

## **Policy Brief for GSDR – 2016 Update**

# **Individual Perception of Environmental Change as Supplement to Big Data\***

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### **Introduction**

Big datasets undeniably provide large and unprecedented opportunities for identifying, measuring, and monitoring regional to global environmental risks. They are a fundamental asset of new technologies in implementing SDGs to reduce vulnerabilities on a global scale. However, certain aspects of big data need to be taken into account and reevaluated in order for the SDGs' intention of 'leaving no one behind' to take effect. A study prepared by the authors on individual perceptions of climatic and environmental change in rural semi-arid and sub-humid Tanzania which this brief is based on showed strong deviations between climatic and environmental data measured by regional weather stations and satellites, and local experiences of changes in the environment (Roeschel, 2016). The interviewed individuals almost unanimously indicated that they had perceived climatic and environmental changes in their surroundings that had affected their water availability as well as their food security. However, scientific data showed no evident trends for precipitation or temperature within the regions.

### **Environmental Perception**

Changes in the environment are not only recorded by advanced technology, but also perceived by the individual. Environmental perception has been adopted as a diagnostic tool since the UNESCO's Man and the Biosphere program of 1968, which declared the study of environmental perception as a fundamental tool for the management of places and landscapes (UNESCO 1968). It is an advantageous tool for diagnosing socio-environmental issues and interlinkages (Whyte, 1977). Studies have shown that perceived changes in the environment are instrumental towards policy design and sustainable resource management (Ayeni & Olorunfemi, 2014; GESAMP, 1996; Weber, 2006). Even though environmental perceptions may be categorized as subjective judgments—because they are not based on scientific quantitative methods—they are highly important due to the incorporation of factors other methods neglect (Elliot et al. 1999). Individual characteristics affect perceptions, but they also affect the individual's actual food and water availability, and consequently matter in terms of necessary political action (Eduful & Shively, 2015; Ngo & Isaacowitz 2015).

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## **Key Findings**

This brief uses the findings of empirical qualitative research conducted in six villages in rural Tanzania. In a survey conducted by Trans-SEC<sup>1</sup>, 899 male and female household heads were asked to describe climatic and environmental changes they had perceived in their immediate surroundings over the past 20 years.

## **Region Specific Perceptions**

Site-specific variables are important components that affect environmental perception (Brehm et al. 2012). The study conducted showed that individual perception was significantly correlated to the case study site that the respected interviewee originated from. While scientific environmental data showed highly similar trends for both regions, individuals had a different experience of changes on the local level.

Present environmental risks within a region increase the individual's perception of other environmental changes when a person's livelihood highly depends on environmental stability. Those individuals from case study sites depending on river water levels for field flooding were much more likely to perceive changes in river water levels. Thus, information about local individual perception can help identify risks and issues hidden in big data.

## **Income Specific Perceptions**

It was determined that for subsistence farmers in Tanzania, the economically wealthier individual was more likely to perceive environmental changes, but was less likely to reduce their vulnerability to these perceived environmental changes through utilization of coping activities. This counter-intuitively implied that household and agricultural production related assets are marginally negatively correlated with the likelihood of a household making a change. Due to more diversified sources of income, wealthier households may perceive themselves as more resilient to environmental shocks. Perception of environmental change rises with income, perhaps due to a higher level of education, but the consequences of environmental change are considered less of a risk. The less a livelihood depends on the environment for food security, the less environmental perception will act as a warning for a critical change. As a result, the opportunity for timely and sustainable adaptation activities may be missed.

## **Gender Specific Perceptions**

Consistent with other studies, the results of this study support that female household heads engaged in subsistence farming perceive environmental changes more intensely than male subsistence farmers (IFAD 2003, UN 2009). Constraints and opportunities for women's livelihood strategies and adaptive capacities are linked to their assets and their levels of access to income and common property resources (Perez et al. 2015). Female household heads have a workload in agricultural crop production exceeding the one of males, increasing their vulnerability to environmental changes, and thus their perception of these changes. Because women are deprived of certain major resources, they have different perspectives

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<sup>1</sup> The project Trans-SEC (<http://project2.zalf.de/trans-sec/public/>) is supported by the funding initiative "Securing the Global Food Supply – GlobE" and embedded in the framework program "National Research Strategy BioEconomy 2030". The specific objective of Trans-SEC is to improve the food situation for the most-vulnerable rural poor population in Tanzania.

and perceptions of constraints. Although female farmers are primary contributors to the world's food production and security, they are frequently underestimated and overlooked in development strategies (IFAD 2003).

### **Limits of Big Data and the Opportunity of Individual Perceptions**

While using big data presents an opportunity for environmental research and policy building in the face of climate change, it also has its challenges and limits that could be overcome by taking into account individual perceptions. Recording and accessing big data is subject to funding, and developing countries such as Tanzania may not have the possibility to invest in highly advanced data collection and processing. This would give LDC's another disadvantage in achieving sustainable development. Recording individual perceptions of environmental changes would be a cost-effective solution to enable policy-makers to act without having to access big data first. Whether scientific data is available or not, vulnerabilities to environmental changes are still present and perceived within the local community. Information on local environmental perceptions could help policy makers identify pressing issues within communities that could then be further explored with the help of big data. Due to the rapid decline in costs associated with cloud-based computing, local research facilities have the opportunity to analyse identified perceptions of risks further without needing access to a supercomputer.

Furthermore, certain variables may not be sufficiently measured by scientific tools, but can only be determined through personal interaction with affected individuals. In this survey, subsistence farmers were asked to rank how wealthy they were in comparison to others from their village. It would be

difficult to metrically measure the income of a subsistence farmer. An individual survey makes that possible.

Finally, vulnerability to climate change is subject to a multitude of factors. Climate risk cannot solely be determined by projecting how a region will be affected by climate change in terms of temperature increase or land-use change. Perception and the respective individual reaction must be taken into account in order to enable the design of effective policy interventions. Only then can the implementation of SDGs hope to 'leave no one behind'.

### **Conclusion**

Based on the discussion above, this brief advocates the utilization of big data for SDG implementation together with using local data of individual perceptions and reactions to ongoing social, economic, and environmental changes. In order to leave no one behind in the decision making process, sustainable development needs to be implemented on the local scale in addition the regional and global level. Big datasets have the potential to give unprecedented insight on global challenges, but are typically available for broad regions. Meanwhile, the effects of global challenges occur on the local level and are subject to a whole new set of variables that cannot be considered on an extensive scale. Big data should be used to support the implementation process of SDGs, but the considered datasets should be supplemented by local data that reflects individual vulnerabilities and challenges. Recording perceptions of i.e. climatic and environmental change is an advantageous method to gain insight on the effects of climate change on local individuals, especially in rural regions, where funding for big data is usually limited.

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