Nat. Hazards Earth Syst. Sci. Discuss., 2, C1129–C1133, 2014
www.nat-hazards-earth-syst-sci-discuss.net/2/C1129/2014/

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Forecast-based financing: an approach for catalyzing humanitarian action based on extreme weather and climate forecasts" *by* E. Coughlan de Perez et al.

Anonymous Referee #1

Received and published: 18 June 2014

General comment

The paper address the design of early warning systems and potential actions to take before the disaster based on such mechanisms. It is very well written and the link to the related literature is very clearly exposed.

1/ Specific comments

- The overall objective is to help the design of 'forecast based financing system to au-

tomatically trigger action based on climate forecasts or observations'. It seem however not so easy to calibrate the model explained, this should probably be expand or at least discussed. For instance, the cost of an action taken on the basis of a wrong forecast can decrease the confidence of (deciders as well as final users) actors/agents, which may be very delicate to estimate. The formalization of the article introduce a (probably new) framework, however it is not clear (and should give more precision if possible) what it brings to the current knowledge and to practitioners. In addition to the rather difficult calibration (particularly due to the high diversity of the contexts it may be applied: e.g. forecasts vs. observations) the probabilities are their selves very uncertain. Extreme events are characterized by specific distributions (e.g. fat tailed) that are thus difficult to parametrize, moreover the reliability of a forecasts also depends on the way it is expressed as well as the accepted confidence interval (that may be different across agents and institutions). This comment should be taken with caution since such potential difficulties in the implementation should not prevent the theoretical framework to be questioned and built, but rather taken into account for its design.

Regarding the following sentence of the conclusion: 'During non-disaster episodes, the knowledge that such a system exists with a known likelihood of providing funding before a disaster will allow all involved parties to invest in long-term disaster-resilient development.' It is not made very clear how the quantification of monetary benefits of such mechanisms will give incentives to third parties (or any other national shareholders) to invest in resilience-enhancing investments for a given level of founds allocated to such issues (nationally or internationally).

- The discount rate is not taken into account (this is maybe mentioned a bit late in the article, i.e. in eq. 6 and with not explanation or justification of such choice) while it is probably the major reason for inaction. Discounting the future is indeed a major reason for explaining inaction regarding future events at the individual and the institutional levels, however since the timing of the disasters does not count (or only counts when we consider people will avoid using a mechanism that happened after a missed crisis)

and will probably leave results largely unchanged since both costs and benefits will be discounted (but it may, and probably should, be discussed, for instance simply by adding an exponential term within the integrals of benefits, costs and losses). However since some costs may occur more often that the benefits (that will only occur when an actual disaster take place, contrarily to the cost of implementation and reputational risk) the discount factor will decrease the relative weight of benefits. The basic intuition behind this idea is the way people weight current costs (we have to implement the system now, and probably dedicate efforts and resources for its implementation) and potential benefits in the long run (the benefits of such implementation may be only seen in the long run).

Moreover, the issue of risk aversion that is not a time related issue but may play a role in apprehension of such risk since the cost benefit approach retained in this article does not consider non-linearities in the utility function, may help to apprehend poverty trap effect, probably important in the context of the developing world. This will most probably significantly affect the result by increasing the weight of benefits: avoiding heavy losses associated to low probability of occurrence in the objective function (i.e. eq. 6). Last but not least, uncertainty issues may be raised as gains are depending on the occurrence of extreme events for which probability apprehension are biased by individuals since they are associated to low probabilities and high damages.

In this regards, type I (false alarm) and type II errors (missed crisis) may have very different outcomes (depending on delta and a(p) / b(p), cf. basis risk in the literature on weather index-based insurance: e.g. Leblois and Quirion 2013). It would be interesting to develop shortly the potential effects of those both (only missed crisis are discussed and illustrated) issues that may arise with such methods (e.g. loss of public money in the first case, decrease in people confidence in the system in the second one).

- Finally the delta is often used for additional entities, it should be made clear that the so-called reputation cost may be very significant (and is not negligible) if people does not pay attention to forecasts in a period following a 'false alarm'.

Moreover a 'missed crisis' may also be damageable to such mechanisms if risk aversion is taken into account as long as the implementation cost is considered. For instance in the case of a poor country, for which the implementation of such mechanism is costly not even in forecasted disasters but also for long run investment (for instance in the forecast capacity of in rainfall station network development, investments quoted in the manuscript), then the trade-off between paying those costs (especially in a year of a missed crisis if the objective function is concave relatively to gains/losses and/or potentially triggering a poverty trap through dynamical effects). The implementation of such actions based on early warning may generally crowd-off other (public or private) resilience-enhancing investments, but also specifically let people to be less careful in case of an (always imperfect) forecast of an absence of disaster and thus increase losses.

This may take part in a broader question about the non-existence of such mechanisms (discussed in the context section, the example of Somalia speaking by itself), while the benefits exceed the costs. Question that probably deserve an explanation/mention in the context of the article (how to explain it with rational decisions and within non-discounted cost benefit ratio as decision rule).

The rather cynical example of smokers, quoted in the conclusion, also emphasize this point (that does not serve, in my opinion, the rationale behind the article's framework). The take-up of such risk reducing/coping/management mechanisms are known to be very low (in rich as well as in poor countries) and this is probably due to factors that can not be taken into account in the proposed framework: uncertainty/ambiguity aversion, confidence in supplying institutions among others.

The last comments are not accurate for costless measures such as diffusion of existing and available information (radio alerts and preparing the people to what will happen) but still remains for evacuating people or implementation of flood response drills.

- The example of Pakistan relates that rainfall was predicted 'several days in advance',

which does not seem to be a sufficient time window for evacuating (a significant share of the) 20 million people given the available resources.

When discussing existing early warning systems in developing countries FEWSNET (in Africa) could be quoted since it exists since 1984.

2/ Technical corrections

- ODI and GFDRR should be defined (at least explain what GFDRR is, which unclear to me)

- I am not sure the following sentence does make sense:

'Ultimately, such as system [...]'

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 2, 3193, 2014.