internal displacement monitoring centre

THEMATIC SERIES

The ripple effect: economic impacts of internal displacement

This thematic series focuses on measuring the effects of internal displacement on the economic potential of IDPs, host communities and societies as a whole

LOST PRODUCTIVITY DUE TO INTERNAL DISPLACEMENT

The 2015 earthquake in Nepal

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INTRODUCTION

The April 2015 earthquake that struck the Nepalese region of Gorkha killed nearly 9,000 people, injured more than 16,000 and destroyed hundreds of thousands of homes across the country. In addition to the human suffering it caused, the magnitude 7.8 quake had an immediate economic impact estimated at as much as half of Nepal's $20 billion GDP.[1] The ensuing internal displacement had further consequences for the economy that until now have not been quantified.

IDMC launched a research project in 2017 to assess the economic impact of internal displacement in terms of livelihoods, housing and infrastructure, health, education, social networks, security and the environment.[2] As part of our research, we developed a new methodology to estimate lost productivity, which we have applied here to the Gorkha earthquake.

ESTIMATING THE IMPACT OF INTERNAL DISPLACEMENT ON PRODUCTIVITY

Estimates of the economic impact of internal displacement are rare and tend to focus on the cost of providing emergency assistance and temporary shelter for internally displaced people (IDPs). This, however, is only the tip of the iceberg, and overlooks longer-term effects on the wider economy, including lost productivity.

Displacement disconnects people from their work for days, weeks and sometimes months or even years. Following the Gorkha earthquake, the UN warned that agricultural productivity would be significantly reduced,[3] potentially leading to food insecurity, unemployment and reduced incomes.

One approach to estimate this lost productivity is to postulate that displaced workers are unable to pursue their main economic activity for the duration of their displacement. Housing destruction levels can be used to assess the duration of displacement, which is otherwise rarely reported. Lost productivity can then be calculated by combining the number of displaced workers, the duration of their displacement and an indicator such as GDP per capita. Severely damaged homes will take longer to be repaired or rebuilt, consigning their inhabitants to longer periods of displacement.

THE DISABILITY-ADJUSTED LIFE YEAR APPROACH

This methodology builds on the disability-adjusted life year (DALY) approach used in public health to quantify the number of years lost because of diseases, disability or early death.[4] One DALY corresponds to a lost year of healthy life, calculated as of the number of years lived with disability added to the number of years of life lost because of premature mortality.[5] Such estimates tend to rely on historical data.

The DALY approach has been used to estimate the non-monetary impact of disasters in terms of life years lost because of an event,[6] and to assess subsequent lost economic production.[7] Until now, however, it had not been used to estimate the economic impacts of internal displacement.

DATA REQUIREMENTS

In order to apply this methodology to a real displacement situation, data is needed to estimate hazard, exposure and vulnerability characteristics.

Hazard data must be given in terms of an intensity measure that correlates well with the expected damage to residential buildings, such as ground motion for earthquakes, water depth for floods or gust speed for cyclonic winds. Such measures should ideally be accompanied by a dispersion measure to account for uncertainties.

Exposure databases are needed to identify the buildings subjected to damage and characterise them by construction materials, structural system, number of storeys, main use and number of inhabitants.

Vulnerability functions associate hazard intensities with expected damage and losses for each of the building classes in the exposure database. To assess internal displacement, they are based on thresholds which assume that once a certain hazard intensity has been reached, the buildings become inhabitable and all of their occupants become displaced.

Figure 1 below shows an example of such a function for earthquakes, in which damage becomes such that all homes are made uninhabitable when peak ground acceleration in the affected area is around 0.2g.

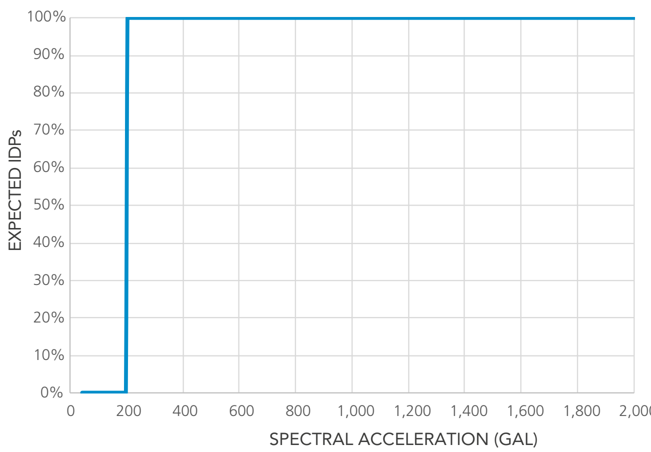

Figure 1. Example of a displacement function for earthquakes

Hazard, exposure and vulnerability components are then combined to obtain mean damage ratios for all homes in the area under study.

ESTIMATING THE DURATION OF DISPLACEMENT

Mean damage ratios are used to calculate the time needed to clean, repair and rebuild residential units, considering not only actual physical damage but also other socioeconomic factors that come into play.[8] Several models have been developed to link recovery times to hazard intensities or the degree of structural damage. This paper uses the Hazus multi-hazard model, developed by the US Federal Emergency Management Agency (FEMA), to estimate potential losses from earthquakes, floods and hurricanes.[9]

Single and multi-family dwellings are assigned different recovery times depending on the degree of structural damage, which Hazus classifies into different structural damage states (see table 1).

Table 1. Recovery time in years based on structural damage states

Building type	Structural damage state				
	None	Slight	Moderate	Extensive	Complete
Single family dwelling	0	0.014	0.33	1.0	2.0
Multi-family dwelling	0	0.028	0.33	1.33	2.67

An aggravating factor is added to the recovery time based on the mean damage ratio for the affected area as a whole. This accounts for the fact that recovery will take longer because of damage to other infrastructure, such as roads, and a sudden increase in demand for scarce construction materials and labour.

ASSESSING LOST PRODUCTIVITY

The number of life years lost because of internal displacement is estimated by combining the number of residents and the recovery times for each unit in the area of analysis.

National or sub-national population distribution data is then used to calculate the number of working-age people among the displaced population. National legislation on working age should ideally be used for this calculation, but in its absence global standards such as the Organisation for Economic Co-operation and Development (OECD)'s reference value of 15 to 64 years old can be used.

The final part of the calculation combines the total number of life years lost because of internal displacement among the working age population with an indicator of economic productivity, such as GDP per capita, to yield an overall estimate for lost productivity.

ASSUMPTIONS AND LIMITATIONS

The proposed model assumes that displacement is always internal, and that IDPs will return to their original homes once they have been repaired or rebuilt. Other cultural, social, economic and psychological factors that might speed up or delay their return are not considered. Only the occupants of residential buildings are considered as potential IDPs.

Estimated recovery times are based on the assumption that the economic and human resources needed for clearing, repairing and rebuilding residential buildlings are readily available and that the recovery process starts immediately after the hazard has struck.

The methodology also adopts an egalitarian principle in that everyone of working age is assumed to have the same economic or productive value, regardless of their socioeconomic characteristics, gender, education level or other factors.

THE CASE OF THE GORKHA EARTHQUAKE

Information on peak ground acceleration for the earthquake that hit Gorkha in April 2015 is available from the US Geological Survey. Figure 2 below shows the areas worst affected in orange.

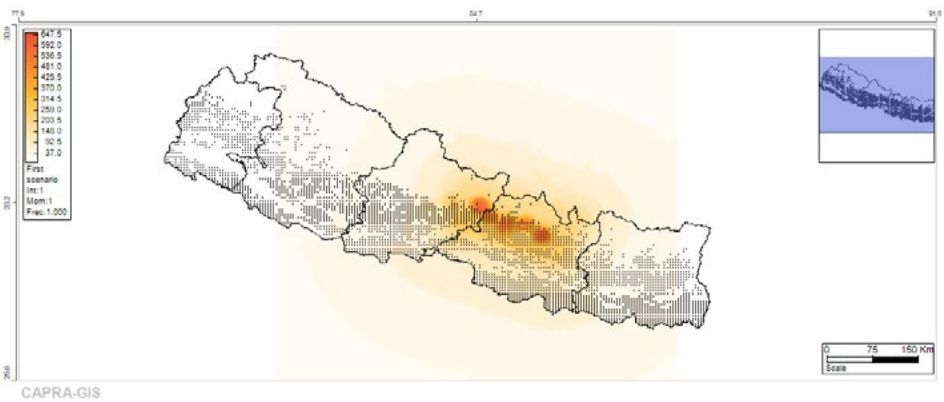

Figure 2. Peak ground acceleration (cm/s2) for the April 2015 Gorkha earthquake[10]

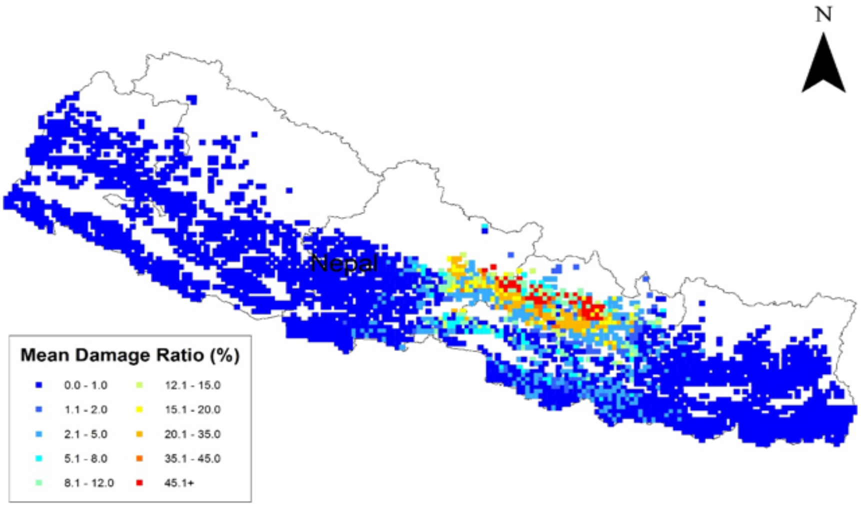

Figure 3. Mean damage ratio distribution for the residential buildings in Nepal

The UN Office for Disaster Risk Reduction (UNISDR) provides exposure data for residential buildings in Nepal in the global exposure database that accompanies its Global Assessment Report 2015.[11] The database also provides regional structural vulnerability functions.

Hazard, exposure and vulnerability data are used to estimate the mean damage ratios for all residential buildings in the area of analysis, in this case at country level. Figure 3 shows the mean damage ratio distribution in Nepal.

Table 2 shows mean damage ratios disaggregated by building class. Those built of reinforced concrete, adobe, stone and bricks were worst affected.

Table 2. Mean damage ratio disaggregation by building class

Buildling class	Mean damage ratio
Adobe block	5.48%
Reinforced concrete	14.64%
Cut stone masonry	4.60%
Informal constructions (parts of slums/squatters)	0.49%
Unreinforced brick masonry	5.09%
Wood	0.51%

These results were obtained using the CAPRA-GIS tool, which performs a fully probabilistic and state-of-the-art damage and loss assessment.[12] This tool can be used for different types of natural hazard.

ESTIMATING RECOVERY TIMES AND LIFE YEARS LOST

UNISDR's global exposure database categorises all building classes in Nepal except reinforced concrete structures as single family dwellings. Based on the indicative recovery times for single and multi-family dwellings shown in table 1, recovery is estimated as taking a total of 1,106 aggregated years.

Applying an aggravating factor based on the extent of damage across Nepal, the estimated total number of years needed for the cleaning, repair and reconstruction of homes takes the figure to 1,216.

Further calculations based on the number of residents in each of the damaged buildlings produce an estimate of 3.7 million people internally displaced by the Gorkha earthquake.

Geolocalised data on the number of residents for each building class and related recovery time was directly available for this calculation, which in turn yields an estimate of around 1.1 million life years lost because of internal displacement.

ESTIMATING LOST PRODUCTIVITY

Working age is taken to be between 15 and 64 years old. National age distribution data for Nepal published by the UN Population Division is shown in table 3, with working age groups highlighted in blue.

Table 3. Age distribution of the population in Nepal[13]

Age range	Total	Share
0-4	2,807,000	9.85%
5-9	3,139,000	11.01%
10-14	3,367,000	11.81%
15-19	3,256,000	11.42%
20-24	2,709,000	9.50%
25-29	2,273,000	7.97%
30-34	1,940,000	6.80%
35-39	1,719,000	6.03%
40-44	1,520,000	5.33%
45-49	1,303,000	4.57%
50-54	1,117,000	3.92%
55-59	906,000	3.18%
60-64	874,000	3.07%
65-69	652,000	2.29%
70-74	457,000	1.60%
75-79	279,000	0.98%
80-84	132,000	0.46%
85-89	50,000	0.18%
90-94	10,000	0.04%
95-99	1,000	0.00%
100+	0	0.00%

This shows around 17,600,000 people (or 61.79 per cent of the country's population) as being of working age. Applying this percentage to the 1.1 million life years lost produces a total of around 700,000.

The final stage of the calculation is to multiply this figure by the GDP per capita for Nepal, which the World Bank estimates to be $695.[14] This yields an estimate of lost productivity caused by internal displacement after the Gorkha earthquake of around $490 million. This represents only the cost of IDPs being unable to carry out their usual economic activities once displaced. It does not include economic losses associated with structural damage.

FINAL REMARKS AND FUTURE RESEARCH

The methodology presented herein can be used retrospectively, but perhaps most importantly it can also be used prospectively to determine potential losses according to different scenarios. To do so, our global disaster displacement risk model can provide estimates of displacement exceedance rates at the country level, which are plots that relate the number of IDPs with different return periods.[15]

Quantitative estimates of the economic impact of internal displacement, whether restrospective or prospective, have the potential to help governments and humanitarian and development stakeholders address the phenomenon more effectively and limit its negative impacts on the lives of all those affected.

Assuming that necessary data are available, the methodology can be adapted to produce global, national or sub-national estimates. Most such data are currently only available for sudden-onset disasters, but the methodology can also be adapted to assess lost productivity in other displacement situations including conflict and slow-onset disasters such as drought.

It is also possible to use the approach to assess lost years of schooling and access to healthcare based on damage to these facilities. Such disruptions have immediate and longer-term consequences for the welfare and economic potential of IDPs and host communities, all of which add to the economic impact of internal displacement and should be quantified as such.

As part of our research project, we will continue to refine this methodology and apply it to a variety of displacement cases, producing quantitative and comparable data across countries and contexts to help informing national policies.

NOTES

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Cover photo: Nepalese women walk through the ruins leftover by the earthquake of April 2015. Credit: NORCAP/Per-Erik Stafanson, June 2015

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