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THE IMPACTS OF FLOODING ON WELL-BEING AND THE ROLE OF ECOSYSTEM-BASED ADAPTATION

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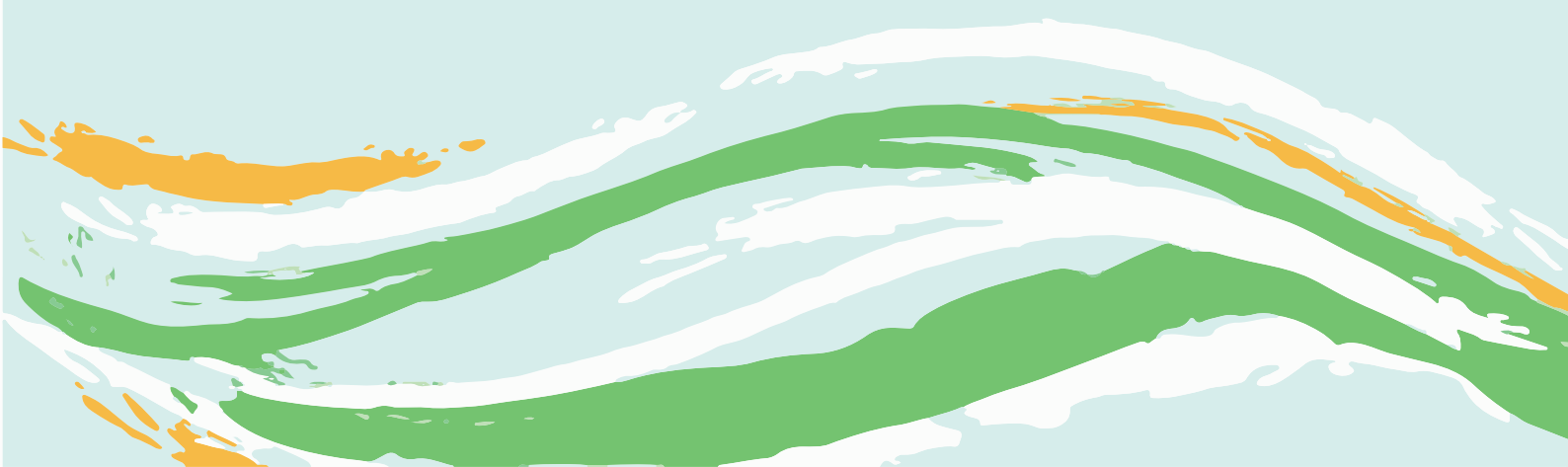
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The problem of flooding

Floods are one of the most devastating disasters, especially in Asia⁽¹⁾. Moreover, it is often the case that poorest in society are the most vulnerable, as they live in the most threatened locations and struggle to cope with the impacts due to income, political, and social constraints. This can be compounded by the observation that developing countries are particularly threatened by flooding because of their limited capacity to prevent and absorb disaster impacts. Moreover, the future threat from flooding is likely to increase due to the effects of climate change changing flood patterns and rapid urbanization placing more people in harm's way^(2,3).

Women present one of the groups in society that are particularly vulnerable to the impacts of flooding, because they commonly experience disadvantages in social, cultural, economic and political domains as well as legal status and opportunities⁽⁴⁾. These socio-cultural circumstances can even lead to higher mortality rates among women during floods, and higher poverty rates due to more unemployment and the lack of basic rights. Moreover, women face more psychological stress during and after a disaster due to the women's caretaker role as part of the family⁽⁵⁾. This difference between women and men in terms of disaster impacts is especially important when it comes to building more resilient communities and it has been recognized as a fundamental part of the United Nation's Sustainable Development Goals (SDGs) 5 (Gender equality), 10 (Reduced inequalities) and 13 (Climate Action).

Currently, the main focus of flood management in many regions within Asia is on structural measures, such as dikes or reservoirs. However, these measures are often associated with negative impacts on the environment, on which the especially poor and vulnerable communities depend. A wider and more inclusive method of limiting flood impacts is required, particularly in order to meet the Sustainable Development Goals. Ecosystem-based Adaptation (EbA, see Box 1) can prove to be an inclusive complementary measure to the structural measures. EbA strategies are more inclusive to vulnerable groups, whose livelihoods directly depend on natural resources, and make it a promising means to strengthen their position by offering multiple benefits (see [here](#)). These multiple benefits provided by EbA measures are how EbA contributes towards meeting the Sustainable Development Goals by increasing resilience (Box 2).

Box 1

Ecosystem-based adaptation

(EbA) can be a cost alternative approach compared to structural measures to increase flood resilience of vulnerable communities. According to the Convention on Biological Diversity, EbA "uses biodiversity and ecosystem services in an overall adaptation strategy. It includes the sustainable management and restoration of ecosystems to provide services that help people adapt to the adverse effects of natural disasters and climate change." In the ResilNam project, we focus on two community level EbA measures:

- Restoring, maintaining, and extending mangrove forests in coastal communities of Thua Thien Hue
- Restoring and maintaining urban ponds and canals in Hue City of Thua Thien Hue

Box 2

Resilience has become an important guiding principle in disaster risk management and climate change adaptation. This is because disaster resilience is proactive and forward looking in managing disaster risk. While no commonly accepted definition exists, flood resilience commonly builds on three pillars: resistance, recovery and anticipatory learning. Resistance is the ability of an individual to absorb the shock caused by a disaster. Recovery relates to the time that an individual needs to return to their state from before the flood (both physically and mentally). Anticipatory learning refers to an individual's ability to learn about and from (changing) flood events, so that they are better prepared than they were before the flood.

The neglected impacts of flooding

Floods impact societies in various ways, ranging from the loss of life, injuries and mental health effects, to the destruction of assets (see Box 3). However, despite the growing numbers of people affected by flooding, there is little acknowledgement of the whole range of impacts that can occur (see Box 3). There has been an overwhelming focus on assessing the physical or tangible impacts of flooding⁽⁶⁾. Much less is known about the intangible or well-being impacts of flooding, even though these can be substantial. Since a speedy recovery is a key aspect of resilience, we seek to address that concern through the ResilNam project. Better insights and management of this aspect are especially important for areas in which floods occur frequently. An incomplete recovery could result in a vicious cycle of well-being losses unless those affected receive external help to recover.

Approach

In order to study these well-being impacts to gain a better understanding of the total impact of flooding on those affected, we use survey data from flood-prone households in Thua Thien Hue, Vietnam. Thua Thien Hue is a coastal province located in central Vietnam (see Figure 1), where ~1.3 million people live (~25% live in Hue city). Hue city was the national capital and seat of Nguyen Dynasty emperors until 1945 and is a UNESCO world heritage site. An important feature of the province is the Huong River that flows through Hue city into the Tam Giang Lagoon and then into the Pacific. The Huong River and the lagoon provide water for the provincial capital of Hue and are the lifelines for many poor and vulnerable people, who directly depend on their natural resources. The province has been repeatedly affected by severe floods in the past decades, as floods occur from rivers, heavy rainfall, and the sea⁽⁷⁾. The last flood was in early November 2017. Across the province over 160,000 households were affected⁽⁸⁾. Typhoon Damray is estimated to have caused ~110 deaths and a monetary loss of ~US\$650 million across Vietnam and the Philippines⁽⁹⁾.

Box 3

The non-physical impacts of flooding are many fold. Listed below are some examples of such impacts (that are often neglected in the planning process):

- Physical health problems occurring due to the flood (e.g., injuries or illnesses due to contaminated water);
- Long lasting psychological impacts that can last for years. For example, anxiety and depression are the most common mental disorders that are reported after flooding. Moreover, floods could worsen pre-existing mental health conditions due to the abrupt increase in stress;
- Floods have adverse impacts on the well-being of the affected population in a more general sense, such as their overall happiness;
- Floods can also have impacts on the social environment as perceptions of their environment and home change, or the impairment (or destruction) of social cohesion or relationships.

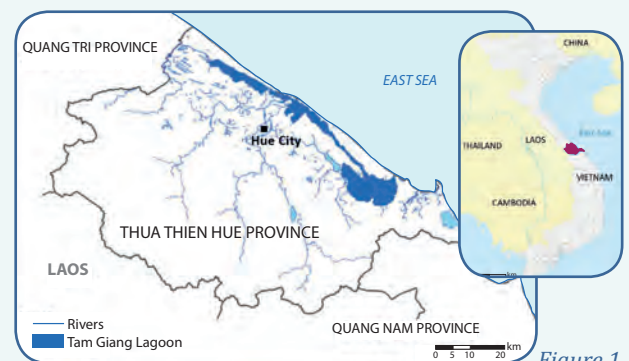


Figure 1



Photo: CSRD

The impacts of floods on well-being are substantial but can be mitigated by EbA

From our survey data we produce the results presented in Table 1, which shows the monetary equivalent of subjective well-being (SWB) losses due to flooding. This monetary estimate is derived from finding the amount of monetary compensation that is needed to off-set the well-being loss from flooding. We present these values in monetary terms (% of annual income) at the household level to show how large these subjective or non-physical impacts are, and that they should not be excluded from flood risk management decision making. This is important as we know that often the intangible impacts of flooding can be larger than the tangible impacts^(1,6). Table 1 shows that the initial drop in SWB immediately after a flood event is equivalent to up to ~300% of annual income in immediate compensation. This shows that the welfare impact of floods is substantial. While a recovery of SWB occurs over time, we find that even 5 years after a flood, the welfare impact still equals a loss that is the equivalent of 40% to 86% of annual income in long-run compensation. The overall welfare losses are substantially larger for women after this period of time (by about 20 to 29 percentage points), indicating a gender-gap in recovery. Moreover, we can see a large potentially long-lasting increase in welfare if EbA measures are employed and maintained over the long-term. This increase can equal up to 152% of annual income and is larger for women, whose livelihood is often more directly linked to local ecosystems.

Implications

Through our results we show that these intangible impacts are important and can be long-lasting, much like with regards to people's recovery after a flood. Therefore, intangible impacts need to be integrated into our understanding of how risk is managed both in order to develop better management strategies, but also to make risk management more inclusive and to avoid the vicious cycle that may occur after experiencing floods. Moreover, in the aftermath of flood events, the existing risk management approaches are usually revisited, so that previously unknown problems can be solved. However, a result of this process is that often structural flood protection measures are repaired, improved, or extended with new measures. These projects can lead to social conflicts due to their unequal benefits and negative impacts across different groups in society. The consequences of which can be long-lasting and far-reaching, which is why EbA measures should be more prominently employed as a complimentary risk management strategy.



Photo: René Arnold

Table 1: The monetary values of well-being losses as a percentage of annual income (negative values represent a loss, positive values indicate an improvement)

Variable	Sample	Monetary equivalent (in % of annual income)	
		Lower limit	Upper limit
Initial welfare loss from experiencing a flood	Everyone	-193%	-276%
	Only men	-193%	-276%
	Only women	-207%	-295%
Long term welfare loss from a flood at least 5 years ago	Everyone	-43%	-62%
	Only men	-40%	-57%
	Only women	-60%	-86%
Importance and quality of the local mangroves/ponds (our examples of EbA measures)	Everyone	103%	148%
	Only men	93%	133%
	Only women	107%	152%



Photo: Sabina Wolf

The ResilNam project

In addition to this policy brief, the ResilNam project will also make recommendations regarding:

- The benefits of ecosystem-based adaptation measures for strengthening the flood resilience of poor and vulnerable;
- How local communities value ecosystem-based adaptation measures and their benefits;
- The potential of micro-credit to build resilience in flood-prone communities;
- Gender dynamics in disaster risk management;
- Community level adaptation projects.

The policy recommendations across all of the ResilNam activities can help to increase flood resilience of urban and coastal communities in Thua Thien Hue Province. Additionally, the ResilNam Project directly invests in ecosystem-based adaptation measures in collaboration with local stakeholders to increase flood resilience and strengthen the role of women in disaster risk management. For instance, joint activities between the Women's Union and the Disaster Management Centre are facilitated.



Photo: Philip Bubeck



More policy briefs and information on the project can be accessed at the [weADAPT platform](#).

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References

1. Bubeck P, Otto A, Weichselgartner J. Societal impacts of flood hazards. In: Oxford Research Encyclopedia on Natural Hazards Science. 2017.
2. IPCC. Climate change 2014: Synthesis report. Contribution of working groups I, II and III to the fifth assessment report of the Intergovernmental Panel on Climate Change. Geneva, Switzerland. 2014.
3. MONRE. Climate change and sea level rise scenarios for Vietnam. Natural Resources – Environment and Mapping Publishing house. Ha Noi, Vietnam. 2011.
4. CSR. Gender needs and roles in building climate resilience in the city of Hue, Vietnam London, UK: IIED. 2015.
5. Bubeck P, Hudson P, Pham M et al. A review of the gender-gap in flood resilience and empirical evidence from flood-prone vietnam. ResilNam Working Paper. 2018.
6. Hudson P, Botzen WJW, Poussin JK et al. Impacts of flooding and flood preparedness on subjective well-being: A monetisation of the tangible and intangible impacts. Journal of Happiness Studies, DOI: 10.1007/s10902-017-9916-4. 2017.
7. Bubeck P, Botzen WJW, Suu LTT et al. Do flood risk perceptions provide useful insights for flood risk management? Findings from central Vietnam. Journal of Flood Risk Management; 5 (4):295-302. 2012.
8. UN Vietnam: Typhoon Damrey & flooding in the central and highland regions of Vietnam situation update No.2. Ha Noi, Vietnam. 2017.
9. Munich Re. Natural catastrophes 2017 - Analyses, assessments, positions. Munich, Germany. 2017.