afrialliance socialinnovation

Monitoring climate for early warning systems to prepare for extreme weather events

Social Innovation Factsheet #1.3

MONITORING

DESCRIPTION

Climate change is expected to alter temperature, air movement, and precipitation in various ways and to varying degrees across Africa with consequences for human health, nutrition, agriculture (e.g. reduction of crop yields and livestock productivity), and water scarcity. Extreme weather events (EWEs) such as droughts and floods are also projected to be more frequent and more intense, with direct consequences for human life and health [a].

As a response to EWE, Early Warning Systems (EWS) are developed as a way to provide timely and effective information, through identified institutions, that allows individuals exposed to a hazard to take action to avoid or reduce their risk and prepare for effective response (b). EWS and making the link between predictable weather and climate events and their impacts are critical to save lives and property when disaster looms. They contribute to the preparedness of decision-makers and individuals in terms of risk knowledge, monitoring warning service, dissemination, communication and response capability (b).

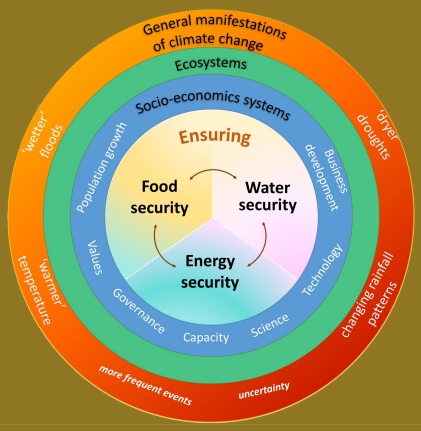
EWS need to have a sound scientific and technical basis and incorporate all relevant factors from natural hazards to social vulnerabilities. The development of EWS for monitoring extreme events includes many steps, ranging from the collection and management of high-quality weather observations (both for drought and flood) to turning data, climate forecasts and projections into useful information. To assess climate change and its impacts, observations of past and current conditions, and scenarios for future developments are required for different components (e.g. atmosphere, cryosphere, water systems, oceans, terrestrial biosphere, urban areas, human and environmental health, etc.).

SOCIETAL CHALLENGES IN AFRICA DUE TO CLIMATE CHANGE

• Given the manifestations of Climate Change and the constraints of ecosystems as well as socio-economic systems, the societal challenges in Africa are to:

– ensure food security, water security and energy security and the balance among them (short term),

– transform into a low carbon, resilient and sustainable society (long term).



The overall objective of the AfriAlliance Social Innovation Factsheets (SIF) is to highlight innovation opportunities that scientists, NGOs, managers and SMEs can act upon, in order to foster short-term improvements in the preparedness of African stakeholders for water and climate change challenges.

Over the duration of AfriAlliance (2016-2021), four sets of SIFs will be delivered. Each set will cover one main theme and explore it across five Social Innovation Factsheets. Monitoring is the main theme of this first series of SIFs, covering the following five sub-themes:

1. Monitoring « drinking water » quality for improved health in Africa.
2. Monitoring of water availability in terms of quality and quantity for food security.
3. Monitoring climate for early warning systems to prepare for extreme weather events (this SIF).
4. Monitoring groundwater quantity to ensure sustainable use of this resource and avoid conflicts.
5. Monitoring water pollution by industries and urban areas to protect human health and ecosystems.

As detailed below, social innovation combines four dimensions: technological, governance, capacity development and business road map. Each is described in a specific section of this thematic Social Innovation Factsheet.

SOCIAL INNOVATION

• In AfriAlliance, social innovation means tackling societal, water-related challenges arising from Climate Change by combining the technological & non-technological dimensions of innovation.

• Social innovation refers to those processes and outcomes focussed on addressing societal goals, unsatisfied collective needs or societal – as opposed to mere economic – returns. It is particularly salient in the context of the complex and cross-cutting challenges that need to be addressed in the field of water and Climate Change – and which will not be met by relying on market signals alone.

• Social innovation consists of new combinations (or hybrids of existing and new) products, processes and services. In order to succeed, social innovation needs to pay attention to technological as well as non-technological dimensions : **1) technology, 2) capacity development, 3) governance structures and 4) business road map.** As such, these four dimensions of the social innovation process cut across organisational, sectoral and disciplinary boundaries and imply new patterns of stakeholder involvement and learning.

• The success of social innovation is reliant on the accountability of diverse stakeholders and across all government levels.

SOCIAL INNOVATION

TECHNOLOGICAL SOLUTIONS

Increasing the preparedness of African populations and governments for extreme weather events is reliant on monitoring the climate and developing scenarios and predictions.

On line with the governance section, identified technological solution should be embedded in a disaster risk reduction approach and not only in relief and mitigation measures [c]

The reliability and availability of data are central to the development of EWS relying on one source of data or combining different ones. Ideally, solutions should also take on board endigenous knowledge and know-how. Specific solutions are also developed according to the type of extreme event considered (e.g. drought or floods).

■ One possibility is to base the warning system on field data. For example, by measuring the variation of the mean level of surface water, an alarm system can be put in place to predict floods. This is indeed already the case in some European countries. To collect this data, it would be essential to use a simple apparatus, which that self-sufficient in terms of energy, such as the SONTEK Stormwater Monitoring Solution [d]. This is a complete, real-time solution that allows several parameters such as level, quality and velocity of water to be measured.

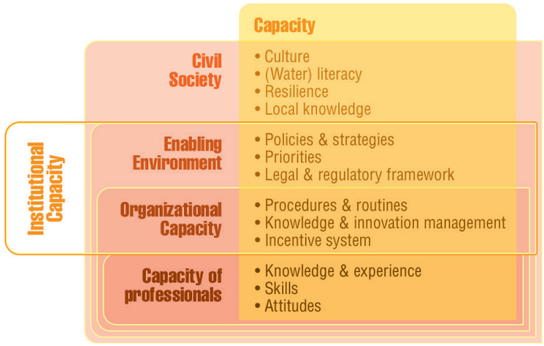
■ Another possibility is to create an early warning system based on meteorological data. Several initiatives aim at enhancing the capacity of African meteorological agencies and other organisations by providing and supporting the use of satellites. TAMSAT [e] for example provides satellite-based rainfall estimates, with archives from 1983. The World Meteorological Organisation has also developed a public service of weather predictions « Nowcasting », based on radar, satellite and observational data. This technique comprises of a detailed description of the current weather along with forecasts obtained by extrapolation for a period of 0 to 6 hours ahead. It therfore constitutes a powerful tool for warning the public of hazardous, high-impact weather including tropical cyclones, thunderstorms and tornados which cause flash floods, lightning strikes and destructive winds.

■ The European online platform on the adaptation to Climate Change Climate-ADAPT [f] and is a source of information presenting experiences, research projects, knowledge platforms presenting the way different European countries are dealing with EWS.

CAPACITY DEVELOPMENT

Capacity Development (CD) is conceived as the inherent responsibility of people, organisations and societies themselves in which support by external parties can play an important role [k].

■ Strengthening capacity is crucial for reliable and long-serving monitoring systems. Monitoring climate requires researchers (e.g. hydrologist and climatologist) and technicians trained on the processing of remote sensing data, AMDAR aircraft data, modelling, and other monitoring technology and applications. Monitoring networks, both physical and human, are instrumental for expanding the coverage of monitoring data, validating data, and also sharing experience to continue human resources. To increase the continuity of monitoring systems, their administrators also require training strenghthening in order to create feasible business plans.



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■ To support monitoring activities, citizens need training on the use of smart-phone technology. In remote areas, citizens can manage monitoring stations and equipment, helping to extend the coverage of monitoring networks at little cost.

■ For public safety, it is also key to strengthen the capacity to operate early warning systems, conduct risk assessments and monitor hazards. Additional training is required for civic organizations and other stakeholders to use the resulting information for emergency planning. Giving users the knowledge to use monitoring products will increase their capacity to respond to weather events and to organize resources more effectively.

■ This capacity of various stakeholders (policy and decision makers, researchers, meteorologists, technology transfer, farmers, communities, etc.) needs to be assessed and strengthened as required.

GOVERNANCE STRUCTURES

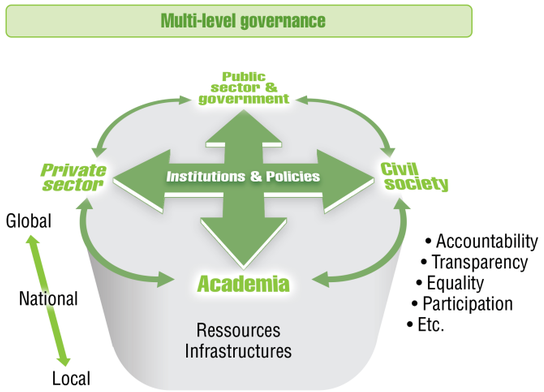
"Governance is essentially the processes and institutions through which decisions are made » [g].

■ Effective governance is essential for overcoming the lack of data and infrastructures needed to monitor climate. One aspect deals with the technological choices that influence climate monitoring in many ways. Another aspect involves political and management interventions that allow the participation of different sectors and citizens in the creation and use of climate data and information (e.g. citizen observatories). The Climate Information and Early Warning Systems Communications Toolkit [i] provides National HydroMeteorological Services (NHMS) and stakeholders with the tools, resources and templates necessary to design and implement an integrated communications strategy. These arrangements also are key for transboundary cooperation for climate monitoring.

■ Public-private partnerships can facilitate the transfer of technology but require transparency and accountability for the financial viability of monitoring networks and infrastructure and to ensure access to citizens (including poor and vulnerable groups) to the information resulting from monitoring.

■ Using climate information in risk management and disaster prevention requires good governance to involve communities, the public and the private sectors in disaster planning and response to increase public safety and reduce infrastructure and property damage in case of extreme weather events. Clear institutional responsibilities are a prerequisite for effectiveness on the ground. Continuous and efficient collaboration of institutions and services involved is required and should not only be limited to drought/crisis periods.

The Global Facility for Disaster Reduction and Recovery (GFDRR) [j] is one example of a grant-funding mechanism, managed by the World Bank that supports disaster risk management projects worldwide.



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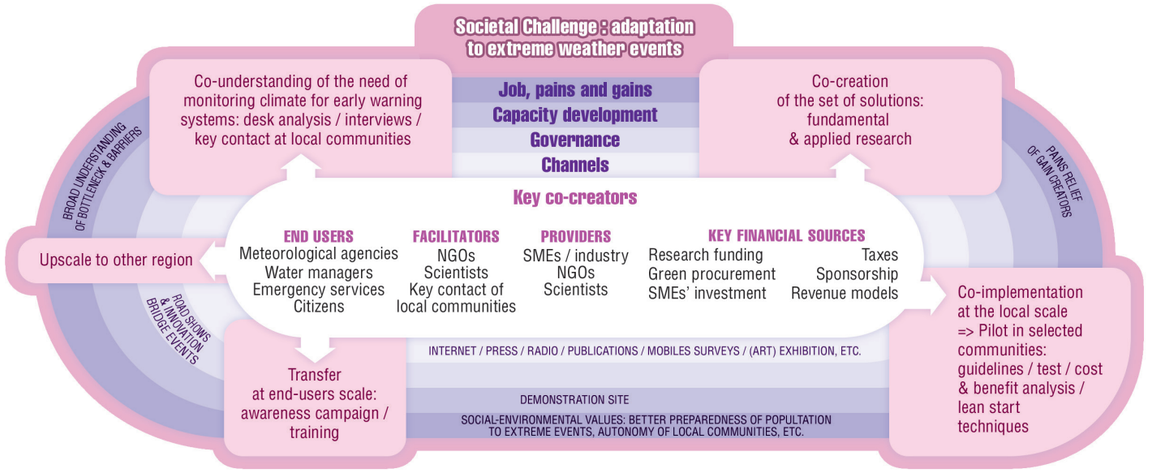
BUSINESS ROAD MAP

Social innovation relies on means other than market mechanisms in order to link the demand and supply sides.

■ Stakeholders from both sides (solution providers and potential users) need to interact during the different stages of the innovation process to create a common ground for the co-production of the required knowledge: from the comprehension of the need to the design, implementation and use of innovative solutions.

■ The scheme highlights the key business opportunities that exist at the different stages, indicating key activities and their socio-environmental values for co-creators.



Further reading

References

DESCRIPTION

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[b] ISDR, DKKW, UNISDR (2010), Emerging CHALLENGES for EARLY WARNING Systems in context of Climate Change and Urbanization, HDN, Switzerland.

TECHNICAL SOLUTIONS

[c] DEWFORA, Improved drought early warning and forecasting to strengthen preparedness and adaptation to droughts in Africa, FP7 European project, https://www.ecmwf.int/en/research/projects/dewfora

[d] http://www.sontek.com/solutionsdetail.php?Stormwater-Monitoring-Solutions-6

[e] https://www.tamsat.org.uk/

[f] http://climate-adapt.eea.europa.eu/

GOVERNANCE STRUCTURE

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CAPACITY DEVELOPMENT

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LIST OF ACRONYMS

- CD: Capacity development.
- SIF: Social Innovation Factsheet.
- EWE: Extreme weather events.
- EWS: Early Warning System.

MORE INFORMATION

Presentation of

AfriAlliance

AfriAlliance is a five year project funded by the European Union's Horizon 2020 research and innovation programme. AfriAlliance facilitates the collaboration of African and European stakeholders in the areas of water and climate innovation, research, policy and capacity development by supporting knowledge sharing and technology transfer.

Rather than creating new networks, the 16 European and African partners in this project consolidate existing ones. The ultimate objective is to strengthen African preparedness for future climate change challenges. AfriAlliance is led by the IHE Delft Institute for Water Education (Project Director: Dr. Uta Wehn) and runs from 2016 to 2021.

Website : http://afrialliance.org/

AfriAlliance activities

Africa-EU cooperation is taken to a practical level by identifying (non-) technological innovation and solutions for local needs and challenges. AfriAlliance also identifies constraints and develops strategic advice for improving collaboration within Africa and between Africa and the EU.

To help improve water and climate Monitoring & Forecasting in Africa, AfriAlliance is developping a triple sensor approach, whereby water and climate data from three independent sources are geo-spatially collocated: space-based (satellites), in-situ hydro-meteorological station observation networks and data collected by citizens.

Sharing of knowledge is facilitated through a series of events and through an innovative online platform. Demand-driven AfriAlliance 'Action Groups' bring together African and European peers with relevant knowledge and expertise to work jointly towards solutions.

Realisation

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