iDMC 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 PRODUCTION DUE TO INTERNAL DISPLACEMENT

## Cuba, 2008: Hurricane Ike

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# INTRODUCTION

Hurricane Ike, the most destructive hurricane in Cuban history, hit the island in September 2008. The Category 4 cyclone brought wind gusts above 200 km/h, damaging more than 300,000 houses and destroying 200. Ike caused the death of seven people in Cuba, 74 in Haiti and 113 in the United States.

FIGURE 1: Complete path of Hurricane Ike[1]

Many more people would certainly have been killed or injured in Cuba, had it not been for the authorities coordinating a mass evacuation days before the hurricane hit. More than 2.6 million people, a quarter of Cuba's population, were moved away from the path of the storm in the days before the arrival of the hurricane.[2] Approximately 80 per cent of evacuees stayed with friends and relatives while the rest went to evacuation shelters.[3]

Ike is estimated to be the costliest storm in Cuba, with material damages alone believed to have cost about $7.3 billion, the equivalent of 12 per cent of the country's GDP.[4] Infrastructure and agriculture were also heavily affected.

This paper assesses further repercussions on the economy, linked to the inability of evacuees and people displaced during and in the aftermath of the cyclone to continue their professional activity. Lost economic production due to displacement in the context of Hurricane Ike is estimated to be $131.7 million, 0.22 per cent of Cuba's GDP.

The same methodology applied to estimate lost production due to internal displacement in the context of the 2015 earthquake in Gorkha amounted to two per cent of Nepal's GDP, while for the 2017 earthquake in Mexico it amounted to 0.01 per cent of the country's GDP.[5] This third case study confirms that investments in preparedness and risk reduction, such as the ones Cuba and Mexico made, are an efficient way to reduce the economic impacts of displacement in the context of disasters.

# OVERALL METHODOLOGY

The methodology applied here assumes people evacuated before the storm or unable to immediately return home afterwards were also unable to access their habitual workplace and pursue their normal economic activity, for the duration of their displacement.

The number of evacuees and the duration of their evacuation is estimated from official reports. Levels of house destruction caused by the cyclone are used to estimate the number of people affected by damage to their housing and the duration of their displacement, where no reports are available.

Since there is no socioeconomic information on the displaced population, every worker is here assumed to have the same productive value, regardless of their gender, education level or any other characteristic. The productive value of one worker is measured using Cuba's 2008 GDP per capita.

Lost production is then calculated by combining the number of displaced workers, the duration of their displacement and the GDP per capita.

# APPLICATION TO THE CASE OF HURRICANE IKE IN CUBA

## NUMBER OF PEOPLE DISPLACED AND DURATION OF DISPLACEMENT

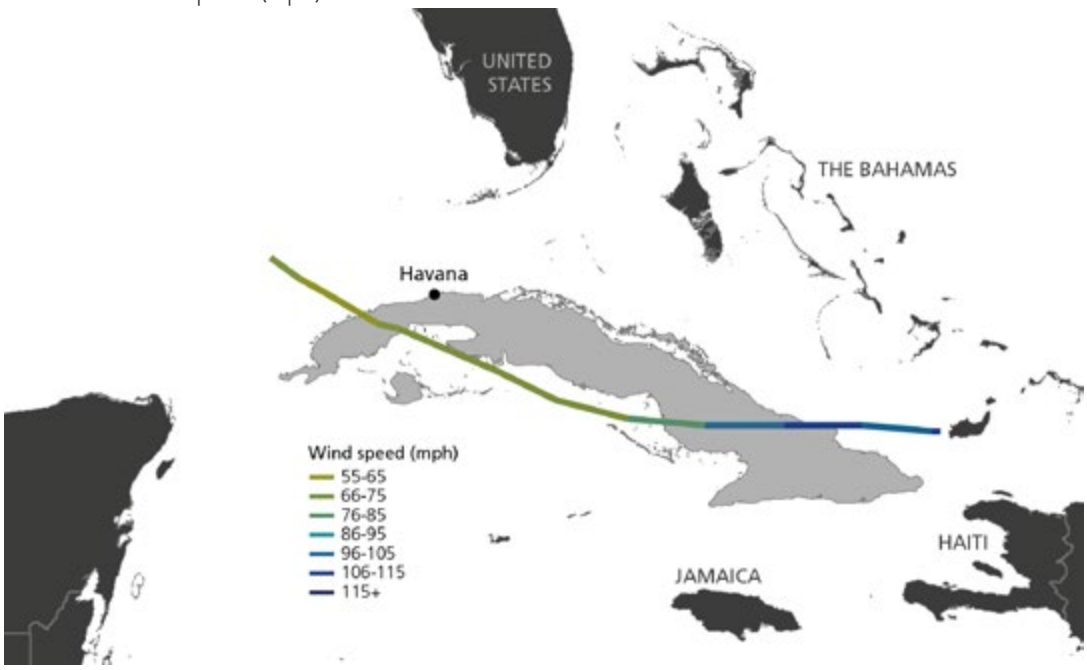
People were displaced in the context of hurricane Ike for two main reasons: evacuations before and during the cyclone, and the inability to return home because of damage to their houses.

The Cuban government reports that 2.6 million people were evacuated before the hurricane struck.[6] The preparation, evacuation and return of those people is estimated to have taken nine days, from the day preparation for evacuation started, 3 September 2008, to 11 September, the day after the hurricane left the territory.

Information on the number of people who were unable to return home because of damages caused by the storm and on the duration of their displacement is not available. Both values are estimated using data on the intensity of the storm, the exposure of the population and the structural vulnerability of their houses to damage.

Hurricanes combine cyclonic winds, storm surge in coastal areas and rainfall that can produce flooding. A comprehensive analysis of Ike's intensity should include all three, but the only data available for this hurricane relates to wind-speed. This may result in under-estimates of the damage caused by the storm. The International Best Track Archive for Climate Stewardship and the HWind Legacy archive publish data on the geographical distribution of wind hazard intensities for this event. Figure 2 shows Ike's wind speeds in miles per hour.

FIGURE 2: Wind speed (mph) for Hurricane Ike over Cuba[7]




Exposure is represented using UNISDR's Global Exposure Database.[8] This dataset has a coarse-grain resolution level of 5x5km that does not allow a detailed representation of assets. This may cause approximations in our calculations. For Cuba, the database has more than 20,000 entries and 30 residential building classes, combining structural systems, number of stories, construction materials, complexity level, building code compliance and main use, among other parameters.

We then used the wind (physical) vulnerability functions developed for UNISDR's Global Risk Model to estimate mean loss ratios for Cuban houses. For each of the building classes identified in the exposure database, a unique damage function projects hazard intensities by estimating expected damage and losses based on sustained wind gusts in km/h.

Other functions are used to link structural damage states with the time needed for these structures to be used again: the cleaning, recovery and repair time.[9] Table 1 summarises the time needed, in years, for each structural damage state on single and multi-family dwellings. All reinforced concrete buildings are assumed to be multi-family dwellings whereas the others (adobe, masonry and wooden) are assumed to be single family dwellings. Under this system, it would take two years before a family can return to a single-family house that has been completely destroyed.

This allows for an estimation of around 11,300 people not immediately able to return home after the hurricane.

The cleaning, recovery and repair of single-family dwellings will take a total 252 years, while the cleaning, recovery and repair of multi-family dwellings will take a total of four years.

TABLE 1: Recovery time (in years) for single and multi-family units by structural damage states

| Building type | Structural damage state | | | | |
|---|---|---|---|---|---|
| | None | Slight | Moderate | Extensive | Complete |
| Single-family dwelling | 0 | 0.014 | 0.33 | 1 | 2 |
| Multi-family dwelling | 0 | 0.028 | 0.33 | 1.333 | 2.667 |

## ESTIMATED YEARS LOST BECAUSE OF DISPLACEMENT

The evacuation of the 2.6 million people from 3 to 10 September 2008 is estimated to have cost a total of 64,500 accumulated years.

To calculate the years lost because people were unable to return to their home, we used a base rate of 3.2 people per single-family dwelling, as this was Cuba's average household size in 2008.[10] We estimated that each multi-family dwelling contained 25.6 people, based on an average height of four storeys per building, with two apartments per storey. Displacement associated with structural damage caused around 1,000 lost years, leading to an estimated total of 65,500 years lost as a result of displacement associated with Hurricane Ike in Cuba.

## ESTIMATED LOST PRODUCTION DUE TO DISPLACEMENT

Not all evacuees or inhabitants of damaged houses contributed to the economy through their work at the time of the event. Estimated lost production should only account for working-age people who were employed before the event.

Table 2 summarises the age distribution for Cuba in 2008, with people aged between 15 and 64 highlighted in blue as the working-age population. There are 7,924,000 people in this age range, 70.1 per cent of the total population.

The labour force rate for Cuba in 2008 was 54.33 per cent and unemployment rate 1.67 per cent.[12] Taking these values into account, the number of years of production lost because of the displacement of employed people is 24,500.

Using a GDP per capita value of $5,376, the total loss of production due to displacement is estimated at about $130 million, with the greatest loss taking place during the evacuation period.

TABLE 2: Population by age range in 2008 for Cuba[11]

| Age | Number of people | Share |
|---|---|---|
| 0-4 | 615,940 | 5.4% |
| 5-9 | 688,933 | 6.1% |
| 10-14 | 737,239 | 6.5% |
| 15-19 | 802,832 | 7.1% |
| 20-24 | 805,322 | 7.1% |
| 25-29 | 674,529 | 6.0% |
| 30-34 | 817,190 | 7.2% |
| 35-39 | 1,065,124 | 9.4% |
| 40-44 | 1,086,026 | 9.6% |
| 45-49 | 911,554 | 8.1% |
| 50-54 | 655,374 | 5.8% |
| 55-59 | 616,142 | 5.4% |
| 60-64 | 490,415 | 4.3% |
| 65-69 | 432,137 | 3.8% |
| 70-74 | 343,003 | 3.0% |
| 75-79 | 245,110 | 2.2% |
| 80-84 | 167,592 | 1.5% |
| 85-89 | 95,780 | 0.8% |
| 90-94 | 43,003 | 0.4% |
| 95-99 | 14,197 | 0.1% |
| 100+ | 2,312 | 0.0% |
| **TOTAL** | **11,309,754** | **100%** |

# FINAL REMARKS

The total loss of production due to displacement in the context of Hurricane Ike in Cuba represents 0.22 per cent of the country's GDP. Expanding the methodology tested in Nepal, Mexico and now Cuba to other countries would require better data on hazard intensity, exposure and vulnerability.

In addition to raising awareness on the benefits of preventing internal displacement and reducing its negative consequences, such estimates can help governments plan for future crises. By studying the economic impacts of past and current displacement, better assessments can be made of the cost of future displacement. This information can support informed budgeting, insurance and recovery measures.

## NOTES

1. National Weather Service
2. NBC News, Lessons from Ike: Cuba gets evacuations right, 2008.
3. World Meteorological Organisation, Report on 2008 Hurricane Season in Cuba, 2008.
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5. IDMC, Lost production due to internal displacement: The 2015 earthquake in Nepal, June 2018; IDMC, Lost production due to internal displacement: The 2017 earthquake in Mexico, January 2019.
6. World Meteorological Organisation, Report on 2008 Hurricane Season in Cuba, 2008.
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8. UNISDR, Risk Data Platform.
9. FEMA, Hazus Hurricane Model.
10. World Bank, Cuba.
11. UN Population Division database.
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Cover photo: Buildings heavily damaged by hurricane Ike in 2008, Gibara village, Cuba. Credit: Shutterstock/Matyas Rehak

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