Applied Geography 45 (2013) 158–166

Contents lists available at ScienceDirect

Applied Geography

journal homepage: www.elsevier.com/locate/apgeog

Participatory 3-dimension mapping: A tool for encouraging multi-caste collaboration to climate change adaptation and disaster risk reduction

JC Gaillard [a, *], Charlotte Monteil [b], Anaïs Perrillat-Collomb [b], Sukhdev Chaudhary [c], Mamta Chaudhary [d], Omkant Chaudhary [e], Franck Giazzi [b], Jake Rom D. Cadag [f]

[a] School of Environment, The University of Auckland, Auckland 1142, New Zealand
[b] UMR 5194 PACTE – CNRS, Université de Grenoble, France
[c] Koshi Victims Society, Nepal
[d] Department of Rural Development, Tribhuvan University, Nepal
[e] Green Secondary School, Rajbiraj, Nepal
[f] UMR GRED, Institut de Recherche pour le Développement, France

Keywords:
Participatory 3-dimensional mapping
Climate change adaptation
Disaster risk reduction
Caste
Nepal

A B S T R A C T

This article reflects upon the use of participatory 3-dimensional mapping (P3DM) for facilitating the collaboration of different castes in disaster risk reduction (DRR) and climate change adaptation (CCA). Unequal power relationships amongst upper and lower castes has indeed been identified has a major driver of people's vulnerability to natural hazards, including the negative effects of climate change, in Nepal and elsewhere in South Asia. However, this does not prevent the members of all these castes, including the lowest untouchables, to display significant capacities in facing these natural hazards and changes in climate patterns. It is therefore similarly important to harness those capacities and address the unequal power relationships underpinning vulnerability. Achieving these goals requires fostering dialogue amongst upper and lower castes as well as with other stakeholders of DRR and CCA, e.g. scientists, NGOs, government agencies, which often tend to work with a single caste because it is easier. P3DM provides a platform for such a dialogue as it makes the knowledge of every caste tangible and credible to others. This proves essential in both assessing and planning for reducing the risk of disasters and adapting to climate change. This article particularly documents activities conducted in a small village of the Terai plain of Nepal frequently affected by flooding.

Introduction

Overcoming unequal power relationships amongst castes in South Asia has been considered as a major challenge to sustainable disaster risk reduction (DRR) and climate change adaptation (CCA) (e.g. Bosher, Penning-Rowsell, & Tapsell, 2005; Hartmann & Boyce, 1983; Jones & Boyd, 2011; Onta & Resurreccion, 2011; Ray-Bennett, 2009; Winchester, 1992). Such power relations have been identified as a major driver of people's vulnerability in facing natural hazards, including the negative effects of climate change (Gaillard, 2012). Vulnerability reflects people's inability to access resources and means of protection that are available to those with more power. In South Asia, many studies have shown that means of protection are most often available locally but these are only accessible to those castes of higher status (e.g. Bosher, 2007; Hartmann & Boyce, 1983; Onta & Resurreccion, 2011). Vulnerability in facing natural hazards is thus deeply rooted within the structure of the society and this is beyond the reach of those who are vulnerable (Wisner, 1993; Wisner, Blaikie, Cannon, & Davis, 2004). In this context, reducing people's vulnerability is a difficult task that warrants the contribution of stakeholders with power outside of local communities (Gaillard, 2010).

Such situations do not prevent the members of all castes, including the lowest untouchables, to display significant capacities in facing natural hazards and changes in climate patterns (e.g. Adhikari & Bohle, 2008; Dekens, 2009; Dixit, Parajuli, & Guragain, 2004; Prindle, 1979). Capacities refer to the sets of endogenous knowledge, skills and resources people resort to in dealing with natural hazards and disasters (Cadag & Gaillard, 2013). The concept of capacity also encompasses the ability to claim, access and use

* Corresponding author. Tel.: +64 (0)9 923 9679.
E-mail address: jc.gaillard@auckland.ac.nz (J. Gaillard).

0143-6228/$ – see front matter © 2013 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.apgeog.2013.09.009

these knowledge, skills and resources (Kuban & MacKenzie-Carey, 2001). Capacities are not the opposite end of vulnerability on a single spectrum, because highly vulnerable communities may display a large array of capacities (Davis, Haghebeart, & Peppiatt, 2004). In fact, capacities are most often rooted in knowledge, skills and resources which are endogenous to the community and which rely on local knowledge, indigenous skills and technologies, traditional medicine and solidarity networks. In this sense, enhancing people's capacities is often much more accessible and easier than reducing vulnerability. It mostly requires the contribution of local communities (Gaillard, 2010).

Reducing the risk of disaster and enhancing people's adaptation to climate change is therefore a complicated task which involves actions from the top down, to address the root causes of vulnerability, and from the bottom up, to harness people's capacities (Gaillard & Mercer, 2013). Achieving such goals requires a preliminary holistic assessment of disaster risk and adaptation needs and opportunities based upon both local and scientific or outside knowledge to fully appraise the extent of both the vulnerability and capacities. A close collaboration is thus needed between a large array of stakeholders from inside and outside local communities. Such collaboration must rely upon dialogue and trust amongst stakeholders, including across castes of different status. Gaillard and Mercer (2013) have suggested a road map for achieving DRR and CCA through integrated disaster risk assessment, dialogue amongst stakeholders and both top-down and bottom-up actions (Fig. 1). Such a road map will constitute the framework for fostering the participation of different castes in both DRR and CCA as described in this article.

Indeed, at present, most of the projects conducted in South Asia have failed to involve different castes and have thus overlooked the importance of power relations (Bosher, 2007; Bosher et al., 2005). In consequence, DRR and CCA still prove challenging (Jones, 2010; Jones & Boyd, 2011; Winchester, 1992). One of the reasons for the lack of dialogue amongst castes and between different castes and outside stakeholders is the lack of appropriate tools to level down power relations and gather different actors around the same table at the same time (Gaillard & Mercer, 2013).

A tool that has recently been identified for its potential in fostering dialogue amongst stakeholders of DRR and CCA is participatory 3-dimensional mapping or P3DM (Cadag & Gaillard, 2012; Gaillard & Maceda, 2009). The present study documents a particular project where P3DM has been used for facilitating dialogue in view of DRR and CCA in a multi-caste context in Nepal. It contributes to the growing geographic literature dedicated to improving DRR and CCA policy and practice in a wide range of contexts and using a large array of different methods, including mapping tools (e.g. Collins, Grineski, & Aguilar, 2009; Jeffers, 2013; Kappes, Papathoma-Köhle, & Keiler, 2012).

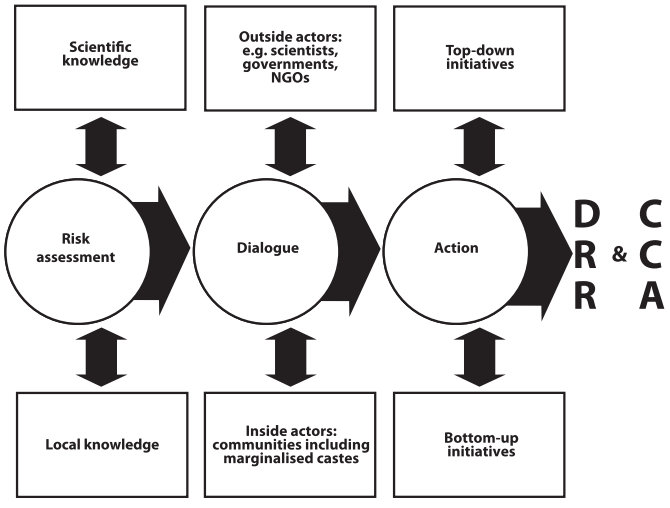

Fig. 1. Road map for disaster risk reduction and climate change adaptation (adapted from Gaillard & Mercer, 2013).

Participatory 3-dimensional mapping for disaster risk reduction and climate change adaptation

Participatory 3-dimensional mapping (P3DM) consists of building stand-alone relief maps made of locally available and cheap materials (e.g. carton, paper, cork, crepe sole) over which people overlap thematic layers of geographic information. It enables the mapping of landforms and topographic landmarks, including land cover and use, and anthropogenic features, which are depicted by push-pins (points), yarn (lines), and paint (polygons).

P3DM, as a tool and method, emerged in the early 1990s in the Philippines and Thailand for facilitating natural resource management and land conflict resolution, especially among marginalised ethnic groups and indigenous people (Rambaldi, Bugna, Tiangco, & de Vera, 2002). To serve their purpose, maps had, back then, scales which ranged from 1:5000 to 1:20,000 to cover large tracts of land. These maps contribute to raising local awareness of territories and serve as effective community-organising tools (Rambaldi, Mendoza, & Ramirez, 2000, Rambaldi et al., 2002). In fact, natural resource management has, in numerous instances, been enhanced and many territorial conflicts, including tribal wars, have been resolved through the use of P3DM (e.g. Rambaldi et al., 2002, 2006; Rambaldi, Muchemi, Crawhall, & Monaci, 2007). This form of P3DM has thus spread quickly throughout the world with numerous experiences in Asia, Africa and Latin America as documented in the Integrated Approaches to Participatory Development (IAPAD) website (http://ppgis.iapad.org/). In some few recent instances small-scale P3DM has also been applied to DRR and CCA (Capelao, 2007; Dwamena, Banaynal, & Kemausuor, 2011; Rambaldi, 2012; Ririmae & Hardcastle, 2011).

Since 2007, P3DM has further been applied to DRR and CCA using large scales, ranging from 1:500 to 1:1500, to plot details at the household level (Cadag & Gaillard, 2012; Gaillard & Maceda, 2009). Land use and other geo-referenced features threatened by natural hazards and climate change are plotted and differentiated according to their vulnerability using yarns and paint. Pins of different shapes, sizes and colours enable distinguishing building materials and locating the most vulnerable people in the community. It is also possible to identify the different resources which compose the household livelihoods, land tenure and some forms of power relationships within the community. People also delineate hazard-prone areas and locate local resources to face these threats. It is then easy and quick to evaluate disaster risk based on hazards, threatened assets, vulnerabilities and capacities. P3DM then enables the planning of DRR and CCA measures based on multi-stakeholder group discussions over the map, helping to find consensus among participants.

This kind of P3DM has proved particularly useful in fostering dialogue amongst a large range of stakeholders of DRR and CCA, i.e. scientists, government officials, NGOs, school communities, faith groups, and local communities, thus enabling the integration of bottom-up and top-down risk reduction measures (Cadag & Gaillard, 2012; Gaillard & Maceda, 2009) as suggested by Gaillard and Mercer (2013) in their road map. It provides a tangible tool where the most marginalised people can discuss DRR with scientists. All stakeholders can contribute their knowledge on the same