International Journal of Disaster Risk Reduction 11 (2015) 13–34

Contents lists available at ScienceDirect

International Journal of Disaster Risk Reduction

journal homepage: www.elsevier.com/locate/ijdrr

Multi-scale participatory indicator development approaches for climate change risk assessment in West Africa ☆

Daniel K. Asare-Kyei *, Julia Kloos, Fabrice G. Renaud

United Nations University, Institute for Environment and Human Security (UNU–EHS), UN Campus, Platz der Vereinten Nationen 1, 53113 Bonn, Germany

ARTICLE INFO

Article history:
Received 5 July 2014
Received in revised form
14 November 2014
Accepted 21 November 2014
Available online 24 November 2014

Keywords:
Expert knowledge
Indicators
Multiple hazards
Participatory assessment
Risk
West Africa

ABSTRACT

A multi-scale participatory process was used to extend the classical approach of indicator development for risk assessment in West Africa. The approach followed a step-wise procedure to develop Indicator Reference Sheet based on conceptual risk assessment framework and combined with knowledge of local experts iteratively selected through snowball approach. Existing risk assessment frameworks being modified to account for multiple hazards were merged into a coherent framework to categorize the components of risks. Local experts including at risk populations were constituted into technical working groups to elicit important processes shaping risks at multiple spatial scales. The results showed that more than half of the designated local level indicators and over two-third of macro scale indicators are rarely used in present risk assessments in the region. Additionally, although an indicator may be common to three countries, their differential rankings will result in differences in explaining the risks faced by people in different societies. However, there were indicators that were unique to each country and this has wider implications for risk assessment that uses common indicators for different countries for comparative purposes. An important output of the study is the identification of locally and nationally evaluated indicator sets for assessing the risk to natural hazards. While it has neither been optimal to completely neglect classical approaches nor to take as an absolute fact opinions from local experts, more emphasis should be paid to the latter in risk assessment that is supposed to serve the very people on whose behalf the assessment is done.

1. Introduction

The dominance of rain-fed agriculture in West Africa where 60% of the population is engaged in agriculture [1] makes its population vulnerable to climate change and variability. The recent IPCC report ([2] p. 3) reported with high confidence that the interaction of climate change with non-climate stressors will "exacerbate vulnerability of agricultural systems in

☆ This article is a revised and expanded version of a paper entitled "Participatory approaches to develop indicators for multiple risk assessment linking different scales in West African Social–Ecological Systems under climate change" presented at the ANDROID Residential Doctoral School, Limassol, Cyprus, 23–24 October 2013. ISBN: 978-1-907842-52-8.

* Corresponding author. Fax: +49 228 815 0299.
E-mail addresses: asare-kyei@ehs.unu.edu (D.K. Asare-Kyei), kloos@ehs.unu.edu (J. Kloos), renaud@ehs.unu.edu (F.G. Renaud).

http://dx.doi.org/10.1016/j.ijdrr.2014.11.001
2212-4209/

semi-arid" Africa such as the West Sudanian Savanna region of Burkina Faso, Ghana and Benin. Vulnerabilities are shaped through a host of biophysical and human related issues in the region including rainfall-related soil erosion, recurring droughts, poor soil quality and fertility, low input farming systems, decreased fallow periods, deforestation, frequent bush fires, and overgrazing [3,1]. Numerous studies exist worldwide that measured vulnerability to climate change at different scales from local to national assessments (see for example [4,5]). Also large-scale studies by Cardona [6] Dilley et al. [7], UNDP [8], Birkmann [9] and USAID [3] have measured vulnerability, resilience and adaptation using a variety of concepts, approaches, and indicators. However, it is impossible to reduce the concept of vulnerability and risk to a single equation or model that has a universal application. This is due to inherent complexity of Social–Ecological Systems (SES); the multi-dimensional nature of vulnerability and risk [10,11,5]; and a variety of concepts such as exposure, sensitivity, susceptibility, response, coping and adaptive capacity, robustness and resilience that are employed in order to measure vulnerability and that are defined in many different ways [12].

The factors outlined above result in a non-universal applicability of existing indicator based vulnerability and risk assessment methods to areas such as the West African sub-region, implying that different and well-adapted methods need to be developed. Such methods should tackle complex settings of hazards occurrence as well as the dynamic socio-economic and environmental exposure; They also need to be context specific, be able to capture all relevant processes shaping vulnerability and risk at various scales and, more importantly, still be applicable to local communities affected usually by multiple hazards [13,14]. However, the available literature suggests that these important considerations have been missing in many risk assessments particularly for the West African sub-region.

To date, no study has attempted to understand the risk patterns of West African rural communities in the context of climate change through a set of indicators. The only study that comes close is a study conducted in Ghana in 2011 by United States Agency for International Development [3]. Even in this study, the indicators were derived purely from literature and lack the important element of the participatory process from the vulnerable themselves. Furthermore, this study only considered social vulnerability to climate change and did not account for the ecological or biophysical aspects which are closely linked to the social processes. More importantly, this study conducted risk level assessment at the district level and not at the rural community level where risk outcomes are first materialized.

Other climate risk assessments studied in the region have either been conducted at the country level or looked at decoupled SES. Studies from Boko et al. [34], Briguglio [35], Challinor et al. [36], Thornton et al. [37], World Bank [38,39] aimed at country level comparisons of risk. On the other hand, studies such as Challinor et al. [36] and IFPRI [40] looked at decoupled SES and assessed narrow segments of it such as the vulnerabilities of agricultural sub-systems or the environmental sub-system. Most of the studies published in Africa Adapt [14] fall into the latter category. It is often very difficult to link local level results to assessments made at higher scales and vice versa, hindering a potential down-scaling and upscaling of results. Besides the USAID [3] study in Ghana, Raschid [41] undertook a water mediated climate impact assessment for urban areas based on indicators. In the three countries studied here, other risk assessment have been carried out at much smaller scales and on decoupled SES such as Arnold et al. [42] in Burkina Faso; World Bank [38] and IFPRI [40] in Ghana, Benin and Burkina Faso. All these studies however, are based on classical risk assessment and did not involve the vulnerable themselves. More importantly, risk assessment was done only at single scales and for single hazards.

In other countries, Bollin and Hidajat [33] developed a community based risk index for Indonesia based on indicators and showed how an indicator based approach could be implemented at the community level where risk outcomes are first materialized. In another example, on a more global level, the Alliance Development Works led by the researchers of the United Nations University Institute for Environment and Human Security has been publishing the World Risk Reports since 2011. The 28 global level indicators depicting current conditions underlying exposure to natural hazards, susceptibility, coping capacity and adaptive capacity were aggregated to generate the World Risk Index. This index allows for the identification of the most high risk and low risk countries of the world [27]. These are also based on classical (top-down) approaches and aimed at country level comparisons. Despite the large amount of knowledge available in local areas [16], most, if not all risk assessments in the West African region have been approached from classical methods[1] without tapping into the wealth of resources available at the local level. Moreover, many risk assessments in the region are mainly based on qualitative assessments without any attempt at combining them to quantitative data despite the fact that it has been recognized that risk assessment from both quantitative and qualitative (social, psychological, ecological) methods is required to deliver a more complete description of risk and risk causation processes [6,43–45].

In the present study, the points of departure from the studies reviewed above are to explore methods to involve at risk populations at multiple scales in a bottom-up participatory process as opposed to the classical top-down, single scale approaches; assess risk indicators from multi-hazard perspectives in a coupled SES rather than single-hazard-decoupled risk assessments and finally assess risk indicators relevant for rural communities across West Africa. Indicator based risk assessment where the indicators have been selected from a rigorous scientific process involving active participation of populations at risk at different scales as well as the authorities governing these risks is a prerequisite in meeting these criteria.

[1] Classical methods here mean traditional, top-down approaches where indicators are selected purely by researchers without involvement of stakeholders or at risk populations.