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Systems Analysis in the Context of Resilience

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This paper, which reflects the deliberations of the RM TWG as a whole, elaborates on the concepts presented in Technical Series Nos. 1 and 2 regarding the definition, principles and proposed common analytical model for resilience measurement. Selected members of the RM TWG served as internal reviewers of earlier drafts of the paper, and feedback was also provided during a one-day meeting in April 2015 in Rome, where Technical Series lead authors presented drafts of their respective papers to leaders from World Food Programme (WFP) and the Food and Agriculture Organization (FAO) jointly responsible for creating and coordinating the RM TWG. It is in this regard that the RM TWG recognize the contributions of Arif Husain (Chief Economist and Deputy Director, Policy, Programme and Innovation Division, WFP) and Luca Russo (Senior Economist, Agriculture Development Economics Division, FAO). The RM TWG also wish to thank the individuals in the field who provided compelling questions and informal contributions. Ultimately, the demand for high quality and useful measures of resilience for food security has been the most fundamental motivation behind the group's activities.

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Abbreviations

BRACED	Building Resilience and Adaption to Climate Extremes and Disasters (Mercy Corps)
CIAT	International Center for Tropical Agriculture
DFID	Department for International Development (United Kingdom)
FAO	Food and Agriculture Organization of the United Nations
FSIN	Food Security Information Network
IDP	Internally displaced person
NGO	Non-governmental organization
OECD	Organisation for Economic Co-operation and Development
RCF	Resilience causal framework
RM TWG	FSIN's Resilience Measurement Technical Working Group
SNA	Social network analysis
UNISDR	United Nations International Strategy for Disaster Reduction
WFP	World Food Programme

I. Introduction

Resilience has been described as a complex systems issue (Constas et al., 2014a & 2014b). In very general terms, systems thinking "is a way of thinking about, and a language for describing and understanding, the forces and interactions that shape the behaviour of systems" (Senge, 1990). In the context of this paper, systems thinking aims to understand communities and households in vulnerable areas as part of broader complex and interconnected sub-systems (including food, markets, and political, social and ecological networks) that interact with shocks and stresses. Systems thinking helps identify the intricate interplay between shocks, stresses, vulnerability, resilience and the well-being of households and vulnerable communities, recognizing that households in vulnerable areas are part of a nested hierarchy of communities, landscapes and regions.

While not a new approach, systems thinking is increasingly applied across a wide range of scientific and practical problems (Adam, 2014; Peters, 2014), in part because new analytical tools, more powerful computers and larger sets of data permit programme planners and evaluators to assemble more comprehensive data and more sophisticated analyses. Given the rapid impact of globalization, it also is widely recognized that vulnerability and resilience are functions of multi-layer processes, increasingly involving both local and global factors such as climate change or the volatility of food markets.

Several initiatives are already using a systems analytical approach in support of resilience programming. The OECD (2014) has devised a method to develop a theory of change based on a systems analysis of the causes of vulnerability and resilience, which has been applied in several countries, most recently in Somalia. The Internal Displacement Monitoring Center is leading efforts to develop displacement simulators that use system dynamics modelling approaches (sophisticated computational algorithms) to better understand the relationship between climate change, disaster risk and displacement among pastoralists (Ginnetti, Lavell and Franck, 2015). Several NGOs are applying systems thinking to create causal frameworks and programme theories of change.

Systems analysis has been adopted by the Food Security Information Network (FSIN) Resilience Measurement Technical Working Group as integral to the task of developing a causal and analytical framework for resilience measurement.

In the context of resilience, systems approaches help understand the vulnerabilities that characterize particular geographies because they examine the relationship between social and ecological systems (socio-ecological systems) and shocks/stresses. They are also key to a better understanding of the nature and determinants of the absorptive, adaptive and transformative capacities of households, communities and societies that make them resilient. Systems approaches look at the causes and outcomes of shocks and stresses from a variety of perspectives and scales (e.g. individual, household, community and socio-ecological system), taking into account the larger system of determinants. A systems approach also is consistent with newer programmatic methods of sequencing, layering and integrating intervention strategies. Sequencing interventions prioritizes targeting the rapidly changing vulnerability dynamics caused by shocks; it also targets causes of vulnerability or resilience that may lead to quick wins, e.g. the rapid redeployment of young people to become veterinary assistants in formerly pastoralist households. Layering can seek to improve national governance or health systems, for example, while developing more regionally tailored livelihood improvement strategies. Finally, the key causes of vulnerability and resilience can be tackled by integrating intervention strategies.

In this systems cluster paper, we describe the implications of systems thinking and analytical techniques, particularly for collecting and analysing information for resilience programme planning, monitoring and evaluation.

II. Brief Overview of Literature

Much has been written on the utility of systems approaches for strengthening the resilience of socio-ecological systems (Folke, 2006), institutional systems (Senge, 1990), social systems (Aldrich, 2012), global health (Peters, 2014), socio-technical disasters (Perrow, 1984; Turner and Pidgeon, 1997) and food systems (Ericksen, 2007), taking into account systems theories and methods developed in engineering, ecology, psychology, economics and other related fields.

Findings from this body of work indicate how systems analysis tools can help guide resilience measurement that seeks to build resilience in poor and food-insecure communities. Work on socio-ecological systems reveals the interdependency between social and environmental systems, highlighting how human systems rely on ecosystems (and vice versa), as well as the complex interactions between them. This point is highly relevant to building resilience in food-insecure and vulnerable communities because of the following issues:

- **Natural resources are a key component of livelihood systems.** Poor and food-insecure populations – especially in rural environments – depend heavily on natural resources for their livelihoods: in this specific context, there is an intimate interdependence between social and ecological components.
- **Ecosystems act as natural buffers against shocks.** Ecosystems and ecosystem services can help protect communities/societies from the effects of natural disasters. A good example is the energy buffering role that coastal mangroves or robust wetlands can play in relation to cyclones and associated tidal waves and storm surges.
- The socio-ecological systems perspective on linkages emphasizes not only social/political dynamics but also **the role of the biophysical environment in constructing an understanding of the vulnerability of households and communities and their potential resilience capacities.**

Looking beyond socio-ecological systems, recent systems methods have been used to capture social capital by examining social networks – a type of system – and their characteristics (Aldrich, 2012). This includes key measures of social capital among vulnerable and food-insecure populations (Frankenberger et al., 2014).

Disaster scholars have developed key concepts such as the transmission of shocks through socio-technological systems (e.g. when local drought conditions lead to global food system failures) and the importance of examining the degree of coupling/de-coupling of systems components (Perrow, 1984). Eastern Africa was initially spared the effects of the recent global economic meltdown because of a low degree of coupling of the regional economy to global markets (Moss, 2009).

System approaches are also increasingly applied to global health issues (Mills, 2012; Peters, 2014), as evidence mounts that health problems such as HIV/AIDS, tuberculosis and epidemic threats cannot be solved through vertical interventions without strengthening the broader healthcare delivery systems. Similarly, conceptual work on food systems and resilience (Ericksen, 2007) explores the complex relationships between food system value chain development and food security. Food systems are important determinants of present and future food security. The food system value chain involves a number of activities from food production to consumption, making the food system increasingly complex, involving numerous trade-offs between short-term gains at the expense of eco-system services. In "modern" food systems, food producers and consumers are less closely linked. This creates new opportunities but also risks for livelihoods because feedback loops between producers and consumers are weaker. These developments have implications for resilience, vulnerability and their relation to well-being outcomes.

III. Systems Approaches for Developing Resilience Causal Frameworks (RCF)

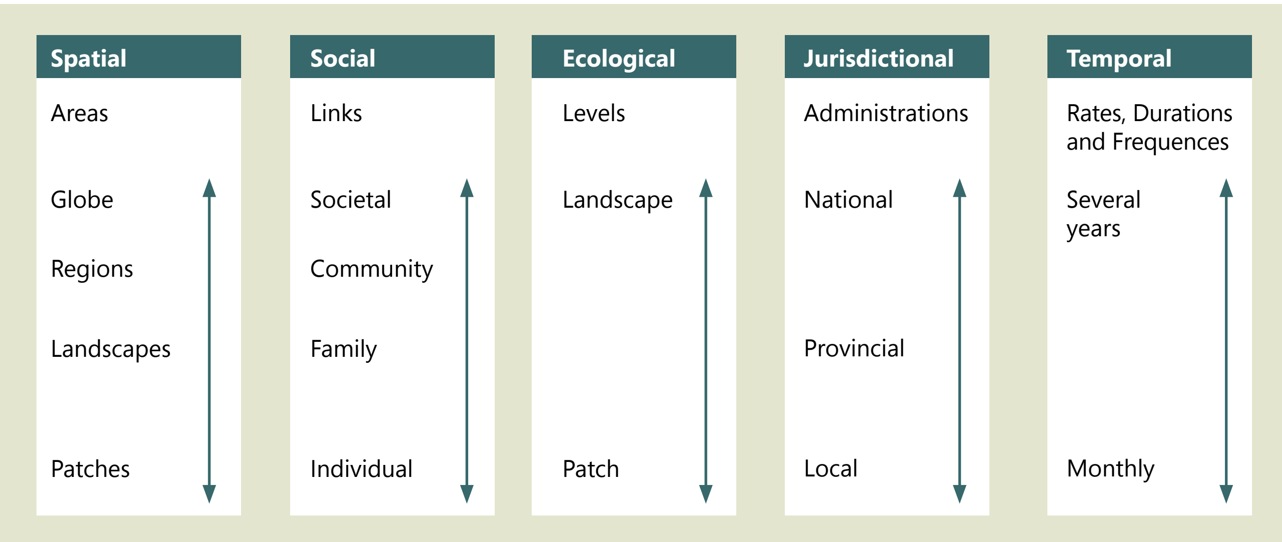
Systems features. This section examines important features of systems analysis and how they help articulate sound Resilience Causal Frameworks (RCF), including causal frameworks that integrate interventions through a theory of change. Table 1 summarizes the key points.

Table 1. Elements of systems approaches for Resilience Causal Framework development

Key features	Examples	Implications for RCF
1. Level and scale of system components	Individual to societal (social); patch to landscape (ecological); local to national (jurisdictional); daily to ten-yearly (temporal)	RCF must explicitly identify levels and scales of major causes of vulnerability and resilience capacities, including social and ecological variables
2. Cross-level and cross-scale interactions	Failure of crops in localized bread baskets can lead to urban food insecurity across the globe; state fragility can lead to local conflicts for land	Explicitly consider cross-scale interactions in RCF
3. Feedback	Poor people may overexploit natural resources, which damages their livelihood prospects further	Causal loop diagrams are relevant tools
4.Thresholds/ tipping points	Traditional insurance schemes may collapse when too many people are affected by the same event	RCF should identify key variables that have these threshold relationships with vulnerability, such as traditional coping capacities and livelihood capital levels – thresholds that when reached lead to failures or successes
5. Networks	Social capital is a key resilience component	Consider bonding, bridging and linking networking in RCF
6. Varying temporal scales of change	Global ecological or social variables may change slowly, while lower level variables are likely to change more rapidly	Timescale of change should be incorporated into RCF
7. Self-organization and unanticipated change	A workshop event may have a profound impact on participants, resulting in systems-wide change	Assumptions in the RCF should be well thought-out/ articulated and situational awareness mechanisms incorporated for unanticipated results

1. **Level and scale of system components.** A systems approach requires that causes of resilience, vulnerability and well-being be analysed from a multi-level and multi-scale perspective. Vulnerable households and communities are embedded in nested dynamics and processes that operate at different levels of spatial, institutional, ecological, social and temporal scales (See Figure 1). Both the scale and the level of the scale are important when analysing resilience. We often refer to the layering of systems elements (e.g. individuals, households, communities or societies), and unique influences on vulnerability and resilience may be found within each layer. DFID (2011) suggests organizing the causes of vulnerability around the sustainable livelihood framework with stocks and flows of the six capitals (physical, social, natural, financial, human and political) in response to the shocks and stresses that determine resilience trajectories considering scale and level. However, there is a general consensus (Gunderson and Holling, 2001) that it is possible to devise a broad analytical strategy to identify the most critical causes of vulnerability at different levels and scales of the systems, and that the end result of this analysis is typically the identification of a smaller/ limited number of key determinants. From a resilience programming perspective, the implication is that systems state changes in well-being are mostly the result of a few key variables that may be operating through different scales and at different levels. For example, ecological systems level landscapes (such as arid and semi-arid lands) are an important level for analysing the vulnerability and resilience trajectories of households living in these ecological areas.

Figure 1. Scales and levels



Adapted from Cash et al., 2006.

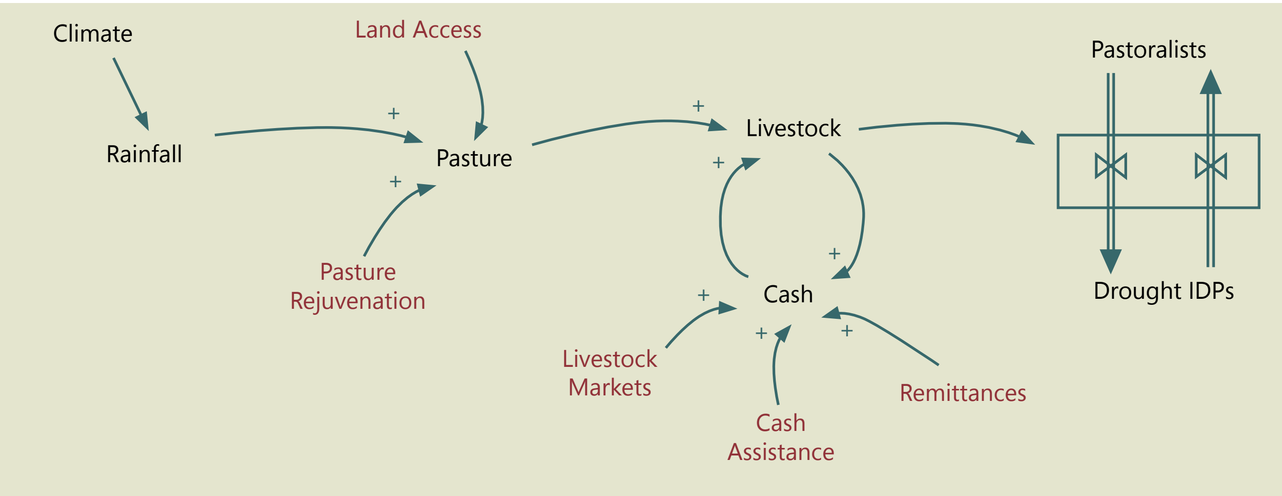
2. **Cross-level and cross-scale interactions** Cross-level and cross-scale interactions reflect changes in capacities and outcomes related to the unique effects of one level of measure on another level (e.g. national governance on community governance) or one scale on another scale (e.g. ecological on social or jurisdictional). An ecological landscape, for example, may influence social or economic processes across a range of communities. Conversely, local variability in ecological factors may have important local effects on communities. Another concern is that jurisdictional

boundaries may not correspond to ecological boundaries, making it difficult to manage ecosystem services. To achieve resilience in communities, landscape-wide actions may be required and thus the cooperation of local, regional and national governance structures. Household resilience is a product of these cross-scale and cross-level interactions (Béné et al., 2011). A more in-depth treatment of these important dynamics is provided in Ericksen (2012).

Similarly, systems thinking puts into perspective the distinction between systems variables and contextual factors in programme design. NGOs often operate at district or lower levels of intervention. In this case, national governance would be a contextual variable. By contrast, nationally targeted resilience-building efforts should consider governance a systems variable and the target of intervention strategies.

3. **Feedback.** Feedback creates complex interactions among system components. Feedback occurs when outputs of a system are "fed back" as inputs in a chain of cause-and-effect that forms a circuit or loop in a system (Ford, 2009). Two variables can be negatively or positively related to each other. Figure 2 shows how climate change affects displacement through rainfall, pasture and a reinforcing feedback loop between livestock and cash that ultimately results in drought-related Internally Displaced Persons (IDPs). Reinforcing and balancing loops also help explain how vulnerability or resilience may be created by a particular relationship. In the case of climate change and drought IDPs, displacement and lower well-being are created by a reinforcing loop between reduced livestock and cash. Another example is the Building Resilience and Adaption to Climate Extremes and Disasters (BRACED) project in Wajir and Karamoja (Mercy Corps, 2014). Mercy Corps systems analysis exposed the reinforcing loop between humanitarian aid strategies and increased socio-ecological vulnerability. Aid camps may attract people to unsustainable (or ecologically fragile) locations that necessitate further aid and produce more vulnerable conditions. Another widely observed example of feedback producing vulnerability is the relationship between poverty and the over-exploitation of natural resources, which damages livelihoods further.

Figure 2. Causal loop diagram



Source: Ginnetti and Franck, 2014, p. 26

4. **Thresholds/tipping points**. Systems feedback can give rise to non-linear relationships among the determinants of resilience, vulnerability and well-being. Many ecological/environmental variables need to reach certain threshold values before they generate specific desired (or undesired) outcomes. One of the most well-studied examples of threshold dynamics is between fertilizer use and lake eutrophication, where once a certain phosphorous concentration is reached in a lake, its dynamics change rapidly and it becomes eutrophic, sometimes irreversibly. Traditional insurance schemes are another example of mechanisms with potential thresholds. They may work well until large covariate shocks occur: these cause the schemes to collapse because too many people are affected. Likewise threshold levels of programme exposure need to be achieved before the programme produces results. Many interventions follow a dose response curve, or a non-linear relationship between intervention intensity and anticipated results.

5. **Networks.** Recent research on community capacity for collective action[1] demonstrates how systems concepts – particularly social networks – are key to understanding community resilience. Community capacity for collective action is considered essential for resilience. Aldrich (2012) for instance demonstrated how the relationships or interactions that people have within and across institutions and communities are key in the process of recovering from a natural disaster; more specifically, bonding (horizontal, or within a community), bridging (across communities) and linking (with political power bases) social capital are all thought to be important to building social resilience. However, more research is needed because some forms of collective action or social capital can in some circumstances prevent adaptation or resilience (e.g. in Coulthard, 2011).

6. **Varying temporal rates of change.** System components may change at different rates (temporal scale). The rate of change is often correlated with the level of scale, where lower levels change more quickly than higher levels of scale. For example, higher level ecological variables such as oceanic circulation or soil nutrient cycles tend to change more slowly than local population abundance. Likewise, changes in social variables can be fast or slow depending on their nature. Understanding the temporal dimension of systems is important in building RCF; an understanding of the rates of change in the determinants of resilience and vulnerability can inform intervention sequencing and the development of milestones for resilience programmes. It also helps provide perspective on trade-offs between faster changing variables, such as local agricultural productivity and slower changing regional water availability.

7. **Self-organization and unanticipated change.** The complex nature of relationships among the various scales and levels of the determinants and dynamics of systems can make it very difficult to predict resilience trajectories. Large-scale change can occur from a seemingly innocuous local event. For example, water contamination in one small community can have a major effect on food

1. This is a capability that cuts cross all three capacities required for resilience, namely absorptive, adaptive and transformative capacities.

security in the whole downstream basin. Food insecurity related to the recent Ebola epidemic was found in unexpected areas because it was difficult for farmers to access markets. On the other hand, some interventions can have much greater effects than expected because farmers groups may organize themselves around interventions that are in high demand. To reflect the connected and adaptive nature of socio-ecological systems, conceptual frameworks must articulate assumptions well when developing a RCF, and monitoring for unanticipated effects is essential.

IV. Principles for Applying Systems Thinking to Resilience Measurement

The features of systems as discussed above have important implications for resilience measurement, which can be summarized in the following principles:

1. **Include ecological indicators in resilience measurement.** A systems approach to resilience measurement should include social and ecological measures. Ecological data on natural/renewable resources should be collected and combined with household and community level data. Examples of ecological indicators include Net Primary Production (from satellite sensors), land cover, cropland use, rangeland and grazing use, land use change, forest (cover), soil (quality), fish and aquatic resources (abundance), watershed rainfall and other measures of ecosystem services such as lake eutrophication.

2. **Calibrate the frequency of measurement. Incorporate high frequency measurements for shock monitoring and situational awareness.** The complex and connected nature of socio-ecological systems requires vigilant situational awareness, especially around shock events and in the face of known stresses. This means shocks must be monitored, which can be done together with resilience capacity and outcome monitoring using multiple methods assessment techniques (Béné et al., 2015). Satellite data streams can be collected to track changes in vegetation and other ecosystem variables. While face-to-face interviews are still important for measuring social data, cellphone-based monitoring is increasingly an option in many settings. WFP recently piloted systems to monitor food consumption and coping behaviours through interactive voice recording. Other approaches include SMS and live operator interviews. Resilience capacity can be monitored this way, along with emergent community threats and identified risks. Similarly, crowdsourcing methods such as crisis mapping can be used to identify shocks, threats, impacts and successful resilience interventions. In sum, a wide range of methods and techniques are now available; the key is to adapt the frequency of the data collection to the dynamics of the process under consideration.

3. **Use multi-level analysis.** The nested hierarchical nature of threats, responses and key socio-ecological system factors means that variables must be measured at different levels of scale. While household surveys can capture social well-being at individual or household level, many of

the determinants of these outcomes may be occurring in higher layers and in multiple systems. For example, community capacity for collective action may need to be measured by assessing community governance structures, community financial resources and the vibrancy of civil society. Data analyses will need to include hierarchical mixed effect regression techniques that can incorporate and estimate the effects of community-level factors as well as their interactions with household-level traits in order to model household well-being outcomes.

4. **Expect and plan for threshold effects in key determinants and resilience interventions, and carefully measure initial conditions. Use panel-type designs where possible.** The relationship between resilience interventions, capabilities and well-being outcomes is not expected to be linear. In fact, the intensity of exposure required to build sufficient resilience capacities might follow a dose response curve. Programme interventions that do not deliver threshold levels of intensity may have no effect on resilience capabilities.

   Measuring initial conditions is important. This means that the initial baseline must include quantified measures of the outcome of interest (i.e. the well-being indicator) as well as the hypothesized causal factors identified in the RCF (e.g. ecosystem/natural resources or health indicators). However, because final well-being outcomes may diverge substantially depending on initial baseline measures, careful modelling/monitoring of the trajectories of households based upon longitudinal panel data can be very useful for understanding the dynamics of pathways to resilience and vulnerability.

5. **Use multiple method assessment techniques.** In contrast to the heavy measurement strategy used by large-scale household food security surveys, a systems approach ensures that the assessment and monitoring of key determinants focuses on well-being outcomes (resilience trajectories). To identify key determinants at different levels and scales, resilience analysts can use a combination of time-series analysis of secondary data on shocks, hazards, stresses and well-being, and qualitative surveys of stakeholder groups (Béné et al., 2011). A more deliberate strategy can then be developed to monitor key variables over time. Multiple method assessments can also help identify potential unexpected effects of shocks and resilience-boosting interventions.

6. **Employ social network analysis (SNA) techniques to capture social capital.** SNA uses graph analysis to better capture bonding, bridging and linking capital by measuring networks more formally. SNA is not yet well developed as an application in resilience measurement, but this should be a priority.

V. Challenges and Limitations

While systems theory has been studied extensively and adapted to the problem of socio-ecological systems, actual empirical work on measuring and modelling these relationships is still sparse. To date, systems methods are primarily applied to developing RCF/conceptual frameworks rather than to analysing data and designing evaluations/monitoring. To analyse resilience and evaluate the impact of resilience-building interventions, panel data that integrates social and ecological information and high frequency shock monitoring is required – as is mixed method assessment. Yet, thus far, most resilience measurements have been based on cross-sectional household surveys and traditional quasi-experimental designs using household data. This limits our ability to retrofit RCF to empirical observations. Much work is needed in this regard.

Systems data analytic approaches are undergoing rapid development with the advent of big data systems, data science development and increased computing power. This means that organizations that engage in resilience-building activities and monitoring should have some in-house expertise or access to expertise in complex systems analysis and/or system dynamics modelling.

VI. Glossary

Adaptive capacity - The ability to make proactive and informed choices about alternative livelihood strategies based on changing environmental, climatic, social, political and economic conditions.

Absorptive capacity - The ability of individuals, households, communities or higher-level systems to minimize their exposure to shocks and stressors and to recover quickly when exposed.

Causal loop diagrams - Diagrams that show non-linear relationships between variables and interrelated effects. They utilize arrows and positive and negative signs to illustrate the nature of the relationships and feedbacks (Kirkwood, 1998).

Covariate shocks - When many households in the same locality suffer similar shocks (e.g. crop failure from drought or floods).

Dose response curve - The non-linear relationship between exposure to a cause and its outcome, typically characterized by a threshold of the causal variable that, when reached, results in exponential change in the outcome variable.

Feedback - When outputs of a system are "fed back" as inputs in a chain of cause-and-effect that forms a circuit or loop in a system (Ford, 2009).

Level (of system component) - Units of analysis located at different positions on a scale. For example, a jurisdictional scale could comprise county, state and national levels.

Panel data - Also known as longitudinal data, panel data is obtained when multiple cases (households, plots, etc.) are observed at multiple (two or more) points in time, allowing for analysis on the change over time of a given case.

Resilience - The "capacity that ensures adverse stressors and shocks do not have long-lasting adverse development consequences" (Costas et al., 2014a, p. 6). Resilience can be viewed as "a capacity that prevents individuals, households and communities from falling below a normatively defined level for a given developmental outcome (e.g., food security, poverty level, well-being)" following a shock or stress (Ibid., p. 7).

Resilience Causal Framework (RCF) - One component of a common analytical model for resilience measurement. It seeks to explain well-being in the face of shocks by examining how resilience capacity is positioned in a dynamic relationship (Costas et al., 2014b, pp. 10–11). The RCF presents indicators that need to be measured in a particular order to model resilience (Ibid., pp. 13–15).

Scale (of system component) - An analytical dimension of a system, e.g. spatial, temporal, jurisdictional scales.

Shocks - External short-term deviations from long-term trends that have substantial negative effects on people's current state of well-being, level of assets, livelihoods, or safety, or their ability to withstand future shocks (Zseleczky and Yosef, 2014).

Social capital - The institutions, relationships, and norms that shape the quality and quantity of a society's social interactions. Increasing evidence shows that social cohesion is critical for societies to prosper economically and for development to be sustainable. Social capital is not just the sum of the institutions which underpin a society – it is the glue that holds them together (World Bank, 2015).

Social-ecological systems - Linked systems of people and nature. The term emphasizes that humans must be seen as a part of, not apart from, nature — that the delineation between social and ecological systems is artificial and arbitrary (Stockholm Resilience Center[2]).

2. See: http://www.stockholmresilience.org/21/research/what-is-resilience/resilience-dictionary.html

Social network analysis (SNA) - Methodology used to analyse the interrelationships among people, organizations and communities.

Stresses - Long-term trends or pressures that undermine the stability of a system and increase vulnerability within it (Zseleczky and Yosef, 2014).

Systems analysis - An approach that uses tools and theories to examine problems or phenomena in their specific context by analysing the systems in which they exist. This involves exploring the problem on a variety of levels, scales and categories as well as considering the range of components that contribute to a particular dynamic context. Systems analysis often combines mathematical models or quantitative tools with qualitative methodologies and approaches (OECD, 2014; Peters, 2014; Folke, 2006).

Systems theory - Bertalanffy (1968) advanced the view that entities must be understood holistically, looking at the organization of – and interactions between – the components of an entity rather than a reductionism that focuses on the parts alone. Systems theory emphasizes the dynamic nature of systems that continuously evolve and shift with the interactions of interrelated, transforming component elements. Though the theory began with a focus on biological and cybernetic applications, it was then broadened to explain systems across disciplines. As a result, the foundational concepts and perspective of systems theory have been adopted and adapted for use by numerous disciplines, resulting in a variety of understandings and interpretations of the term.

Systems thinking - An approach to problem solving and exploration that seeks to understand the relationships between the structures and components of the system in a holistic way. Peters (2014) states that systems thinking involves a number of different theories based on methods from a variety of fields of study designed to investigate the complex problems of dynamic, learning systems.

Theory of change - Evidence, context, assumptions and hypotheses are used to build a dynamic interactive model that illustrates how a programme, project, organization, etc. believes change will happen. This involves considering ideas of causality, external factors and systems, and intervention outcomes, among other issues (Vogel, 2012).

Tipping point/threshold - The point at which major change occurs in system dynamics (OECD, 2014).

Transformative capacity - The ability to create an enabling environment through investment in good governance, infrastructure, formal and informal social protection mechanisms, basic service delivery and policies/regulations that constitute the conditions necessary for systemic change.

Vulnerability - "[T]he characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard" (UNISDR, 2009).

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FSIN
Food Security Information Network

Technical Series No. **6**

Resilience **M**easurement **T**echnical **W**orking **G**roup




FSIN was launched in October 2012 under the leadership of FAO, IFPRI and WFP to help build sustainable food and nutrition security information systems. One major objective is to provide access to standards, methods and tools on food and nutrition security (FNS) information systems.

Resilience has recently garnered intense, wide spread interest among FNS practitioners and policy makers because it focuses attention on people's and communities' capacities to reduce their exposure and cope with and/or adapt to shocks and stressors. However, a common understanding of how to identify and measure the factors that predict various dimensions of well-being, such as food security, in the face of shock and stressors is lacking. The ability to evaluate the impact of resilience programmes and the opportunity to track progress depend on effective measurement and clear understanding of plausible cause-effect relationships related to resilience. In this context, the *Resilience Measurement Technical Working Group* (RM-TWG) was established by FSIN to identify and promote means of operationalizing the concept of resilience in humanitarian and development practice.

Operationalizing resilience as a focus of measurement requires the provision of credible, data-based insights into the attributes, capacities and processes observed at various scales (e.g., individual, household, community and national). Therefore, the RM-TWG promotes the adoption of best practice in resilience measurement through collaborative development of three primary outputs published as a Technical Series:

- A report that provides a definition of resilience along with resilience measurement principles;
- A report that provides a common analytical model and causal framework for resilience measurement; and
- A set of technical briefings that provide guidance on specific aspects of resilience measurement.

These outputs provide practical guidance for those working in field settings and serve as a reference for continued discussions on how to collect measurement data on resilience that is accurate and useful.

For more information and to join the network: www.fsincop.net

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