A methodology to estimate the average annual cost of internal displacement

Cross-border climate change impacts and systemic risks in Europe and beyond
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Introduction

- Between 2008 and 2028, over 32M internal displacements triggered by disasters have been registered by IDMC
- Over 29M have been triggered either by floods or storms
- For internal displacement risk to be managed, it first needs to be measured and a prospective approach is needed
- We propose a methodology to estimate, in a prospective manner, the average annual cost of internal displacement with a scalable and peril-agnostic approach
- Two main components: a) estimation of average annual IDPs, and b) estimation of the average annual displacement duration
Previous studies

- IDMC first developed a global internal displacement risk model, considering multiple hazards.

\[
\text{Displacement risk} = \text{Hazard} \times \text{Exposure} \times \text{Vulnerability}
\]

- Those results provide an estimate of the average annual number of IDPs per hazard, but it is only a part of the picture.

- For historical events in Mexico and the Caribbean (EQ and TC), the estimates of the internal displacement costs have been made.
Available (and missing) data

- IDMC first developed a global internal displacement risk model, considering multiple hazards and over 200 countries
- Those results provide an estimate of the average annual number of IDPs per hazard, but it is only a part of the picture
- Historical data on IDPs were systematically recorded since 2008. However, human mobility patterns and the duration of the displacement are rarely captured in the databases
- IDMC has carried out extensive research to estimate the average annual cost of attending an IDP. For disaster-triggered events, that value has been set in $290
- Ongoing research to establish relationships between physical damage levels and recovery/reconstruction times
Proposed methodology

Assumptions and limitations:

• Only sudden-onset events are to be modelled
• All displacements are assumed to be internal
• IDPs will all return home once the recovery/reconstruction activities are finished
• The model cannot describe where IDPs will go to
• Evacuation measures are not included (of relevance for some hazards, such as TC)
• Protracted displacement (i.e., 5+ years) is not accounted for
Proposed methodology

Step 1: estimate the average annual IDPs (by hazard)

• Risk as a function of hazard (synthetic catalog of events), exposure (for residential buildings and population), and physical vulnerability (relationship between the hazard intensity measures and the expected losses)

• The methodology allows for a probabilistic representation of all components, analogous to what is used in the catastrophe risk modelling field

• For each event, the expected damage level and IDP are calculated.

• The average annual values are the sum of the product of these expected values times the occurrence frequency of each simulated event
Proposed methodology

Step 2: estimate the average displacement duration, using the damages on the residential buildings as a proxy.
Proposed methodology

Step 3: multiply the average annual IDPs by the annual cost.

Additional remarks:

• The proposed methodology is fully scalable and peril-agnostic

• Average Annual Displacements are a quantity that can be arithmetically added, facilitating the comparison and integration of the results into a MH context

• The effects of CC can be included in the analysis (e.g., baseline vs. future scenario comparisons) through simulations or counterfactual analyses
Application for TC Idai (2019)

- Massive damage to housing and infrastructure as well as 478,000 IDPs (IDMC)
- Modelled flood depths by PIK
Application for TC Idai (2019)

- Physical damage estimates for different building typologies
- Weighted average displacement duration based on the characteristics of the buildings
- The coastal global exposure database (UNDRR) and its attributes, with a 1x1km resolution level, were used for this case-study

<table>
<thead>
<tr>
<th>Type</th>
<th>Share</th>
<th>Recovery time (yrs)</th>
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</thead>
<tbody>
<tr>
<td>1 story</td>
<td>40%</td>
<td>2</td>
</tr>
<tr>
<td>2 stories</td>
<td>45%</td>
<td>0.33</td>
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<tr>
<td>3-4 stories</td>
<td>10%</td>
<td>2</td>
</tr>
<tr>
<td>5+ stories</td>
<td>5%</td>
<td>2</td>
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</tbody>
</table>
Application for TC Idai (2019)

- For TC Idai, the internal displacement cost, with an average 1.9yr duration, was established in $265M
- These values are to be added to those related to direct losses and emergency costs
- Estimates for future climate scenarios were carried out for year 2050

<table>
<thead>
<tr>
<th>Year 2050</th>
<th>IDPs lower estimate</th>
<th>IDPs high estimate</th>
<th>Displacement cost lower estimate (USD M)</th>
<th>Displacement cost high estimate (USD M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSP</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1</td>
<td>478,000</td>
<td>489,950</td>
<td>$</td>
<td>265</td>
</tr>
<tr>
<td>5</td>
<td>478,000</td>
<td>573,600</td>
<td>$</td>
<td>265</td>
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</table>
Possible uses of the method and results

• Quantify the different facets of internal displacement risk and enhance its prospective management, reducing its burden on individuals and communities
• Prepare for disaster-triggered internal displacement (i.e., prevent future displacement)
• Respond to disaster-triggered internal displacement, in combination with forecast-based initiatives (i.e. support life-saving activities, including evacuations)