Environmental Science & Policy xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

Environmental Science & Policy

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

Adapting to risk and perpetuating poverty: Household's strategies for managing flood risk and water scarcity in Mexico City

Hallie Eakin[a,*], Amy M. Lerner[b], David Manuel-Navarette[a], Bertha Hernández Aguilar[b], Alejandra Martínez-Canedo[b], Beth Tellman[a], Lakshmi Charli-Joseph[b], Rafael Fernández Álvarez[b], Luis Bojórquez-Tapia[b]

[a] School of Sustainability, Arizona State University (ASU), P.O. Box 875502, Tempe, AZ 85287-5502, USA
[b] Laboratorio Nacional de Ciencias de Sostenibilidad (LANCIS), Instituto de Ecología, Universidad Nacional Autónoma de México (UNAM), P.O. Box 70-275 Ciudad Universitaria UNAM, Mexico City 04510, Mexico

ARTICLE INFO

Article history:
Received 4 February 2016
Received in revised form 21 May 2016
Accepted 8 June 2016
Available online xxx

Keywords:
Adaptive capacity
Flooding
Water scarcity
Poverty traps

ABSTRACT

Adaptation is typically conceived uniquely in positive terms, however for some populations, investments in risk management can entail significant tradeoffs. Here we discuss the burden for households of coping with, and adapting to, adverse water conditions in economically marginal areas of Mexico City. We argue that households' efforts to adapt in conditions of marginality can come at the expense of households' investment in other aspects of human welfare, reinforcing poverty traps. Both economic theory and social-ecological systems analysis point to the importance of cross-scalar investments and institutional support in breaking down persistent poverty traps. Using data from twelve focus groups conducted in Mexico City, we illustrate how such cross-scale connectivity is failing as a result of lack of trust and transparency, the difficulty of collective action, and the devolution of some responsibilities for risk management from the public sector to the household level. We conclude our analysis by arguing for greater attention to these tradeoffs in public policy to help ensure that adaptation does not come at the cost of more generic welfare gains among the most vulnerable populations.

1. Introduction

The concept of "poverty trap" is used in both development economics and in social-ecological system analyses to describe the existence of a persistent, undesirable system state. In the development field, poverty traps refer literally to intransigent conditions of chronic poverty that prove resistant to interventions to improve welfare. In essence, the condition of poverty itself creates reinforcing feedbacks that maintain that condition over time (Banerjee and Duflo, 2011). Social-ecological systems analysis employs the term "poverty trap" to describe a phase of system dynamics characterized by a lack of capacity for consolidation and connectivity, and thus resistance to change (Carpenter and Brock, 2008). In both literatures, poverty traps are conceived as stable states that are self-reinforcing through internal feedbacks, but that can also be externally reinforced from spillover effects originating at other levels of system organization (Barrett and Swallow, 2006). Consequently, a system's capacity to move toward a wealthier stable dynamic equilibrium, or to remain in a poverty trap, will depend not only on the system's internal capacities, but also on the shocks and transfers from or to other systems and scales.

In this paper we use the concept of poverty traps to focus on the burden of adaptation among economically marginalized households in Mexico City. Coupling the concept of poverty traps with insights into differential capacities for adaptation at the household level, we argue that tradeoffs among investments in risk management (a households' *specific capacity*) and investments in more general future human welfare (*generic capacities*) contribute to maintaining poverty traps (Eakin et al., 2014). Our aim is to inform the design of interventions to improve endogenous capacities that can be used to move the system away from poverty traps, while also supporting efforts to manage water-related risks. Analyzing focus group interview data, we present the different strategies that households use to manage water-related risk and stress. We situate these strategies in the institutional context of household decision-making to evaluate the implicit and explicit costs associated with strategies that, on the surface, appear to be successful local adaptations to uncertain and adverse

* Corresponding author.
E-mail address: Hallie.Eakin@asu.edu (H. Eakin).

http://dx.doi.org/10.1016/j.envsci.2016.06.006
1462-9011/

conditions. We argue that these adaptations, in the context of the particular institutional environment of Mexico City's water sector, can result in reinforcing the political-economic status quo, undermining the potential for more profound systemic transformation. We argue that the adaptations of households to chronic risk essentially break down feedback mechanisms between residential experience and public sector responsibility, leading to inequity in the burden of risk management that hinders the endogenous investment in the generic capacities – health, income, education – that are critical to overcome poverty traps.

2. Poverty and adaptation

Income poverty and asset deficiencies are strongly associated with vulnerability to environmental stress. Not only are the poor more likely to reside and work in areas of high exposure to risk, but also the poor tend to have fewer savings and assets at their disposal with which to cope and adapt to stress. Nevertheless, the relationship between poverty and vulnerability to environmental stress is not a simple one (Lemos et al., 2007, 2013; Dercon, 2005; Heltberg et al., 2009).

In the climate change literature, an adaptation – or an action, process, or activity designed to reduce the adverse outcomes (or take advantage of opportunities) posed by climatic variability and change (Smit and Wandel, 2006) – is typically defined, *a priori,* as good and desirable if it results in a reduction of exposure or sensitivity to climatic shocks or change (see discussion in Eriksen et al., 2015). Households that lack access to safety nets and formal institutional risk-mitigating support programs must address their risk autonomously, or, where collective action is possible, at the level of local communities (Agarwal and Perrin, 2008). Their strategies can involve pooling risk in different ways to alleviate the individual burden of harm: across space (mobility), across time (storage), across assets (diversification), across social networks or households (communal pooling) and through exchange (e.g., accessing storage, mobility, diversification, social networks etc. through markets mechanisms) (Agarwal and Perrin, 2008).

Nevertheless, there may be real trade-offs to adaptation, as effective management of some particular risks may create opportunity costs affecting other forms of investment for future wellbeing (Dercon, 2005). These costs can be substantial: requiring not only financial liquidity, but also bundles of human capital (education, labor, time), social capital (collective action, trust, participation), political capital (ties to actors of greater influence), and material and natural assets ("infrastructure" broadly defined). The "lumpiness" of many investments in risk management also creates significant barriers: it isn't enough to make incremental adjustments to livelihoods and assets; adaptation can require the investment of significant capital all at once (Barrett and Swallow, 2006; Nicol and Kaur, 2008).

Disaggregating the capacities required for adaptation and adjustment to risk into generic and specific capacities offers analytical traction in the challenge elucidating the linkages between poverty and adaptation (Lemos et al., 2013; Eakin et al., 2014). Generic capacities, such as education, health status, wealth, and information access/use, are those that are associated with an individual or households' ability to manage a wide diversity of stressors and shocks. For example, households with savings and stable income are more likely to have financial assets to invest in measures that will reduce future risk, and can often recover more quickly from shocks (Morton, 2007). Households that are healthy or educated are more likely to be able to flexibly deploy their labor, knowledge and other assets to cope with economic, environmental or other disturbances and respond to opportunities (O'Brien et al., 2009). In contrast, specific capacities are those capacities that are more narrowly focused on mediating a particular type of risk, e.g., use of climate hazard insurance, climate forecasts, ownership and use of infrastructural barriers or defenses, or use of technological innovations designed to reduce its sensitivity to a specific environmental hazard.

It is often assumed that capacity attributes are inherently additive: whether specific or generic, "more is better" (Lemos et al., 2013). However, capacities may not always work synergistically, and it is probable that investments in some capacities entail tradeoffs. These tradeoffs may manifest themselves differently depending on an actor's or community's initial endowments and the institutional context of risk management (Eakin et al., 2014). For example, impoverished households with limited assets facing significant variability in their environment may decide to allocate scarce resources to risk management with the aim of providing some stability in consumption (Heltberg et al., 2009). Yet this investment comes at a cost: they may have fewer assets to invest in those capitals that are only likely to generate adaptive benefits in the longer-term, such as education or health. Poverty traps are defined by these tradeoffs: the priorities of risk management for the impoverished today inhibit the ability to invest in the capacities that would substantially improve both welfare and risk management tomorrow (Barrett and Swallow, 2006; Dercon, 2005).

In social-ecological systems analysis, poverty traps are typically explored through the heuristic of the adaptive cycle (Gunderson and Holling, 2001). The adaptive cycle brings attention to disturbance and shocks, and the capacity of systems (including both social and ecological elements) to reorganize, consolidate and recover. In the adaptive cycle or "lazy eight" heuristic, system dynamics are described as a process of wealth (e.g., biomass, assets, or infrastructure) creation, concentration and connectivity ("k" or conservation phase), often followed by a "collapse" or release phase ("Ω"), reorganization ("α"), exploitation ("r"), through back into the "k" phase (Fig. 1). Here poverty traps are system states that remain in chronic states of low connectedness (or internal controllability) and potential (wealth), in other words, the system is unable to transition out of the exploitation phase ("r") (Fig. 1).

The adaptive cycle is typically used to describe natural-resource based systems, and has been critiqued from the social sciences as inadequately accounting for the political nature of human behavior and social interactions (Davidson, 2010; Pelling and Mauel-

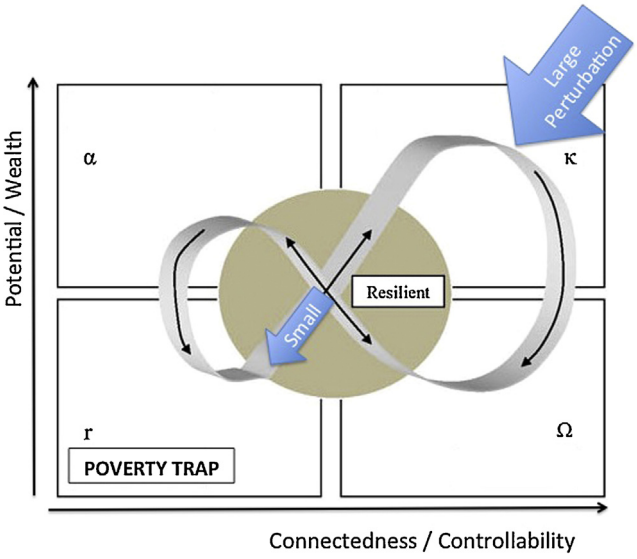

Fig. 1. The adaptive cycle heuristic.
Source: Derived from Carpenter and Brock (2008).

Please cite this article in press as: H. Eakin, et al., Adapting to risk and perpetuating poverty: Household's strategies for managing flood risk and water scarcity in Mexico City, Environ. Sci. Policy (2016), http://dx.doi.org/10.1016/j.envsci.2016.06.006