What drives decision-making on livelihood options in the forest communities of Cameroon?

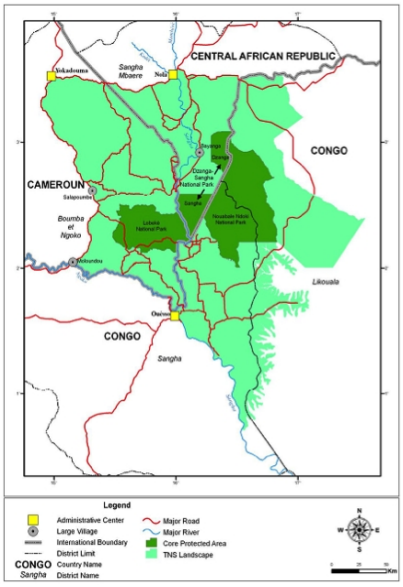
Authors: Sukaina Bharwani, Richard Taylor, Tahia Devisscher, Monica Coll Besa and Michael Fischer

Track: Using qualitative data to inform behavioral rules

Extended Abstract

Background

The focus of this application builds on the regional baseline climate and social vulnerability assessment conducted in the “Climate Change and Forests in the Congo Basin: Synergies between Adaptation and Mitigation (COBAM)” project. There are five landscapes in the baseline assessment, most of which are cross-boundary, spanning more than one country of the Congo Basin. For this application we are focussing on the case study located in the Tri-National de la Sangha (TNS) landscape, which consists of three national parks: Lobéké (Cameroon), Nouabalé-Ndoki (Republic of Congo) and Dzanga-Ndoki (Central African Republic), covering 4,520,000 ha in total. The areas surrounding the national parks, around 3,751,800 ha in total, have multiple uses with zones for logging concessions, community forest use and professional hunting (Usongo and Nzooh 2008).



The TNS Landscape
Source: Usongo and Nzooh, 2008

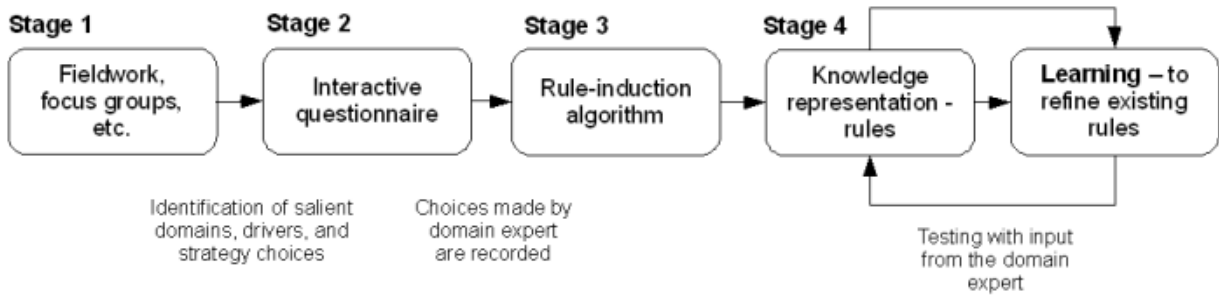
A methodology for eliciting decision-making heuristics (KnETs) through the application of a field-based participatory game (Bharwani, 2006) is applied for the exploration of livelihood

options that have co-benefits for both adaptation and mitigation in the forest communities of the TNS. The output of the game - a set of decision rules - feeds into an agent-based model which further defines the decision-making environment of the agents to observe behaviours and environmental feedbacks that emerge when many individual heterogeneous agents responding to differing drivers, and with differing goals, interact (e.g. Bharwani et al., 2005). This social simulation model will be further validated in a workshop with communities in Cameroon to evaluate its potential in improving our understanding of livelihood strategies which have co-benefits for both adaptation and mitigation under differing scenarios of climate change and changing future vulnerabilities.

This paper will describe the application of the KnETs approach for formalising qualitative data in the TNS case study, the results obtained and how this has provided evidence to better inform the social simulation model.

Approach

The methodology for eliciting decision-making heuristics (KnETs) is a computer tool developed by anthropologists and computer scientists, which has been applied to understand decision processes in climate change, environment and sustainability contexts (Bharwani, 2006). Initial participatory field research (stage one in diagram) is followed by more structured interviews with individual decision-makers (carried out using the tool), to understand their livelihood choices or responses in a range of situations (stage 2 in diagram) and the application of a machine learning algorithm to the set of these responses (stage 3 in diagram).



Stages in the knowledge elicitation process.

The output of this methodology is a set of decision rules (stage 4 in diagram) that is verified and validated iteratively with key informants. This allows the refinement of the decision rules and the potential to access tacit knowledge that can be difficult to elicit.

The identification of drivers that are potentially salient for decision-making can be supported by both preliminary and follow up field research e.g. vulnerability assessments, network mapping, feedback workshops, interviews as well as other participatory tools. Researchers have also been using bottom-up ‘mixed methods’ combining KnETs with ABMs and the water demand model WEAP (Kemp-Benedict et al., 2010) to create a systematic and transparent approach for formalising qualitative evidence for use in other types of models.

This methodology allows a range of factors that shape particular decisions or decision processes of interest to be simultaneously examined. It provides some guidance on what to

include in a model and it also adds a structured step towards elicitation of information about the reasoning behind decisions.

This approach is both *systematic and transparent* because it includes the specification of multiple drivers of decision-making, identified by the participants themselves, during previous participatory interviews and household surveys (120 on perceptions of vulnerability), and they are therefore linked to evidence. This evidence is transposed into a 'game' that encapsulates stressors, adaptation strategies and livelihood options.

In the game, the stressors or drivers are then iterated systematically to produce and to examine every possible combination/scenario, in terms of how they affect a particular decision. The outputs are reported and described in the write-up/ documentation of the game: decision trees have been found to be very valuable in the visualisation and therefore understanding of decision-making.

Transparency to participants is increased by a 'verification' stage, which allows the participants to refine the output of the game and this feedback leads to a revised game design or set of rules which better captures the important decision factors. Before inclusion in the agent-based model, the decision rules can be further validated by another set of informants that have not been involved in the design or 'playing' of the game to test whether the resulting rules hold true in any way for this particular 'set' of informants.

When the decision rules are coded in the model, there is a clear link with the data collected on the drivers and also the documentation of the KnETs game. This provides transparency to other people inspecting the model design in terms of understanding how key decision processes were represented, and where the evidence for these aspects of the agent-based model comes from. Since entities in an agent-based model are often conceptualised as the decision-making actors in a social system, an important aspect of modelling is then open to criticism/feedback.

Furthermore, this approach can help to access a new world of evidence. As mentioned above, one benefit is the possibility to access tacit knowledge that can be difficult to elicit through more traditional interview techniques. The method is capable of handling interaction of drivers. This could be important for understanding participants' behaviours in complex scenarios, where decisions are thought to be conditioned on many different factors. An agent-based model can then be used to examine the implications of these findings about the nature of decision processes.

The process of eliciting knowledge and producing decision trees involves a transformation of qualitative knowledge into a set of decision trees that have weights assigned to them that reflect how often the rule has been satisfied, or not, during interviews with informants. This bottom up articulation of agent rules makes any participatory validation of the model, using narratives of different scenarios, a potentially more meaningful and insightful process than would be the case if rules were derived from literature or surveys for example.

This particular game focuses on livelihood options that have co-benefits for both adaptation and mitigation in the TNS landscape. Our previous research (an in-depth baseline vulnerability assessment and household interviews – see Devisscher et al. 2013) has shown

that the drivers that affect decision-making include climate, socio-economic and institutional elements. In the climatic domain, these include the changing characteristics of the wet and dry seasons, changing onset, intensity and distribution of rainfall and increasing warmer, drier periods. In the socio-economic domain, while there are many factors that could be considered, the most salient for decision-making about livelihood options, appear to be access to urban markets through cooperative associations, formalised forest management and whether any benefit from this is perceived from this initiative and incentives for 'avoided deforestation'. Other drivers include crop-raiding, population growth (due to in-migration from neighbouring Central African Republic and Democratic Republic of Congo), availability of forest cover and whether illness within the household (the incidence of malaria is high in this region) is a consideration when choosing livelihood options.

Experiments and expected findings

The KnETs approach, and experimental simulations with ABMs allows us to address a number of questions relevant to this special track, and to the domain of interest (forest livelihoods). Can KnETs help us understand how different drivers (e.g. climate variability and change) might make a decision more complex? Can it help to better understand are the underlying factors that drive decisions (for example, decisions about forest use strategies)? Do the models developed in this way generate more accurate/adequate simulation results or outcomes, when later checked against quantitative evidence? Can they reveal trade-offs, or co-benefits, that otherwise might not be very apparent?

In this research we are interested in the co-benefits for adaptation and mitigation and therefore our analysis has focussed on crop choices that vary in the degree to which they provide co-benefits. As a simple example, one assumption is that crops that require forest cover or little or no clearing of trees are also good from a mitigation perspective. This means that cocoa, which requires shade to grow well, will encourage forest cover to be preserved if it is a chosen crop. However, cassava and palm oil require more sunlight and forest will have to be cleared to grow them. Therefore, these choices are indicative at a simplistic level of co-benefits for adaptation and mitigation (though they are not presented in this way in the game to informants). The ABM will provide a valuable way to test how far into the future such co-benefits are retained as a result of other factors such as market prices and future climate change (which we have information on from climate model projections). It may be that a reliance on one crop that has co-benefits in the short-term can lead to new vulnerability in the long-term if climate or market becomes unsuitable for the crop, and there is no longer as diversification in cropping patterns. Thus, the ABM will be designed to test coping and adaptation strategies, that have emerged as possible decision-making options in the KnETs game, under differing scenarios of the future.

References

Bharwani, S., Bithell, M., Downing, T.E., New, M., Washington, R and Ziervogel, G. (2005) Multi-agent modelling of climate outlooks and food security on a community garden scheme in Limpopo, South Africa. Philosophical Transactions of the Royal Society B-Biological Sciences 360(1463): 2183-2194.

Bharwani, S. (2006). "Understanding Complex Behavior and Decision Making Using Ethnographic Knowledge Elicitation Tools (KnETs)." Social Science Computer Review. 24(1): 78-105.

Devisscher, T., Bharwani, S., Tiani, A.M., Pavageau, C., Kwack, N., Taylor, R. (2013). Current vulnerability in the Tri-National de la Sangha landscape, Cameroon. Working Paper. Bogor: Center for International Forestry Research. [online] URL: http://www.cifor.org/online-library/browse/view-publication/publication/4084.html

Kemp-Benedict, E. J., S. Bharwani and M. D. Fischer (2010). Using Matching Methods to Link Social and Physical Analyses for Sustainability Planning. Ecology and Society 15 (3): 4.
[online] URL: http://www.ecologyandsociety.org/vol15/iss3/art4/

Usongo and Nzooh (2008). *Chapter 9. Sangha Tri-National (TNS) Landscape* In: de Wasseige C., Devers D., de Marcken P., Eba'a Atyi R., Nasi R. and Mayaux Ph.(Eds), State of the Forest 2008. *The Congo Basin Forest Partnership Priority Landscapes.* Luxembourg: Publications Office of the European Union, ISBN 978-92-79-13210-0, doi: 10.2788/32259