coupled with an **Hydraulic model** developed in HEC-RAS leading to different floods scenarios.
When the discharge (from forecast and measured data) is beyond defined thresholds an alert will be sent to the interested villages.

The dissemination of warning messages will be carried out through Web Platform, Phones and Radio.





Future development/2: Meteodiversity

Meteodiversity is a new concept for quantifying meteorological diversity; it is defined as the variety of different types of meteorological phenomena in a defined area (Mason and Pino, 2017).

It will be interesting to compare the different results using two available datasets for the city of Niamey (Aéroport): the dataset used during the Climatological Analysis (made available by the DMN) and a reconstructed long-term, multivariate local climatic dataset downloadable on the AMMA Catch website (Leauthaud et al., 2017).

References:
- Africa- Frontex Intelligence Community Joint Report2016, April 2017
- Mason and Pino, 2017. Meteodiversity: a new concept for quantifying meteorological diversity. Weather, 72.
- Leauthaud et al., 2017. A 60-year reconstructed high-resolution local meteorological data set in Central Sahel (1950–2009): evaluation, analysis and application to land surface modelling. Int. J. Climatol., 37.