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POLICY BRIEF

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How does a person's attitude to risk affect the way they adapt to floods – an experimental study from Cape Town, South Africa

Abstract

In Cape Town, in South Africa, many poor communities are badly affected by flooding - which damages property and roads and has a negative effect on people's health. The problem is expected to get worse as the impact of climate change increases. In light of this, it is important that policy makers know as much as possible about the factors that influence people's decisions to act to protect themselves from flooding.

To help provide this much-needed information, this CEEPA study looks at the links between attitudes to risk and the actions people take to adapt to the floods that affect Cape Town's informal settlements. The results show that people who are happier to take risks take less effective steps to protect themselves from floods. This shows that local authorities must take people's attitudes to risk into account when deciding how to help communities deal with flooding.

Cape Town's informal settlements are at risk from flooding.

A summary of CEEPA Discussion Paper No. 17: Risk Attitudes and Adaptation: Experimental Evidence from a Flood-Prone Urban Informal Settlement in South Africa by Kerri Brick and Martine Visser from the School of Economics, University of Cape Town, South Africa.

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Report Summary

Many of Cape Town's informal settlements are situated on the flood-prone Cape Flats. This is a low-lying area that has a high water table and an infrastructure that often gets blocked by rubbish. As a result, the residents of these marginalized communities are extremely vulnerable to flooding. Major flood events have taken place in July 2001, August 2004, July 2007, July 2008 and July 2009, with many thousands of households displaced during each of these floods.

Such flooding does not affect one or two people, but rather, entire communities. A 2005 survey of three informal settlements in the Cape Flats revealed that 83% of residents had been affected by flooding. In all, 20 informal settlements have been identified that are at a high risk of being affected by winter flooding. An additional 14 settlements face such a high risk of flooding that they need to be relocated. However, in reality, relocating these communities would be very difficult and costly and is unlikely to happen in the short term.

However there are a number of adaptation strategies that the residents of these informal communities can adopt to reduce the negative impact of flooding. Such strategies include: ensuring that their floors are elevated above ground level on pallets, stilts or sandbags, performing general maintenance on their roofs before the start of the rainy season, ensuring that their roofs are slanted to assist with rainwater runoff, securing plastic sheeting to their roofs prior to the advent of the rainy season and making sure that the trenches/channels around their homes are not blocked with refuse.

> **"City officials should incentivize risk-seeking individuals to engage with flood adaptation."**

How do attitudes to risk affect the way people adapt to flooding?

Because these strategies can go some way to reduce the negative impacts of flooding, it is clear that the way in which a householder chooses to act is a key determinant of how badly his or her household will be affected by flooding. To shed light on this decision making process, this study set out to see whether attitudes to risk affected how householders acted to protect themselves from flooding.

Over 170 individuals were recruited for the study from the BM section in Khayelitsha. This is a particularly flood-prone urban informal settlement situated on the Cape Flats. Since the households who participated in the study live in the same geographical area and are largely exposed to the same level of flood risk, it was possible to examine whether the choices they made about flood adaptation were related to their attitudes to risk.

Gauging people's attitudes to risk

To gauge their attitudes to risk, each of the participants in the study was presented with a number of choices between two lottery options (Lottery 1 or Lottery 2). For each pair of choices the participant had to choose between Lottery 1 and Lottery 2. Participants were given one of three frames: in the gain frame, they could win between R0 and R150; in the loss frame, they could lose between R-150 and R0; in the mixed frame, participants could either earn or lose money. The probability of winning (or losing) a particular sum, depended on which lottery option the participant chose. For example, in one choice set, if a participant chose Lottery 1, she or he had a 13% chance of earning nothing, a 25% chance of earning R100 and a 62% chance of earning R150. Conversely, if she or he chose Lottery 2, that participant was guaranteed R100.

Depending on the choice sets they were offered, participants were provided with a particular endowment of money to play the game, so that the net prizes were equalized across the different framings (gain, loss and mixed). In addition to the endowment, all participants received a participation fee. Subjects were paid their total earnings at the end of the day.

Participants' performance in this 'lottery experiment' provided an indication of their attitudes towards risk – someone who was risk averse would tend to choose the safer option, while someone who was not averse to risk would tend to try and win the larger prizes (despite the fact that this would open them up to the risk of winning no money or losing money). The experiment was designed so that a person's level of risk aversion could be calculated.

People's experience of flooding

Participants also completed a survey. This survey captured information on the participants' demographic characteristics. It also included a number of questions about the participants' experience of flooding and the flood adaptation strategies that they put in place. The survey also captured information about what happened in the aftermath of a flood.

Approximately 80% of the sample reported that they experienced flooding on an annual basis. Around 36% of subjects described their experiences of flooding as "water coming up through the ground", just over 49% described it as "water coming in through the roof", and almost 15% describe it as both. Less than 10% of the sample reported that they had never experienced flooding.

Approximately 10% of the sample has done nothing to mitigate the risk of damage from flooding (half of this 10% had never experienced flooding). Around 37% of participants said that they had raised their homes above ground level with the use of pallets (16%), stilts (7%) and sandbags (18%). Around 45% of the subjects had put plastic sheeting on their roofs, and 14% had put this sheeting on their floors. Less than 9% of the sample had raised one side of their roof to help rainwater to run off.

Flood adaptation strategies

	All $n = 174$
Annual flooding (%)	0.80
Flood risk mitigation strategies (%)	
Do nothing	0.10
Use pallets to raise home above ground	0.16
Use stilts to raise home above ground	0.07
Use bags of sand to raise home above ground	0.18
Put plastic sheeting on the roof	0.45
Put plastic sheeting on the floor	0.14
Raise one side of the roof	0.09

The impact of flooding

Around 33% of the sample reported that flooding had damaged the structure of their homes, while 48% reported that flooding had damaged their possessions. Approximately 24% of those sampled indicated that their floor had been either wet or underwater following flooding. Over 30% indicated that the roads around their homes had become wet and muddy, and that this had made it difficult for people to access the area. Almost 30% reported difficulties in reaching communal toilets. Just over 43% report that people (especially children) had become sick from the pools of stagnant water that had been produced by flooding. Finally, 26% reported that flooding had caused electricity outages.

When asked if they had elected to stay in an emergency shelter (for example, a community hall) after a flood event, around 35% indicated that they have moved to an emergency shelter in the wake of a flood, while 52% said that they had preferred to remain in their homes for fear that their belongings would be stolen if they left.

Who adapts to flooding most effectively?

The adaptation strategies that people described were classified from the least effective (doing nothing or relying solely on plastic sheeting) to the most effective (raising a home above ground or slanting a roof).

When people's responses to flooding were compared to their attitude to risk (as revealed by the lottery experiment), it was clear that there was a significant correlation between people's level of risk aversion and the adaptation strategies they chose. Specifically, the results indicate that individuals that elected to do nothing, relied solely on plastic sheeting to protect their roofs or floors, or who raised their homes above the ground, are less risk averse than individuals who slanted their roofs to facilitate rainwater runoff.

In other words, with respect to flood adaptation strategies, the results suggest that individuals opting for less effective strategies are more risk seeking. Specifically, for those individuals who opted to do nothing (relative to those individuals who slanted their roofs), RRA decreased by 0.542. In addition, RRA decreased by 0.619 for those individuals who relied solely on plastic sheeting. Finally, for those individuals who raised their homes above ground, RRA decreased by 0.535.

The need to take risk into account

These results imply that attempts by local authorities to encourage the uptake of flood adaptation strategies must take into account people's attitudes to risks (as opposed to assuming risk neutrality on the part of the decision maker). More specifically, the study recommends that, given the level of variation in individual adaptation efforts, city officials should supplement ongoing education initiatives with proactive measures to incentivize risk-seeking individuals to engage with flood adaptation. This could be done by, for example, providing a subsidy on building materials.

More generally, while risk preferences are often considered within very specific contexts - for example in applications to addiction - the results of this study indicate that attitudes toward risk impact on individual decision-making (and therefore welfare outcomes) within the wider framework of a person's daily life. This has significant implications for policy makers of all types.

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