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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Exploring drought vulnerability in Africa: an indicator based analysis to inform early warning systems" *by* G. Naumann et al.

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While the frontiers of drought forecasting and monitoring are being pushed back, the third domain of drought vulnerability, resilience, and drought impacts remains poorly explored, so the effort presented within this paper is an encouraging sign. Efforts have been underway within the international development community to document how resilience can accommodate drought shocks and stresses without national collapse. Even within the more developed community, attempting to find ways for the agricultural community to survive decadal droughts during Australia's Millennial Drought have been explored. The occurrences of the East Africa Greater Horn of Africa rain failures

in 2010 and 2011 has provided grist for the mill regarding: 1) difficulties confronting humanitarian intervention for famine relief for drought cases in locations where there is no or negligible national authority or infrastructure (as in the case of Somalia, for example)(Alinovi, Hemrich, and Russo, 2008 Beyond Relief: Food Security in Protracted Crises); and 2) what criteria are used for the determination of the depth of severity of a drought-induced famine, i.e, the International Food Security Phase Classification IPC Phase 4 (http://www.fao.org/docrep/010/i0275e/i0275e.pdf). For Africa (and parts of South and Southeast Asia, as well) food security considerations comprise the brunt of drought vulnerability. At the same time, cases where governments have collapsed or in the midst of civil war, implies that impacts must be assessed on sub-national ethnic and clan groups. Indeed, a strong case might be made that to really provide useful utility, a drought vulnerability assessment tool should be able to discern vulnerability of subnational groups and clan or ethnic or "work" groups, whether the national government is effective or not. This raises the ultimate question: who is the user for whom use of the Drought Vulnerability Indicator is targeted? Is the tool designed to provide a quick assessment for countries within the African continent? If there is an existing institutional framework, such as the Food Security and Nutrition Working Group (FSNWG), is this tool being developed independently of them (the user constituency), or does the DVI share methodology in common with the FSNWG and the IPC? A first look can be made at the countries identified as being vulnerable using the Drought Vulnerability Indicator (Nauman et al 2013 within this paper being reviewed) and the countries for which IPC reports are being routinely carried out. There are actually three categories of areas identified within the DVI analysis. The first is identification at the national level, for which Sierra Leon (Figure 8), Guinea-Bissau (Figure 8), Mali, Niger, Chad, Somalia, Ethiopia, and Burundi have the highest vulnerability, while Sudan, South Sudan, Central African Republic, Democratic Republic of Congo, Rwanda, Mozambique, Mauritania, Liberia, and Togo are identified as less vulnerable. To place these countries in perspective, the countries for which IPC reports are prepared (within East Africa) include: Burundi, Central African Republic, Democratic republic of Congo, Djibouti,

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Kenya, Ethiopia, Rwanda, Somalia, South Sudan, Sudan, Tanzania, and Uganda. One will note that DVI does not include Kenya, Tanzania, and Djibouti. Reports are in the process of being drafted for West Africa for the countries of Burkina Faso, Chad, Senegal, Mali, Mauritania and Niger, Togo, Guinea Republic, the Gambia, Cote d'Ivoire, Ghana, and Cape Verde. This omission is recognized by the authors, who acknowledge in section 3.3, comparing drought vulnerability estimates with observed data, two exceptions to this agreement are Ghana and Kenya where more than 10 million people affected have been reported during the 1970–2006 period but are classified as having low vulnerability according to DVI.

However, as has been noted above, the authors are using three spatial scales. Besides the national scale, one of the indicators, that of renewable national capital, is also plotted at one geographical degree resolution. The identified vulnerable areas, identified under this indicator, include:

Figure 2a shows the natural capital component of drought vulnerability of agricultural systems. The areas of higher vulnerability correspond with the areas of high density of crops and population as depicted in Vörösmarty et al. (2000). Those areas include the Mediterranean climates of Africa, the Sahel, and almost the entire eastern part of the continent including the Greater Horn of Africa (GHA).

A regional vulnerability analysis was performed by aggregating the data at sub-basin level (Fig. 2b). The most vulnerable sub-basins (high to moderate in Fig. 2) can be grouped in three main different regions: (1) the Mediterranean coast of Africa comprising most of the Moroccan and Algerian basins and the Nile Delta; (2) the Sub-Sahara and the south of Sahel regions with the Volta and Niger, White and Blue Nile and the Horn of Africa; (3) the Serengeti, the Eastern Miombo woodlands in Tanzania and Mozambique, and the Limpopo.

To conclude, then, better agreement is seen between the IPC report coverage area and the one degree pixel areas identified as being vulnerable under the renewable natural

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capital measure. In fact, the authors acknowledge the first section is a “simplified agricultural drought vulnerability indicator” taking into account only renewable natural capital variables available at 1 degree by 1 degree.

The IPC technical manual includes key reference outcomes of crude mortality rate, acute malnutrition, stunting, food access and availability, dietary diversity, water access and availability (using the same criterion as the DVI for this factor), civil security, livelihood assets, and hazards.

However, the spirit of DEWFORA calls for closer engagement with the user community in rephrasing the drought question within Africa, so what practical value does the DVI provide for actual early warning situations? Does it provide the early stage for a future tool? To answer this question, one must look at actual cases where drought impacts upon the population have been measured. The categories used to assess such impacts can be compared with the categories used within the DVI.

Alinovi, Romano, D’Errico, and Mane, 2010: Livelihoods Strategies and Household Resilience to Food Security: An Empirical Analysis to Kenya” (http://erd.eui.eu/media/BackgroundPapers/Alinovi-Romano-D%27Errico-Mane.pdf) tapped the Kenya Integrated Household Budget Survey 2005-06 (KIHBS), conducted by the Central Bureau of Statistics, in order to identify the groups at risk to drought (and to attempt to quantify “resilience.”) Another source is Community Based Resilience Assessment (CoBRA) Conceptual Framework and Methodology of the UNDP Drylands Development Centre.

To provide a little perspective for those in the drought discipline, “livelihoods thinking” is mainly an offshoot of British developmental think thanks and organizations (IDS, ODI, and DFID) which–rather than resources, facilities, or organizationsâĂŤ attempts to understand the strategies pursued by people and the factors behind people’s decisions. Livelihood outcomes are the goals to which people aspire, such as increased income, reduced vulnerability, improved food security, etc. Livelihood analysis evaluates peo-

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ple's access to assets and their ability to put these to productive uses, and these assets are traditionally identified with: human capital (or assets); social; natural; physical; and financial (Alinovi et al 2010), similar to the generic categories of capital identified in Nauman et al.

The greater, more treatment, given to the impacts of drought upon specific groups is given for Kenya by Alinovi et al (2010). Some of the measures used to determine resilience of specific groups included: "Access to basic services" factor includes access to telecommunication (cell phones, for example), access to electric power, distance to water, distance to work, and access to credit; secondly, a "social safety net" factor, of which wage employees had the highest access, while pastoralists and small holder farms had the lowest. A third "stability" factor included crop shocks, i.e., crop losses caused by droughts or floods, while other shocks included illnesses and deaths; small farm holders were the least stable. The fourth "adaptive capacity" factor includes "diversity," or number of household sources of income (multiple sources of income provide a buffer) and employment ratio, the number of household members currently employed and the household side. This also included education. Another adaptive capacity sub variable was food ratio, the food expenditure to total household expenditure. Using these variables, Alinovi et al (2010) were able to identify six different kinds of livelihood strategies for Kenya: pastoralist (6%), agro-pastoralist (14%), small-holder farmers (34%), large-holder farmers (3%), entrepreneurs (19%) and wage-employees (24%). The impact of drought was felt least for the most resilient group, the large-holder farmers (0.22), followed by wage-employees (0.15), entrepreneurs (0.08) and agro-pastoralists (0.03). Those most heavily impacted by drought were the pastoralists (-0.26) and smallholder farmers (-0.13) World Bank, 2009 Kenya Poverty and Inequality Assessment. Report No. 44190-KE, Poverty Reduction and Economic Management Unit, Africa Region. April, 2009). The drought impacts also extended to the urban poor since the typical poor rural Kenyan was heavily impacted by the food price spikes resulting by decline in food due to famine-induced crop failure.

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The lack of adequate transport infrastructure makes offsite transport of animals from drought stricken areas to markets impossible, a major problem for pastoralists in times of drought (HPG, 2006 Saving Lives Through Livelihoods: Critical Gaps in the Response to the Drought in the Greater Horn of Africa. HPG Briefing Note. London: ODI). When this option is prevented, credit may play a crucial role in ensuring the household livelihood, and this explains the emphasis that pastoralists put on the access to credit. Conversely, agro-pastoralists and smallholders seem to be more concerned about the distance to water sources. The Regional Resilience Enhancement Against Drought (RREAD) initiative aims precisely at this through livestock interventions (for example, de-stocking, supplementary livestock feedings, emergency veterinary program, transport subsidies to support de-stocking, enhancing water access (for example, creating and re-habilitating wells and boreholes, establishing strategic water sources, subsidized provision of fuel and pumps Pantuliano and Pavanello, 2009 Taking Drought into Account. Addressing Chronic Vulnerability Among Pastoralists in the Horn of Africa. HPG Policy Brief 35. London: ODI. May 2009). This strategy is tantamount to increasing the DVI infrastructure factor but applied to the drought stricken area.

Returning back to the Nauman et al 2013 methodology, the authors acknowledge "there are some limitations. . .Second, our list of proposed variables that represent these components does not capture the full range of possible vulnerabilities and vulnerable groups to be included in early warning systems, particularly since it does not completely evaluate social conditions nor the response of stakeholder groups or market aspects."

A slightly detailed look has been given internally of the impact of drought upon different groups in Kenya. From this perspective, we return back to the question posed earlier: what is the justification for the DVI result that Kenya has low vulnerability, despite the observed history of droughts there and semiarid conditions? Does this suggest the methodology may be in error?

Figure 9 shows that while "renewable natural capital" is viewed as having vulnerability

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greater than moderate (to be expected), the three remaining factors are ranked with low vulnerability which pulls the renewable natural capital result out of the most vulnerable category. I think the authors need to demonstrate more conclusively in their paper that this is not an artefact produced by the way the indices are designed for the remaining assets. For example, larger farms may be utilizing fertilizer which would reduce the vulnerability for the infrastructure and technology weight, while, as shown above, this has no relevance for the pastoral population (or perhaps even small farmers). Certainly, major improvements in water infrastructure would be hard to justify.

The global drought community is maturing. There is a need for dialogue between the international developmental community, the food security community, and the drought community on the most reliable way to supply drought forecasts and monitored products in a form truly useful to people impacted by drought, and there is a need to develop tools that will help identify vulnerable user groups as early as possible within the process. An in depth methodology has been illustrated. What role does the DVI have in this process? A greater engagement is required between the expert drought community, the food security community, the regional climate outlook forum, and the different groups in Africa. This process has begun, and this paper makes a contribution for branching out to these communities and building bridges, but it has not carried the dialogue far enough.

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