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The Causal Structure of Vulnerability: Its Application to Climate Impact Analysis

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From Impact Analysis to Vulnerability Analysis

Climate impact analysis is a way of looking at the range of consequences of a given climatic event or change (Rosenzweig and Parry 1994; Rosenberg and Crosson 1992). For instance, drought – however defined – is associated with a number of outcomes. Impact assessments begin by mapping out direct physical consequences of a climatic event or change, such as, reduced crop yields; livestock losses; reservoir depletion; hydroelectric interruptions; drinking-water shortages or quality changes; dry-land degradation; or forest die back. These direct outcomes are then traced to social consequences, such as, forced sales of household assets or land; further ecological losses such as soil erosion and deforestation from people trying to cope with the other losses by drawing more heavily on their remaining natural resources; speculative price rises driving food prices out of the range of the poorest households; dislocations resulting in out-migration to shanty towns and farther frontiers, destitution or servitude; disease outbreaks; hunger; or famine (cf. Wilhite and Glantz 1987, pp. 19–24; Parry and Carter 1987, pp. 170–171.)

But, it is misleading to designate these outcomes as "impacts" of climate variability or change. This type of "impact" analysis implicitly attributes to nature causality that can be directly and more productively traced to social organization. *Vulnerability analysis* provides a basis for tracing out social causality. Vulnerability analysis turns "impact" analysis on its head by examining the multiple causes of critical outcomes – dislocation, hunger, famine – rather than the multiple outcomes of a single event (Downing 1991; 1992). It traces outward from each instance of vulnerability the multiple physical, social and political-economic causal agents and processes. In doing so, it places climatic events among the social and political-economic relations and processes that shape the negative consequences with which we are concerned. By linking climate-associated "impacts" (or outcomes) to causality, vulnerability analysis can also provide a sound basis for policy, since it is through responding to its causes that vulnerability can be redressed.

The methods for analysis of vulnerability – developed from the work of Amartya Sen (1981) – lay the groundwork for examining causality in a systematic way. Examining vulnerability to hunger and famine, Sen begins at the household level with what he calls entitlements (1981; 1989). A household's food entitlement consists of the food that the household can obtain through production, exchange, or extra-legal legitimate conventions – such as reciprocal relations or kinship obligations (Drèze and Sen 1989). A household's assets, or endowment, include investments in productive assets; stores of food or cash; and claims on other households, patrons, chiefs, government or on the international community, that a household can make. In the words of Swift (1989, p. 11), "Assets create a buffer between production, exchange and consumption". They form the basis of a household's entitlements. In turn, assets depend on the ability of the household to produce a surplus that they can store, invest in material goods and markets, or in the maintenance of social relations (cf. Scott 1976; Berry 1993).

Vulnerability in this framework is the risk that the household's entitlements will fail to buffer against hunger, famine, dislocation or other losses. The power of this analytic framework is that from each instance of entitlement failure – that is each instance in which a household's production, investments, stores and claims are insufficient to sustain them – chains of causality can be traced out. From an understanding of causality, we can move toward policies to reduce the vulnerability which is located at the confluence of these causal chains (Jessop 1990, p. 13).

The Household Perspective on Vulnerability

Through a household perspective on vulnerability, climatic and other environmental phenomena can be understood socially. By focusing on the household authors such as Sen (1981), Blaikie (1985), and Blaikie et al. (1994) have replaced eco-centric models of natural hazards and environmental change with social models in which environmental fluctuations and changes - in climate, forests or soils - are located among the other material and social conditions shaping and shaped by household well being (see Watts 1983). By incorporating environment (including climate) into a social framework, the environment may appear to become marginalized - set as one among many factors affecting and affected by production, reproduction and development. But, this does not diminish the importance of environmental variability and change. Indeed, it strengthens environmental arguments by making it clear how important - in degree and manner - the quality of natural resources is to social well being. These household-based social models also illustrate how important it is that assets can help cope with or buffer against these environmental variations and changes so that the activities of production and reproduction on the land are not undermined by and do not undermine the natural resources on which they depend.[2)]

Watts and Bohle (1993), building upon Drèze and Sen's (1989) analysis of entitlements, argue that vulnerability is configured by the mutually constituted triad of entitlements, empowerment and political economy. Here, empowerment is the ability to shape the political economy that in turn shapes entitlements. Drèze and Sen (1989, p. 263) have empirically observed the role of certain types of political enfranchisement in reducing vulnerability - particularly the role media can play in creating a legitimation crisis in liberal democracies. Watts and Bohle have situated Sen and Drèze's analysis in a broader theoretical framework, allowing for a more systematic analysis of the political economy of the production and reproduction of vulnerability. Their analysis illuminates the role of empowerment through enfranchisement in redressing the inequities ongoing political-economic processes produce.

Vulnerability to hunger, famine, dislocation or material loss results from the dynamics of the social system in which agricultural and pastoral households are located. Vulnerability is shaped by ongoing political-economic processes of extraction, accumulation, social differentiation and marginalization, within a given set of property relations (ownership and access) shaped by relations among various groupings within society (eg class, caste, or professional groups). These relations are mediated by state policies (such as development policies, social security policies, and patterns of enforcement). The resulting distribution of material stocks and of access to income opportunities, land, and other material resources as well as access to formal and informal social security arrangements (eg entitlements) spells out the material and social conditions underlying vulnerability for some households and security for others. In short, the distribution of entitlements is produced by a set of ongoing political- economic processes in which household's are embedded.

In Search of "Root Causes" of Vulnerability[3)]

Correlations between the results of these processes and vulnerability are plentiful. For example, vulnerability is a function of the relative status of socioeconomic groups. It is a function of income or class as well as caste, clan, religion, political party, livelihood, race, ethnicity, family, gender and age (Sen 1981; Drèze and Sen 1989; Chambers 1989; Swift 1989; Agarwal 1993, Wisner 1993). Different socioeconomic groups have differing assets as well as differing patterns of access to productive resources. Their assets and access are critical aspects of their vulnerability. Vulnerability also is a function of the type of production system and degree of development (Wilhite et al. 1987, p. 558). For subsistence farmers, even a short-term drought can be disastrous, especially for the peasant farmer whose only security is a small piece of land on which to grow food and some cash crops. If seasonal rains fail, no alternative supply of water is available to sustain growth. The result is critical shortages of food, inadequacy of grazing land, suffering and possibly loss of life for both human beings and livestock. The lack of adequate infrastructure (related to the lack of proactive government programs) and the high price of grain from external markets may also spell vulnerability by producing or exacerbating or by impeding governmental ability to assist inhabitants of such distressed areas.

Knowing that vulnerability to dislocation, hunger or famine are a function of geographic location, production system, social identity and income is a first step in evaluating vulnerability. But, this does not tell us why people end up on sub-marginal lands. To understand how these conditions are arrived at requires a historical analysis of causality. The causes of such spatial and economic marginality, and hence vulnerability could be partly a function of processes of land concentration, as is the case in Brazil's Northeast (Magalhães 1992; Rodriguez 1992; Demo 1989). It could be due to the inability of a farm household to accumulate sufficient capital to invest in the maintenance of the land, or to have sufficient assets to buffer against the consequences of a drought (Blaikie 1985; Downing 1991). Vulnerabilities may be results of class or social-status based lack of access to inputs to the productive process. Often it is due to integration into fluctuating markets or to the classic case of declining producer prices with increasing input and consumption-good prices, as in a "simple-reproduction squeeze" (Bernstein 1979; Blaikie 1985; Sen 1987; Wisner 1988, pp. 146-86; Swift 1989; Heathcote in Ribot et al., forthcoming).

Examining the causes of vulnerability historically can demonstrate how it is formed by these broader social and political-economic processes. Causal relations in the historical and contemporary production and reproduction of vulnerability occur at the level of the state, region, community, and household. While drought, floods, commodity price fluctuations and conflict trigger crises, historical analysis can locate the causes of vulnerability in the face of these events in the longer-term production of vulnerability through state policies, class relations, and demographic shifts. State policies have played major roles in both security and vulnerability through their effects on resource access and population movements. These policies of the state range from the creation of spatial and class inequalities in colonial and contemporary periods, land- tenure and economic arrangements, to supports for the occupation of marginal lands. State development policies and processes have relegated some regions or classes to higher vulnerability while aiding others.[4] Vulnerability has been shaped through the allocation of state funds and through the structuring of class-differentiated access to alternative income generating opportunities and access to productive resources such as land, irrigation, credit, fertilizer, and improved seed.

Vulnerability can also be created by forces pushing and pulling people of particular classes down the rainfall gradient into more and more marginal lands (Glantz in Ribot et al. 1995).

Wealth Accumulation and Vulnerability

Climate variability effects rich as well as poor sectors of society. But, while hunger, famine and dislocation tend to threaten the poor, economic losses threaten the better off. Those who are well off may experience great material losses without ever going hungry. Thus, policies targeting both food security and economic security may be in order. But accumulation on the part of the wealthy, and policies justifying or structurally disposed to economic growth in already more economically productive regions or on larger farms, have often been part and parcel of the problem of marginalization - marginalization being a flip side of concentration of wealth. Hence, special attention must be placed on intervening in ways that do not exacerbate marginalization and vulnerability by reinforcing existing inequalities and ongoing differentiation processes. That is, policies must acknowledge the role of accumulation and the lack of it in creating and maintaining vulnerability. It must also be kept explicitly in mind that those with wealth do not feel the effects of subsistence vulnerability directly, but rather through the costs - economic and political - of other's vulnerability and related crises. How the wealthy experience the vulnerability of marginalized populations is critical for policy response, since the wealthy are often those making decisions that affect or redress the problems that vulnerability produces.

In short, accumulation and concentration of wealth usually shifts resources from the poor to the rich. The poor are further marginalized. Blaikie and Brookfield (1987) identify three sorts of marginality that interact with each other intensely: political, economic, and ecological. Lack of access to political power, especially in situations where the post-colonial state controls many vital resources, cuts people off from economic opportunities. Economic marginality refers to weak market position, high costs of production due to distance and lack of infrastructure, etc. Ecological marginality arises when groups are pushed down the rainfall gradient or into other environments where there are severe physical limitations to production. The combination of the three can cause people to mine their remaining natural resources, which only increases their vulnerability.

Accumulation and concentration of wealth by a rich minority can contribute directly to the ecological decline that makes marginal populations more vulnerable. Pesticide and fertilizer overuse, uncontrolled effluents, and speculative deforestation are all associated with the accumulation process. These insults all increase vulnerability of marginal populations. They too must be taken into account in evaluating both environmental decline and vulnerability.

Empowerment and Capacity Building

The fact that vulnerability is produced by ongoing processes must be considered in responses. While inequalities can be observed - in a static sense - to be the basis of vulnerability, redistribution of material wealth and reform of the legal or informal rules of access to resources will continue to be subject to these processes. Inequities will continually re-emerge. Thus, there is a need to go beyond redistribution to identify and nurture ongoing countervailing processes. Watts and Bohle's (1993) formulation links entitlements back to political economy via enfranchisement. Enfranchisement through empowerment provides a counter balance to the ongoing political-economic processes that produce vulnerability. This formulation can help to direct policy makers to focus on these processes, in addition to the static material conditions that indicate who is vulnerable and how vulnerable they are. Indicators can help us evaluate where policy attention is most needed, but historical analysis can help us identify the processes that need to be confronted if vulnerability is to be reduced.

The result of effective empowerment and enfranchisement should be increased capacity to cope with extreme events. Capacity is the opposite of vulnerability (Anderson and Woodrow 1987). Indeed, a possible definition of sustainable development would include the movement from less to greater capacity to cope with environmental variability and change.

Footnotes

1) This paper draws on the analysis of vulnerability developed by Watts and Bohle (1993), from which the title "The Causal Structure of Vulnerability" originates. I owe great thanks to Michael Watts for comments on earlier drafts and to Ben Wisner for editorial assistance. This paper is derived from the introduction to Ribot et al. 1995.

2) Household models are often limited by their failure to account for intra-household dynamics of production and reproduction, but they do not have to be. See for example, Guyer 1981; Guyer and Peters 1987; Carney 1988; Hart 1992; Agarwal 1993; and Schroeder 1992.

3) Blaikie et al. (1994, pp. 22–29) work backward as they seek a "chain of explanation" for household vulnerability from "unsafe conditions" to "dynamic pressures" and, ultimately, to "root causes". The last concern access to power, institutions, and resources as well as the overall structure of the political and economic system.

4) Observations on the effects of state policies are drawn from the work of a number of the contributors to a forthcoming volume on climate variability and change (Ribot et al., forthcoming), covering a variety of countries including Mexico, Kenya, China, Australia, and Brazil.

References

Agarwal, B.: Social Security and the Family: Coping with Seasonality and Calamity in Rural India. Agriculture and Human Values, 156–165 (Winter-Spring 1993)

Anderson, M.; Woodrow, P.: Rising from the Ashes: Development Strategies in Times of Disaster. Westview and UNESCO, Boulder and Paris 1989.

Bernstein, H.: African Peasantries: A Theoretical Framework. Journal of Peasant Studies 6,4, 420–443 (1979)

Berry, S.: No Condition is Permanent: The Social Dynamics of Agrarian Change in Sub-Saharan Africa. The University of Wisconsin Press, Madison 1993.

Blaikie, P.: The Political Economy of Soil Erosion in Developing Countries. Longman, London 1985.

Blaikie, P.; Cannon, T.; Davis, I.; Wisner, B.: At Risk: Natural Hazards, People's Vulnerability, and Disaster. Routledge, London 1994.

Carney, J.: Struggles over Land and Crops in an Irrigated Rice Scheme. In: Davidson, J. (ed.), Agriculture, Women and Land: The African Experience. Westview Press, Boulder CO 1988.

Demo, P.: Methodological Contributions Towards Societal Drought-Management Practices. In: Magalhaes, A. (ed.), Socioeconomic Impacts Of Climatic Variations and Policy Responses in Brazil. UNEP, Fortaleza-Ceará, Brazil 1989.

Downing, T.: Assessing Socioeconomic Vulnerability to Famine: Frameworks, Concepts, and Applications. Final Report to the US Agency for International Development, Famine Early Warning System Project, January 30, 1991.

Downing, T.: Vulnerability and Global Environmental Change in the Semi-arid Tropics: Modelling Regional and Household Agricultural Impacts and Responses. Presented at ICID, Fortaleza-Ceará, Brazil, January 27 to February 1, 1992.

Drèze, J,; Amartya S.: Hunger and Public Action. Clarendon Press, Oxford 1989.

Glantz, M.; Drought Follows the Plow: Cultivating Marginal Areas. In: Ribot, J.; magalhães, A.; Panagides, S.: Climate Change, Climate Variability and Social Vulnerability in the Semi-Arid Tropics. Cambridge University Press, Cambridge 1995.

Guyer, J.: Household and Community in African Studies. African Studies Review 24, 2–3 (1981)

Guyer, J.; Peters, P.: Introduction. Special Issue on Households. Development and Change 18, 197–214 (1987).

Hart, G.: Household Production Reconsidered: Gender, Labor Conflict, and Technological Change in Malaysia's Muda Region. World Development 20,6, 809–823 (1992).

Jessop, B. State Theory: Putting the Capitalist States in Their Place, University Park: The Pennsylvania State University Press, University Park 1990.

Parry, M.; Carter, T.: Climate Impact Assessment: A Review of Some Approaches. In: Wilhite, D.; Easterling, W. with Wood, D. (eds.), Planning for Drought: Toward a Reduction of Social Vulnerability. Westview Press, Boulder CO 1987.

Ribot, J.; Magalhães, A.; Panagides, S.: Climate Change, Climate Variability and Social Vulnerability in the Semi-Arid Tropics. Cambridge University Press, Cambridge 1995

Rodrigues, V, et al.: Evaluation of Desertification Scene in the Northeast of Brazil: Diagnoses and Prospects. Presented at. ICID, Fortaleza-Ceará, Brazil, January 27 to February 1, 1992.

Rosenberg, N.; Crosson, P. Understanding Regional Scale Impacts of Climate Change and Climate Variability: Application to a Region in North America with Climate Ranging from Semi-arid to Humid. Presented at ICID, Fortaleza-Ceará, Brazil, January 27 to February 1, 1992.

Rosenzweig, C.; Parry, M. Potential Impacts of Climate Change on World Food Supply. Nature 367, 133–138 (1994)

Schroeder, R.: Shady Practice: Gendered Tenure in The Gambia's Garden/Orchards. Paper Prepared for the 88th Annual Meeting of the Association of American Geographers, San Diego, CA, April 18–20, 1992.

Scott, J.: The Moral Economy of the Peasant. Yale University Press, New Haven 1976.

Sen, A.: Research for Action: Hunger and Entitlements. World Institute for Development Economics Research, United Nations University, Helsinki 1989.

Sen, A.: Poverty and Famines: An Essay on Entitlement and Deprivation. Oxford University Press, Oxford 1981.

Swift, J.: Why are Rural People Vulnerable to Famine? IDS Bulletin, 20,2, 8–15 (1989)

Watts, M.: On the Poverty of Theory: Natural Hazards Research in Context. In: Hewitt, K. (ed.), Interpretations of Calamity. Allen Unwin Publishers, London 1983.

Watts, M.; Bohle, H.: Hunger, Famine and the Space of Vulnerability. GeoJournal 30,2, 117–26 (1993)

Wilhite, D.; Easterling, W. with Wood, D. (eds.), Planning for Drought: Toward a Reduction of Social Vulnerability. Westview Press, Boulder CO 1987.

Wilhite, D.; Glantz, M.: Understanding the Drought Phenomenon: The Role of Definitions. In: Wilhite, D.; Easterling, W. with Wood, D. (eds.), Planning for Drought: Toward a Reduction of Social Vulnerability. Westview Press, Boulder CO 1987.

Wisner, B.: Power and Need in Africa: Basic Human Needs and Development policies. Earthscan Publications, London 1988.

Wisner, B.: Disaster Vulnerability: Scale, Power and Daily Life. GeoJournal 30,2, 127–40 (1993)