

MEASUREMENT OF PHYSICAL CAPACITY TO ADAPT TO CLIMATE CHANGE IN SRI LANKAN HOUSEHOLDS

U. S. Thathsarani¹ and L. H. P. Gunarathne²

¹*Department of Economics and Statistics, Sabaragamuwa University of Sri Lanka*

²*Department of Agricultural Economics and Business Management, University of Peradeniya*

Introduction

Natural variability of climate has always posed a challenge to human livelihoods. Human-induced climate change has lent a complex new dimension to this challenge. Evidence shows that natural climatic variability compounded by climate change will adversely affect millions of livelihoods around the world (IPCC, 2007). Rural communities in developing countries are expected to be affected more due to their extensive dependence on climate sensitive livelihood options and limited adaptive capacity to adapt to the changes. Adaptive capacity is defined as the capacity of an economic, social, environmental or other system to cope with or recover from a potentially damaging external influence (Brooks and Adger, 2005).

A tangible item of value that derives its worth from its ability to be sold, used or bartered is categorized as a physical asset. At the household level, physical capital can refer to the number of assets it owns, such as farming implements, or to the quality of housing. Thus those in mud huts are considered more vulnerable than those in brick houses. Physical capital can also be infrastructure such as the provision of electricity, roads or transport systems which mitigate isolation (Smit & Wandel 2006). In the climate change context physical capital is identified as the capacity to bear with climate change related hazards.

Institutions and infrastructure are important in estimating communities' resilience or vulnerability to climate change (Agrawal 2002). The primary objective of this research is to construct an index of physical capacity of adaptation to climate change at household level while a secondary aim is to clarify the links between the hypothesized relationship and estimated (fitted) physical capacity.

Methodology

A Household Physical Capacity Index was estimated and analysed by the method of Multiple Factor Analysis for Mixed Data (AFDM) using the FactoMineR package in R. Multiple Factor Analysis for Mixed Data (AFDM) is the combination of both Principle Component Analysis and Multiple Corresponding Analysis.

Data for relevant variables were obtained from the Household Income and Expenditure survey (HIES) 2009/2010 conducted by the Department of Census and Statistics covering 25,000 households (Department of Census and Statistics 2011).

Results & Discussion

Estimated components based on household data are reported in Table 1.

Adaptive capacity increases with increasing number of bedrooms, communication cost, newspaper cost and travel cost (continuous variables). Further, the first component correlates most strongly with communication cost. Households can increase their adaptive capacity if they spend more money on communication, newspaper, travel and housing. Adaptive capacity also increases with decreases in energy cost, time taken to bus halt and hospitals.

As per the results, it can be hypothesized that households who own or can access physical assets face less risk of damage during a hazardous period compared with other households. Possession of a better quality house will improve the capacity to withstand the risk from extreme climate events. Tenure of the house is also very important in adaptive capacity. According to the results people with their own houses have a higher capacity than people with types of tenure. Rental occupation correlates most negatively with the first component. Permanent construction materials for the wall are performed positively with the adaptive capacity.

Ownership of radio, television and telephone as physical assets will increase adaptive capacity through access to weather related information. Out of these, high loading is presented in ownership of telephone.

Table 1. Component matrix for Physical factor

Type	Variable	Component	
		1	2
Continuous variable	Bedrooms (number)	0.549	0.328
	Communication cost (LKR)	0.664	0.038
	Newspaper cost (LKR)	0.285	0.021
	Energy cost (LKR)	-0.684	-0.081
	Time to hospital (minutes)	-0.352	0.659
	Time to bus halt (minutes)	-0.305	0.566
	Travel cost (LKR)	0.115	-0.228
Categorical variable			
Tenure	Owned	0.191	0.012
	Rent	-2.14	0.525
	Other	-1.617	-2.74
Wall construction	Permanent	0.042	-0.014
	Semi permanent	-1.829	0.625
Radio	Yes	0.53	0.193
	No	-1.573	-0.573
Television	Yes	0.622	0.090
	No	-2.57	-0.371
Telephone	Yes	0.723	-0.285
	No	-2.34	0.088
Lighting	Kerosene	-3.142	-0.369
	Electricity	0.49	-0.045
	Solar energy	-2.084	5.8
	Other	-3.98	13.051
Fuel	Firewood	-0.971	0.299
	Gas	1.736	-0.061
	Kerosene	-0.54	-1.655
	Electricity	0.081	-1.048
	Other	-3.25	-4.677
Transport items	No	-0.685	-0.194
	Yes	0.688	0.195

Source: (Household Income and Expenditure Survey 2009/2010)

Except for electricity, other sources of lighting have negative impact on to the adaptive capacity. It can be speculated that in a natural disaster, households would be less able to collect firewood.

Conclusion

A society, household, group or person with limited or no physical capital, is at risk of adverse effects on their livelihood. Physical capital is represented by the presence of structures, infrastructure, intensity of inputs which is hypothesized to increase adaptive capacity.

Physical capital allows people to develop livelihood strategies that improve their resilience. The quality and location of settlements, infrastructure and transport system influence their physical ability to respond to the immediate impact.

References

- Intergovernmental Panel on Climate Change. (2007). *Impacts, adaptation and vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.
- Agrawal, A. (2002). 'Indigenous knowledge and the politics of classification'. *International Social Science Journal* , 28-297.
- Department of Census and Statistics (2011). *Household Income and Expenditure Survey - 2009/10* Colombo: Department of Census and Statistics.
- Næss, L. O., Bang, G., Eriksen, S., & Vevatne, J. (2005). 'Institutional adaptation to climate change: flood responses at the municipal level in Norway'. *Global Environ. Chang.*, 15 , 128-138.
- Smit, B., & Wandel, J. (2006). 'Adaptation, adaptive capacity and vulnerability'. *Global Environ. Chang.*, 16: 282-292.