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The U.S. Government's Global Hunger & Food Security Initiative

Community Resilience: Conceptual Framework and Measurement Feed the Future Learning Agenda

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USAID

FROM THE AMERICAN PEOPLE

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LIST OF ACRONYMS

ACCRA	Africa Climate Change Resilience Alliance
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
HLM	Hierarchical Linear Modeling
IFAD	International Fund for Agricultural Development
ITC	International Transhumance Certificate
NGO	Non-Governmental Organization
OECD	Organization for Economic Co-operation and Development
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

USAID defines resilience as "the ability of people, households, communities, countries, and systems to mitigate, adapt to, and recover from shocks and stresses in a manner that reduces chronic vulnerability and facilitates inclusive growth" (USAID, 2012). As part of the broader USAID Feed the Future Learning Agenda, the agency seeks to operationalize and measure resilience, recognizing that there is ongoing debate over definitions of resilience and measurement approaches. These questions are under examination in a range of academic fields and by the community of development practitioners, as evidenced by initiatives such as the Technical Working Group on Resilience Measurement and the recent Expert Consultation on Resilience Measurement for Food Security.

This paper seeks to advance the discussion by focusing specifically on a conceptual framework for the measurement of community resilience. It is intended for use by donors and implementing partners, non-governmental organizations, multilateral organizations, and government and community stakeholders seeking to apply a resilience measurement framework to policy and programming of development initiatives. It is envisioned as especially relevant in areas with highly vulnerable populations subject to ongoing shocks and stresses, where the effectiveness of past efforts to improve the situation has fallen short.

The focus on community reflects recognition that resilience manifests at several levels: individual, household, community, and higher-level systems (e.g., nations, ecosystems). The authors adopt the following definition of community resilience:

> *The general capacity of a community to absorb change, seize opportunity to improve living standards, and to transform livelihood systems while sustaining the natural resource base. It is determined by community capacity for collective action as well as its ability for problem solving and consensus building to negotiate coordinated response.* (Walker, Sayer, Andrew, & Campbell, 2010)

The authors endorse this definition because it underscores the main types of capital that are collectively managed (e.g., social and natural) and the distinctive aspect of community resilience: *the community's capacity for collective action*. This concept is at the heart of the proposed conceptual framework for community resilience. The objective of the framework is to provide a comprehensive understanding of the factors and processes influencing vulnerability and resilience at the community level. The main building blocks of community resilience include socioeconomic context, shocks, stresses, community livelihood assets, social capital, and community social dimensions. Together, these factors constitute the community's capacities for collective action that influence community resilience. Ultimately, the framework should help to explain why certain communities are relatively resilient, whereas others are on a descending pathway of vulnerability. The framework enables identification of the key leverage points to focus on as part of a theory of change, and the interventions that should be included in programs aimed at enhancing community resilience.

This conceptual framework identifies several categories of community assets that are essential to community resilience, placing special emphasis on a community's social capital. Strong social capital is the foundation of collective action, collaboration, and self-organization. The framework borrows from

Aldrich (2012) to describe three types of social capital that assist communities to prepare for, cope with, and recover from an array of shocks and stresses such as natural disasters, slow-onset shocks (e.g., drought), climate change, market shocks, and violent conflict.

- ***Bonding social capital*** is seen in the bonds between community members. It involves principles and norms such as trust, reciprocity, and cooperation, and is often drawn on in the disaster context, where survivors work closely to help each other to cope and recover.
- ***Bridging social capital*** connects members of one community or group to other communities/groups. It often crosses ethnic/racial lines, geographic boundaries and language groups, and can facilitate links to external assets and broader social and economic identities. Bridging social capital makes a direct contribution to community resilience in that those with social ties outside their immediate community can draw on these links when local resources are insufficient or unavailable (Wetterberg, 2004).
- ***Linking social capital*** is seen in trusted social networks between individuals and groups interacting across explicit, institutionalized, and formal boundaries in society. Linked networks are particularly important for economic development and resilience because they provide resources and information that are otherwise unavailable. This type of social capital is often conceived of as a vertical link between a network and some form of authority or power in the social sphere.

Communities with higher levels of bonding, bridging and linking social capital are inherently more resilient than those with only one type or none (Aldrich, 2012; Elliott, Haney, & Sams-Abiodun, 2010; Woolcock & Narayan, 2000).

Social capital is a driving force behind informal or customary institutions that make collective action possible. The paper describes these institutions in terms of structures, processes, and practices that a community engages in to achieve shared goals in the areas of disaster risk reduction, conflict mitigation, social protection, natural resource management, and in managing and maintaining public goods (e.g., schools, health clinics, roads). This may include mutual commitments to sharing food, water, labor, or child care in times of need; informal savings groups; community-based natural resource management; disaster committees; traditional mechanisms for conflict mediation and management; and voluntary initiatives to maintain public infrastructure such as feeder roads, public water pumps and irrigation systems. The community-based collective actions taken by these groups may be supported or constrained by formal or external initiatives. Governments and outside stakeholders must have a solid understanding and valuation of these traditional systems when planning community resilience strategies so as not to displace or hamper their effectiveness. The paper offers a few examples of how informal and formal systems can collaborate successfully.

The conceptual framework for community resilience is a basis for measurement. To gather information on the key indicators related to the community assets, social dimensions, and capacities for collective action described in the framework, a mixed-method approach is needed that combines quantitative and qualitative measures. Given the mix of tangible and intangible assets involved and the dynamic nature of each component, measurement should entail a combination of traditional outcome measures with process measures, as well as others that capture capacity. The paper proposes indicators for five types of collective action, which can be aggregated to create an index that is a proxy measure of community resilience capacity. There is nonetheless some complexity in weighting individual indicators so as to

reflect their relative influence on resilience. Community-based approaches to defining and measuring resilience can provide important insights here to customize the model to the local context.

To determine how community resilience interacts with other levels of resilience, such as household resilience, Hierarchical Linear Modeling (HLM) is introduced. HLM is highly applicable to understanding this interscalar dynamic because of the nested relationship between different levels of resilience. The effects of some intervention or set of conditions observed for each level are not independent of one another. HLM is a multilevel quantitative analysis technique that allows data on outcomes and their determinants at all relevant levels of analysis (household, community, and higher-level system) to be included in an integrated analysis. As a result, estimates of effects are less biased, and recommendations for practice tend to be more accurately targeted.

The authors recognize the wide range of approaches currently used to measure community resilience, and that it is critical to develop a set of harmonized standards, methods, tools, and indicators to guide resilience measurement for practitioners. This paper seeks to contribute to the ongoing collective effort by offering the community resilience conceptual framework and the corresponding measurement approach outlined in this paper. The main value added of these concepts is the emphasis placed on the key distinguishing attribute that differentiates community resilience from household resilience: the capacity for community collective action to manage shocks and stresses. Longer term, it is envisioned that continued assessment and identification of new indicators to better measure resilience will emerge as evidence accrues.

I. INTRODUCTION

USAID defines resilience as "the ability of people, households, communities, countries, and systems to mitigate, adapt to, and recover from shocks and stresses in a manner that reduces chronic vulnerability and facilitates inclusive growth" (USAID, 2012). It manifests at several levels: individual, household, community, and higher-level systems (e.g., nations, ecosystems). Development interventions and assessments of resilience usually focus on household resilience (Frankenberger & Nelson, 2013a), and most disaster research has focused on individual-level outcomes (Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008, p.133). To date, the tendency to focus on households has left a gap in our understanding of resilience at higher levels and makes it difficult to investigate resilience across multiple scales.

This paper examines resilience at the community level. A community is resilient when it can function and sustain critical systems under stress; adapt to changes in the physical, social, and economic environment; and be self-reliant if external resources are limited or cut off. One of the paper's main arguments is that the key characteristics distinguishing community resilience from individual and household resilience are social capital and collective action. These characteristics are important for differentiating conceptual and measurement aspects of community resilience from resilience at the individual and household levels. Without stores of communal social capital or the capacity to effectively engage in collective action, communities will be unable to achieve or maintain resilience in face of shocks and stresses. The varying degrees to which individual communities exhibit these characteristics result in heterogeneous pathways of community vulnerability or community resilience. More simply, the extent to which communities can effectively combine social capital and collective action in response to shocks and stresses is a defining feature of community resilience.

There is continuing debate over definitions, the suitability of outcome versus process indicators, and what subsystems and policy arenas are the subjects of resilience, which encumbers action and the task of measurement. This paper recognizes that there is a developed body of literature in natural resource economics around collective action;[1] however, our primary concern here is that there is a gap between theoretical discussions of resilience and the application of a resilience lens among the development community (Cutter et al., 2008; Cutter, Burton, & Emrich, 2010). For instance, in terms of natural resource management and disaster risk reduction efforts, "…[T]he same problems as with previous definitions persist: there is limited scope for measurement, testing, and formalization. Yet, there is an unrelenting devotion to using the concept and an unquestioning, almost naïve acceptance that resilience is good and must be promoted.[2] The challenge remains to transform the concept into an operational tool for policy and management purposes"(Klein, Nicholls, and Thomalla, et al. (2003, p. 41).

[1] See for example D. Bromley, *Environment and Economy: Property Rights and Public Policy* (Cambridge, MA: Basil Blackwell, 1991); R. Meinzen-Dick, A. Knox, F. Place, and B. Swallow, eds., *Innovation in Natural Resource Management: The Role of Property Rights and Collective Action in Developing Countries* (Baltimore: John Hopkins University Press, 2002); and R. Meinzen-Dick, A. Knox, and M. Di Grigorio, eds., *Collective Action, Property Rights, and Devolution of Natural Resource Management: Exchange of Knowledge and Implications for Policy* (Feldafing, Germany: German Foundation for International Development [DSE]/Food and Agriculture Development Centre [ZEL], 2001.

[2] Klein et al. (2003) focus on coastal megacities. The authors clarify that whether resilience is a desirable quality of megacities depends on how resilience is defined, e.g., as returning to a state of vulnerability after a disaster versus more expansive definitions that include capacities for self-organization, learning, adaptation, and improved functioning.

This paper is one of several current efforts to move the discussion forward in applying resilience measurement to development practice. Related efforts include the USAID Feed the Future Learning Agenda Paper on resilience (Frankenberger et al., 2013d), the Technical Working Group on Resilience Measurement, the Expert Consultation on Resilience Measurement for Food Security,[3] and blogs on resilience on the USAID Agrilinks web site.[4] This paper is intended to inform responses by donors, implementing partners, non-governmental organizations, government, and other stakeholders by translating community resilience into an actionable and measureable concept. By identifying the specific elements of community resilience and the ways in which they interact, the paper clarifies the types of information that must be collected in order to adequately measure it. Importantly, the conceptual and measurement frameworks for community resilience allow policymakers and implementing organizations to formulate Theories of Change that address specific gaps in the capacity of vulnerable communities to cope with and recover from shocks and stresses.

The paper starts by defining community resilience and other key terms. Section III follows, proposing a conceptual framework as a basis for assessing community resilience. This conceptual framework is further elaborated in Section IV. Section V presents a measurement framework that identifies main data categories and indicators for measuring the mediating effect of community resilience on shocks and stressors. The paper concludes by recommending next steps for moving community resilience measurement forward.

II. COMMUNITY RESILIENCE DEFINED

This section discusses the current thinking around community resilience in terms of key definitions and the distinction between vulnerability and resilience. It concludes with additional considerations for community resilience programming.

Working definitions of *community* and *resilience* are useful for understanding the interaction of these concepts in *community resilience*. In humanitarian and development practice, *community* is often conceived as a unified group with shared norms, beliefs, behaviors, interests, trust, and reciprocity, and further defined by spatial parameters. In line with this practice, this paper adopts the following as its working definition of *community:*

> *A group of people in a shared geographical space with diverse characteristics and priorities, linked by social ties, interactions shaping local life, shared identity, collective action, and providing a means for accessing external resources.* (Murphy, 2007)

Delineating a community based on geographic or administrative boundaries is practical for programming and measurement purposes and for establishing jurisdiction, such as in disaster/emergency and security management and responses by government and outside stakeholders (Oxley, 2013a; Longstaff,

[3] The Technical Working Group on Resilience Measurement is jointly coordinated by the Food and Agriculture Organization(FAO) and the World Food Program (WFP) as part of the Food Security Information Network (FSIN). The Expert Consultation was organized by the FAO of the United Nations and WFP supported by the European Commission and USAID.

[4] E.g., Frankenberger, T. (2013). "Evidence for resilience programming: Bouncing out of the cycle of crisis," Agrilinks blog post, August 2, 2013. http://agrilinks.org

Armstrong, Perrin, Parker, & Hidek, 2010; Twigg, 2009).[5] Definitions of community using spatial parameters proliferate in the literature of diverse disciplines, with additional qualifications such as having a "shared fate" (Norris et al., 2008), common social or work interactions (McAslan, 2010; Cutter et al., 2008), or using common ecological and environmental resources (Adger, 2000). However, the social complexities of community membership – the interactive relationships that are at the heart of community resilience – may extend beyond spatial parameters to include extended family, or be based on shared values, religion, or occupation. A community may be also parsed into subgroups such as a religious minority in a large city, a group of fishermen in a village, or a youth group association. Interconnectedness based on such socioeconomic, cultural, and kinship linkages is important to acknowledge in the community resilience concept because it recognizes resources that lie outside the area affected by the shock or stress.

Resilience, a concept originally derived from the field of ecology, is commonly understood as the ability to bounce back and return to a stable state in which some entity (e.g., individual, household, or community) existed before a disturbance (Constas & Frankenberger, 2013). The disturbance could be a collective shock shared by a large group of people (covariate shock) or a shock experienced only within a given household or community (idiosyncratic shock). The concept of resilience has gained popularity because it holds the promise of bridging the operational gap between humanitarian aid and development assistance, and because it highlights the need to build the capacity of individuals, households, and communities to withstand and/or adapt to a broad array of risks (Constas & Frankenberger, 2013).

The idea of *community resilience* has largely evolved from writings on social resilience. Adger (2000) offers one of the earlier and more accepted definitions of social resilience: "the ability of groups or communities to cope with external stresses and disturbances as a result of social, political, and environmental change." Folke (2006) describes social resilience as the necessity of human systems to learn to manage by change and implies that "uncertainty and surprise are part of the game." Table 1 lists a number of prominent definitions of resilience offered over the last decade. While not exhaustive, collectively the definitions suggest that resilient communities share the following attributes:

- the ability to recover from some sort of event or shock to the system;
- the capacity to learn, plan for, and communicate about possible disruptions;
- the ability to self-organize and to be self-reliant in times of crisis; and
- strong social connectedness that serves as a "core engine" for response.

[5] However as observed by Buckle (1998), challenges may arise when administrative boundaries are not coterminous and service jurisdictions within and across public, private, and non-government sectors overlap.

Table 1: Representative definitions of resilience

Citation	Definition
Cadell, Karabanow, and Sanchez (2001)	"…the ability to adapt to, cope with and even be strengthened by adverse circumstances."
Ganor and Ben-Lavy (2003)	"the ability of…communities to deal with a state of continuous, long-term stress, which causes gaps between environmental stimuli and their functional coping behavior."
Doron (2005)	"…is built in a process of creating and strengthening personal, familial, social, organizational and economic systems to resist and cope effectively in times of stress, threats, crisis and emergencies."
Frankenberger et al. (2007)	the "collective capacity to respond to adversity and change and maintain function. A resilient community can respond to crisis in ways that strengthen community bonds, resources, and the community's capacity to cope."
Cutter et al. (2008)	"The ability of a social system to respond and recover from disasters and includes those inherent conditions that allow the system to absorb impacts and cope with an event, as well as post-event, adaptive processes that facilitate the ability of the social system to re-organize, change, and learn in response to a threat."
Norris et al. (2008)	"a process linking a set of adaptive capacities to a positive trajectory of functioning and adaptation after a disturbance."
Walker et al. (2010)	"…the general capacity of a community to absorb change, seize opportunity to improve living standards, and to transform livelihood systems while sustaining the natural resource base. It is determined by community capacity for collective action as well as its ability for problem solving and consensus building to negotiate coordinated response."
Pasteur (2011)	"the ability of a …community…to resist, absorb, cope with and recover from the effects of hazards and to adapt to long-term changes in a timely and efficient manner…"
DFID (2011a)	"…the ability of …communities… to manage change, by maintaining or transforming the living standards in the face of shocks or stresses…without compromising their long-term prospects."
Arbon, Gebbie, Cusack, Perera, and Verdonk (2012)	"…when members of the population are connected to one another and work together, so that they are able to function and sustain critical systems, even under stress; adapt to changes…; be self-reliant...; and learn from experience to improve itself over time."
Béné, Wood, Newsham, and Davies (2012)	"…the ability to resist, recover from or adapt to the effects of a shock or a change."
USAID (2012)	"the ability of people, households, communities, countries, and systems to mitigate, adapt to, and recover from shocks and stresses in a manner that reduces chronic vulnerability and facilitates inclusive growth."
UNDP Drylands Development Centre (2013)	"…a transformative process of strengthening the capacity of…communities…to anticipate, prevent, recover, adapt and/or transform from shocks, stresses and change."

From these concepts a number of central ideas regarding community resilience have evolved, namely that community resilience can be both preventative (avoiding poor outcomes by developing risk mitigation strategies), or facilitate recovery after a traumatic event. Community resilience also speaks to whether more vulnerable stakeholder groups (i.e., the economically or politically weak) can recover from a disturbance without reducing the well-being of any other community-based institutions or individuals (Wilson, 2012). Community resilience is seen by a number of scholars as the balance between economic productivity, environmental health, and the social needs of communities – in other words, resilience is about communities being able to successfully cope with endogenous and exogenous disturbances based on economic, social (political/cultural), and environmental parameters (Rotmans, Martens, & van Asselt, 2002; Resilience Alliance, 2009).

The authors adopt the following definition of community resilience:

> *The general capacity of a community to absorb change, seize opportunity to improve living standards, and to transform livelihood systems while sustaining the natural resource base. It is determined by community capacity for collective action as well as its ability for problem solving and consensus building to negotiate coordinated response.* (Walker, Sayer, Andrew, & Campbell, 2010)

While all the definitions cited make a valuable contribution to the community resilience concept, this one is selected because it recognizes key types of capital that are collectively managed (e.g., social and natural) and effectively captures what the authors view as the concept's distinctive aspect: collective action. Using various forms of capital as focal points also allows one to leverage and build on the notion of productive assets found within the well-developed livelihoods approach. Incorporating these capitals into the framework for community resilience is also important for measurement given that the levels of each form of capital vary considerably among individual communities and that each is empirically accessible.

Relationship Between Vulnerability and Resilience

The contribution of a community resilience framework must be considered in relation to the well-established construct of vulnerability (Constas & Frankenberger, 2013). There is substantial debate as to whether and how these two concepts are distinct. The authors take the view that vulnerability refers to the sensitivity of a household or community to a disturbance, while resilience is concerned with the capacities of households and communities to resist or recover from a disturbance. Accordingly, although related to resilience, vulnerability is not the inverse of resilience (Constas & Frankenberger, 2013). With respect to community resilience, it is important to understand variations in vulnerability to food insecurity associated with risk exposure events (i.e., vulnerability is not a static state – it varies depending on risk exposure) (Sumner, 2013) and the role of collective action in aiding communities to reduce vulnerability and to cope and adapt to shocks and stresses.

The following quotation encapsulates how the authors view the interaction of resilience and vulnerability: "The concept of resilience is useful because it provides an overarching organizational scheme within which vulnerability, shocks, and heterogeneity of recovery pathways may be understood, measured, and modeled" (Constas, Frankenberger, & Hoddinott, 2013, p. 7). In this sense, resilience is a

higher order concept that may help explain how vulnerability states shift over time, across contexts, at multiple scales, and in the face of varied shocks and stresses.

Important Considerations in Programming for Community Resilience

Despite growing consensus within the development community regarding the theoretical constructs of resilience, several important factors create both challenges and opportunities for applying these constructs as part of humanitarian assistance and development initiatives. The following considerations highlight some of these factors and their implications for resilience programming.

Complexity of community-level systems. Communities vary in the complexity of their formal and customary institutions. The institutional context differs between a small village, a provincial capital, and a large urban area, and varies in nature and function according to factors such as population density, overall wealth, geography (e.g., isolation of communities due to mountain ranges or location of water sources), etc. The frameworks presented here are oriented toward institutional settings in priority investment areas with chronically vulnerable populations such as the Sahel, as well as other rural areas where agro-pastoral and agricultural livelihoods predominate and where exposure to risks (weather extremes, conflict, other stresses) is high.

Community heterogeneity. Despite sharing many attributes, communities are not homogeneous (Harrington, Curtis, & Black, 2008). A community is typically made up of diverse individual interests, different initial endowments of the various forms of capital (see Sections IV-A and IV-B), variations in risk exposure, and power inequities. Certain kinds of diversity can strengthen community resilience when different groups are tied to each other by norms of reciprocity and trust relationships (see Section IV-D), and when governance systems and social attitudes are oriented to protect the rights of different groups, for example, by balancing resettlement efforts with the rights and abilities of shock-affected residents to remain, or by recognizing the rights of pastoralists to manage communal rangeland. However, social inequities and unequal power relationships can be reinforced if community collective action is not inclusive and participatory. There are cases in which certain households may manage to strengthen their resilience but only at the expense of the wider community (Béné et al., 2012), for example, by rallying community power to exclude people from economic opportunities, or by limiting access to community resources based on ethnicity or kinship. In other words, gains for some can be losses for others – though it is possible to mitigate the extent of these disparities.

Household versus community resilience. The recognition of community heterogeneity is linked to the notion that community resilience does not necessarily equate to uniformly resilient individuals/households. Conversely, a collection of resilient individuals/households does not necessarily imply community resilience (Norris et al., 2008). A community may be resilient overall, in that it has the ability to absorb disturbance and adapt while maintaining its essential functions, structure, and identity (Longstaff et al., 2010), yet resilience at the individual or household levels within that community may vary widely.

III. CONCEPTUAL FRAMEWORK FOR ASSESSING AND ENHANCING COMMUNITY RESILIENCE

The overall objective of the proposed community resilience framework is to provide a comprehensive understanding of the factors and processes influencing vulnerability and resilience at the community level. Within constantly changing natural, social, and economic environments, a conceptual framework for community resilience should ultimately help stakeholders specify, measure, and model heterogeneous resilience and vulnerability pathways at the community level (Frankenberger et al., 2013; Constas & Frankenberger, 2013).

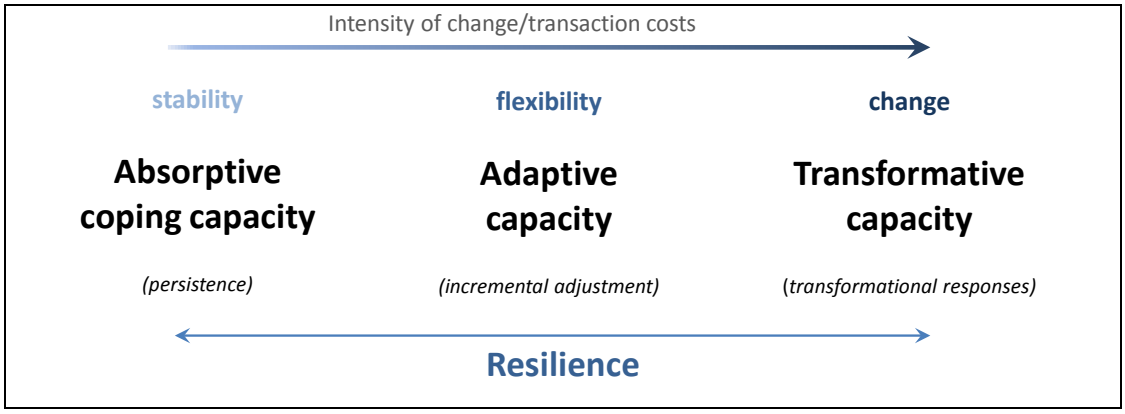
The proposed framework (Figure 2) includes socioeconomic context, shocks, stresses, community livelihood assets, social capital, and community social dimensions. Together, these factors constitute the community's capacities for collective action that influence community resilience. Ultimately, the framework should help to explain why certain communities are relatively resilient, whereas others, as a consequence of being less resilient, are on a descending pathway of vulnerability. Perhaps most importantly, the framework enables identification of the key leverage points to focus on as part of a theory of change, and the interventions that should be included in programs aimed at enhancing community resilience.

The framework integrates a livelihoods approach, a disaster risk reduction (DRR) approach, and contributions from recent literature on the role of social capital and collective action (Aldrich, 2012; Béné et al., 2012; Wilson, 2012; McCreight, 2010). The *livelihoods approach* emphasizes the importance of access to productive community assets, institutional structures and processes, and the predominant livelihood strategies pursued by member households; whereas *the DRR approach* focuses on preparedness, prevention, response, and recovery activities formulated in response to potential disasters. Key components of *social capital and social dimensions* have been added to previous constructs of household resilience by providing a means for determining the capacity for collective action. This conceptual framework has also been informed by alternative models for depicting community resilience elements and processes (Oxley, 2013a; Longstaff et al., 2010; Cutter, Burton et al., 2010 and Cutter Barnes et al., 2008; Mayunga, 2007; Adger, 2000).

The framework also incorporates the work of Béné et al. (2012) by considering key capacities that socioecological systems must acquire and maintain to ensure resilience. It adopts an explicit view of resilience as a process rather than a static state, with its determinants consistently changing within evolving social, economic, and environmental contexts (Frankenberger & Nelson, 2013a). It incorporates three types of capacities: ***absorptive capacity*** – the ability to minimize exposure to shocks and stresses through preventative measures and appropriate coping strategies to avoid permanent, negative impacts; ***adaptive capacity*** – making proactive and informed choices about alternative livelihood strategies based on an understanding of changing conditions; and ***transformative capacity*** – the governance mechanisms, policies/regulations, infrastructure, community networks, and formal and informal social protection mechanisms that constitute the enabling environment for systemic change (Figure 1) . These capacities are interconnected, mutually reinforcing, and exist at multiple levels (individual, household,

community, state, and ecosystem) (Béné et al., 2012; Frankenberger, Langworthy, Spangler, & Nelson, 2012).

Figure 1: Key capacities for achieving resilience

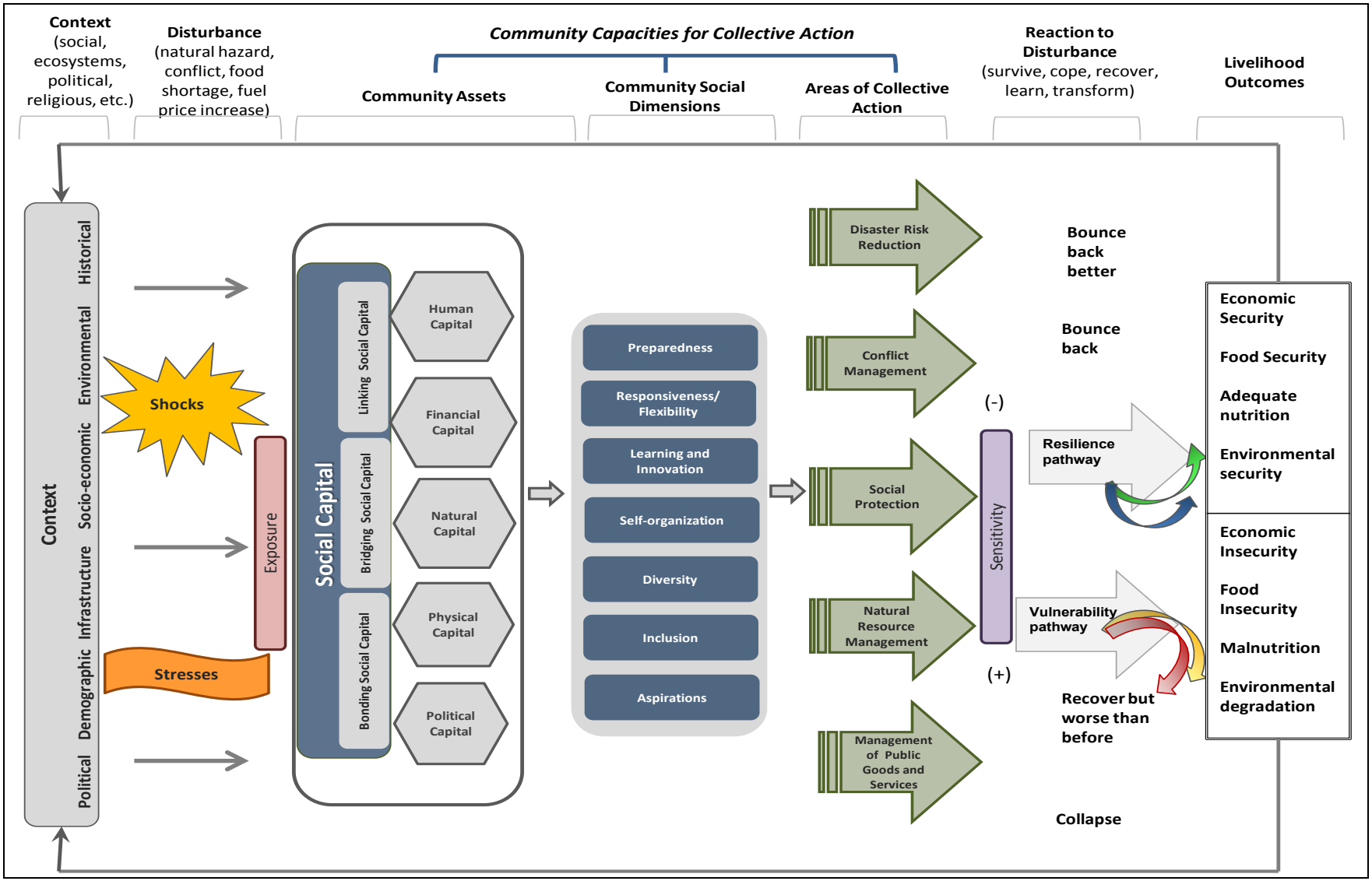


Reproduced with permission from Béné et al. (2012). Resilience: new utopia or new tyranny? Reflection about the potentials and limits of the concept of resilience in relation to vulnerability reduction programmes. IDS Working Paper, (2012) (405, 21)

As illustrated in the framework (Figure 2) , building community resilience ultimately requires an integrated approach to building community capitals that will enhance the capacity of communities for collective action in the areas of disaster risk reduction, conflict mitigation, social protection, natural resource management, and the management of public goods and services. These and other areas are influenced by a community's internal capacities – but also by external factors. Many of the circumstances that shape life in disadvantaged communities – poverty, inequality, discrimination, climate change – are neither generated nor reproduced at the local level, and the solutions to these more fundamental, structural social problems probably also lie elsewhere (Rival, 2009). Programming in a community resilience framework must be designed with an awareness of linkages to wider systems that create enabling (or disabling) conditions within which community functions are realized. Community resilience programming and measurement must reflect that individuals, households, and communities form an interrelated hierarchy of scalar dependencies: individuals operate within households that operate within communities, which in turn operate within larger governance units (e.g., districts, departments, regions) (Barrett & Constas, 2012). Households may achieve some level of resilience on their own, but will be limited if resilience-enhancing policies and programming are not supported through local and regional institutions and governance systems. External factors that have a direct bearing on – but are not always subject to – community influence include the wider context affecting economic productivity, the extent and quality of infrastructure, and the accountability and responsiveness of government.

The concepts in the community resilience framework are summarized in Table 2.

Figure 2: Conceptual framework for community resilience



Source: Adapted from Frankenberger et al. (2012), DFID (2011a), TANGO (2008), and CARE (2002).

Table 2: Elements of the community resilience framework

Context: Environmental, political, social, economic, historical, demographic, religious, conflict, and policy conditions that affect, and are affected by community resilience (ability of communities to collectively cope with shocks).

Disturbance: May come in the form of rapid onset or slow onset shocks (e.g., earthquakes or droughts) or longer-term stresses (e.g., environmental degradation, political instability, price increases). Experience shows that it is typically easier to mobilize resources for rapid onset shocks than slow onset shocks and stresses. In assessing resilience, it is important to acknowledge that some disturbances are idiosyncratic (affecting only certain individuals or households) whereas others are covariate (affecting an entire population or geographic area). Also, resilience to one type of shock (e.g., drought) does not ensure resilience to others (e.g., food price increases, conflict).

Community Capacities for Collective Action: Building resilience requires an integrated approach and a long-term commitment to improving three critical capacities*: absorptive capacity, adaptive capacity, and transformative capacity* (Béné et al., 2012). *Absorptive capacity* is the ability to minimize exposure to shocks and stresses (*ex ante*) where possible and to recover quickly when exposed (*ex post*). *Adaptive capacity* involves making proactive and informed choices about alternative livelihood strategies based on changing conditions. *Transformative capacity* relates to governance mechanisms, policies/regulations, infrastructure, community networks, and formal social protection mechanisms that are part of the wider system in which communities are embedded. The capacity for collective action is evident in the processes of customary and formal institutions in five main areas relative to community resilience: disaster risk reduction, conflict mitigation, social protection, natural resource management, in managing and maintaining public goods and services (e.g., schools, health clinics, roads).

- *Community Assets:* These are tangible and intangible assets that allow community members to meet their basic needs. Livelihood security depends on a sustainable combination of six assets/capitals: financial, physical, political, human, social, and natural. Certain assets are interdependent on others. Asset levels and quality can be improved and/or repaired. Landscapes can be restored, soils improved, new skills and abilities can be learned, and new markets can be developed or accessed. Livelihood assets can and should be grown and improved.

  Community Social Dimensions: The dynamic qualities possessed by a community that enables it to manage community-based assets in an equitable and sustainable way. They include preparedness, responsiveness, connectivity, learning and innovation, self-organization, diversity, inclusion, social cohesion, and aspirations. Community social dimensions are evident in perceptions, attitudes, and in the nature and quality of relationships. The depth of community social dimensions and the way they are applied determines the collective actions the community will take relevant to different functions.

  Areas of Collective Action: These are areas in which communities organize and collaborate in a strategic way in the interest of advancing resilience at the community level. Effective functioning in these areas depends on the efficient and equitable use of community assets and optimization of community social dimensions. Emphasis is on the key tasks that must be performed to maintain or restore essential community institutions, structures, and related environments in the context of actual or potential shocks and stresses. The areas of collective action in the framework include disaster risk reduction, conflict management, social protection, natural resource management, and the management of public goods (e.g., community-maintained physical assets and infrastructure such as roads, community water pumps, and community latrines) and services (e.g., health and education services – health volunteers and mother care groups; parent groups that assist in school activities).

Resilience and Vulnerability Pathways: The term "pathways" underscores the idea that both vulnerability and resilience are properly viewed as processes rather than static states. Communities that are able to combine their assets, social dimensions, and collective actions to manage the shocks or stresses they are exposed to and incrementally reduce their vulnerability are less sensitive and are on a resilience pathway. Those that have little or no capacity to engage in collective action to manage shocks or stresses are sensitive and are likely to follow a vulnerability pathway.

Livelihood Outcomes: These are the needs and objectives that households and communities are trying to realize. Resilient communities will be able to meet the food security needs of its members; will ensure access to adequate nutrition; will have a protected environment; will have income security and health security; will be able to educate their children; and will be able to participate in broader socioeconomic processes that affect the lives of their members. Vulnerable communities experience deficits or a high risk of deficits in these aspects.

As noted previously, the concept of community collective action is a distinguishing feature of this framework. It is a composite of other components (community assets, community social dimensions, etc.) that act in combination to influence community resilience. This calls for innovation in measurement approaches – specifically, the use of proxy indicators for collective actions that have a bearing on community resilience. Section V will use the conceptual framework outlined here to elaborate on these measurement issues and discuss the types of information that must be collected to adequately measure community resilience; specifically, it will describe how proxy indicators can be used to construct a "community capacities for collective action index."

IV. DETAILED DISCUSSION OF COMMUNITY RESILIENCE CAPACITIES

To fully understand the process and potential of community resilience, it is critical to remember that each of its individual components entails dynamic attributes, as well as transactional linkages and relationships that must complement and work in conjunction with one another to achieve a resilient community (Norris et al., 2008). These components include community assets, especially social capital; collective capacity of customary institutions, community social dimensions; and several areas of collective action.

A. Community Assets

Community assets, including social, human, financial, natural, physical, and political capital, are the tangible and intangible resources that enable communities to meet the basic needs of their members. Greater diversity of these assets reduces vulnerability to shocks, and higher levels of absorptive and adaptive capacity result from the ability of communities to access and utilize these assets in a way that allows them to respond to changing and unforeseen circumstances (Frankenberger et al., 2007). As such, the most vulnerable communities are those that have deficits in one or more of these resources and therefore have limited capacity to absorb the negative consequences of shocks and/or stresses and to engage in adaptive livelihood strategies. Tracking the level of livelihood assets at the community level is important for assessing community resilience because it helps identify important changes, differences, and trends regarding community risk. When measuring livelihood assets at the community level, it is essential to address four critical questions:

- What is the extent and quality of each form of capital?
- Which populations have access to the capital?
- Which institutions control access to the capital?
- How does the current status of the capital contribute to or constrain livelihood security and resilience?

This section discusses community assets/capitals with the exception of social capital, which is discussed in detail in Section IV-B. Social capital receives special emphasis in this paper because of its critical role in collective action to achieve community resilience.

Human Capital

Human capital consists of the skills, knowledge, ability to labor, and good health that are important to the pursuit of livelihood strategies (TANGO, 2006). At the individual and household levels, the

educational attainment and health status of members shapes their ability to absorb the negative impacts of a shock and to successfully adapt to changing social, economic, and environmental conditions. At the community level, human capital reflects the collective level of access to skills, labor, knowledge, and physical and mental health; it is also key to innovation. Human capital will obviously be compromised in communities encountering health epidemics (e.g., HIV/AIDS), undergoing armed conflict, or suffering from underinvestment in education and health infrastructure. Important insight into the level of human capital at the community level can be gained through examination of demographics, socioeconomic conditions, and access and quality of social services.

Human capital is among the most important determinants of resilience because it can increase or decrease the efficiency of the other types of capital in resilience-building efforts by providing access to a skilled and trained workforce for economic development and capacity building (Mayunga, 2007; Gill & Ritchie, 2011). Acquisition and maintenance of human capital at the community level is essential for effectively managing collective responses in the wake of a shock or disaster (Bahadur, Ibrahim, & Tanner, 2010; Buckle, 1998).

Financial Capital

Financial capital denotes the financial resources households and communities use to achieve their economic and social objectives. It includes cash and other liquid resources, (e.g., savings, credit, remittances, pensions, etc.) (TANGO, 2006) that increase "the ability and the capacity of individuals, groups, and communities to absorb disaster impacts and speed up the recovery process." It can directly ward off vulnerabilities through mechanisms such as insurance schemes and building protected homes and businesses (Buckle, Marsh, & Smale, 2001; Gahin, Velveva, & Hart, 2003; Oudenhoven, Mijatovic, & Eyzaguirre, 2010). The accessibility, reliability, and inclusiveness of formal and community-based savings and credit institutions are one indication of a community's resilience capacity because these represent social protection mechanisms that can be tapped to cope with a shock or stress. Similarly, post-disaster investment of financial capital can have direct and positive consequences for community infrastructure (through construction of roads, bridges, dams, etc.) and human capital development (through funding of health care and education) (Gill & Ritchie, 2011). Finally, financial capital can play an important role in supporting community resilience in terms of financial services (e.g., microfinance) and by sustaining small- and medium-size enterprises in event of social and economic disruptions (Twigg, 2009; Pasteur, 2011). Financial capital at the community level is evidenced in community patterns and trends in formal employment, petty trade, entitlements, remittances, and external financial assistance from government and/or civil society (TANGO, 2006).

Natural Capital

Natural capital is a community's natural resources: environmental stocks from which resources useful for livelihoods are derived (e.g., land, water, forest, rangeland, fisheries, wildlife, biodiversity, and environmental services) (TANGO, 2006). Several authors have noted that the resilience of a community is directly linked to the condition of the natural environment and the maintenance of productive natural resources (Gill& Ritchie, 2011; Cutter et al., 2008; Smit & Wandel, 2006; Folke, 2006; Ekins, Simon, Deeutsch, Folke, & DeGroot, 2003). In addition to simply possessing natural capital, the management of natural resources and ecosystem services while maintaining a sustainable livelihood base is a key element of community resilience (Pasteur, 2011; Twigg, 2009). Natural resources are one of the key assets

collective action tries to manage. Effective management and protection of environmental resources requires collective norms and valuation of the environment as a public good in order to avoid "tragedy of the commons." An example of a natural resource is a watershed; the manner in which one community uses watershed resources has implications for watershed health and viability, and thus for its use by other communities that rely on it.

Resilience at the community level may be affected by an array of factors relating to the quality of natural assets such as soil, forest cover, pasture, fishery stocks, riverine/coastal habitats, surface, and below-ground water supplies. Many of the natural disasters that pose the greatest risk for vulnerable populations have an immediate, detrimental, and long-lasting impact on the natural resource base. Likewise, many man-made shocks and stresses (e.g., conflict, price increases, and disempowerment) are centered on competition for and dispute over access to scarce natural resources (Frankenberger et al., 2012).

Physical Capital

Physical capital includes basic infrastructure (e.g., transportation, shelter, energy, communications, and water systems, health facilities, and markets); production equipment; and other material means that enable people to maintain safety and enhance their relative level of well-being (Gill & Ritchie, 2011; Mayunga, 2007). Doing so requires ensuring that community infrastructure systems and other basic services can operate at a level that provides individuals and groups the means to survive and recover during natural or man-made disasters (Longstaff et al., 2010; Pasteur, 2011). While communities are not always able to directly control some of the physical assets available to them (e.g., power systems or electrical grids), they may be able to influence their use through indirect means, for example, by building in redundancies that allow alternatives when one system breaks down, or by requiring maintenance/user fees; these are examples of collective action for the management of public goods. It is important to acknowledge that redundancy and maintenance of physical assets can be expensive, and communities will have to weigh the tradeoffs of allocating funds for long- and short-term reserves (Longstaff et al., 2010).

When assessing the impact of a disaster on critical infrastructure and determining the contribution of infrastructure to community resilience, it is necessary to determine whether infrastructure supports key services (education, health, safety, economic activity), the accessibility of infrastructure to all members of the community, existing gaps in productive infrastructure, and community-based mechanisms for maintenance.

Political Capital

Political capital consists of power relationships, as well as access to and influence on the political system and governmental processes at local and higher levels (TANGO, 2003). The level of political capital at the community level determines the nature of community participation in the process of policy formulation and implementation. Given that political capital helps to regulate access to influential institutions and processes, it can also give rise to inequity and differences in power dynamics within and between individual communities (Pasteur, 2011; Gill & Ritchie, 2011).

When seeking to measure community levels of political capital potential areas of interest may include the effectiveness of local government in addressing the needs and priorities of the community, voter

participation, involvement of women and minorities in political leadership and decision-making, interaction between formal government and traditional authorities, and transparency and accountability among government officials (TANGO, 2003).

B. The Role of Social Capital in Supporting Community Resilience

The last section gave an overview of community assets/capitals. This section will provide a more in-depth discussion of social capital. This paper focuses on social capital because community resilience is determined largely by the capacities dependent on social capital such as collective action, collaboration, and self-organization.

Social capital can be described as the quantity and quality of social resources (e.g., networks, membership in groups, social relations, and access to wider institutions in society) upon which people draw in pursuit of livelihoods (Frankenberger & Garrett, 1998). While it may encapsulate political institutions, social capital is broader than political capital because it includes informal social processes at individual, household, and community levels. Social capital has often been described as the "glue" that binds people in society together. It is based on strong perceptions of local embeddedness, self-regulating moral codes, and the norms, reciprocity and trust that exist between individuals and groups at the community level (Chaskin, 2008). Close interaction between people through tight-knit communities, the ability to rely on others in times of crisis, and open communication between stakeholder groups are all generally seen as signs of well-developed social capital.

Previous research demonstrates that the extent and application of social capital is a crucial element in determining the nature of resilience at the community level (Aldrich, 2012; Wilson, 2012; Magis, 2010; Elliott et al., 2010). At the household level, social capital is properly viewed as one form of capital among many that have a direct bearing on household food security, nutrition, livelihood security, and resilience. However, amid the complex and dynamic interactions that take place within and between larger populations, social capital can have a predominantly strong influence on the attainment of resilience at the community level (Aldrich, 2012; Cutter et al., 2008). For instance, disasters may sometimes enhance social capital because they activate or give rise to neighborhood associations and collective organizations that can be used to disseminate vital information, provide community members with a voice, and afford leverage to assist in taking control of rebuilding efforts (Aldrich, 2012). Conversely, lack of sound leadership, weak governance structures, high levels of corruption (low moral and ethical standards, self-centeredness), poorly managed public spaces, or lack of control of a community over future development pathways are signs of poorly developed social capital and have a negative impact on community resilience (Smit & Wandel, 2006).

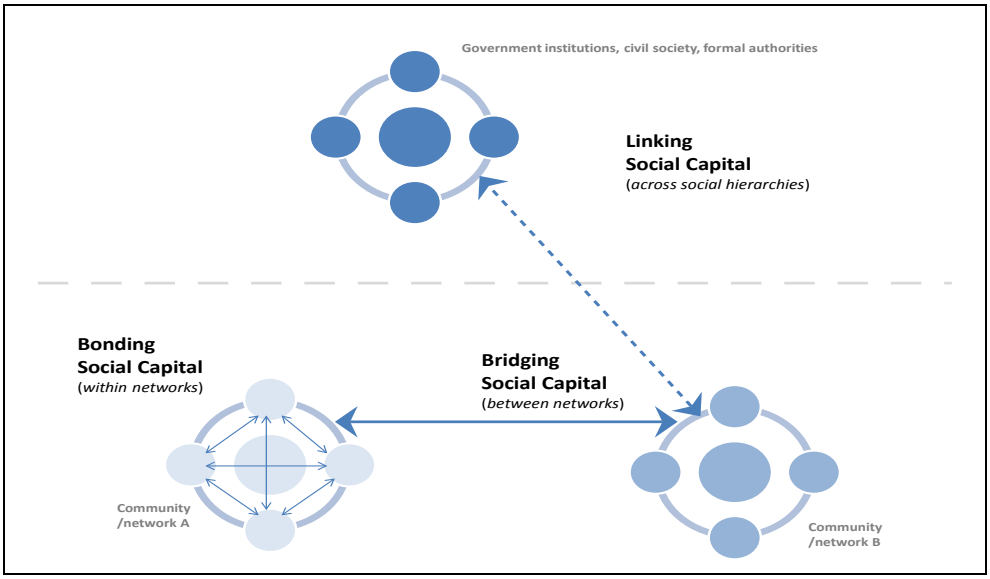
> *The resilience of a community is dependent on social bonds and collective action based on networks of relationships, reciprocity, trust, and community norms. Social capital can contribute to community resilience by providing an informal buffer to those affected by disaster, overcoming challenges to adaptation through coordinated local processes, and enabling transformative change by strengthening the community's collective voice.*
>
> *- Aldrich 2012*

Aldrich (2012) provides a useful analytical approach for assessing the influence of social capital on community resilience by identifying three distinct but interrelated forms of social capital: **bonding**

social capital, **bridging social capital,** and **linking social capital** (Figure 3). Aldrich's framework can be useful for considering the influence of social capital on community resilience because resilience at this level requires institutional reforms, behavior shifts, cultural changes, the questioning of values, challenging of assumptions, and close examination of identities, stereotypes, and fixed beliefs (Béné et al., 2012; Smith & Sterling, 2010). Each of these forms of social capital will be discussed now.

Bonding social capital is seen in the bonds within and between community members. In many rural community environments, members operate as if they were members of the same extended family. Bonding social capital assumes high levels of familiarity, involves a willingness to forego some degree of privacy, and typically entails an implicit commitment to reciprocity. Bonding social capital is perhaps most simply described as "horizontal" ties between individuals who are similar to each other and may live within close proximity to one another (Putnam, 2000). An important potential downside to bonding social capital is that a strong sense of belonging to a group, tribe, or nation can create indifference or even hostility toward nonmembers (e.g., nationalism, patriotism, xenophobia). Others note a potentially symbiotic relationship between bonding social capital and disaster management capacity in situations where survivors work more closely together to address the multiple problems that arise in the wake of a disaster. In such instances, the extent and quality of bonding social capital can increase *because of* difficult conditions (Solnit, 2009; Norris & Stevens, 2007).

Figure 3: Bonding, bridging, and linking social capital



Reproduced with permission from Aldrich (2012, p. 34)

Bridging social capital connects members of one community or group to other communities/groups (Aldrich, 2012). Bridging social capital often crosses ethnic/ racial lines, geographic boundaries and language groups, and can link community/group members to external assets and broader social and economic identities. Bridging social capital makes a direct contribution to community resilience in that those with social ties outside their immediate community can draw on these links when local resources are insufficient or unavailable (Wetterberg, 2004). Additionally, because contact with close friends and

relations is more regular, interaction with those outside of one's immediate network is more likely to provide new perspectives and resources. In addition to forming linkages with external assets, bridging social capital enables generation of "broader identities" among linked network members (Putnam, 2000; in Aldrich, 2012).

Linking social capital is seen in trusted social networks between individuals and groups interacting across explicit, institutionalized, formal boundaries in society (Aldrich, 2012). Linked networks are particularly important for economic development and resilience because they provide resources and information that are otherwise unavailable through bonding or bridging capital (Aldrich, 2012). Linking social capital is often conceived of as a vertical link between a network and some form of authority or power in the social sphere. It also can involve linking across functions that would otherwise operate independently, e.g., biologists working on ecosystem health may not, as matters of course, interact with engineers constructing road networks or governmental economic developmental departments promoting value chain development.

Communities with higher levels of bonding, bridging, and linking social capital are inherently more resilient than those with only one type or none (Aldrich, 2012; Elliott et al., 2010; Woolcock & Narayan, 2000). It is also critical to acknowledge that none of these forms of social capital by itself is a panacea for food and livelihood insecurity. To ensure community resilience to shocks and stresses over the long term, each of the different types of social capital must be promoted and sustained together, and communities can take actions that enhance their absorptive, adaptive, and transformative capacities simultaneously.

It is also important to recognize that while rich intra- and inter-communal relationships facilitate collective action, this may have heterogeneous effects on community subgroups given the equity and power relationships inherent in the social structure, such as the often uneven distribution of power and wealth (Morduch & Sharma, 2002). For example, social capital may help in-group members recover from a shock, while out-group members or those with fewer social resources who live outside the mainstream (Aldrich, 2012) experience slower or no progress towards recovery. Neighborhoods and groups with fewer social resources face negative outcomes, both inadvertent and deliberate (e.g., people who are dependent on others for their well-being, such as children or the elderly, may lose their caretakers due to illness, death, or migration; members of low castes). The absence of any form of social capital can stall a community's recovery, compromising collective action (Buckle, 1998; Chamlee-Wright, 2010). Finally, it is critical to acknowledge the central role of effective leadership at multiple scales. Leadership at the community level is vital to strengthening both bonding and bridging social capital whereas leadership at higher levels is a critical component of the enabling conditions that support linking social capital and transformative capacity.

That being said, Table 3 provides a series of examples drawn from resilience literature in which the use (or lack of use) of different forms of social capital has a direct influence on the absorptive, adaptive and/or transformative capacities of communities affected by a disturbance.

Table 3: Social capital and key capacities for achieving community resilience

	Bonding Social Capital	Bridging Social Capital	Linking Social Capital
Absorptive Capacity	Evident in informal social protection: - Community-based early warning - Community-based dissemination/diffusion of critical information (e.g., plans/available resources in the face of a disaster, post-disaster entitlements) - Community-based risk sharing (e.g., savings and credit groups, funeral associations) - Sharing resources (food, cash/loans, labor, child care, tools, transportation). Bonding social capital works well for idiosyncratic risks, when only one or a few households are potentially affected: they can turn to unaffected households.	Evident in community-to-community support during disasters: - Unaffected communities share resources with disaster-affected ones (e.g., remittances) - Unaffected communities share knowledge, expertise, and networks based on their own experiences of similar shocks - Inter-community communication/sharing of technologies, innovations. Bridging social capital works well for covariate risks: unaffected communities can support communities that have experience or are vulnerable to a shock.	Community-based organizations formed in response to disasters can provide community members with voice and leverage in decision-making in externally-supported rebuilding efforts. Linking social capital facilitates a feedback loop between grassroots and policy/ formal governance regarding covariate risks, e.g., collaboration over climate information gathering and dissemination: government agencies, research institutions, media
Adaptive Capacity	Bonding social capital is more limited in applications to adaptive capacity. Exceptions: - Close relationships between community members facilitate adoption of proven practices for income generation, health and nutrition, and climate change. - Women-led Village Savings and Loan Associations can promote women's empowerment, greater livelihood diversification, and climate adaptation.	Bridging social capital facilitates dissemination and multiplier effects of proven good practices. Formal and/or informal ties between communities in different agro-ecological zones can contribute to livelihood diversification and protection from adverse seasonal trends affecting agricultural productivity. Exposure to models and experiences in other communities can inform and broaden aspirations and thereby encourage trying new practices.	Adaptive capacities strengthened through collective action can compel formalization or strengthening of structures that can have an impact at higher levels, e.g., people resettled into new areas as a protection measure or in the aftermath of a disaster form new networks and institutions (farmers' unions, women's associations) beyond the immediate community.
Transformative Capacity		Relationships forged to realize one community function can be applied to other functions: - Increased exposure to other groups in markets (formal or informal, as along roadsides) can help to mitigate conflict as different groups become more familiar with each other over common interests. - School-based programs (e.g., school feeding, meal preparation) that engage families from otherwise warring factions can improve their interrelationships and reduce antagonism.	Strong vertical linkages are essential to realizing transformative capacities. These are evidenced in a variety of areas: - infrastructure investment - land reform - pro-poor policies - government accountability mechanisms - equitable allocation of entitlements - policies informed by representative participation of different community sectors (sociocultural groups; women/men; elderly/youth; disabled).

Combining the work of Aldrich (2012) on social capital described above with that of Béné et al. (2012) and others can provide insight into how horizontal and vertical ties between communities enable transmission of information and access to key assets at critical times. This synthesis of ideas serves as a tool for helping donors, policymakers and program managers incorporate support for social capital among multiple networks into strategies for disaster mitigation, recovery, and resilience (Zhao, 2010). Building on this idea, Section IV-D will discuss community social dimensions that facilitate collective action, invoking the social capital concepts discussed here.

Projects designed with a community resilience framework ideally will address all the forms of community assets described above, as well as community's capacities for collective action and adaptation. For example, the current USAID/Food for Peace Title II Development Food Assistance Program, "Building Community Resilience in Ethiopia," is implemented by Food for the Hungry and is organized under the overarching themes of building adaptive capacity and disaster risk reduction. The combined interventions address household and community resilience in tandem through watershed-based natural resource management, strengthening social infrastructure (including gender aspects), livelihood diversification activities, maternal and child health and nutrition, stakeholder capacity building, and strengthening early warning and response systems. Specific strategies to build collective action aspects include training and support to savings and credit groups and early warning committees and community-led total sanitation (Food for the Hungry, 2013).

C. Collective Capacity of Customary Institutions

Before moving on, it is important to comment on trends relating to customary or traditional institutions where social capital is exercised in an organized way to promote community resilience. These structures are central to collective action at the local level in areas such as risk sharing, social protection, natural resource management, and conflict prevention/mitigation.

Traditional systems tend to function best in the event of idiosyncratic shocks and stresses, while formal systems are more effective in the context of covariate shocks (Frankenberger et al., 2013c; Dercon, 2002; Morduch& Sharma, 2002). This is because communities are more likely to have sufficient resources to assist individual households experiencing loss or hardship, compared to large-scale, mass impact shocks and stresses that can overwhelm the community's capacity for self-help. Traditional systems can break down for a variety of reasons related to the dynamics of social capital: competition versus cooperation, strength of norms around reciprocity, moral or ethical codes, etc. Specific inherent challenges include enforcing a strictly social contract, especially in situations where it is unclear or uncertain whether the short-term gain from fulfilling one's obligations is greater or less than forgoing the pledge to insure benefits in the long term. Moral hazard is another problem: insuring risk may encourage people to engage in risky behavior, which burdens other group members when those behaviors result in losses (Morduch & Sharma, 2002). Another limitation of community-based systems is the resistance of wealthier households to insuring poorer ones: "Diverse patterns of resources and trajectories of income growth … make it hard to achieve broad, community-based informal insurance arrangements" (Morduch & Sharma, 2002, p. 578).

Despite the challenges germane to some customary mechanisms for protection and recovery from shocks and stresses, many of these long-established institutions can be quite effective in these roles, as illustrated by the funeral societies common across Africa, community-based savings groups, and indigenous pastoral management systems (Pavanello & Levine, 2011). Somalia, for instance, offers strong examples of clan-based commerce and informal systems for resource transfers that have thrived in the absence of state welfare and market systems (Sexsmith, 2009).

There is some debate as to whether formal protection schemes "crowd out" informal mechanisms whereby community members transfer resources to others in times of shocks and stresses. Yet there is some evidence indicating that formal cash transfers, for example, can support the growth or strengthening of customary social protection measures, such as by enabling people to participate in rotating savings clubs (Deveraux et al., 2008, p. 22). Such savings clubs in and of themselves are a form of collective action, in that the community is self-organizing itself to assist its members manage disturbances that cause loss or hardship.

Nevertheless, many customary institutions anchored in communities are in a state of decline. For example, increased migration and the resulting fragmentation of households can compromise the reliability and robustness of informal social protection mechanisms, and increase the burden on those who remain behind. Seasonal or permanent migration can also remove both the incentive and the ability to care for home community natural resources on a sustained basis. On the positive side, migration can help home communities through transfers (remittances), though the importance and impact of remittances also varies with context (Morduch & Sharma, 2002); this is an illustration of the value of bridging social capital. Idiosyncratic events such as illness or death, and casualties in contexts of violent conflict, can also weaken resilience at both household and community levels because of their toll on human capital assets.

The impact on resilience capacities can be quite severe when these shocks are experienced on a grand or protracted scale. For example, "In the 1980s, Uganda was the epicenter of the first wave of the [HIV] pandemic in Africa, and although HIV-prevalence appears to be leveling off, the legacy in terms of impoverishment and orphans continues to impose heavy burdens on both kin-based and formal social protection mechanisms" (Devereux & Sabates-Wheeler, 2004, p. 15).

Regarding the impact of conflict on social capital and collective capacities, it should be acknowledged that both "productive" and "destructive" social change scenarios are possible, which, respectively, support or hamper resilience: "In Somalia, customary institutions for maintaining trust in trading relationships and for redistributing resources have been maintained, encouraging efficient economic behavior and supporting conflict resolution. Informal political networks based on clan identity have played a crucial role in maintaining commercial activity after state collapse" (Sexsmith, 2009, p. 91). In contrast, in Sierra Leone, "Informal institutions … facilitated the perpetuation of a patrimonial economic system whose leaders relied on violent conflict to generate wealth, contributed to prolonged suffering and delayed the emergence of democratic order (Sexsmith, 2009, p. 92).

There are also substantial exogenous factors that add to the resilience deficit of communities and of the more vulnerable households in the affected communities.[6] For one, "The commercialization of labor and the increasing cash orientation of economic activity…undermined individual acts of altruism or reciprocity (e.g., neighbors assisting each other with farming chores) or collective efforts (e.g., building or maintaining community infrastructure)" (Devereux & Sabates-Wheeler, 2004, p. 14). In addition, and of special relevance to stakeholders designing resilience-oriented programs, "Any policy intervention that improves the individual's position outside a private group-based informal risk-sharing arrangement may provide incentives to break down the informal arrangement" (Dercon, 2002, p. 155). Significantly, communities' ability to continue effective joint management of risk and of shared local resources is undermined when government and other formal sector policy and program interventions do not take community collective action into account.

A good example of this is the erosion of customary pastoral management systems in East Africa. Networks of social relationships based on clan, ethnicity, and kin are used by herders, livestock traders, middlemen, and transporters to facilitate livestock movement and thus manage climatic risks and market uncertainties (Mahmoud & Little, 2000). Reasons for this include "state policies and actions that have not recognized the right of the pastoralists to own or manage their rangelands" (Pavanello & Levine, 2011, p. 1). Many of these actions constrict the freedom of movement essential to the cooperative maintenance of the health and resilience of pastoral lands that span across borders. These include the following, for instance:

- the expropriation of communal rangelands for farmland (reflecting a trend to move pastoralists into settled agricultural livelihoods);
- converting pastoral land areas into protected areas for environmental conservation (e.g., national parks);
- restrictions in cross-border mobility of humans and livestock;
- border control measures taken in the interest of national security; and
- the integration of the pastoral economy into national and international markets (Pavanello & Levine, 2011; Mahmoud & Little, 2000).

Policy measures such as these severely reduce the flexibility needed for pastoralists to be effective stewards of the environmental resources that form their traditional rangelands. Moreover, state policies have tended to undermine traditional authorities and the behavioral norms and processes that regulate access to land and water resources. These norms have both technical and social aspects: they include established systems of self-monitoring the quality and availability of water and pasture shared by different clans and ethnic groups, and observing principles of reciprocity and mutual cooperation to regulate access and use of these resources. When government officials seek to control resource access (e.g., by declaring that everyone has equal rights to exploit communal rangelands, or failing to recognize pastoralists' rights to manage rangelands), this undermines the knowledge and authority of community authorities and elders and their capacity to enforce environmental protection measures. This ultimately results in the degradation of environmental resources. Moreover, it upsets social norms and relationships that are important to preventing community conflicts over resources (Pavanello & Levine, 2011). When government and other external actors focus on individual or household resilience without

[6] Tim Mahoney, personal communication.

recognizing and integrating the community-based natural resource and conflict management systems in place, projects can have the adverse outcome of degrading both the natural and social capital essential to resilience on a larger scale.

There is increasing recognition among international development actors that the resilience-promoting international and state strategies must recognize and integrate customary institutions. For example, cross-border committees along the Kenya-Ethiopia border include community elders and state officials to form a "hybrid" authority that blends customary and formal rules and mechanisms to enable participatory joint management of water and pasture on both sides of the border. However, further work is needed to solidify and empower these committees to carry out their roles in peace initiatives and natural resource management, and to amplify their voice in higher-level decision making around land ownership and use. This could be accomplished by recognizing and delineating their status and powers in the legal sphere, by capacity building, and by expanding their cross-border linkages (Pavanello & Levine, 2011).

There is some evidence of increasing cooperation between customary institutions/ practices and state efforts in resilience-promoting actions. For example, the Government of Kenya drought strategy names "policy recognition of indigenous knowledge and practice" as one of its priorities under rangeland management to increase drought resilience and adaptive capacity. The strategy also references the International Transhumance Certificate (ITC), in use in much of West Africa, as a model for facilitating cross-border movement of people and livestock. Implementing ITCs helps facilitate pastoralists' ability to continue customary practices that promote resilience of pastoral livelihoods in the face of drought (Republic of Kenya, 2011).

Certain weather-indexed crop insurance schemes are another example of how formal systems can be successfully integrated with community-based systems (rather than replace or undermine them). Though designed to increase farmers' ability to manage and recover from weather-related shocks and stresses, uptake of crop insurance, especially among poor farmers, tends to be low. Basis risk is one of the main obstacles to greater adoption of this kind of protection,[7] as are lack of trust and limited understanding of formal insurance products (Frankenberger et al., 2013d). A recent study in Ethiopia found that farmer uptake of weather index insurance was higher when marketed as a mechanism to complement informal risk-sharing groups (specifically, funeral societies). The idea here is that when a farmer experiences an idiosyncratic loss not covered by the index insurance, the informal group will step in to assist that particular farmer (Frankenberger et al., 2013d; Dercon et al., 2012). Other examples exist of how insurance has been successfully coupled with existing community-based social structures, such as weather index insurance channeled through farmers' unions (Meherette, 2009) and other schemes limited to insuring events that are too costly for traditional risk-sharing mechanisms to absorb, such as health insurance for hospitalization (in contexts where families and social networks can typically cover lower-cost, high-frequency health issues) (Jütting, 2009).

In addition to expressly valuing the role and contribution of the collective actions of customary institutions to risk management and working to include them in resilience strategies, specific strategies

[7] *Basis risk* refers to the difference between losses incurred and the losses insured: farmers insured under an indexed scheme may receive a payout when their crops are unaffected by the weather extreme, yet it is also possible that an actual crop loss results in no payout. The latter risk makes this kind of insurance less palatable.

are suggested to minimize the negative impacts of formal protection schemes on community-based systems. These must all be grounded in information about what informal mechanisms exist and how they function. They include targeting groups rather than individuals (e.g., including the entire group involved in the informal scheme, in the formal one); promoting group-based self-insurance (e.g., by expanding access to savings instruments and banking systems); (Dercon, 2002); integrating indigenous knowledge about local climatic conditions with contemporary weather monitoring/ early warning systems (Mahmoud & Little, 2000); and others.

D. Community Social Dimensions

The previous section described the types of social capital that may be present within and across communities and their relevance to community resilience. Also relevant are the dimensions of such social networks that enable them to take collective action in the context of shocks and stressors. This section identifies several dimensions, building on the "resilience principles" proposed by Oxley (2013a), and discusses the rationale for their inclusion in a conceptual measurement framework.

Preparedness

Relevant, accurate, and timely knowledge is a prerequisite to preparedness for coping with shocks and stressors. Access to quality information aids communities in their perception and assessment of risk, which influences their potential to manage risk collectively and to increase absorptive capacity at the community level. Early warning systems, for example, help communities prepare for weather extremes by structuring a way for information to enter and circulate within the community. Effective systems draw on bonding, bridging, and linking social capital to maximize information flow within and across communities and higher-order structures, thus enabling collective actions to prepare for shocks.

Risk perception, an important aspect of preparedness, is influenced by bonding social capital: an individual's most trusted and timely information often comes from family and neighbors, who may also aid preparedness by sharing knowledge of how shocks have been managed in the past. This information can be shared among households and spread more widely to "bridge" information gaps across communities. Linking these informal information systems with municipal and regional institutions charged with emergency preparation and response enacts the transformative capacity of overarching formal systems.

Once a risk is perceived, community resources and attitudes toward risk must be taken into account to determine preparedness. A minimum level of capital and collective will are necessary to take action to prepare for risks at the community scale. Cannon (2008) cautions that some households and communities will choose to live with risk regardless of their risk awareness because they do not have adequate resources both to take hazard mitigation measures and to satisfy daily needs. "There is indeed sufficient micro-level evidence showing that people often fail to invest even though returns are positive (and sometimes very high) – a behavior often even more acute among poorer people" (Frankenberger et al., 2007). A community's collective attitudes toward risk will also influence its priorities for collective action to prepare for shocks and stressors.[8]

[8] For example, anthropological research on coastal settlements in Papua New Guinea finds that in the face of rising tides and coastal erosion, resettlement to the interior was viewed as "cowardly," "a defeat that implied masculine weakness," and that

Responsiveness

In Oxley's framework, responsiveness extends to emergency management, social protection, communication systems, and accountability (Oxley, 2013a). As with preparedness, responsiveness has formal and informal dimensions and is manifest in absorptive capacity, adaptive capacity (when communities learn from experience and make changes that will aid in their preparedness for the next disaster), and transformative capacity (when these changes become institutionalized and codified in policies, regulatory systems, budgets, and societal norms).

Local government may be especially likely to offer formal response and protection mechanisms. However, it often fails to address underlying issues of vulnerability that cause or exacerbate risk, preventing true adaptive and transformative capacities from being developed. For example, local government does not often attend to risks such as climate change beyond emergency response (Jabeen, Allen, & Johnson, 2010).

Learning and innovation

Innovation and learning are important processes for absorptive, adaptive, and transformative capacities at the household and community level. These social dimensions imply the ability and willingness to take risks, exploit new opportunities, make errors, create new knowledge and make modifications based on new experiences (Oxley, 2013a; Levine, Ludi, & Jones, 2011; Longstaff et al., 2010; Berkes, 2007).

Innovation may derive from urgent necessity; however, it is also a value that is cultivated by societal attitudes and norms. It is facilitated by openness to change, which manifests when learning from new experiences leads to adaptations. Innovation may be suppressed in cultures and structures that are top-down and highly rules-driven where experimentation is not rewarded or encouraged. For innovation to be scaled up, it must connect to a **shared learning process** that enables institutional and social learning and memory (Berkes, 2007), which contributes to adaptive capacity at the community level. When communities use shared experience to modify preparedness and mitigation measures, they contribute vastly to improving "antecedent conditions" before a future shock (Cutter et al., 2008, p. 603). When this learning is institutionalized, it translates into transformative capacity. "Social learning occurs when beneficial impromptu actions are formalized into institutionalized policy for handling future events and is particularly important because individual memory is subject to decay" (Cutter et al., 2008, p. 603).[9] At the institutional level, learning is facilitated when deliberate strategies exist for analyzing experience and incorporating it into institutional practice (e.g., formal knowledge management systems).[10]

residents felt apprehension around land tenure issues (Lipset, 2013, p. 150). Measurement instruments that probe for cultural attitudes such as these can be helpful to understanding the opportunities and constraints to community resilience.

[9] Carpenter and Gunderson, writing of the dynamics of learning processes in ecosystem management, state that "The challenge of developing a capacity for learning continues to be problematic at natural resource management institutions," (Carpenter & Gunderson, 2001, p. 456). They point out that learning must be deliberately sought, and that this tends to happen only when policies fail, rather than also when things are going well.

[10] This is acknowledged, for example, in the World Economic Forum Framework for Building National Resilience to Global Risks, which includes in its definition of recovery, "…the ability of a system to be flexible and adaptable and to evolve to deal with the new or changed circumstances after the manifestation of a risk. This component of resilience assesses the *nation's capacities and strategies for feeding information into public policies and business strategies* [emphasis added], and the ability for decision-makers to take action to adapt to changing circumstances" (World Economic Forum (WEF), 2013).

Memory plays a central role in learning at all levels. Strong community memory of traditions, practices, past disasters, and changing conditions supports communities' abilities to draw on experience to prepare for and respond to similar challenges. Research on a slum settlement in Dhaka, Bangladesh, for example, found that most older residents observed a declining trend in rainfall over their lifetimes and associated the increased heat (a climate change impact) with an increase in diseases related to water supply (Jabeen et al. 2010). These are important connections for communities to understand as they plan collective action to prepare for climate-related shocks and stressors.

Self-Organization

Self-organization is another social dimension that enables collective action. "… [I]f industries and communities can build trust within their networks and are able to self-organize, then they are more likely to spontaneously react and discover solutions to resolve unanticipated challenges when larger country-level institutions and governance systems are challenged or fail" (WEF, 2013). Spontaneous self-organization in a disaster reflects absorptive capacity; it may or may not be sustained beyond the crisis period. When it does, it may be carried forward into collectively organized adaptations or into advocacy efforts that influence transformative capacity.

The capacity to self-organize depends on many factors, including aspects of human capital (e.g., education and literacy levels) and attitudes, motivation, and emotional aspects that indicate a disposition toward self-organization. For example, a study of the resilience of Australian commercial fishers to changes in fisheries policy found that interest in adapting to the policy change is related to an individual's financial, social, and emotional flexibility (e.g., family commitments, attachment to the occupation, and financial position). The study also found that "the ability of fishers to plan, learn, and reorganize was important in determining their resilience to policy change," and that there was substantial variation across fishers in these respects (Marshall & Marshall, 2007). It must be noted that representative and accountable leadership is another defining feature of effective self-organization at the community level.

Diversity

Diversity refers to having both a number and a variety of means to realize a given resilience function. "Multiple pathways, redundancies and institutional multiplicities are vital features of resilient systems as they provide stability and support flexibility, optionality, inter-changeability and diversity – all central to adaptive capabilities" (Oxley, 2013a, p. 6). Diversification is a key risk reduction strategy in many arenas, from financial investment to disaster planning to livelihood diversification (Berkes, 2007).

In the context of natural hazards, diversity is manifest in several spheres: ecological (genetic, species, landscape); economic (with livelihoods being strongly dependent on ecosystem services such as food, fuel, water purification, and disease regulation); and in governance and institutions, where it could refer to diversity of political and social groups and interests with representation, and to the diversity of partnerships (Berkes, 2007). "Diversity is also seen as an attribute, for example, where you have a diversity of stakeholders who can increase connections to external assets" (Bahadur et al., 2010).

A high level of diversity expands options, and a low level can constrain them.[11] Adger (2000) discusses how low diversity of natural resources can decrease social resilience in communities dependent on that limited range of resources. Having multiple communication methods to send emergency messages to communities is important for their resilience (Longstaff et al., 2010) because the chances of conveying the message are higher when one outlet fails and because the messages are reinforced in multiple ways. Livelihood diversification also supports resilience – as long as the combination of livelihood options is selected in relation to their relative levels of exposure to different risks, e.g., a resilient combination is one that includes livelihood activities that are not vulnerable to the same risk.

Inclusion

Resilience programming has thus far been limited in its ability to consider issues of agency and power (Béné et al., 2012; Davidson, 2010; Leach, 2008), which are reflected in the inclusiveness of community processes and the relative powers of different groups in those processes. Inclusion refers to the involvement and participation of diverse community members in decision-making and planning processes around collective actions, and to its access to and representation in formal governance structures. In this sense, it is manifest largely in a community's transformative capacity. Inclusion can be observed in shared decision-making and governance (Oxley, 2013a; Levine et al., 2011), in citizen participation in community-based groups and community leadership, and in terms of the representativeness of that participation of all community members. A community's inclusiveness is also discernible in its social and cultural norms and traditions.

Another significant point about inclusiveness is that it is influenced by power relations such as those based in gender, socioeconomic class, age, caste, tribe, and ethnicity. Gender is a much studied area that demonstrates the value of in-depth analysis of the roles of different socially constructed groups to enhancing resilience. Enarson (1998), for instance, stresses the importance of understanding gendered roles in preparing for and responding to disasters, in relief and recovery, and in communication and learning about disaster events. She cites numerous examples of research on the importance of women in conveying family and community historical knowledge relative to slow-onset or sudden disasters, in creating and maintaining a shared narrative, and in post-disaster community mobilization. Enarson argues that "We need to know more about how gender relations in disaster-prone communities are constructed historically and in relation to race and ethnicity, social class and other power domains," (Enarson, 1998, p. 168). Enarson's work suggests that measuring inclusiveness must go beyond "counts" (e.g., disaggregating data by sex or other demographic descriptors): it should seek to understand interactions, dynamics, and contributions of groups with different relative power, knowledge, and skills to community resilience processes.

Aspirations

Aspirations are the manner in which people visualize the future and act in a way to improve their future well-being (Rao & Walton, 2004; Appadurai, 2001). Aspirations are "…directly linked to self-resiliency, as only one who is willing to make well-being enhancing investments may durably and autonomously stay out of poverty" (Frankenberger et al., 2007). The ability to make those investments – whether it be in a

[11] It bears noting that – as with any one capability taken independently – diversity does not guarantee resilience. For instance, Adger points out that there is no agreed relationship between ecosystem resilience and diversity: "[M]any tropical terrestrial ecosystems have stable and diverse populations but are relatively low in resilience, while similar ecosystems in temperate regions with apparently low diversity can exhibit greater resilience" (Adger, 2000, p.340).

community health clinic or creation of disaster-resistant infrastructure – is guided by aspiration and vision, though tempered by available assets, knowledge, and opportunities.

Communities possess different capacities to aspire (Frankenberger et al., 2007, summarizing Appadurai, 2001, and Ray, 2002). Aspirations are embedded in societal traditions, norms, and structures that "prevent the poor from building a culture of aspiration."

E. Collective Action Capacities

Conceptions and measurement of community resilience must be founded on a thorough understanding of the collective actions a community carries out in support of the security and well-being of its members. While it is clear that government, civil society, private enterprise and external interests have a direct influence on food and livelihood security at the community level, the burden of preparing for, planning, resourcing, and developing a truly resilient community will reside in the leaders, community associations, school officials, health care providers and citizens themselves (McCreight, 2010). In planning and carrying out community-level strategies for achieving resilience, emphasis must be on the collective actions that must be performed to restore and maintain essential community-based processes and institutions. This conceptual framework emphasizes five main areas of collective action where communities play a significant role: DRR, conflict mitigation, social protection, natural resource management, and management of public goods and services. Each is discussed briefly below.

Disaster risk reduction

The participation of community members in disaster readiness activities and early warning systems is essential to effective DRR. The community role may include leadership and participation in disaster committees, disaster and contingency plans, and sharing information useful for planning – as well as during the disaster itself. Collective actions in DRR rely heavily on the interconnectedness of the community: its members' willingness to work together to protect the community from shocks, and the inclusiveness of the mechanisms and processes it uses to do so.

Conflict mitigation

As discussed in Section IV-C, the role of customary institutions and processes for conflict mitigation and management is especially evident in areas such as natural resource management; honoring these mechanisms is key to effective conflict prevention and other prerequisite areas for resilience. Other types of conflicts where local institutions tend to play a strong role include land disputes or disputes over access to other resources. While outside mechanisms for managing conflict such as the legal code and formal judicial processes are relevant and important, the community's internal governance systems, regulated informally through the bonds of social relationships and norms of trust, reciprocity, valuation of traditional leaders, etc., have a great impact on community success in "keeping the peace."

Social protection

While social protection is a common intervention area for national governments and non-governmental organizations (NGOs), this is also a strong area of collective action of communities at the grassroots level. Self-organized forms of social protection include informal practices such as sharing resources during times of need (e.g., child care, sharing food, sharing labor, sending remittances), as well as structures such as community-based savings groups, funeral associations, and farmer groups.

Natural resource management

Degradation of land, water, and biodiversity due to deforestation, overexploitation of natural resources, and poor collective resource management practices reduces the capacity of the natural environment to provide livelihood resources and ecosystem services to rural populations that depend on them. Communities can complement proven traditional resource management practices and enhance resilience through promotion of integrated watershed management, farmer-managed natural regeneration, drought-tolerant crop and livestock systems, integrated pest management, conservation and utilization of local genetic resources, breeding for local adaptation, and other climate-smart agricultural practices (FAO, 2010; Macek, 2011; Walker & Salt 2006).[12] Collective actions in the interest of managing natural resources have additional impact on conflict prevention, in that successful community-based systems also head off conflicts over use and access to natural resources (Pavanello & Levine, 2011).

Management of public goods and services

Key infrastructure at the community level typically includes transportation (roads, river transportation, ports); water; electricity; schools; health care facilities; markets; and communication (McCreight, 2010). While the government, donors, NGOs, and the private sector usually play a large role in establishing these systems and maintaining them at least to some degree, community-level mechanisms for monitoring their effective functioning and for maintenance are essential for the upkeep and adequate functioning of these systems. For example, a community committee may ensure that a public water pump, latrine, or shared irrigation system is in good order, perform regular maintenance, and alert municipal officials when material or technical resources are needed to repair a structure. Community-based groups may also support public initiatives related to basic services such as volunteer health committees working in support of public health campaigns, or parent groups assisting in school programs. It is the complement of the collective actions of such groups with formal systems that together enable community resilience.

V. MEASURING COMMUNITY RESILIENCE

One of the key features distinguishing community resilience from household resilience is the capacity for collective action. This is the value-added component of the community resilience concept. In addition, communities draw on a range of intangible and tangible assets and social dimensions to carry out these collective actions. To gather information on the key indicators related to these assets, social dimensions, and capacities for collective action, a mixed-method approach is needed that combines quantitative and qualitative measures. This section opens by discussing the challenges of measuring community resilience. It then reviews community-based approaches as a backdrop for the next section, which proposes a community resilience measurement framework. The following section describes an index for community collective action. Section V concludes with a proposal for applying hierarchical linear modeling to community resilience measurement.

[12] Agriculture that sustainably increases productivity, resilience (adaptation), reduces/removes greenhouse gases (mitigation), and enhances achievement of national food security and development goals.

A. Challenges in Measuring Community Resilience

This section discusses the main challenges in measuring community resilience. Foremost is that resilience capacities and resources have a dynamic quality, spatially and temporally (Norris et al., 2008; Cutter et al., 2008). The prevailing tendency to conflate resilience with the outcomes that are a byproduct of resilience is therefore misplaced – or at least, this approach does not fully reflect the dynamic nature of resilience capacities and resources (Frankenberger & Nelson, 2013a). In this regard, process measures (i.e., those that assess interactions between individuals and/or community institutions) are more appropriate than outcome measures (i.e., measures of food and livelihood security status) (Norris et al., 2008; Cutter et al., 2008).

Another challenge argued by some researchers is that in the absence of shocks or stressors during the life of a project, there is no way to determine whether a community is resilient. These scholars contend that resilience capacities represent a *potential* to respond to change (Levine et al., 2011; emphasis added).

The solution to these measurement challenges is likely to be some combination of traditional outcome measures and innovative indicators that apply a process lens and are capable of capturing capacity (Cutter et al., 2008, p. 600). Annex 1 presents a table of illustrative indicators, including both outcome and process measures, that can be used for measuring the dimensions of community resilience based on the community resilience model described in this paper.

Some of the variables defined in Annex 1 (and others that may be developed specific to project and community contexts) can be combined, but others are not suitable to combine. This is an important notion in the context of the strong desire among some researchers and policymakers to devise a **composite resilience index** that is a composite measure of the different dimensions of community resilience highlighted in this paper. A number of composite indicators are already used in environmental hazards and disaster contexts. Cutter et al. (2010) describe a range of these, including those focusing on social vulnerability to natural or technological hazards such as the Social Vulnerability Index, Prevalent Vulnerability Index, the Index of Social Vulnerability to Climate Change for Africa, and others. FAO's resilience model involves development of a suite of latent variable indices that are derived from a number of observable indicators. These indices are used to derive a single resilience index that is a weighted sum of the factors generated using Bartlett's scoring method; the weights are the proportions of variance explained by each factor (Alinovi, Mane, & Romano, 2008; Alinovi, D'Errico, Mane, & Romano, 2010).

One of the challenges in creating a resilience index is weighting individual indicators to reflect each one's relative influence on resilience. Some models – including the one proposed here – opt *not* to weight indicators because of the diversity of perspectives about the relative importance of different indicators. As commented by Cutter and colleagues in reference to their community disaster resilience model, "While methods exist for determining weights that are subjective or data reliant, such weighting schemes do no always reflect the priorities of decision makers" (Cutter et al., 2010, p. 10).[13] In addition,

[13] Cutter et al. (2010) cites Esty et al. (2005) on this point: Esty, D. C., Levy, M., Srebotnjak, T. & de Sherbinin, A. (2005). *Environmental Sustainability Index: Benchmarking National Environmental Stewardship.* New Haven: Yale Center for Environmental Law and Policy.

there is the issue of integrating indicators that are measured at different levels into a single model: some indicators, such as those rating community capacities, might best be measured at the household level, while others reflect data gathered from community leaders or key informants.

The resolution of these and other measurement challenges require contributions not only from scholars and development practitioners but also from community stakeholders. The next section turns to the role of the community in defining and measuring community resilience, which is critical in enabling and sustaining community resilience overall.

B. Community-Based Approaches for Measuring Resilience

There is increasing and well-placed emphasis in a number of disciplines on the role of the community in defining and assessing its own resilience (Abdou et al., 2010; Acosta-Michlik, Kelkar, & Sharma, 2008; Förch, 2012; Kindra, 2013; International Federation of the Red Cross and Red Crescent Societies [IFRCRC], 2010; Longstaff et al., 2010; Stephen, 2004). The basic premise holds that a community-level focus on resilience results in local participation, ownership, and flexibility in building resilience (Brown and Duguid 2000). In addition, strengthening resilience capacity can help empower local communities rather than foster institutional dependency (Wisner, Blaikie, Cannon, & Davis, 2004). Several ongoing initiatives are putting these principles into practice, such as the mixed methods work by FAO, UNICEF, and WFP in Somalia and the Resilience and Economic Growth in the Arid Lands – Accelerated Growth (REGAL-IR and REGAL-AG) projects in Kenya.

Most shocks and stresses are local and affect communities in different ways, and communities are unique and have their own local needs, experiences, resources, and ideas about the prevention of, protection against, response to, and recovery from different types of disturbances. Longstaff et al. (2010) propose an approach that allows community leaders and policymakers to begin to think about resilience as it pertains to their own community's unique circumstances. Their strategy is based on the idea that communities will define themselves during the process of conducting a resilience self-assessment. Their model involves communities assessing and planning for their resilience based on an analysis of "the robustness of their available resources and [their] adaptive capacity to utilize their resources" (Longstaff et al., 2010). They define *adaptive capacity* as a function whereby individuals and groups have the ability to store and remember experiences; use these experiences to learn, innovate, and reorganize resources as they respond to changing environmental circumstances; and connect with others both within and outside their own community to communicate lessons learned and to self- or reorganize resources from outside their communities. Their framework allows community members and assisting planners to identify and make judgments regarding which functions and resources matter most for strong (or weak) resilience (Longstaff et al., 2010).

Abdou et al (2010) use a mixed-methods, participatory approach to increase understanding of "…the unique stressors and resilience resources in communities with disproportionate burdens of disease, disability, and premature death, namely communities of color and those lacking sufficient socio-economic resources" in Los Angeles, California, United States. Specifically, these researchers based their study on Dressler's "cultural consonance" model (2004) where community members provide insights into the norms, values, and broader cultural landscape of their own communities, focusing on stress factors, health status, coping behaviors, and religiosity and spirituality. Their results indicate consensus

among respondents regarding the nature of their communities as places where education, income, and material success are valued, and where lack of socioeconomic progress or success is often viewed as negative. Their findings provide valuable insights into perceptions of stress, coping, parenting, health status, and resilience within these under-resourced Los Angeles communities.

Further examples of the importance of community participation in resilience solutions are given by Kindra (2013), who highlights a number of initiatives in Africa showing that most rural communities that have to manage recurrent climate-related shocks learn to adapt successfully, and do so using their own resources and knowledge. The Africa Climate Change Resilience Alliance (ACCRA), for example, is working to understand communities' mindsets before determining interventions. Their work involves identifying how communities cope with shocks and their local institutional arrangements and power relations, and it explores how the social networks' community members rely on for support. This information provides the basis for development agencies and NGOs to explore how a range of development interventions could improve people's adaptive capacity in these regions.

The Homeless People's Federation in the Philippines, in collaboration with the Asian Cities Climate Change Resilience Network, is also working to promote locally embedded strategies targeted towards building resilience and incorporating a strong focus on both disaster risk reduction and climate change adaptation (IFRCRC, 2010). On the ground, this effort consists of a national network of urban poor community associations and savings groups involved in initiatives to secure land tenure and increase economic opportunity, working wherever possible in partnership with local governments.

Working with an emphasis on participation and empowerment in development, Förch (2012) contends, "Managing resilience is about who has the right and power to decide about resilience of whom and to what, and whether it should be strengthened or eroded." Local scales are necessary to build lasting response capacities to Global Environmental Change. A community-based focus of research is justified in the sense that impacts of climate change affect an entire community's capacity (Sharp & Devereux, 2004; Smit & Wandel, 2006, in Förch, 2012). Emphasis on resilience puts focus on human agency and planned action as integral to any response to change.

More specifically, the basic premise of Förch's study of the drylands region in Tigray, northern Ethiopia, is that with resilience emphasizing the empowerment of communities, a different approach to its measurement is required. Rather than predefining what constitutes resilience and what factors determine it, her research used a participatory approach to determine local factors of community resilience and, based on eight clusters in this case, a consolidated methodological framework for determining levels of community resilience, specifically in dryland regions."

Participatory approaches permit communities to improve their understanding of and control over the factors that determine community resilience. Förch's participatory approach is not only about enhancing knowledge of the determinants of community resilience, but also about engaging community members as research partners (Förch, 2012). The secondary goals of community empowerment to strengthen resilience are met by promoting participation. Beyond data collection, learning is facilitated and capacity is built to enable more effective local action and involvement towards enhanced community resilience. Community members identify local characteristics of community resilience and consolidate these with relevance to the local context.

It should be noted that precautions in Förch's research (2012) were taken to build confidence in participatory research findings regarding internal validity and quality in data collection. Based on Pretty (1995), some of these concerns were addressed by building confidence in the "truth-of-findings via extended stays, triangulation, observation, team communications, self-reflection and by reporting findings back to the communities for their validation."

Based on Förch's research, some key components that enable a community to build its own resilience include the following:

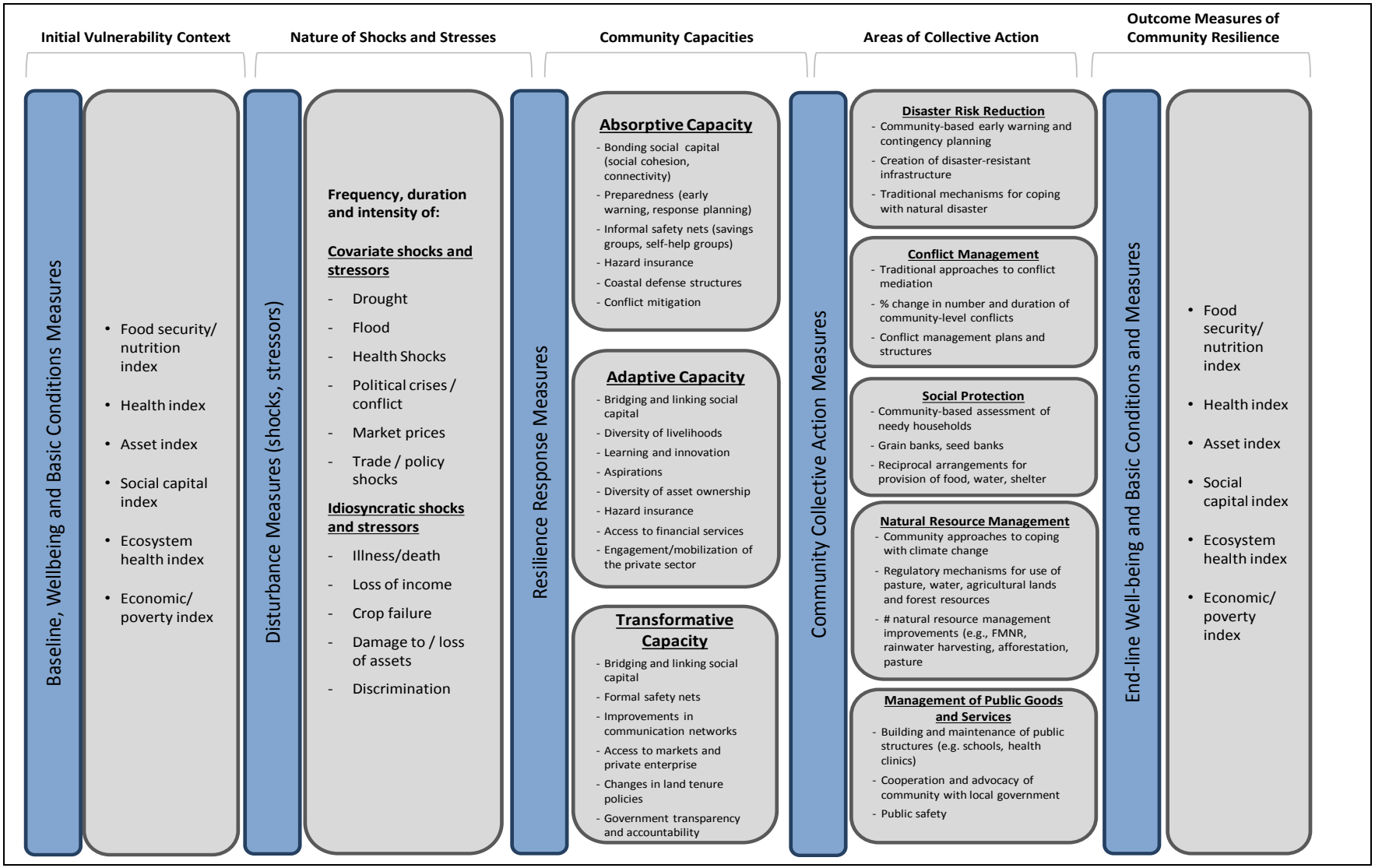
- Community's capacity for collective action,
- Community's ability for problem-solving and consensus-building – to negotiate coordinated responses,
- Presence of community institutions and their horizontal and vertical linkages (bridging and linking social capital), and
- Community approach that focuses on human agency – highlights community capacities to make and implement decisions (Davis, 2004; Förch, 2012).

Through engagement with a community, researchers could also determine which types of collective action are more important to that community. This information could then be used as a subjective means for weighting the collective action dimensions that are combined in a collective action index (see Section V-D). While such weighting would be important for an individual community, it may not be the same for other communities. If comparisons are to be made among communities, then this weighting approach will not be appropriate.

C. Framework for Measuring Community Resilience

The previous section emphasized how including communities in measurement efforts enhances not only the strength and relevance of the measurement approach in a particular local context, but the contribution of the measurement process itself to community resilience. In any context, this process should be guided by an overall analytical framework. There is a strong need for a community resilience measurement framework that is general enough to be applied in different contexts but flexible enough to be contextualized, as two sets of metrics are required to effectively measure community resilience: standard measures and context-specific measures (Constas & Barrett, 2013). This paper proposes a measurement framework for community resilience to model the dynamics of resilience capacities (capacity for collective action) in relation to key well-being outcome indicators and shocks and stressors. This analytical framework is diagrammed in Figure 4; the main components of this framework are briefly described below.

Figure 4: Measurement Framework for Community Resilience



Source: Adapted from Frankenberger, T. R., & Nelson, S. (2013b); Constas & Barret (2013).

The diagram represents, from left to right, standard measures for different components of the community resilience framework, which are listed across the top of the figure. The categories of measures are baseline well-being and basic conditions, or "initial states;" disturbance measures (e.g., shocks, stressors); resilience response measures (to measure community capacities, e.g., absorptive capacity, adaptive capacity, and transformative capacity); community collective action measures; and well-being and basic conditions measures at the end-line. Each of these measurement categories is described briefly below.

Baseline well-being and basic conditions measures. These are measures of the initial vulnerability context, which is a dynamic state. They include food security, health/nutrition, assets, social capital, access to services, infrastructure, ecological/ecosystem services, psychosocial measures and additional poverty measures. These can be single indicators or composite indices that represent some level or state of well-being/condition (Constas & Barrett, 2013).

Disturbance measures. These measures are intended to capture the type, duration, intensity, and frequency of shocks or disturbances. Shocks are natural, social, economic, and political in nature. They can occur as slow- or rapid-onset shocks or longer-term stressors or trends, and can be idiosyncratic or covariate. Shocks can be transitory, seasonal, or structural, and their frequency, severity, and duration can vary widely (Frankenberger & Nelson, 2013a).

Resilience response measures. Building resilience requires an integrated approach that involves a long-term commitment to improving three critical capacities: ***absorptive capacity***, ***adaptive capacity,*** and ***transformative capacity.*** Communities draw on their assets and social dimensions to manifest these capacities. Examples of these capacities are detailed in the diagram.

Collective action measures. To be resilient, communities must be able to perform collective action in at least five dimensions. These include ***disaster risk reduction, conflict management, social protection, natural resource management and management of public goods.*** Illustrative indicators for each dimension are listed in Annex 1, and Section V-D elaborates an index approach for measuring the collective action component.

End-line well-being and basic conditions measures. Differential well-being outcomes or pathways (e.g., levels of food security) after a shock will result from the dynamic interaction of conditions (current vulnerability level of the community) disturbance events (shocks and stressors), and community resilience capacities for collective action (Constas & Frankenberger, 2013).

D. Index for Community Collective Action

This section focuses on measurement of the unique collective action elements of the proposed community resilience model. If there is agreement that the capacity for collective action is one of the key defining features that distinguishes community resilience from household resilience, then an index can be created from indicators that capture different dimensions of community collective action. Indicators for five such dimensions are proposed to construct a community collective action index to serve as a proxy measure of overall community resilience capacity: 1) disaster risk reduction, 2) conflict management, 3) social protection, 4) natural resource management, and 5) public goods management.

Scores for each of these dimensions would not be weighted a priori but weights may be derived inductively from accumulated empirical findings. The community-level index could be used to test a number of empirical questions, one major question being the relationship between strong community resilience (a high collective action score) and household resilience. A method for testing this relationship is discussed in Section V-E.

To construct the collective action index, a score would be given for each indicator that is used to measure a particular dimension of collective action. Referring to Annex 1, there are three indicators for disaster risk reduction, four for conflict management, three for social protection, three for natural resource management, and three for management of public goods. Each indicator would be scored using a ranking of 1-5, with 5 being the highest value. Thus, a collective action index score using the indicators in this annex would range from 0 to 80. It bears reiterating that the indicators in Annex I are not intended to be definitive: these must be customized to the community under assessment. A customized model may have different indicators, as well as a different number of indicators for each dimension, thus a different maximum sum for each dimension. The maximum score for the composite index will therefore vary.

E. Using Hierarchical Linear Modeling to Analyze the Impacts of Community Resilience

As we have seen in this paper, communities and households within them have unique resilience characteristics and capacities. In understanding (1) how community resilience impacts household resilience in the face of shocks; and (2) how interventions designed to enhance resilience impact outcomes like household food security, it is important to take into account the nested relationship between households and communities. It may also be important to take into account the fact that communities themselves are nested within higher-level groups, such as districts or eco-systems within countries because the effects of some intervention or set of conditions observed for each level are not independent of one another. When effects observed at one level, such as household, are linked to effects at another level, such as community or higher-level system, it is useful to employ a multi-level quantitative analysis technique called Hierarchical Linear Modeling (HLM). [14] HLM allows data on outcomes and their determinants at all relevant levels of analysis to be included in an integrated analysis.[15]

As an example of where HLM may be applied, consider an attempt to reduce food insecurity through an agricultural intervention designed to increase the availability of a food staple. Increased production of the staple is expected to have food security and economic benefits both at household and community levels. If the intervention is implemented on a large scale (e.g., national scale), it may also create a shift in demand for the staple as the country becomes more price-competitive, and thus have effects at the country level. This example illustrates that the effects observed at the community level can be dependent on outcomes observed at both lower and higher levels. In analytical terms, inferences between different levels should thus not be arrived at through simple aggregation. Rather, the estimates

[14] The suggestion to apply HLM to community resilience analysis was provided by Dr. Tiffany M. Griffin, Monitoring and Evaluation Specialist, USAID.

[15] This modeling discussion was provided by Dr. Lisa Smith, TANGO International with input from Dr. Mark Constas, Cornell University.

of effect for a given intervention observed at one level should be factored into the analysis of interventions observed at another level. This tactic, which is central to HLM, ensures that dependencies resulting from nested structures are reflected in the analysis. As a result, estimates of effects are less biased, and recommendations for practice tend to be more accurately targeted.

For a specific quantitative analysis example, suppose we are interested in determining whether community resilience affects household resilience in the face of a shock, such as a protracted drought. To do so, HLM is implemented in two steps. We first look at the relationship between household resilience, denotedR_{hc}, and household exposure to the drought, where the latter might be measured using an index of coping strategies. To do so, the following model can be used:

$$R_{hc} = \beta_{oc} + \beta_{1c} * shock_{hc} + \cdots + \beta_{nc} * X_{hc} + e_{hc}. \quad (1)$$

Household resilience is seen to be a function of the degree of exposure of the household to the drought ($shock_{hc}$) as well as other household characteristics influencing their resilience (X_{hc}). The $\beta's$ are slope coefficients representing the impact of shock exposure and other household characteristics on household resilience. The β_{oc} is a constant, and e_{hc} is an error term. Notice that in equation (1) separate slope coefficients (β_{1c} ... β_{1n}) are estimated for each community, so the fact that households are nested within communities is taken into account. These coefficients give an estimate of the impact of the drought for households in each community in the geographical area of interest.

In a second step the community-level slope coefficients on the drought exposure variable (β_{1c}) become the subject of analysis (dependent variable), and one can examine how community resilience (R_c), measured by a collective action index, influences the impact of the drought on household resilience by estimating the following:

$$\beta_{1c} = \gamma_{1o} + \gamma_{11} * R_c + \cdots + \gamma_{om} * Z_c + u_{1c}. \quad (2)$$

In this equation the Z_c are other community characteristics influencing β_{1c}, The γ are the coefficients to be estimated, and $u_{1c}$is an error term.

For a further example of how HLM can be used to understand the impact of community resilience, we may be interested in determining the food security impact of an intervention designed to enhance household resilience in the face of the drought. We would like to find out whether the degree of community resilience made a difference in the success of the intervention. To do so, the following HLM setup can be employed. First, food security (FS) is modeled as a function of drought exposure and a variable indicating whether or not the household participated in the intervention (denoted "Int"):

$$FS_{hc} = \beta_{oc} + \beta_{1c} * shock_{hc} + \beta_{2c} * Int_{hc} + \beta_{3c} * [shock_{hc} * Int_{hc}] + \cdots + \beta_{nc} * X_{hc} + e_{hc}. \quad (3)$$

Here an interaction term between drought exposure and intervention participation, [$shock_{hc} * Int_{hc}$], is included to determine whether the intervention buffers the impact of the drought on food security. Next, as in the previous example, the community-level slope coefficients become the dependent variables. They are used to determine whether the impact of the intervention is modified by the degree

of community resilience. From (3), the impact of the intervention for each community can be expressed as[16]:

$$Impact = \beta_{2c} + \beta_{3c} * \widehat{shock}_c,$$

where $\widehat{shock}_c$ is the average value of the drought exposure variable for each community. This impact is then modeled as a function of community resilience:

$$Impact = \gamma_{2o} + \gamma_{21} * R_c + \cdots + \gamma_{2m} * Z_c + u_{2c}. \quad (4)$$

Equation (4) gives insight into whether greater community resilience served to increase the likelihood that the intervention did in fact mitigate the impact of the drought on household food security.

These examples have illustrated how HLM can be applied in community resilience measurement to account for the influence of resilience in a higher-level system (the community) on the resilience of units within it (households), and to make explicit the relationship of effects observed at the community level with impacts at both lower and higher levels. In order to ensure accurate, comprehensive and contextually specific assessments of community resilience, the HLM approach should be integrated with complementary qualitative research methods that can probe further to explain the interrelationships of the resilience status of different levels in a nested relationship.

VI. CONCLUSION AND NEXT STEPS

This paper is intended to inform the policies and practices of donors, implementing partners, NGOs, government and other stakeholders by establishing conceptual and measurement frameworks for community resilience. By identifying the specific elements of community resilience and the ways in which they interact, the paper clarifies the types of information that must be collected in order to adequately measure it. Perhaps most importantly, the frameworks enable identification of the key leverage points to focus on as part of a theory of change, and the interventions that should be included in programs aimed at enhancing community resilience.

The concept of community resilience presented here is consistent with previous constructs of household resilience in that it acknowledges the central role of various livelihoods assets in enhancing resilience. The key difference between households and communities in relation to these assets is that when assessing community resilience, the focus is on collective or communal access to and use of such assets. As such, the paper asserts that community capacity for collective action to manage shocks and stresses is a key attribute distinguishing community resilience from resilience at the household level. To accurately measure resilience at the community level, the authors propose establishing complementary indices for five separate but inter-related dimensions of collective action. Taken together, these indices serve as reliable proxy measures of resilience processes and outcomes at the community level.

The analytical framework described here is presented in the context of a wide range of approaches currently being utilized to measure community resilience. The authors recognize that a critical step in enabling accurate and consistent measurement of community resilience is to reach a basic level of

[16] Calculated as the derivative of equation (3) with respect to Int_{hc}.

consensus on the best elements of these approaches and build on these to develop a set of harmonized standards, methods, tools, and indicators to guide resilience measurement for practitioners. While it is necessary to distinguish community resilience from resilience at lower (e.g., individual, household) and higher (e.g., ecosystem, national) levels, for measurement purposes it is also important to acknowledge that communities themselves are nested within such systems, which is a key contribution of the proposed measurement approach. This is because the effects of individual interventions or sets of conditions observed at each level are not independent of one another, and in fact interact in complex and dynamic ways that are contextually specific. This paper proposes the use of HLM to engage in quantitative analysis of how effects at different levels influence the resilience of integrated systems. HLM allows data on outcomes and their determinants at all relevant levels of analysis to be included in an integrated analysis.

Complementary work on resilience measurement is currently underway, coordinated by the Resilience Technical Working Group of the Food Security Information Network and the M&E Harmonization Group of Food Security Partners (USAID, DFID, IFAD, FAO, WFP, Bill and Melinda Gates Foundation, the Millennium Challenge Grant, IFPRI, OECD, and the World Bank). An important first step in moving the agenda forward is reaching agreement on a common overarching analytical framework and development of a common set of indicators for measuring community resilience. Longer-term, it is envisioned that continued assessment and identification of new indicators to better measure resilience.

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ANNEX 1: COMMUNITY RESILIENCE MEASUREMENT: LIST OF ILLUSTRATIVE INDICATORS

The table below presents an illustrative list of indicators. The precise indicators for a specific community resilience measurement exercise must be selected according the purpose and focus of the exercise, tailored to the community under study, and designed with the input of the community. The indicators used to measure different aspects of community capabilities and assets are not mutually exclusive; i.e., an indicator may be used to measure more than one thing.

Asset, Social Dimension, or Area of Collective Action	Methodology	
	Quantitative	Qualitative
Type of Asset (Capital)		
Social capital		
--% population participating in traditional self-help groups[e] (e.g., informal insurance groups, funeral associations, others as defined locally)	X	
--attitudes toward sharing food and other resources within community; spirit of reciprocity[e]		X
--presence of formal and informal conflict resolution mechanisms		X
--knowledge-sharing by different stakeholder groups[f]		X
--satisfaction with the way decision-making is assigned[f]		X
--subjective levels of trust and support[f]		X
--% of land use for cultivation within community boundaries[f]	X	
Human capital		
--school enrollment, school completion (primary, secondary)	X	
--literacy rate	X	
--health status and trends (presence of infectious disease, chronic disease)[d]	X	
--immunization coverage[d]	X	
--nutrition status	X	
--% population with convenient (defined locally) access to health care	X	
--skills diversity	X	
Financial capital		
--opportunities for new businesses to be developed; business support networks and services[f]		X
--% of population covered by formal or informal banking /credit groups	X	
--savings groups	X	
--% of population covered by hazard insurance (e.g., crop insurance, weather-based index insurance)	X	

Asset, Social Dimension, or Area of Collective Action	Methodology	
	Quantitative	Qualitative
Natural capital		
--Wetlands acreage and loss[b]	X	
--Erosion rates[b]	X	
--% impervious surface[b]	X	
--Biodiversity[b]	X	
--presence/coverage of communal resource management structures		X
--water quality		X
--quality of terraces, berms, drainage channels, etc.[f]		X
--main type of land tenure (own, rent, sharecrop)[f]	X	
Physical capital		
--% population with access to cell phones, radio, Internet[f]	X	
--community productive assets (e.g., roads, markets, grain banks, irrigation, water storage tanks)		X
--# coastal defense structures[b]	X	
--quality of public transport[f]		X
--electricity infrastructure[f]		X
--schools, water, community centers, clinics		X
Political capital		
--perceptions about access to political processes		X
--presence of community-based organizations representing diverse constituencies		X
--participation in community meetings		X
Social Dimension		
Preparedness		
--% population covered by hazard mitigation plan[a]	X	
--% population covered by emergency response plan	X	
--perception of hazard risk		X
--% population with contingency/emergency funds[c, e]	X	
--disaster preparedness exercises/drills		X
Responsiveness		
--emergency management planning and response procedures[e]		X
--% of population that can be accommodated in designated shelter structures	X	

Asset, Social Dimension, or Area of Collective Action	Methodology	
	Quantitative	Qualitative
Learning and innovation		
--attitudes toward change		X
--attitudes toward the value of education		X
--% of population age XX and older (age determined locally; indicator speaks to potential for passing down community history/memory)		X
--% of disasters experienced in the community in the past XX years (number determined locally) (could be customized by type of disaster)		X
--adoption of new technologies (e.g., farming practices)		X
--valuation of knowledge from older generation[f]		X
Self-organization		
--# self-help groups in the community	X	
--% population participating in traditional self-help groups	X	
--presence of community projects		X
Diversity		
--livelihood diversity	X	X
--supply chain options		X
--diversity of asset ownership (e.g., communal cooperatives)[e]	X	x
--critical infrastructure redundancies[e]		X
--access to a range of social relationships		X
Inclusion		
--% voter participation in the last election[a]	X	
--% membership in community organizations (organization type(s) can be specified locally, e.g., youth group, women's group, farmer cooperative, etc.)	X	
--% of women in decision-making structures (village councils, tribal councils)	X	
--% of minority groups in decision-making structures (village councils, tribal councils)	X	
--land user rights[e]	X	
--perceptions of inclusiveness in decision-making processes		X
Aspirations		
--Exposure to media (e.g., frequency of listening to the radio, accessing Internet)[c]		X
--Number of contacts across eco-system boundaries/ geo-political borders (e.g., contacts with people from outside the community)[c, e]		X

Asset, Social Dimension, or Area of Collective Action	Methodology	
	Quantitative	Qualitative
Area of Collective Action		
Disaster Risk Reduction		
--Community-based early warning and contingency planning	X	X
--Disaster-resistant infrastructure	X	X
--Traditional mechanisms for coping with disaster	X	X
Conflict Management		
--Conflict management structures (e.g., peace committees, consultation with elders)	X	X
--conflict management plans	X	X
--regulatory/ accountability system	X	X
--% change in number and duration of community-level conflicts	X	X
Social Protection		
--grain banks, seed banks	X	X
--community-based assessment of needy households	X	X
--reciprocal arrangements for provision of food, water, shelter	X	X
Natural Resource Management		
--community-based approaches to coping with climate change	X	X
--regulatory mechanisms for use of pasture, water, agricultural lands and forest resources	X	X
--# natural resource management improvements (e.g., adoption of Farmer Managed Natural Regeneration (FMNR), establishment of rainwater harvesting structures, afforestation, pasture regeneration)	X	X
Management of Public Goods and Services		
--Building and maintenance of public goods structures (e.g., health clinics, schools, feeder roads, irrigation channels)	X	X
--cooperation and advocacy of community and local government around providing goods and services	X	X
--community support for maintenance of services (e.g., communal gardens)	X	X

[a]Cutter et al. (2010); [b]Cutter et al. (2008); [c]Frankenberger et al. (2007); [d]WFP (2008); [e]Oxley (2013b); [f]Wilson (2012)