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BENEFIT OF WEATHER-CLIMATE FORECASTING FOR AFRICAN SOCIETIES -BY OUSMANE NDIAYE (PHD STUDENT AT DEES, COLUMBIA UNIVERSITY)

When I was asked to give a talk to the African Students Association (ASA) at Columbia on a topic related to my PhD research (which is climate forecasting and its value for the development of Africa), I quickly realized that the audience was more familiar with weather forecasting than climate forecasting. One way to define and differentiate between weather and climate is to think of weather as "what you get" and climate as "what you expect." In other words, weather is the prediction of the behavior of the atmosphere in a given place and in a short time period (as seen on TV) while climate forecast is more probabilistic and is for a larger scale (several months and a big region encompassing national boundaries). A good example of source for climate forecasting is the so-called ENSO phenomenon which tends to occur every 2 to 7 years, persists for several months and ultimately has a huge impact on atmospheric circulation under the tropics. Weather and climate forecasts are becoming more and more accurate with the development of more powerful computers and improved understanding of physical processes in the climate system. Easy internet access makes forecast products from international centers (IRI, ECMWF, NCEP, UKMetOffice, Bracknell) instantaneously accessible to many African National Meteorological Services. Weather forecasts (5 to 10 days ahead) have high value for African societies in many sectors such as health, agriculture and hydrology. Climate forecasting (one to several months ahead), usually presented in a more probabilistic way, has an even higher value and many practical applications due to the seasonal character of the climate in Africa, and its long lead-time offer a better preparedness. We can give the example of forecasting in the short rainy season (June to October) in the Sahel region. The incorporation of weather and climate forecasts in decision-making can increase an African government's efficiency in responding to many climate-related calamities (severe drought, flooding, disease outbreak, locust invasion, pollution) whose impacts are disastrous for African economies and society as a whole. I will present here a few examples on how weather and climate forecast can be used in Africa.

> "I quickly realized that the audience was more familiar with weather forecasting than climate forecasting"

Climate forecasting for better farming:

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Agriculture is one of the most important economic sectors in Africa due to its role in food security (rain-fed agriculture) and the mass of people involved in these activities (farmers and pastoralists). One of the crucial questions for many African climate-users in a seasonally varying climate is the timing of the start (onset) of the rainy seasonal and seasonal rainfall total. If the onset is well-predicted and the seasonal rainfall total is forecasted, many activities can be better planned and thus optimized.

Weather forecasts can help to identify the rainfall onset and seasonal forecast of the total.

A ten-day weather forecast can help to better plan for the planting date and farm preparation. Planting needs to be done when the soil is moist enough: the surface needs to have received some rainfall not followed by any long dry spell. If a long dry spell is predicted, the planting date can be delayed until the weather forecast indicates a long enough wet spell to sustain the young plant. In the semi-arid weather, Sahel farmers cannot afford many plantings due to the scarcity of financial resources to buy seeds, especially peanuts. Weather forecasts can be used to guide the farmer to plant at the optimum date in order to avoid false starts.

> "Many planting diseases occur during specific weather conditions"

Seasonal forecasts can, on the other hand, aid in the choice of crop variety by identifying the length of the season and availability of water. We can combine those two: the weather dictating the optimal planting date, and the seasonal forecast the variety of crops to plant.

Many plant diseases (pathogens) occur during specific weather conditions (for example, high temperatures during dry seasons). Weather forecasts can help to localize pest-prone areas in the country and plan the ordering and spreading of pesticides. Locust invasion occurs often in North Africa and can jeopardize the entire crop yield.

Weather forecasts can help identify potential locust breeding sites and anticipate the proper action to be carried out before the invasion of the locusts. Once locust invasions occur, wind forecasts can be used to project the direction of spread of the locusts and issue early warnings.

During harvesting, a dry period is needed for the crop to mature and also for fieldwork. Weather forecasting can help plan the best period to harvest and transport the crop. In West Africa, the crop

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is often left outdoors for a while before being transferred first into storage, and then to cities for transformation.

Climate forecast for a better reservoir management:

The same kind of bridging between weather and climate can be used to manage dams and reservoirs. West Africa has many large cross-border/ country river basins and reservoirs (Niger, Senegal, Nile), for which meticulous management is needed to avoid conflicts during water allocation. A critical decision-making point is when the reservoir is filling (or emptying): do we release (or keep) water to avoid going beyond the maximum (or minimum) required capacity of the dam in case of more (or less) runoff coming along? Another issue is the conflict demand for electricity production, irrigation, and river navigation, each requiring a specific action with trade off. All these day-to-day decisions can be better managed using weather forecasts which indicate potential water runoff expected from rainfall. Similarly, we can combine weather and climate forecasts to improve long-term management of reservoirs.

> "Many diseases in Africa are seasonal"

Climate forecast for better disease control:

Many diseases in Africa are seasonal, such as meningitis during dry season and malaria during wet season. To fight these diseases, proactive preparedness is needed to move specialists, order drugs, call for international aid, etc. Vector-borne diseases like malaria and diarrhea are particularly sensitive to climate. The vector (anopheles for malaria) of the disease needs very specific environmental conditions to thrive. These conditions can be identified using weather forecasts (for rainfall, wind and temperature). A forecast for a protracted rainy period could identify the enhanced probability of outbreak of many vector-borne diseases. Forecast of a high probability of above normal (wet) rainfall can be used to prepare for an outbreak and take concrete action.

Conclusions:

In this article I have tried to give examples of how climate and weather, which we can now differentiate between, can be used in Climate Risk Management or as a tool to support decision making in Africa. Weather affects many day-to-day activities in Africa such as planting of

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crops, disease outbreaks, management of a water reservoir and other economic activities (outdoor local market planning, harvesting, road traffic) and climate forecasting allows for the future planning on many issues (calamities, selection of crop, start/end of the school year etc). Using climate and weather forecasts in Africa can be of huge societal value (saving lives and optimizing our decision-making system). Seasonal climate forecasts are regularly produced now in many parts of Africa during so-called African Climate Outlook Forum (COF - SARCOF in the southern African Region, PRESAO in West Africa, PRESAC in Central Africa and GHACOF in the Greater Horn region of eastern Africa).

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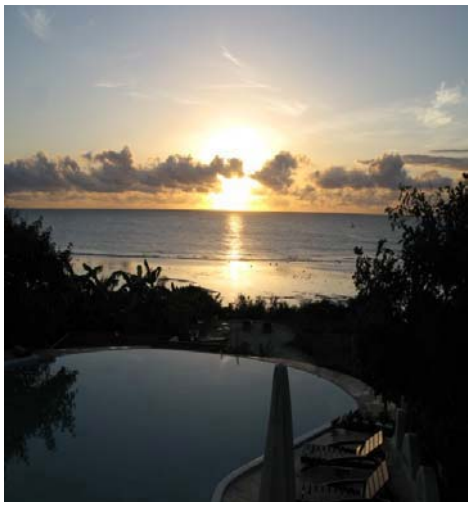

Climate and weather in (from top to bottom): Sierra Leone, Kenya and Lesotho