



Analysis

Socioeconomic Vulnerability to Disaster Risk: A Case Study of Flood and Drought Impact in a Rural Sri Lankan Community



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ARTICLE INFO

Keywords:

Flood
Drought
Poverty
Socioeconomic Vulnerability

ABSTRACT

While climate change is a global phenomenon, its negative impacts are more severely felt in poor countries because of their high dependence on natural resources and limited coping capacity to climate variability and extremes. However, investigation of the relationship between poverty, climate variability and water-related disasters is complex. This article investigates the relationship between disaster risk, poverty, and the associated vulnerability of households and communities. The case study on which the article is based was carried out in Sri Lanka, a developing country prone to disasters. Data collected from household surveys conducted in North Central province, Sri Lanka, was examined with the use of cross tabulation and regression analysis techniques. Our study is novel because it considers floods and droughts together and compares their economic impact on socioeconomic groups at a local level.

Our findings show that households depend heavily on natural resources for their livelihood, and that those with low income suffer greater losses from floods and droughts than households with high income. On the other hand flood impact is higher on households depend heavily on natural resources for their livelihood, and having lower income. The study uses survey data to examine the relationship between disaster frequency and localized poverty, an issue rarely considered in past literature. We show that low income households that depend fully on natural resources for their livelihood are exposed to more frequent disasters and most vulnerable to financial losses incurred through floods and droughts. To combat the effects of disasters, the Sri Lankan government might encourage members of poor households to seek at least some income from non-agricultural endeavors.

1. Introduction

1.1. Background and Objectives

Humans often earn their livelihoods in locations that combine opportunity and hazard. Exposure to these opportunities and hazards is not equal (Wisner et al., 2003). Poor people tend to live in hazard prone areas (Hoeven et al., 2015), often rural, because they do not have the money or resources to live elsewhere (Chan, 1995). This makes them more vulnerable to natural disasters (Fankhauser et al., 2001). In developing countries such as Sri Lanka, many people are employed, directly or indirectly, in the agricultural sector which is highly vulnerable to natural disasters. Nearly 72% of the Sri Lankan population depends on the agricultural sector for its livelihood (De Costa, 2010).

The main objective of this study is to investigate the intricate relationship between floods and droughts, poverty and socioeconomic vulnerability. The study focuses on individual households. The analysis is based on two main questions. First, how do floods and droughts affect

households from different socioeconomic groups? Second, in what specific ways do poor households, who dependent on natural resources to make a living, suffer when exposed to frequent natural disasters? Investigating the links between natural disasters and poverty in a country such as Sri Lanka is timely; poverty eradication is the most important aim of the Sustainable Development Goals (SDGs) (Aitsi-Selmi et al., 2016).

A variety of studies (Carter et al., 2007; Brouwer et al., 2007; Masozera et al., 2007; Glave et al., 2009; Lopez-Calva and Ortiz-Juarez, 2009; Rodriguez-Oreggia et al., 2013) have examined the vulnerability of different economic groups to certain disasters, and their responses to those disasters. Other studies have focused on the relationship between poverty and disasters by considering the impact of a single type of disaster, either floods (Brouwer et al., 2007; Patnaik and Narayanan, 2010; Hallegatte et al., 2010; Henry et al., 2015; Tahira and Kawasaki, 2017; Borgomeo et al., 2017), droughts (Reardon and Taylor, 1996; Hoddinott, 2006; Little et al., 2006), or hurricanes (Morris et al., 2006; Van Den Berg, 2010; Masozera et al., 2007). While accounting for

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differences in conditions, regions and scale, most of these studies confirm that natural disasters have a significant and adverse effect on poverty and human development. A limited number of studies consider the impact of various types of disasters (Tesliuc and Lindert, 2002; Foltz et al., 2013) on poverty. While poverty is originally a local phenomenon that affects both individuals and members of household units (Griffin, 1995; King, 2000), and is easiest to analyze at a local scale, little work has been done on the relationship between local poverty (at a household level), floods and droughts. Our study analyzes the direct financial impact of floods and droughts on a rural agricultural community in Sri Lanka, and how different economic groups are affected by these natural disasters.

The analysis presented in this study is based on the theory that underpins the Pressure and Release (PAR) and Access models (Wisner et al., 2003). The PAR model is a simple tool for showing how disasters occur when people are vulnerable to natural hazards. Vulnerability, defined as the characteristics of a person or group and how their situation influences their capacity to anticipate, endure, resist, and recover from the impact of natural hazards/climate change (Testa et al., 2014; Wisner et al., 2003; Piya et al., 2012; Du et al., 2015; IPCC, 2014a, 2014b), is rooted in social processes (unequal distribution of assets, wealth and resources; population growth; the nature of political systems; civil conflict) and other causes that may be unrelated to the disaster event.

The basis for the PAR idea is that a disaster is the intersection of these two forces: the processes that generate vulnerability, and natural hazards. However, the PAR model does not provide a detailed and theoretically informed analysis of the precise interactions of environment and society at the ‘pressure point’; that is, where and when the disaster starts to unfold. The Access model analyses people’s ability to cope with the impact of disasters in terms of what level of access they have (or do not have) to the resources needed to earn a living, both before and after a disaster has occurred (Wisner et al., 2003). Both these models are designed for qualitative analysis, whereas our study takes a quantitative approach. While the models are not directly applied in this paper, the theory behind them does inform the analysis.

This article evaluates, empirically, household vulnerability to floods and droughts. The results suggest that low income households that depend on agriculture for their livelihood suffer most from these disasters. In aiding understanding of the impact of floods and droughts on a rural agricultural community in Sri Lanka, our findings will help the Sri Lankan government to develop management strategies to cope with future water-related natural disasters.

1.2. Definitions of Poverty

Poverty, measured both in terms of monetary and non-monetary dimensions, persists in Sri Lanka (Joshi, 2011). The Asian Development Bank (ADB) refers to poverty as “a deprivation of essential assets and opportunities to which every human is entitled”. According to The World Bank, “Poverty is pronounced deprivation in well-being, and comprises many dimensions. It includes low income and the inability to acquire the basic goods and services necessary for survival with dignity. Poverty also encompasses low levels of health and education, poor access to clean water and sanitation, inadequate physical security, lack of voice, and insufficient capacity and opportunity to better one’s life” (World Bank, 2001).

Poverty is a multidimensional social phenomenon (Atkinson and Bourguignon, 1982; Maasoumi, 1986; Lipton and Ravallion, 1995; Bourguignon and Chakravarty, 2003) and not simply a reflection of income. In defining poverty, gender, age, culture, health and nutrition, access to clean water, housing, literacy, life expectancy, and other economic and social measures must also be considered. This is the function of such indices as the Human Development Index (HDI), Multidimensional Poverty Index (MPI), Gender Development Index (GDI), and Gender Inequity Index (GII). These measures gauge poverty

for populations as a whole or for population subgroups. In this study, conducted at the household level, we consider only financial poverty, with per capita income used as the main indicator.

1.3. Study Area

As Sri Lankan Disaster Management Center (DMC) records confirm, Sri Lanka suffers from many natural hazards. Floods, droughts, cyclones, landslides and lightning strikes are common, and the country is also affected by coastal erosion, rising sea levels and environmental pollution. DMC records show that floods and droughts are the most common and damaging natural disasters. Floods usually come with the monsoon; the south and west of Sri Lanka are exposed to floods during the south-west monsoon (May–September), the north and east during the north-east monsoon (December–February). Severe floods used to occur about every 10 years, but they are becoming more frequent due to intense rainfall caused by climate change (Meehl et al., 2007; IPCC, 2014a, 2014b). As documented in DMC records, Sri Lanka has experienced 6 severe floods in the last 16 years.

The north-central, south-eastern, and north-western parts of the country are the most exposed to drought. This is due primarily to low rainfall. Serious droughts used to occur every 3–4 years, and a severe drought of national significance every 10 years or so (DMC, 2005); now there are more droughts, and of greater severity (Aadhar and Mishra, 2017; Gilligan et al., 2015). Climate change has led to longer periods of consecutive days without rain (Parry et al., 2007; Filho, 2013).

This analysis is based on data from our survey conducted in the Anuradhapura and Polonnaruwa districts of North Central province (Fig. 1), approximately 200 km from Sri Lanka’s commercial capital, Colombo. The total area of North Central province is approximately 10,000 km² (about 15% of Sri Lanka). More than a million people (2011 census data), who mostly rely on agriculture for their livelihood, live in this area. 80% of cultivated land is dedicated to rice, with maize, vegetables and cereals also grown. A few people farm livestock on a small scale. Hundreds of irrigation tanks supply water for cultivation.

The area was developed as part of an agrarian movement after national independence (1948), when the government donated an equal amount of land to every household. As a result, most householders own the house in which they live and the fields in which they work. Our findings are relevant also to the Gal Oya, Mahaweli, Senanayaka and Deduru oya areas, where similar agrarian programs were pursued.

The topography of the study region is flat. Sri Lanka has three main climatic zones (based on annual average rainfall); the study area is located in a dry climatic zone where annual average rainfall is approximately 1750 mm. > 60% of this rain falls during the north-east monsoon from December to February. Monsoonal rainfall causes excessive outflows in reservoirs. In most years this leads to floods that damage houses and other properties, crop lands, and infrastructure. From May to September, when there is no monsoon and less rain, droughts have become common. These droughts lead to the loss of crops. Whether through flood or drought, households and the rural economy suffer.

2. Data and Methods

2.1. Data Collection and Characteristics

Data were collected through a “questionnaire” conducted in North Central province, Sri Lanka. Nine main villages were selected randomly for the survey, which took place in August 2016. Based on probability sampling (Denscombe, 2010) the minimum sample requirement is 384. In this study, 517 household residents – 243 in Anuradhapura district and 274 in Polonnaruwa district – were interviewed. Each face to face interview, conducted by locals speaking in the Sinhala language, took approximately 30 min. Interviewees were asked about their livelihood and socioeconomic conditions, exposure to floods and droughts, and

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