3/2015

PEGNet Policy Brief

December 2015

Changing priorities in climate change research and adaptation policy

By Lykke E. Andersen

Key Points

- At a century scale, climate variability explains more than 95% of the variation in monthly temperature anomalies while climate change explains less than 5%.
- It is therefore important to invest in early, no-regret policies to adapt to already existing climate variability.
- These investments will also help us adapt to future climate change.

Poverty Reduction, Equity and Growth Network (PEGNet)
Kiellinie 66
D-24105 Kiel,
Germany
pegnet(at)ifw-kiel.de
www.pegnet.ifw-kiel.de

This month is likely to be one of the hottest on record, with a very strong El Niño adding to more than a century of global warming. Two of the five global temperature indices already broke records in October 2015 (NASA-GISS and NCDC), and the remaining three also show a clear upward jump due to the strong El Niño this Christmas (see www.climate4you.com for up-to-date climate indicators).

These record events could help favor a positive outcome at the twenty-first session of the Conference of the Parties (COP21) in Paris this month. However, even if the COP21 turns out to be exceptionally successful in securing worldwide commitments to reduce CO_2 emissions, this would have an almost imperceptible effect on our vulnerability to climate events over the rest of this century. According to standard model simulations (using the MAGICC model), all the mitigation policies promised by the US, China, the EU and the rest of the world, implemented from the early 2000s to 2030 and sustained through the century are likely to reduce global temperature rise by about 0.17°C in 2100 (Lomborg, 2015). Add to that the fact that climate change constitutes only a small fraction of all our climate related problems (see following sections), and an even smaller fraction of all the problems and risks that we continually face (accidents, disease, wars, terrorism, unemployment, pests, earthquakes, volcanic eruptions, price fluctuations, etc.), one must conclude that climate change mitigation policies, however successful, will only solve a small part of our problems. Much more will be needed to increase resilience.

As evidenced in this policy brief, this realization is beginning to penetrate the most recent literature on adaptation policy.

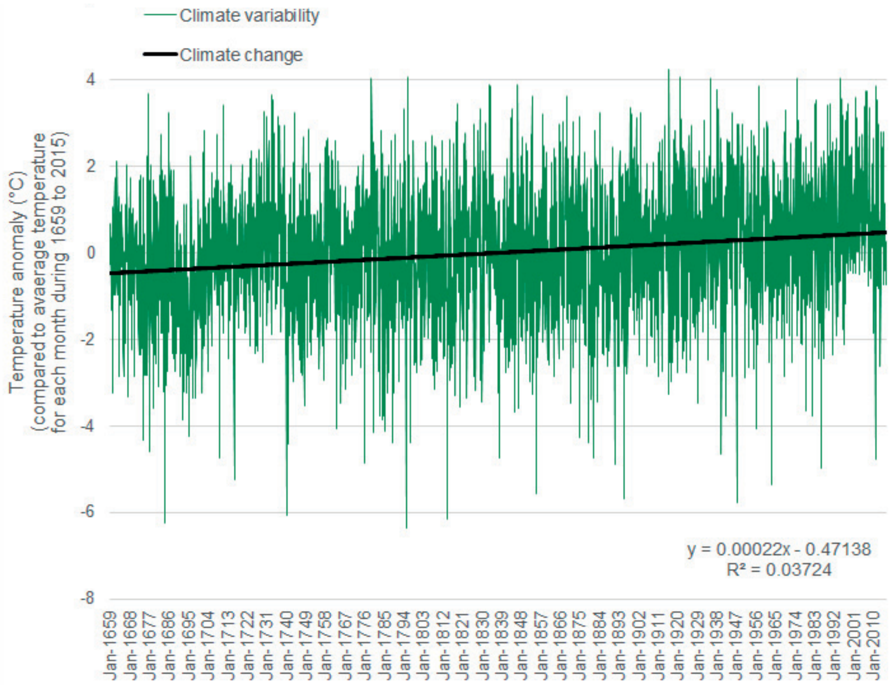
Climate change versus climate variability

Robert A. Heinlein wrote "Climate is what you expect, weather is what you get", and this difference between climate and weather is of great importance when analyzing vulnerability and resilience. Weather, by definition, is a lot more volatile than climate, since climate is defined as the average weather over several decades, and thus excludes natural year-to-year or month-to-month variability.

The difference between climate change and climate variability can be illustrated by plotting any climate related variable over time, and comparing the measured values with the trend line. For example, **Figure 1** plots the monthly temperature anomaly in Central England during the last 357 years (the longest temperature series that exists in the world). There is a significant upward trend, which reflects climate change, but there is also substantial variation around that trend.

The trend line indicates climate change in the order of +0.00022°C per month (corresponding to 0.26°C per century). In this series, about 3.7% of the variation in temperatures over the last 357 years is explained by climate change, while the remaining 96.3% is explained by climate variability (see the R^2 of the trend line in the graph). This simple fact highlights the utmost importance of addressing not only climate change, but also current climate variability. Even if we managed to stop climate change (that is, keep the trend line horizontal), we would only solve about 4% of our climate problems. The remaining 96% can only be dealt with through adaptation measures that make us more resilient to climate variability.

Figure 1: Monthly temperature anomalies in Central England, January 1659 – September 2015 (compared to average temperature for each month during the whole period



Sources: Authors' elaboration based on data from the **MetOffice**

Most damaging extreme climate events

While extreme climate events have already resulted in severe damages, global climate models indicate that at least some of these events are expected to increase in the future due to climate change. Extreme climate events can be classified into five main categories:

- Extreme heat
- Extreme cold
- Extreme rainfall
- Extreme lack of rain
- Extreme winds

While the relative importance of these categories differs from place to place, extreme winds appear to be the leading cause of deaths and damage to physical infrastructure globally. **Table 1** shows that between 1980 and 2014, tropical cyclones were responsible for about half of the value of climate related losses caused by damage to private and public physical assets in the United States. This was followed in importance by droughts and severe storms (NCDC, 2015).

Tropical cyclones also cause the most human fatalities, with the five most lethal ones in recorded history being: 1) Bangladesh, 1970, 500 thousand deaths; 2) Bangladesh and India, 1737, 300 thousand deaths; 3) Vietnam, 1881, 300 thousand deaths; 4) India, 1839, 300 thousand deaths; and 5) Bangladesh, 1584, 200 thousand deaths (see http://www.wunderground.com/hurricane/deadlyworld.asp?MR=1).

On the one hand, the vulnerability of countries depends on the type and frequency of extreme weather events which they are exposed to. But, on the other hand, and even more so, it also depends on local capacities to deal with such events (i.e. early warning, disaster response capacities). For example, while Bangladesh is hit by only about 1 percent of the world's total tropical storms, this very vulnerable, low-lying country has experienced more than half of all deaths from tropical cyclones in recorded history (Ali, 1999).

In terms of cyclones, the most fatal decade was 1970-1979, when Bangladesh was first hit by a Category-3 cyclone that killed close to 500 thousand people in November of 1970. Five years later, China was hit by the typhoon Nina, which caused the Benquiao Dam to collapse, triggering a cascade of dam failures downstream and a total death toll of about 200 thousand.

With more and more people living in coastal areas exposed to tropical cyclones, both economic and human losses are likely to keep increasing, unless we vastly improve the quality of construction, and the systems of early warning and disaster response. The experience from Bangladesh indicates that general economic progress, combined with effective warning systems and well-planned disaster responses can dramatically reduce the loss of life (see **Box 1**). Such efforts to reduce current vulnerabilities, especially in countries and regions that are most likely to be affected, would constitute early-action, low-regret adaption investments, and they should be a priority in the climate negotiations.

It is worth keeping some perspective on these deaths, though. Even the most lethal climate events, during the most fatal decade in recorded history, killed less than a million people. For comparison, coronary heart disease and strokes, mainly caused by poor diets, lack of exercise, being overweight, high alcohol intake and smoking, killed around 130 million people over the last decade. Diarrhea, an easily curable disease, killed about 15 million children over the last decade; and road accidents took another 13 million lives (WHO, 2014).

The number of deaths by extreme climate events is thus significantly smaller than the number of deaths due to easily preventable diseases, such as diarrhea, in developing countries, and due to unhealthy life-style choices in rich countries.

New trends in climate research and adaptation policies

Every person on Earth is vulnerable to adverse events of many different kinds. The simple statistics presented in this policy brief suggests that climate change, or even extreme climate events, currently is a relatively minor threat. It would therefore be wise to identify and implement policies that reduce current, immediate, well-known vulnerabilities and inequities, especially because these same policies would likely reduce the risk of future adverse impacts from climate change as well.

Table 1: Accumulated losses during 1980-2014 for all billion-dollar events in the US (adjusted for inflation)

Disaster type	Inflation-adjusted losses (billions of USD)	Percent of total losses
Tropical cyclone	539	50.1%
Drought	206	19.0%
Severe storm	155	14.5%
Flooding	88	8.2%
Winter storm	37	3.4%
Wildfire	26	2.4%
Freeze	25	2.4%
Total	**1076**	**100.0%**

Sources: Author's elaboration based on data from **the National Oceanic and Atmospheric Administration**

For example, investing in relatively cheap measures to prevent the debilitating impacts of malaria, diarrhea and intestinal worms in the poorest countries would not only immediately improve the quality of life for some of the most disadvantaged population groups in the world, but it would make the same people better able to handle adverse shocks in the future, as they would be healthier, better educated and wealthier due to these interventions.

These more rational priorities are beginning to emerge in the climate change literature. A recent survey by Watkiss (2015) identifies a number of important changes in the framing of adaptation studies, which are consistent with the more practical, early implementation, low-regret recommendations demanded by policy makers.

First, there has been a shift away from science-first, impact-assessment driven methods based on highly uncertain future climate scenarios towards more practical approaches focusing on adaptation assessments (Watkiss, 2015). Second, there is a greater emphasis on integrating (mainstreaming) adaptation into current policy and development, rather than implementing it as a stand-alone activity (Watkiss, 2015). Third, there has been a shift to differentiate the phasing and timing of adaptation, with an increasing recognition of uncertainty. This new approach takes current climate variability as a starting point, considering early low-regret options first and then longer-term adaptation interventions using decision making under uncertainty and iterative adaptive management (Watkiss, 2015).

Early, no- or low-regret adaption options

No- and low-regret actions constitute good starting points for early adaptation, as they address immediate vulnerabilities and inequities while at the same time laying the foundations for future resilience. Some of these no-regret actions address existing risks from extreme climate events while others are simply sound development policies. DFID (2014) reviews a large number of early adaptation options with high benefit-cost ratios.

However, the fact that all these no-regret actions have not already been implemented, indicates that important capacity constraints or transaction costs may exist, especially in developing countries. Part of early adaption efforts therefore needs to include capacity building, including institutional strengthening, awareness-raising, access to timely information, effective communication systems, and probably also some tools to help decide between hundreds, if not thousands, of different possible interventions.

Mainstreaming adaptation into development

There is a strong overlap between many adaption activities and existing development priorities. For example, irrigation systems help adapt to increasingly unpredictable precipitation, but it is an old technology that has been used for millennia to deal with insufficient or irregular rainfall.

This overlap sometimes raises the question of additionality, as poor countries have been promised additional funds for adaptation, in addition to the aid they already receive for development. However, both objectives can be achieved more efficiently if adaptation gets integrated (mainstreamed) into existing development priorities and activities (DFID, 2014). Andersen (2014) argues that we should be looking for synergies instead of additionality, and design interventions that serve multiple purposes (development, adaptation and mitigation).

For example, large tree planting programs in cities could help the population adapt to a warmer climate because the trees will provide refreshing shade in the future. At the same

Box 1: Disaster preparation efforts pay off in Bangladesh

In 1970, the world's most devastating cyclone to date, although at Category-3 not at all the strongest, claimed approximately 500,000 lives in Bangladesh. In 1991 a Category-4 cyclone hit Bangladesh again and claimed around 140,000 lives. Since 1991, the government, with the help of foreign technical and financial support, has established early warning systems, shelters along coastal areas, search and rescue teams and first-aid training and equipment.

Bangladesh now has the capacity to evacuate hundreds of thousands of people from the path of floods and cyclones. When Sidr, a very strong, Category-4 cyclone struck Bangladesh in November 2007, the devastation it wreaked was widespread but while Sidr was of similar strength as the cyclone of 1991, its death toll, 3,000 lives, was much lower.

WHO & WMO (2012)

time, trees absorb CO_2 while growing, thus contributing to mitigation, and they also tend to increase property values, make people healthier and happier, and reduce air pollution (Andersen, 2014).

Long-term planning

Although early low-regret actions are a priority, we also need to think ahead. Many of the development decisions we make now will have implications for decades to come. Urban planning, building codes, zoning regulations, public transportation systems, and energy investments all strongly influence not only the future energy needs of the population, but also their health. Compact, but green, cities where people can get around on foot, bikes or public transportation are more environmentally friendly than sprawling urban areas requiring private cars and hours of daily commute. But additionally, they are also much healthier for the citizens, and smart investments could thus potentially contribute to reducing the two biggest causes of death in the world (coronary heart disease and strokes).

When making cost-benefit analyses of long-lived infrastructure, it is important to take into account these kinds of co-benefits. All too often, investment decisions are compartmentalized, and cost-benefit analyses often apply very high discount rates (in Bolivia, for example, the law mandates a 12.67% discount rate), which makes rational, climate-smart long-term planning almost impossible. Political costs can also be almost prohibitive, even for policies, such as reducing barriers to migration, which would create tremendous net benefits even in the absence of climate change (Clemens, 2011; World Bank, 2016), and could potentially be part of an effective strategy to adapt to both current climate variability and future climate change.

In sum, flexible and iterative adaptation is needed. While we should start picking the low hanging fruits in the form of early, no-regret initiatives that address current vulnerabilities and inequities, we also need to think ahead, be creative, and initiate major, positive social transformations.

Author

Institute for Advanced Development Studies (INESAD):
Lykke E. Andersen
landersen(at)inesad.edu.bo

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