Chapter 4

Disasters and their impact on poverty

Assessment of options for disaster-related poverty targets

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4.1
Introduction

Disasters can reverse gains made in poverty reduction, throwing large numbers of vulnerable and marginalised households, previously above the poverty line, into poverty. Disasters affect the poor and vulnerable disproportionately, especially women, children, the elderly and those recovering from the impact of conflicts. Very often, it is those living on the fringe of society without adequate coping mechanisms (savings, insurance, social safety nets, family etc.) who are most vulnerable to the impacts of disasters, and are most likely to fall into poverty through the consequences of disasters. For example, case studies carried out in Dar es Salaam, Jakarta, Mexico City and São Paulo found that, in all four cities, those living in informal settlements were most vulnerable to climate-related and disaster risks (World Bank, 2011a).

Although there is limited literature that directly correlates disaster impacts with poverty, some examples illustrate this effect. For example, in Haiti, the percentage of poor and extreme poor fell by more than 8% on average across the country between 2001 and 2010, but following the 2010 earthquake it was estimated that poverty had returned to the 2001 level, with 71% in moderate poverty and 50% in extreme poverty (Government of the Republic of Haiti, 2010). Similar findings are cited in analysis carried out following the 2011 drought that affected Djibouti, which suggests that post-disaster poverty levels in the country were probably even higher than 2002 levels, when extreme poverty was 42% and relative poverty 74% of the population (République de Djibouti, 2011).

When considering an overall objective of reducing or eliminating absolute poverty in the medium term, it is not enough to ensure households are free from absolute poverty most years – even short time periods spent in extreme poverty can have long-run consequences, both for health outcomes (particularly if there are young children in the household) and for livelihoods (particularly if households have to engage in forced selling of assets to meet basic consumption needs). In the language of poverty measurement, it is not enough just to eliminate chronic poverty, whereby households are in poverty (in that their welfare is below a given poverty line) for a number of consecutive years. Transitory poverty, whereby

households are in poverty in some years but not in others, must also be addressed, or growth out of chronic poverty may only be temporary.

If individuals and communities are able to build resilience[1] to natural hazards and avoid falling into poverty as a result of disasters, these disaster-induced poverty spikes can be avoided, and growth out of chronic poverty can be protected. This chapter therefore suggests that a relevant indicator to measure progress towards building disaster resilience, particularly in the most vulnerable segments of society, can focus on impact indicators related to transitory poverty, in the context of the headline development goal to reduce/eliminate poverty.

The chapter addresses two aspects of DRM poverty indicators. First, we introduce two potential indicators for disaster-induced transitory poverty and argue that they would be measureable and clear, would capture disaster-induced poverty well and would incentivise both better understanding of the impact of risk on poverty and action to address causes rather than symptoms.

Second, we consider challenges with experience-based disaster indicators from the perspective of statistical theory, noting that year-to-year comparisons are difficult to make within a single country, as disasters are sporadic and can occur with varying intensity and frequency. We present a potential solution, drawing on advances by the insurance industry in using models that take into account (among other things) the probability of an extreme event of a given magnitude occurring in a given year. This chapter explores the feasibility of using such models in tracking national poverty reduction progress over time.

The proposed indicators are given below. There are, of course, alternative approaches that could be considered, but for the purposes of this chapter we restrict attention to the following:

- No increase in proportion of population in poverty;
- No additional people enter poverty; and
- Less than a 1-in-50-year chance a disaster will return proportion of population in poverty to 2015 levels.

The above three indicators could each be applied to any underlying static poverty measure, such as the $1 per day (PPP) headcount poverty measure.

Of course, such measures would inherit challenges of the selected underlying poverty measure. For example, if a headcount poverty measure were used as the basis, the resulting dynamic indicator would not reflect worsening poverty for those already in poverty. Alternatively, other static poverty measures, such as the 'material poverty', 'social poverty' or 'subjective poverty' measures proposed in Chapter 6, could be used as the poverty measure underlying the above indicators.

This chapter is not advocating for one approach over another, and we are aware that there are approaches to track disaster resilience progress over time. For example, input- and output-based indicators of resilience can also be used to consider the extent to which countries have put in place means of reducing disaster risk, such as DRM strategies and action plans, safe schools, hospitals and critical infrastructure, EWSs, flood protection infrastructure etc. However, we leave aside the pros and cons of using such approaches, and instead focus on presenting and analysing a potential impact-based indicator for disaster-induced poverty.

4.2
Three potential indicators for disaster resilience

Poverty that lasts a long time is known as 'chronic poverty'. By contrast, people who move into and out of poverty are said to experience 'transitory poverty' (CPRC, 2009). Table 6 presents a collection of evidence on transitory and chronic poverty.

Arif and Bilquees (2006) suggest that by emphasising exclusively on the measurement and targeting of chronic poverty, policymakers focus too heavily on structural changes in existing policies such as education, health and land reforms that aim to permanently enhance the incomes and assets of the chronic poor. However, an appreciation of the social cost of transitory poverty can make measures such as safety nets, credit and insurance schemes relatively more attractive, as such mechanisms can help protect the development gains of households.

Eradicating transitory poverty is evidently one component of eradicating poverty (which includes chronic and transitory poverty), and can be justified

both because being in poverty at a given moment in time is undesirable, but also because even brief periods in poverty can cause long-term problems for people, households and communities. This is especially true for disaster-induced transitory poverty, because disasters typically affect whole communities at a time, and traditional mechanisms for coping, such as relying on nearby friends and family, are of limited use.

For example, Alderman et al. (2006) estimate that the 1982-1984 drought in Zimbabwe resulted in surviving children completing 0.4 grades fewer of schooling and having lifetime earnings reduced by 14%. Dercon et al. (2005) estimate that the 1984-1985 famine in Ethiopia led to reduced consumption and distress sales that reduced income nine years later by 16% relative to counterparts who had not suffered to the same degree.

Indicators that accurately capture resilience to disasters could be effective at stimulating effective responses to the disaster-induced transitory poverty that can be devastating for households. In the remainder of this section, we present three potential indicators that attempt to do just this; we conclude the section with a comparison and summary. All three indicators capture dynamic aspects of poverty, and could be used with any static poverty measure that separates people into 'in poverty' and 'not in poverty' at a given moment in time.

'No increase in the proportion of the population in poverty'

The first indicator, 'No increase in the proportion of the population in poverty', focuses on the dynamics of poverty from the perspective of a country. If the indicator used a poverty definition that featured in another indicator (such as a $1 per day PPP definition of poverty), then no additional data would need to be collected; one would just use these data to target not only reductions in poverty but also the protection of gains.

Of the three indicators, this would be by far the simplest to measure. However, unlike the two other potential indicators, it would not stimulate the collection of additional data that could be useful for targeting resources, and would not be directly attributable to disaster impacts.

'No additional people enter poverty'

The second indicator, 'No additional people enter poverty', focuses on the dynamics of poverty as experienced by individuals, and has strong links to existing literature on chronic and transitory poverty. Like the first indicator, it is measurable using well-established econometric techniques (e.g. Ravallion, 1996). Essentially, all one needs to do is to track a sample of individuals and at each measurement time record whether that individual is in poverty or not. An individual would be judged to have entered poverty if they are in poverty now but were not in poverty at the previous measurement time.

However, while simple in theory, such an indicator would require long-term panel (longitudinal) datasets, whereby the same individuals or

Table 6:
Summary of studies reporting on chronic and transitory poverty

Country and source	No. of waves	Welfare measure	% of population Chronic	% of population Transitory	% of population Non-poor
Chile (Scott, 1999)	2	Income per capita	54.1	31.5	14.4
China (Jalan and Ravallion, 1998, 1999, 2000)	6	Expenditure per capita	6.2	47.8	46.0
Cote d'Ivoire (Grooteart and Kanbur, 1995)	2	Expenditure per capita	14.5	20.2	65.3
Egypt (Haddad and Ahmed, 2003)	2	Average per capita consumption	19.02	20.46	60.52
Ethiopia (Dercon and Krishnan, 1998)	2	Expenditure per capita	24.8	30.1	45.1
Ethiopia (Kedir and McKay, 2003)	3	Median consumption expenditure	21.5	36.2	51.1
India (Gaiha, 1988)	3	Income per capita	33.3	36.7	30.0
India (Gaiha and Deolalikar, 1993)	9	Income per capita	21.8	65.8	12.4
Indonesia (Skoufias et al., 2000)	2	Expenditure per capita	8.6	19.8	71.6
Pakistan (McCulloch and Baulch, 1995)	5	Income per adult equivalent	3.0	55.3	41.7
Pakistan (McCulloch and Baulch, 1999)	5	Annual income	15.31	43.0	41.69
Russia (Mroz and Popkin, 1999)	2	Income per capita	12.6	30.2	57.2
South Africa (Carter, 1999)	2	Expenditure per capita	22.7	31.5	45.8
Zimbabwe (Hoddinnott et al., 1998)	4	Income per capita	10.6	59.6	29.8

Source: Jayaraman (2006), adapted from Baulch and Hoddinott (2000).

households are tracked over time. Although such data are increasingly common, they are not yet available in many countries. However, investing in such data would have substantial additional benefits for understanding and tackling poverty (Wadugodapitiya and Baulch, 2010), such as:

● Informing the effective design, targeting and implementation of anti-poverty policies;
● Enabling the monitoring and robust evaluation of policy; and
● Helping policymakers identify the policies that facilitate escape from poverty.

To measure disaster resilience under such an indicator, one would need a disaster to occur, and then for a new round of the panel survey to be collected in the aftermath of the disaster. This would allow an estimate of the effect of that disaster on individuals, and calculation of the number of people who have entered poverty following the disaster. Of course, the precise timing of the new round of the panel survey would affect the results, as, for example, some people may enter poverty as a result of the disaster but then be able to exit poverty before the survey, although the survey could be designed carefully in a way to account for this.

Another challenge of this approach to measuring disaster resilience is that it can be difficult to distinguish people entering poverty because of a disaster and people entering poverty after a disaster but owing to shocks and stresses other than the disaster itself. Regardless, in disaster-prone countries, disasters are likely to be a substantial cause of transitory poverty, and the collection of high-frequency data on poverty can help guide evidence-based actions, even if the data are imperfect.

A more pressing challenge with the above two approaches is that both would not account for the intensity of a disaster. This would mean that a 1-in-500 year high intensity disaster event would distort the trend, even if in relative terms the impact had been significantly reduced thanks to DRM measures put in place, such as in the case of the Great East Japan Earthquake and tsunami. Any such impact-based indicator will reflect recent historical experience, but this may not reflect (in a probabilistic sense) the true disaster resilience of a country, region or city. Our third proposed indicator

attempts to tackle this limitation, although by doing so it introduces other challenges.

'Less than a 1-in-50-year chance that a disaster will return the proportion of the population in poverty to 2015 levels'

The third indicator, 'Less than a 1-in-50-year chance that a disaster will return the proportion of the population in poverty to 2015 levels', focuses on the 1-in-50-year disaster resilience of a country. This, if measured well, could focus attention on resilience to politically conceivable, but low-probability, disasters. Such an indicator offers substantial measurement challenges, but would provide an impetus for building probabilistic risk models in disaster-prone developing countries, which could be used to support informed investments in disaster resilience.

In choosing a strategy for measuring such an indicator, one must implicitly make a judgement about:

● How subjective development indicators should be;
● When we really learn about resilience: when events occur, and the level of resilience is demonstrated, or when an expert, or set of experts, judges that resilience has changed; and
● When events occur, what we really learn about resilience.

Mitchell (2012) and Muir-Wood (2012) propose potential disaster resilience indicators that could be used alongside disaster resilience goals. Broadly speaking, Mitchell (2012) takes an approach based on experience (what has happened), whereas Muir-Wood (2012) suggests an approach based on modelled variables (what the risk model predicts will happen on average).

An experience approach would estimate the 1-in-50-year disaster-induced poverty rate for a given year as the xth largest disaster-induced poverty rate over a 20x year period. As discussed by Muir-Wood (2012), the main challenge with this is that it would not account for 'how bad the 20-year period was' compared with what would be expected in the future. The indicator could be very high in a bad 20-year period or very low in a good 20-year period, and an

Table 7:
Advantages and limitations of proposed targets and indicators

Advantages	Indicator 1 No increase in proportion of population in poverty	Indicator 2 No additional people enter poverty	Indicator 3 Less than 1-in-20-year chance that a disaster will return the proportion of population in poverty to 2015 level
Measurable	✓	✓	•
Clear	✓	✓	✓ / ✗?
Captures resilience to recurrent events	✓	✓	✗
Captures resilience to low-probability events	✗ (unless low-probability event occurs)	✗ (unless low-probability event occurs)	✓
Incentivises investments in collecting data that could support better understanding of the impact of risk on poverty	✗	✓	✓
Incentivises action to address causes rather than symptoms	✓	✓	✓
Low cost	✓	✗ (annual panel survey)	✗ (probabilistic risk models)
Objective	✓	✓	✗

apparent downward or upward trend over the period 2015-2030 would be driven by the timing of disasters as opposed to reflecting a fundamental change in disaster resilience.

A modelled approach (Muir-Wood 2012) would use a probabilistic model to estimate the average expected 1-in-50-year disaster-induced poverty rate over 100,000 'equally probable versions of next year', using the exposure and vulnerability information for the current year. Purely modelled indicators may be smoother from year to year than experience-based estimates, but are subjective, in the sense that experts' claims are unlikely to be empirically disprovable (in a probabilistic sense) over a 20-year period, will require continual updating of probabilistic risk models and may not reflect trends in actual resilience, particularly for perils like flood and drought, for which risk models are in their infancy. More generally, there is always a risk of model error, for example because

of incompleteness of the underlying exposure database. Probabilistic risk models would need to be updated throughout the period 2015-2030 to reflect changes in exposure, vulnerability and hazards, if the results were to accurately reflect the changing resilience.

Were probabilistic risk models developed for countries exposed to substantial disaster risk, it would be possible to run the models in the aftermath of a given disaster to sense-check the model. For example, one might report that an experience in a given country as bad as in year 2016 is estimated to occur once every 10 years (i.e. with probability 10%), or that an experience as bad as in year 2017 is estimated to occur once every 2 years (i.e. with probability 50%).

Comparing the indicators

Each indicator has strengths and weaknesses

from the perspective of capturing disaster-induced poverty (Table 7). As already discussed, over a 15-year period, Indicator 1 may capture changes in resilience to recurrent shocks quite well, but will (probably) not capture resilience to low-probability events. Moreover, it will not incentivise investment in data, with wide-reaching policy implications. Indicator 2 is also likely not to capture resilience to low-probability events, but could incentivise investment in data with many potential uses, albeit at a cost. Indicator 3 is subjective, potentially very expensive and perhaps less clear than the other two potential indicators, but has the potential to capture resilience to extreme events and, by doing so, support evidence-based investments to improve resilience to an even greater degree than the other two indicators.

4.3 Conclusion

Monitoring progress towards building disaster resilience is challenging, but will enhance the quality of a post-2015 development framework by providing an evidence basis for action to ensure poverty reduction progress can withstand shocks and stresses, including disasters. A target of eliminating disaster-induced poverty could be considered legitimate under the overarching goal of poverty reduction, as could a broader target of eliminating all transitory poverty. Both targets could seek to address shocks and stresses that result in new poverty.

If the international community were to consider impact-based indicators to measure disaster resilience over time, then a modelled or hybrid approach could be considered in addition to raw impact-based indicators to account for varying levels of intensity and probabilities of natural hazards. The benefits and limitations of such approaches, as outlined above, must be recognised.

There is a need to find a balance between feasibility and accuracy of targets and indicators. Further work may be needed to consider input- and output-based indicators that measure the extent to which countries have implemented DRM measures, as well as or instead of measuring changing impact of disasters over time. Both options have their merits, and a combination of impact-level targets combined with input/output-level indicators could be the best path to pursue.

Chapter 4 Endnotes

1   Views expressed in this paper are the authors' and should not be attributed to the World Bank or the Global Facility for Disaster Reduction and Recovery. Email: dclarke2@worldbank.org, rreid@worldbank.org.

2   'The ability of countries, communities and households to manage change, by maintaining or transforming living standards in the face of shocks or stresses – such as earthquakes, drought or violent conflict – without compromising their long-term prospects.' (Dfid 2011)