

## ***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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This is the same review as posted but shortened and edited further.

While the frontiers of continental-scale drought forecasting and monitoring are being pushed back, the neglected third domain consisting of drought vulnerability, resilience, and drought impacts remains relatively unexplored, so the effort presented within this paper is especially welcome. While the study itself is acceptable, there is a disappointing lack of connection of the study with results that have been published within the international development community. Furthermore, user groups in Africa, partic-

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ularly East Africa are tied to efforts of the food security community there. This East Africa developmental effort is also being extended to West Africa. There is an established methodology being used by the food security community, particularly the Food Security and Nutrition Working Group (FSNWG), and while there is some overlap of methodological categories with those used by the authors, this food security literature is not acknowledged in the paper. These communities, the food security community and the drought community, have developed independently, and the dialog which started at the 1st Global Drought Information System workshop needs to be sustained. In addition to the more general FSNWG Integrated Food Security Phase Classification (IPC), more detailed studies have been published on vulnerability (expressed sometimes as resilience) for some of the countries in Africa; these studies particularly have focused on actual groups at the subnational level, often using national governmental studies. The difference in focus between a country-centered study and a study attempting to cover the breadth of Africa (as in the case of the authors) is acknowledged. Given the large number of countries with which they are working, the authors have attempted to base the Drought Vulnerability Indicator, upon nationally available data. However, the end result of the DVI is to identify those countries that are considered to be vulnerable. The purpose of the FSNWG is the same, to offer, from a pan-Africa perspective, reports for countries that are considered to be at higher risk, obviously from a food insecurity point of view. The authors have acknowledged that the renewable national capital indicator is a “simplified agricultural drought vulnerability indicator” taking into account only renewable natural capital variables available at 1 degree by 1 degree. The DVI itself, particularly the countries identified as being vulnerable, have been so classified, based upon the supplemental indicators, beyond that provided by the renewable national capital indicator. Nevertheless, the pixel plots for the renewable national capital indicator, particularly when aggregated to basin scale, can be compared against the countries for which FSNWG food security bulletins are being prepared.

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 Su-

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dan, South Sudan, Central African Republic, Democratic Republic of Congo, Rwanda, Mozambique, Mauritania, Liberia, and Togo are identified as less vulnerable. In comparison, the East African countries for which IPC reports are prepared include: Burundi, Central African Republic, Democratic republic of Congo, Djibouti, Kenya, Ethiopia, Rwanda, Somalia, South Sudan, Sudan, Tanzania, and Uganda. One will note that DVI does not include Kenya, Tanzania, and Djibouti. Reports are being drafted for West African 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 (drought disaster database), 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.

What is the justification for the DVI result that Kenya has low vulnerability, despite the observed history of droughts there as well as its semiarid terrain? (Much of this is also true of Tanzania).

Figure 9 shows that while “renewable natural capital” is viewed as having vulnerability 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.

Routine food security monitoring carried out for Kenya and Tanzania would hardly lead one to believe that these countries have low vulnerability. However, as noted

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above, the food security classification, to some extent, is synonymous with the natural resource indicator. To provide a second test (besides IPC) as to whether Kenya has low vulnerability or higher vulnerability, 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, to identify the groups at risk to drought (as well as to attempt to quantify "resilience.")

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 heav-

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ily impacted by the food price spikes resulting by decline in food due to famine-induced crop failure.

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 review of the Drought Vulnerability Indicator, 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.”

In conclusion, looking at some of the detailed sub-national picture for Kenya, there seems to be little basis for support that Kenya has low vulnerability, as the DVI sug-

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gests; the same is probably true for Tanzania, as well.

I do not think a major revision of this paper is necessary: the authors clearly have spent considerable effort attempting to provide a pan-Africa picture of vulnerability, as opposed to an in depth examination of vulnerability for specific regions or countries within Africa. However, the authors, I believe, need to clarify and provide a little more detail and documentation as to why their DVI-identified vulnerable countries do not overlap with the FSNWG identified countries, particularly in East Africa. Apart from that, the authors are to be congratulated for adding to the vulnerability and drought impact literature at the continental scale.

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