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USAID Ethiopia Resilience Learning Activity

RAPID FEEDBACK RESOURCE GUIDE

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ACTIVITY INFORMATION

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ACRONYMS AND ABBREVIATIONS

CLA	Collaborating, Learning and Adapting
CLD	Casual Loop Diagramming
CSO	Civil Society Organization
GIS	Geographic Information System
MEL	Monitoring, Evaluation and Learning
PSA	Participatory Systems Analysis
RF	Rapid Feedback
RLA	Resilience Learning Activity (USAID Activity)
SDA	System Dynamics Analysis
SNA	Social Network Analysis
USAID	United States Agency for International Development

ABOUT THIS GUIDE

This Rapid Feedback Resource Guide has been developed for use by the USAID/Ethiopia Resilience Learning Activity (RLA) to support USAID implementing partners working to strengthen resilience systems in Ethiopia. This guide focuses on feedback tools that can be used by USAID's partners to guide their decision-making in line with recent developments; support their monitoring, evaluation. and learning (MEL) efforts; and provide feedback and insight to adapt management approaches. The five rapid feedback tools covered in this "Revision 1" version of this guide are:

Social Network Analysis (SNA): SNA is a powerful platform to better understand a local system and relationships between stakeholders. SNA can be used to map a system or network of stakeholders and identify key influencers and relationships within communities. The results can foster collaboration and facilitate collective action.

Causal Loop Diagramming (CLD): CLD is a visual modeling tool used to model and analyze complex systems, focusing on cause-and-effect relationships between different variables, including how each variable can either reinforce (positive feedback) or balance (negative feedback) other variables and the overall system. By analyzing cause-and-effect relationships, CLD helps to understand vulnerabilities, design effective interventions, and adapt in the face of change and disruptions, contributing to the system sustainability and resilience.

Ethnography: Ethnography is a *qualitative* research method used to study and understand culture, behaviors and social dynamics of communities, groups, or individuals. Ethnography can be an effective tool to improve development programs, by ensuring efforts are contextually relevant and culturally sensitive.

Participatory Systems Analysis (PSA): PSA is not a tool, but an approach, to help understand and improve systems that actively involves stakeholders and participants in the analysis process. PSA emphasizes the active engagement of system actors and facilitating the processes that allow them to interact. learn from each other. and find common interests for collaboration. PSA does not analyze the system, but rather uses multiple tools and techniques (including others in this guide) to help actors analyze the system to which they belong.

System Dynamics Analysis (SDA): SDA is a computer-aided modeling and simulation tool for high-level strategy to help understand the behavior of complex systems over time. SDA provides a structured way to understand and simulate the feedback loops, delays, and interdependencies that exist within systems. SDA is valuable for addressing complex problems, anticipating unintended consequences, and making informed decisions in various fields; its use in development fields remains limited.

Each of the tools is covered in turn, providing the reader with an overview of the tool and its application. We recognize that not all the tools described in this guide are equally conducive for "rapid" feedback, depending on the timeframe applied. While some of these tools inherently lean toward higher commitments of time and resources, we have outlined possible applications of each of the tools to inform rapid feedback in resiliency efforts.

This Revision 1 of this guidebook expands on the five tools covered in the original version, providing more detail on how to apply the tool, including step-by-step guidance, software and other tools, and examples applied of the tools in resiliency efforts and for rapid feedback.

Other USAID resources from the Learning Lab that complement the tools outlined in this guide include: Understanding CLA; Collective Action in Programming: A Practical Guide for Facilitators; Incorporating CLA in Activity Management; Theory of Change Workbook; and Outcome Mapping: Building Learning and Reflection into Development Programs.

Recommendations to consider for future revisions of this guide and to support the adoption and utilization of these tools include:

- Include summary sections on additional tools and topics, such as Effective CLA Workshops, Outcome Mapping, Theory-of-Change Development, Cost-Benefit Analysis, or GIS and Spatial Analysis.
- Solicit feedback and input from USAID resiliency partners to gauge interest and propose other topics or content for inclusion in this guide. A request can coincide with the next survey, meeting, workshop or other appropriate forum.
- Gauge interest among USAID resiliency partners on receiving team training on these and potentially other tools. Alternatively, if aligned to coincide with another meeting of USAID resilience partners, short break-out sessions could be offered on these tools, including an introduction to the tool and software applications.

1. SOCIAL NETWORK ANALYSIS (SNA)

WHAT IS SOCIAL NETWORK ANALYSIS (SNA)?

SNA is a powerful platform to better understand and quantify the characteristics of a local system and relationships between stakeholders. With the use of powerful software platforms like open source Kumu, users can generate attractive, user-friendly network maps and track quantifiable indicators that measure the effectiveness of relationships and collaboration within the system. When the attributes of a network's actors and their relationships are defined, SNA becomes a powerful tool to analyze a rich array of sub-networks sharing commonalities or characteristics.

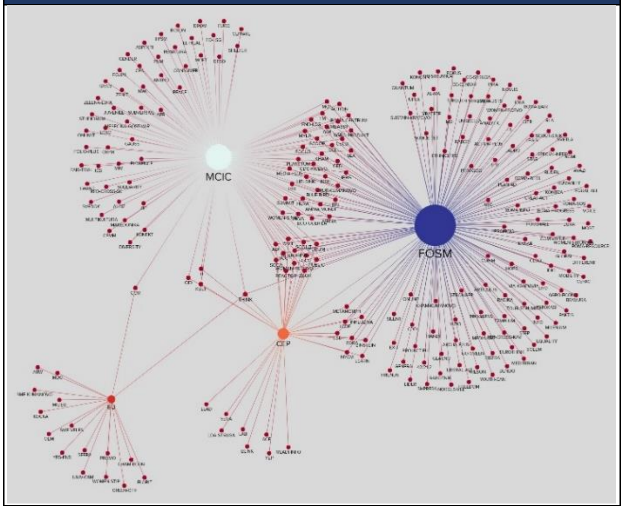
PURPOSE

- Map systems, stakeholders, and their relationships.
- Identify system leaders and how they influence the network.
- Facilitate and track collective action over time.
- Measure and quantify impact on system and relationships.
- Support data-driven adaptive management.
- Supports detailed analysis according to myriad attributes.

HOW CAN SNA BE USED IN RESILIENCE ACTIVITIES?

- Track stakeholder participation in networks over time.
- Feed information back to stakeholders in easily understood, visual terms to facilitate dialogue.
- Use as monitoring, evaluation, and learning (MEL) tool to define and track indicators.
- Inform adaptive management and activity pivots and refinements.
- Facilitate and target collaborative, locally led interventions.
- Enables both visual and mathematical analysis: capture the structural characteristics of a network and sub-groups; identify central actors; analyze relationships; identify gaps and fragmentation; provide insight about relationships and power structures; highlight resource flows and directions of influence; analyze at whole-of-network and individual actor levels.

Using SNA to Track Donor Grantees



Here, SNA shows civil society organizations (CSOs) and their links to different donors. Linkages represent grant agreements and the flow of financial resources. Many CSOs in this example are linked to a single donor; those in the middle of the diagram have worked with multiple donors. In this example, USAID used SNA to inform its Local Works activity and identify prominent CSOs with whom they had not previously worked.

EXAMPLES OF RAPID APPLICATION OF SNA IN RESILIENCE ACTIVITIES

- Track the participation of stakeholders in a network or collective action over time. Identify other stakeholders whose participation will strengthen the effort. Simple exercises incorporated into facilitated meetings and activities can deliver a rapid data set.

- A simple exercise incorporated into an existing workshop or event can request participants in the room to identify others with whom they previously collaborated; repeating the question at subsequent meetings can show the stakeholders how their network has evolved over time.
- Ask participants to identify stakeholders with whom they desire to strengthen relationships, then facilitate collective action in this direction and draw new participants into the network.
- Identify the most influential and well-connected members within a system; facilitate and build capacity for stakeholders to better serve bridging and collaboration roles within the network.
- Create visual "maps" of communities' social networks to illustrate how information and knowledge flow within the community and identify experts who can deliver support or advice.
- Identify knowledge and sharing gaps within the network, then facilitate interventions to bring together individuals who fill gaps but may be less connected.
- Identify stakeholders with a high propensity in the network to share information and encouraging them and others to increase and innovate new ways to share and cooperate.
- Gamify participation in working groups by rewarding members for connecting with others or contributing valuable knowledge.
- Monitor the "health" of the community network, detecting signs of isolation or disconnect among members and take proactive measures to reintegrate isolated members into the network.

WHAT SNA TOOLS DO I NEED?

There are a dozen or more SNA platforms and applications; among the most popular and widely used are summarized below, including hyperlinks. Presently, LINC most widely uses the Kumu platform due to its versatility, robust mapping features, relative ease-of-use, and interactive web-based application.

SNA Software Comparison		
Software	**Source**	**Description**
Kumu	Web-*Based* Interactive Free and Paid Plans	• *User-friendly interface to create and share dynamic and interactive network maps.* • Supports multiple i*mport data formats.* • *Provides metrics and network analysis tools.* • Allows *multiple team members to work together.* • Generally utilized by LINC.
SocNetV	Download Open Source	• *Intuitive graphical interface easy to create and analyze without extensive programming skills. Users can draw directly onto canvas to create powerful visualizations.* • *"Community Detection" feature allows users to identify clusters or communities within the network.* • "Dynamic Network Analysis" feature allows users to explore dynamic network changes over time.
Visone	Download Open Source	• *Network analysis and visualization tool.* • *Provides a range of network metrics and visualization options.* • Interactive graphical user interface; import and export all standard formats for SNA data.
Gephi	Download Open Source	• *Popular open-source network analysis and visualization software.* • User-friendly interface to create, analyze and visualize networks; suitable for beginners and advanced users.

NodeXL	Download Basic Free Advanced Paid	• Excel add-in for network analysis. *Ease of use and integration with Excel makes it accessible to a range of users.* • Basic (free) version has minimal features.
Others (less used)	*NetMiner: Commercial (paid) network analysis tool focusing on business and social network analysis; features for data collection, analysis, and visualization.* *NetworkX: Open-source platform to create and study structure, dynamics, and functions of complex networks. It's a library rather than standalone software and is widely used in research.* *Pajek: Downloadable software supports advanced network analysis and visualizations. Well-suited for large, complex networks.* *UCINet: Comprehensive metrics and network centrality measures. Mapping and visualization require NetDraw add-on. Primitive command line interface (not menu-driven).* Cytoscape: Open-source platform for visualizing and analyzing complex networks, including biological and social. Supports development of plugins.	

HOW MUCH EFFORT IS NEEDED TO CONDUCT SNA?

The table below provides illustrative levels of time and resources to conduct SNA at various levels ranging from a rapid application to sophisticated analyses for long-term impact evaluation, research and learning efforts. Rapid applications can range from one-off activities conducted as a workshop exercise, or simple survey or data collection around a smaller network of actors. Complex efforts conducted on a longitudinal basis might typically require resources on par with a traditional impact evaluation.

SNA Effort & Resource Requirements			
Level	**Preconditions & Goals**	**Time**	**Human Resources**
Rapid	• Can be integrated into existing activities. • Small networks of up to 20 members. • Network members defined in advance ("closed" roster). • Basic analysis and stakeholder mapping. • Use results for network feedback and strengthening efforts.	Event activity 1-3 weeks for stand-alone study	Network Facilitator: Design, collect data, analyze.
Medium	• Network members defined in advance. • Medium networks 20-50 members. • Require more intensive survey and data collection to achieve objectives. • Medium to higher level analysis. • SNA will be repeated in the future.	1.5 - 3 months Repeat on intermittent basis	SNA Professional / Analyst. Enumerators: As necessary for roster data collection.
Complex	• Sophisticated, higher-level analysis to support research and learning. • Larger networks and systems: ~50-100, up to 500 members. • Not all network members defined in advance ("snowball" roster). • Respondents are difficult to reach or motivate to respond. • May require multiple iterations over time.	3 - 5 months Repeat on intermittent basis	SNA Professional / Analyst. Local Experts: As necessary. Enumerators: As necessary for roster data collection.

STEPS FOR CONDUCTING SNA

Conducting an SNA involves several steps to collect, analyze and interpret data; these steps and brief illustrations are summarized below.

Step 1: Define Objectives and Research Questions: Clearly articulate the research questions and objectives that you aim to address through the SNA. These might include identifying prominent actors, determining factors that contribute to positive relationships, or design interventions to stimulate collaboration or fill knowledge gaps in the network.

Step 2: Define the Network and Establish Members: Identify the specific network you want to analyze and define its "boundaries" that determine who precisely should be included. A "closed roster" is a network whose members are defined prior to the SNA and will not be expanded. A "snowball roster" is one that allows network members to cite other members that are or should be included in the network. These are then generally subsequently surveyed to gauge their membership potential and interest.

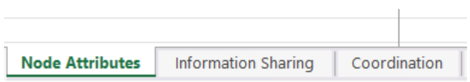
USAID/Ethiopia Resilience Partners

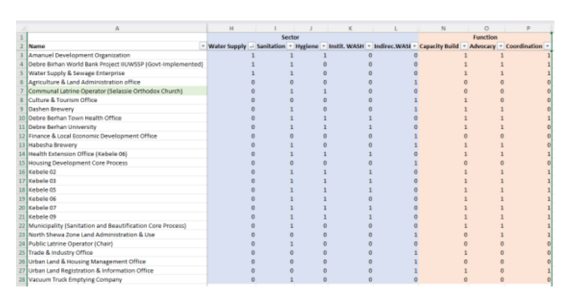
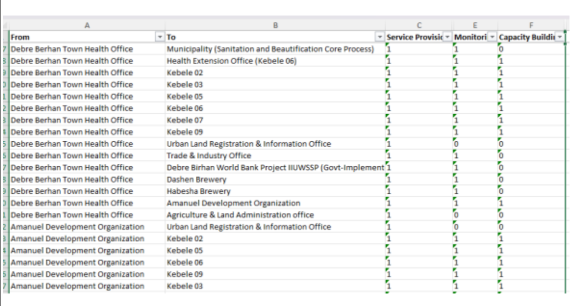
This map shows the USAID/Ethiopia resilience partners with whom the RLA activity is working. Here, resilience partners are shown with their linkages to USAID program offices.

Step 3: Define Actor and Relationship Attributes: Identify necessary attributes of both actors and relationships. Actor (node) attributes often include type of entity, sector, geography, markets, and services provided. Relationship (connection) attributes often include type and strength of relationship, frequency of communication, or value of resource flow. This is the data that will be collected, via survey, interview, or other means in the next step.

Step 4: Collect Data: Assess how to best collect the data and outline the methodology. Options include online survey instrument (e.g., KoboToolbox or SurveyMonkey); phone or personal interview; and potentially observations and analysis of existing data. For example, if connections represent flow of money or resources in a supply chain, available statistics can be incorporated. Other questions might include those like, "With whom do you communicate and collaborate with, and how often?" Throughout the data collection process, it is important to be transparent in how the data will be used, ensuring privacy, and obtaining consent. Remember that, if the actors' names are shown in the SNA, they will be able to derive others' responses about their relationships.

Step 5: Code and Enter Data: Collate and code the data (responses) and enter the data into a spreadsheet; other data file format; or directly into the SNA software. Most users typically create an Excel file structured for SNA (see inset) and readable by most SNA software.

SNA Data: Actor and Connection Attributes		
Spreadsheet Organization		This screenshot shows Excel worksheet tabs for recording all node attributes (first), and two types of relationships: information-sharing and coordination.

SNA Data: Actor and Connection Attributes		
Actor (Node) Attributes		This screenshot shows a portion of the "Node Attributes" worksheet. It displays the name of the actor, with a column designated for each attribute and option. Here, Sector (blue) and Function (orange) are shown. Others might include geography, participation in a working group, or any other organizational attribute. "1" and "0" responses are utilized.
Connection Attributes		This screenshot shows a portion of the "Coordination" worksheet. The first two columns designate the source (survey respondent) and target (named actor) in Columns A and B, respectively. Four types of coordination were tracked: Service Provision, Maintenance, Monitoring, and Capacity Building. Again, "1" and "0" indicate the type of coordination between the actors.

Step 6: Clean and Validate Data: Review and "clean" the data from anomalies and ensure all names and attributes are accurate and consistent. Listing the same organization as two different names will indicate an extra actor (node) in the network. Analysts can find these manually or with the help of Excel "approximate matches," fuzzy lookups" or similar tool. Resolve all outliers, missing or erroneous data. Validate the data to confirm that it accurately represents the relationships within the network.

Step 7: Map the Network: After importing all the data (including all node and connection attributes) into the SNA application, the program can generate maps and other visual representations on demand. Use the software to add filters or commands to adjust graphic details such as node color (e.g., by type of organization) and size (e.g., by "degree," or number of connections). An intermediate knowledge of coding, or the assistance of a specialist, can be helpful here. With an online SNA platform, such a specialist can embed selectable filters to create a highly user-friendly system that allows users to manipulate filters to analyze any range of sub-networks (e.g., by region covered or type of services delivered).

SNA Network Metrics Overview	
Metric	**Description**
Degree	Number of times an actor (mode) is linked to others, either incoming ("in-degree") or outgoing ("out-degree"). Actors with high degrees are more central and influential.
Density	Proportion of actual connections in a network relative to the total possible connections if all actors are directly connected to one another. High density indicates a more connected network.
Betweenness Centrality	The extent to which a node lies on the shortest paths between all other nodes in the network. Nodes with high betweenness centrality act as bridges or intermediaries and control the flow of information or resources.
Closeness Centrality	How close a node is to all other nodes in the network, measured by shortest path. Nodes with high closeness centrality are more central and can quickly reach other nodes in the network.
Clustering Coefficient	The degree to which nodes in a network tend to cluster together, quantifying the level of local connectivity. Identifies communities or cliques within a network.

Step 8: Analyze the Network: Analyze the network and use the program to select sub-networks and zoom in on select

stakeholders to draw relevant findings and conclusions about the network and relationships. The use of quantitative metrics like degree and centrality can be useful for measuring activity indicators and identifying unique or important actors within a network. (See inset above for a sampling of some of those commonly examined, but there are numerous others.) These and other advanced analytical techniques offer quantifiable insight into the network's structure and dynamics.

Step 9: Provide Feedback and Deliverables; Plan Action: With the software, users can create network visualizations and analysis outlining findings, key actors, clusters and sub-networks. Tailor the outputs to the audience and make sure to provide feedback to the participants, using the findings to stimulate discussion and future actions with the network members.

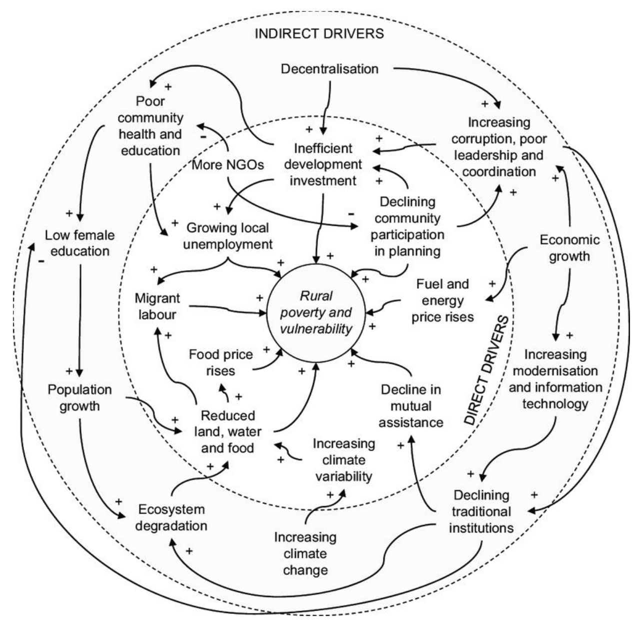
Step 10: Monitor, Evaluate and Learn: As appropriate to the objectives, monitor changes in the network over time, especially if the analysis has led to interventions or changes in network dynamics.

2. CAUSAL LOOP DIAGRAMMING (CLD)

WHAT IS CAUSAL LOOP DIAGRAMMING (CLD)?

Causal Loop Diagramming (CLD) is a visual modeling tool used to model and analyze complex systems, focusing on cause-and-effect relationships between different variables (“elements” in CLD terms). In CLD, causal relationships are depicted as arrows, showing how changes in one variable can influence others in a feedback loop. Relationships between variables can be either “reinforcing” (positive feedback) or “balancing” (negative feedback). Reinforcing loops amplify change, while balancing loops stabilize or counteract change. Arrows can indicate the direction of causality, the nature of the relationship, and whether there is any delay in an expected effect’s occurrence. By visualizing and analyzing cause-and-effect relationships, CLD helps to understand vulnerabilities, design effective interventions, and adapt in the face of change and disruptions, contributing to the long-term sustainability and resilience of systems.

Using CLD to Model Rural Poverty Influences



This CLD models the influences of direct (i.e., inner ring, proximate causes) and indirect drivers (i.e. outer ring, systemic causes) on each other and on rural poverty and vulnerability in Indonesia. A “+” polarity on an arrow indicates that if the source variable increases or decreases, the variable being influenced will also change in the same direction. A “-” indicates that if the influenced variable will change in the opposite direction as the source variable. Colors and other features can also be incorporated.

PURPOSE

- Understand complex systems such as ecosystems, communities, or organizations.
- Identify system vulnerabilities by modeling how factors contribute to stability (or instability).
- Allow for "what-if" scenarios, to predict outcomes based on different combinations and influences of variables.
- Inform ongoing monitoring and adaptive management by analyzing critical variables and potential consequences of interventions, both intentional and unintentional.

HOW CAN CLD BE USED IN RESILIENCE ACTIVITIES?

- CLD can help identify vulnerabilities within a resiliency system by modeling how various factors contribute to its stability or instability. For example, in a community resilience context, a CLD can show how economic fluctuations and resource scarcity interact to affect food security.
- CLD can reveal the presence of feedback loops that can either reinforce or mitigate the impact of disturbances. Understanding these loops can inform strategies to enhance resilience. For instance, a reinforcing loop showing how community cohesion fosters disaster preparedness can guide interventions to strengthen social ties.
- CLD is useful to project and plan for “what-if" scenarios. Scenarios such as extreme weather events or economic downturns can be modeled to assess their potential impact on a resiliency

system, informing proactive strategies to mitigate adverse effects.

- Resilience-building policies and interventions can be designed based on CLD insights. Decision-makers can use CLD to identify leverage points where interventions would have the most significant impact.
- CLDs provide a visual and accessible way to communicate complex systems to stakeholders. They facilitate dialogue and engagement among diverse groups invested in resilience, allowing them to collectively explore and understand system dynamics.
- In dynamic systems, resilience requires adaptive management. CLD can inform ongoing monitoring and adaptive responses by highlighting critical variables and potential unintended consequences of interventions.

EXAMPLES OF RAPID APPLICATION OF CLD IN RESILIENCE ACTIVITIES

- When a potential disaster or crisis is anticipated, a rapid CLD can be constructed to illustrate how factors like community cohesion, emergency response times, and resource availability interact to influence community resilience. This can inform last-minute preparations and resource allocation.
- In the face of a drought or other food supply disruption, CLD can be used to analyze how factors like rainfall, crop yields, food distribution, and market prices interact. This can guide both short-term relief efforts and longer-term resilience strategies.
- CLD can be employed to explore how urban planning decisions, such as infrastructure development or green space preservation, affect a city's resilience to climate-related events like floods or heatwaves.
- In the logistics and transportation sector, CLD can be used to model how disruptions like a trade embargo, natural disaster, or other supply chain disruption might impact the resilience of a supply chain. A rapid analysis can help identify alternative suppliers and transportation routes.
- During a public health crisis, CLD can help understand how factors like medical supply chains, hospital bed capacity, and government interventions influence the resilience of the healthcare system.
- During a serious health crisis like a pandemic, CLD can be used to map variables impacting employment resilience, including factors like remote work capabilities and employee well-being. In response to a sudden shift to remote learning, CLD can illustrate the dynamics of virtual learning, including factors like internet access, teacher-student interaction, and technological support.
- In the energy sector, CLD can be used to assess power outages caused by extreme weather, analyzing factors like grid infrastructure, renewable energy integration, and emergency response to enhance energy grid resilience.

WHAT CLD TOOLS DO I NEED?

While CLDs can be created manually with pen and paper or through drawing software, there are dedicated software applications that facilitate the process. Due to the similarities with SNA diagrams, many of the SNA software platforms can be adapted for use in CLD. The choice of CLD software depends on the user's specific needs, expertise level, and project requirements. Some software tools are more focused on system dynamics modeling and simulations, while others are designed for creating CLDs with a user-friendly interface. Online platforms like Kumu and InsightMaker offer collaboration features, making them suitable for team-based modeling efforts. Below are some popular CLD software tools and a brief description of their capabilities:

CLD Software Comparison		
Software	**Source**	**Description**
InsightMaker	Web-Based Free Account	• Online modeling and simulation platform that includes CLD. Allows users to create CLDs, conduct simulations, and collaborate on modeling projects. • Accessible via web browser, making it convenient for collaboration; designed to simplify the process of creating and sharing CLDs.
Visual Paradigm	Download Paid Perpetual or Subscription Options	• CLD capabilities with professional tools and templates. Site boasts, simplest way and simplest tools to create CLDs. • Comes with an extensive library of visualizations and icons. • Supports a range of other features for project management, visual modeling, business modeling, team collaboration.
Kumu	Web-Based Interactive Free and Paid Plans	• Analogous to SNA, Kumu can construct CLDs by replacing relationship maps with influence labels replaced by +/- causal loop influence conventions. Kumu is generally utilized by LINC. • User-friendly interface to create and share diagrams and allow for collaborative teamwork. • Accessible via web browser; supports multiple import data formats.
LucidChart	Cloud-Based Paid Plans (reasonable cost)	• Cloud-based diagramming and visualization tool that can be used for CLDs; offers CLD templates and shapes. • Accessible and collaborative, making it suitable for collaboration and teamwork. • Integrate-able with many commonly used apps and software.
Vensim	Download Variety of Paid Plans	• Powerful system dynamics software, offering a user-friendly interface for constructing CLDs, running simulations and analyzing system behavior. Configurations and plans support a range of users. • Contains industry-leading technical advances in simulation technology: Causal Tracing™, Reality Checks™, subscripting, optimization, resource-allocation algorithms.
Stella Architect -and- Stella Professional	Download Paid Plans (higher cost options)	• System dynamics software that supports CLD creation. Offers features for modeling dynamic systems, visualizing feedback loops, and running simulations. • User-friendly interface suitable for both beginners and experienced modelers. • Widely used in various fields, including business, environmental management, and public policy.

HOW MUCH EFFORT IS NEEDED TO CONDUCT CLD?

The amount of resources required to effectively conduct a CLD depend on several factors such as the complexity of the learning question, complexity of the system and scope of the CLD, available data and empirical knowledge about the subject, and whether the CLD will be maintained going forward. If CLD development will rely on stakeholders and group modeling, how many will be involved and how sophisticated will their input processes will be will determine the level of effort. The table below provides illustrative levels of time and resources to conduct CLD in rapid, medium and complex levels.

Time and Effort Requirements for CLD			
Level	**Preconditions & Goals**	**Time**	**Human Resources**
Rapid	• Learning questions and problems clearly defined. • Available information and/or working with a small number of stakeholders (<5). • High level of clarity and characterization of key variables and feedback influences. • Roughly 20-30 or fewer variables.	1-2 months	Senior Analyst/Facilitator
Medium	• Learning questions and problems require additional definition and clarification. • Limited information available requires deeper research dive. • Facilitating input from more than roughly five stakeholders. • More complex system and/or detailed characterization of feedback loops required. • Approximately 30-50 influencing variables. • Might be tracked and replicated going forward.	3-4 months	Senior Analyst/Facilitator Junior Analyst/Researcher
Complex	• Learning questions and problems require additional definition and clarification. • Limited information available requires deep research. • Facilitating input from 10 or more stakeholders. • Participatory modeling, feedback and review required. • Complex interaction between variables and detailed characterization required. • Approximately 50 or more influencing variables. • Additional systems analysis based on CLD required.	Up to 6 months or more	Senior Analyst Facilitator 1-2 Junior Analysts

STEPS FOR CONDUCTING CLD

Conducting a CLD typically involves a systematic process that incorporates both background research and facilitated stakeholder input. Key steps are summarized below.

Step 1: Define the Purpose and Scope: Clearly articulate the purpose of the CLD. Define the x system and/or problem you are trying to model and understand. Define the boundaries of the analysis and identify key objectives. Engage a team of subject matter experts, stakeholders, researchers, and facilitators as appropriate for the CLD.

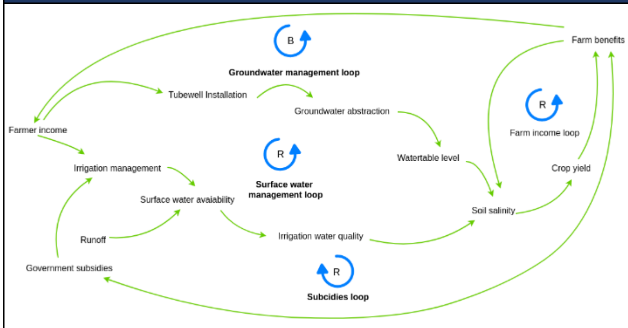
Step 2: Conduct a Literature Review and Collect Data: Conduct thorough research to gather existing knowledge, data, and information about the system and key variables that affect the system. Research may include development reports from other implementers and donors, input from experts, statistical data, and academic literature.

Step 3: Identify Key Influencing Variables: Identify the key variables, factors, and components that are relevant to the system and its dynamics. These are the variables (elements) that will be represented in the CLD. If stakeholders will be engaged in a participatory exercise, it is a good idea to have identified some of the key variables to illustrate the process and stimulate discussion.

Step 4: Engage Stakeholders: Identify and engage key stakeholders. Facilitate workshops or conduct interviews to engage participants in the CLD process. Encourage open discussions to gather their insights, experiences, and influences of variables on the system and on other variables. Facilitate discussion to define each variable and its relationships with other variables in the system. Discuss cause-and-effect relationships and feedback loops. Use sticky notes or digital tools to record these relationships and their effects.

Step 5: Create the Initial CLD: Begin constructing an initial CLD using diagramming software or tools designed for this purpose. Most of the software applications presented previously provide customizable, user-friendly data input features and prompts. In the CLD, variables are represented as nodes and causal relationships as arrows or arcs connecting them. Arrows are typically labeled with a "+" or "-" to indicate reinforcing or balancing feedback loops.

CLD Templates: Farm Management



Many CLD software applications boast a range of templates to support and facilitate CLD across a range of fields and practices. This example shows a template available on Visual Paradigm to guide CLD construct on farm management.

Step 6: Validate and Refine: Validate the initial CLD with participating stakeholders and experts, soliciting feedback on the accuracy and completeness of variable definitions and relationships. Revise as necessary. Depending on the availability of stakeholders and their time constraints, if can be best to validate and refine the CLD during the workshop, using the software to generate the CLD while participants are present. Oftentimes, they may not be available to review later, so it may be best to stimulate dialogue and validate the results while the topic is fresh.

Step 7: Run Simulations: If the CLD requires and the software used supports simulation, consider running simulations to explore the behavior of the system under different conditions. Simulations can help stakeholders better understand the system's dynamics.

Step 8: Review and Finalize: Conduct a final review with stakeholders and experts to ensure that the CLD accurately represents the system and its dynamics. Make any necessary refinements, then document the CLD, making sure to include detailed variable definitions, relationships, feedback loops, and any assumptions made during the process. Present the finalized CLD to stakeholders and other interested parties. Use the diagram to facilitate discussions, raise awareness, and inform decision-making related to the system. CLDs are intended to be dynamic models; thus, as new information becomes available or the system changes, it may be useful to revisit the CLD for updates and refinements, encouraging ongoing stakeholder engagement.

3. ETHNOGRAPHY

WHAT IS ETHNOGRAPHY?

Ethnography means researching and writing about people. Ethnography is a *qualitative* research method used to study and understand the culture, behaviors and social dynamics of communities, groups, or individuals in the context of development. Ethnography can involve immersive, in-depth fieldwork and participant observation to gain insights into the lived experiences and perspectives of the people being studied. Ethnography is a primary tool used by anthropologists, sociologists, historians, and political scientists and can be an effective tool to improve development programs.

PURPOSE

- Understand local realities, context, culture, social structures, and daily life, and ensure cultural sensitivity.
- Elicit data that is more accurate and precise through trust-building.
- Access objective information that the respondents might not otherwise share.
- Observe real behaviors and recalled responses; assess real versus reported behaviors.

HOW CAN ETHNOGRAPHY BE USED IN RESILIENCE ACTIVITIES?

Incorporating ethnography into resilience activities helps ensure that strategies are rooted in the local context, respect cultural norms, and are co-created with communities. This participatory approach itself enhances the resilience of communities by leveraging their strengths, knowledge, and adaptive capacities.

- Provide an in-depth assessment of a community's resilience by studying how individuals and groups cope with and adapt to various stressors, shocks and changes over time. Capture local knowledge, traditional practices and wisdom related to resilience to inform development strategies built on existing adaptive capacities.
- Explore how communities and individuals perceive and interpret risks and vulnerabilities. This insight can inform risk communication strategies and improve community planning, preparedness, and coping strategies during various stressors. Contribute to early warning systems by understanding how communities receive, interpret, and respond to warnings.
- Understand vulnerable groups within a community, such as marginalized populations or those with limited access to resources, helping to understand their needs and constraints.
- Generate narratives and stories that can be used for advocacy and raising awareness about resilience challenges and solutions, empowering communities to advocate for their needs.
- Inform the development of policies that are sensitive to local realities. Policies crafted with ethnographic insights are more likely to be effective and well-received by communities.
- Contribute to MEL efforts by providing qualitative data on the impact of development interventions, complementing quantitative data with rich narrative and context.
- Conduct gender analysis, identifying the roles, responsibilities, and power dynamics of men and women within a community to inform gender-sensitive development approaches.
- Uncover the barriers and challenges that communities face in accessing education, healthcare, clean water, and other services; guide the removal of identified obstacles.
- Encourage community participation and engagement in development processes and empower community members to have a voice in decision-making, activity design, and implementation.

EXAMPLES OF RAPID ETHNOGRAPHY IN RESILIENCE ACTIVITIES

Rapid application of ethnography in resilience activities might involve conducting ethnographic research quickly to inform immediate decision-making and actions in response to a specific crisis or challenge. For rapid analysis, researchers often work closely with local partners and organizations to ensure that the research is informed and responsive to the needs of affected communities. Rapid ethnography provides valuable, context-specific insight that can guide resilience activities in real-time, helping communities respond effectively to crises and build their capacity to withstand future challenges. Some examples of how ethnographic methods can be adapted for quick data collection and analysis are outlined below.

- In the aftermath of a disaster or crisis, practitioners can conduct rapid ethnographic assessments to understand the needs, vulnerabilities, and coping strategies of affected communities. This information can inform the deployment of relief efforts, future allocation of resources, early warning systems and public messaging.
- Ethnographers can rapidly assess food security in communities facing acute shortages due to drought, conflict or other crises. This involves a better understanding of local food systems, coping mechanisms, and barriers to access that be gained through ethnography.
- In contexts where there is conflict or tension, ethnography can be used to understand the root causes and dynamics of conflicts and inform conflict resolution and peace-building efforts. Ethnography helps to understand local power dynamics, grievances, and peacebuilding potential.
- Following a displacement crisis, ethnographic research can inform the design of emergency shelters, housing and food solutions, in light of cultural preferences, family structures, and community dynamics. In refugee camps, ethnography can rapidly assess water and sanitation needs and practices and ensure that programs align with local customs. Ethnography can be used to rapidly engage with communities to reveal local hazards, traditional risk reduction practices, and barriers to disaster risk reduction.
- Ethnographers can study the impact of urbanization on vulnerable communities, examining access to services, housing conditions, and social networks and inform urban resilience strategies.
- Ethnographic research can assess healthcare access and utilization in remote or underserved regions, and identify the challenges faced by communities in accessing healthcare services.
- Ethnography can inform assessments of climate change impacts on communities. Researchers can examine local climate awareness and adaptation strategies and the effectiveness of climate efforts.

WHAT ARE SOME ETHNOGRAPHY BEST PRACTICES AND TOOLS?

Ethnography plays a vital role in ensuring that development interventions are contextually appropriate, participatory, and responsive to the needs and aspirations of the people they aim to serve. It helps bridge the gap between development theory and local realities, contributing to more sustainable and impactful outcomes. Ethnography itself is a *qualitative, human-centered* research method that involves in-person fieldwork, observation, interviews, and data. Ethnography helps contextualize development challenges and opportunities, uncover the root causes of issues, and explores how they are connected within the local context. Some of the tools and best practices for ethnography are outlined below.

Community Empowerment: Ethnographic research can empower communities by giving them a voice in the development process. It fosters participatory approaches where community members actively engage in decision-making.

Built on Trust: The strength of ethnographic research is based on trust between respondent and ethnographer, and networks of trust between ethnographer and the community.

Asset and Resource Mapping: Ethnography helps map community assets, including human, social, natural, and other resources to inform strategies for asset-based community development.

In-Depth Interviews: Ethnographers conduct interviews with community members, leaders, and other stakeholders. These interviews are typically open-ended, allowing respondents to share their experiences, perceptions and concerns related to development issues. Detailed field notes document observations, conversations and reflections, providing rich data for analysis.

Capacity Building: Ethnography often involves collaboration with community members as researchers or partners. This approach builds local research capacity, fosters a sense of ownership over development, and empowers communities to conduct their own resilience assessments and advocacy.

Storytelling and Advocacy: Generates narratives and stories that can be used for advocacy and fundraising efforts. Personal stories from community members can effectively communicate the impact of collaboration.

Cultural Sensitivity: Ethnographers approach their work with cultural sensitivity, respecting local customs, traditions, and ethical considerations. This helps build trust and rapport with the community.

Evaluation and Impact Assessment: Ethnography can be used to evaluate development projects; assess the impact of interventions on communities; and capture unintended consequences, both positive and negative.

Qualitative Data Analysis Software (QDAS): QDAS tools like NVivo, ATLAS.ti, MAXQDA, and Dedoose are widely used for organizing, coding and analyzing qualitative data, including text, images, audio and video. They help researchers efficiently and quickly categorize and explore themes and patterns in ethnographic data.

Other Software Tools: Other useful software includes transcribing software like Express Scribe or Transcriber for WhatsApp. Geographic Information System (GIS) software like ArcGIS or one of several open-source alternatives can be used to map and analyze spatial data. Those working with video and audio recordings may use Adobe Premiere Pro or Audacity for editing and analyzing multimedia data. Some ethnographers use online survey software like Qualtrics or SurveyMonkey to collect structured qualitative data from participants alongside ethnographic research. Leximancer and other programs support text mining and content analysis, which can be particularly useful for large datasets. Evernote or Microsoft OneNote can help ethnographers organize and sync field notes, and they often support collaboration and data sharing. Reference management software like EndNote or Zotero can be valuable for organizing and citing sources.

STEPS FOR ETHNOGRAPHIC RESEARCH

While ethnographic research is characterized by its flexibility and adaptability to different contexts, there are some logical steps that ethnographers typically follow to conduct their studies effectively. These steps can be adapted and modified as needed to fit the specific research objectives and complexity of the study.

Step 1: Define Research Objectives: Clearly articulate the research questions and objectives of the study. What do you want to understand or explore?

Step 2: Conduct Literature Review: Conduct a comprehensive literature review to familiarize yourself with existing research on the topic, understand the context, and identify gaps in knowledge.

Step 3: Design Research: Develop a Research Plan that outlines the approach, data collection methods, sampling strategy, and other parameters. Consider how you will gain access to the community or group you want to study; oftentimes, local individuals and organizations can help with the research, while strengthening their capacity.

Step 4: Build Relationships and Trust: Establish or sustain rapport and trust; ethnography relies on building relationships to gain access and collect meaningful data. Ethnographers may immerse themselves in the community or setting they are studying, spending time with participants, observing their activities, and actively participating in their daily life when appropriate.

Step 5: Collect Data: Collect a variety of data, including field notes, interviews, audio or video recordings, photographs, and artifacts. Document daily experiences, interactions, and cultural practices.

Step 6: Analyze Data: Analyze the collected data, using coding, thematic analysis, content analysis, and other methods in line with the Research Plan. Identify patterns, themes, and key insights. Continuously compare data and observations to refine and deepen understanding. This process helps in the development of theories and concepts and may challenge existing understandings.

Step 7: Triangulate Findings: Use multiple data sources to cross-validate findings. Triangulation can also involve comparing data from different participants, methods or time frames.

Step 8: Feedback and Validate: Engage with participants to validate and feedback findings and interpretations; this can further inform and deepen understanding and clear up any misperceptions. Reflect on your role as the researcher and how it may have influenced your observations and interpretations; consider your positionality and biases. Lastly, ensure that all research adheres to ethical guidelines, including informed consent, confidentiality, and respect for cultural sensitivities. Ethnographers often work with ethics review boards.

4. PARTICIPATORY SYSTEMS ANALYSIS (PSA)

WHAT IS PARTICIPATORY SYSTEMS ANALYSIS (PSA)?

Participatory Systems Analysis (PSA) is an approach to understanding and improving complex systems that actively involves stakeholders and participants in the analysis process. It emphasizes collaboration, dialogue, and the co-creation of knowledge among those who have a vested interest in the system being studied. This approach recognizes that people with direct experience and expertise in the system are valuable sources of insights and solutions.

PSA puts the emphasis on the system actors and the processes that allow them to interact, learn from each other, and find common areas for collaboration. PSA is not a tool, but rather an approach that may rely on other tools and techniques (including those in this guide) used to help stakeholders analyze and better understand their system.

PURPOSE

- Build trust and consensus among stakeholders.
- Enhance stakeholder engagement, fostering a sense of ownership and shared responsibility.
- Generate holistic understanding of a system by drawing on the knowledge, experience, and insight of stakeholders.
- Promote co-creation and collective action that are effective and contextually relevant.
- Empower communities and stakeholders by giving them a voice in decision-making and the ability to shape their own futures.

HOW CAN PSA BE USED IN RESILIENCE ACTIVITIES?

- Identify vulnerabilities by engaging community members and stakeholders in analyzing the system's vulnerabilities, including those related to environmental, social, or economic factors.
- Collaboratively develop resilience-building strategies that are contextually relevant and responsive to the needs and priorities of the community.
- Integrate local knowledge and expertise to improve the common understanding of system dynamics, which can inform adaptive strategies for coping with disruptions.
- Strengthen social capital and community cohesion by fostering collaboration, communication, and trust among stakeholders, all of which are essential components of resilience.
- Create mechanisms for ongoing monitoring and adaptive management, allowing communities to provide input and respond effectively to changing conditions and emerging threats.
- Ensure that decision-making processes are inclusive, transparent, and participatory, which enhances buy-in and the sustainability of resilience initiatives.
- Identify and mobilize financial and human resources by engaging a wide range of stakeholders in collective action.
- Facilitate mutual learning among participants, enabling them to better understand and navigate complex resilience challenges.
- Develop and practice preparedness plans and response strategies collaboratively, which can improve a community's ability to withstand and recover from shocks and stressors.

WHAT ARE SOME PSA TOOLS AND BEST PRACTICES?

PSA can involve a variety of resources and tools to facilitate the engagement of stakeholders and the analysis of complex systems. PSA approaches are also most useful when the implementation of solutions depends on aligned interests of multiple actors and their active engagement. PSA can be utilized when overall objectives are clear, but specific problems and their root causes are unclear. Similarly, PSD is useful when priorities and timelines are not yet defined and must be agreed upon by multiple stakeholders. When higher levels of trust and mutual awareness are required (e.g., in volatile, conflict, hierarchical, traditional, and other contexts) PSA can unlock a path forward. The resources and tools outlined below can be adapted to different contexts and tailored to suit the specific needs of research and feedback efforts.

Inclusive Participation: Effective facilitation and a commitment to inclusivity are key to the success of participatory processes. PSA is most effective when it involves a range of stakeholders, including community members, experts, decision-makers, and those directly impacted by the system. Inclusivity ensures that diverse perspectives and experiences are considered. PSA is a process; thus, for this tool, outputs may be less important than the convergence, learning, and trust-building that takes place due to the interactions between stakeholders.

Participatory Input: Skilled facilitators are essential for guiding participatory processes, managing group dynamics, and ensuring that all voices are heard. Effective workshops and group sessions encourage active participation, brainstorming and collaborative problem-solving. Interviews and surveys can be used to gather insight and information from stakeholders about their experiences and perspectives. Group discussions help participants share their views, explore issues, and identify common goals and concerns.

Shared Learning and Capacity Building: PSA promotes mutual learning among participants, fostering a deeper understanding of the system's complexity and dynamics while building trust and shared ownership of the analysis. Training and capacity-building support can reinforce learning and help stakeholders to enhance their skills in participatory methods.

Mapping and Analytical Tools: Stakeholder mapping and analytical tools, including those offered in this guide, can be effective participatory engagement tools. PSA can incorporate both qualitative and quantitative data collection and analysis, often blending more structured approaches with participatory techniques like focus groups and workshops. Collaboratively developing scenarios and future narratives can be effective ways to explore the potential impacts of events or decisions within the system.

Collaborative Problem Solving: Participants working together to identify and define the problems or challenges within the system can draw on their knowledge, experiences, and local wisdom to collectively develop solutions.

Participatory Budgeting: Participatory budgeting is a collaborative process where various stakeholders allocate and manage resources for a collective effort. This ensures that all stakeholders have a voice in shaping the budget, fostering cooperation, and aligning resources with shared goals and community needs.

Community Scorecards: Community scorecards allow citizens and stakeholders to assess and rate the performance of services, institutions, or projects. These provide a formal and effective method of feedback to the system.

Action-Oriented: The goal is not only to understand the system better but to take action to address identified challenges and improve the system's performance. PSA should emphasize practical solutions and actionable recommendations. PSA is often iterative, allowing for continuous feedback and adjustment of strategies based on emerging insights and changing circumstances.

Challenges for PSA: Be cognizant of potential challenges going into a PSA exercise. First, the process can be highly political; stakeholders will almost defend their own interests and protect the status-quo if they stand to benefit. PSA can also be highly influenced by cognitive biases and hampered by the discomfort of new ideas that run counter to traditional practices. PSA can get unpleasant and tense; in most cases, it manifests in motivation to collaborate, but it can sometimes manifest in conflict or resentment, especially if some stakeholders feel excluded or that their interests weren't considered.

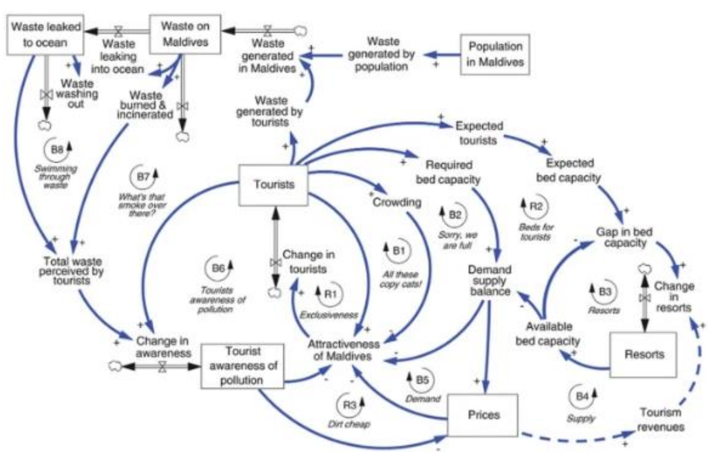
Community Engagement Software: Several online platforms and software are designed for community engagement, collaboration, and data collection. These tools facilitate communication, information sharing, and active participation among community members and stakeholders. Some of these include: Menti, an interactive polling and survey platform that allows real-time audience engagement; Slack, a collaboration platform that allows communities to create channels for discussions, share files, and coordinate group activities in real time; Trello, a project management tool that can be adapted for community collaboration by helping to organize tasks and projects; Asana, a task and project management platform suitable for coordinating community initiatives; Ideascale. an innovation management platform that allows communities to submit, discuss, and vote on ideas and initiatives; and CitizenLab, a platform designed for civic engagement, enabling local governments and organizations to gather input from community members on important issues.

5. SYSTEM DYNAMICS ANALYSIS

WHAT IS SYSTEM DYNAMICS ANALYSIS (SDA)

System Dynamics Analysis (SDA) is a computer-aided approach for strategy and policy design used to understand the nonlinear behavior of complex systems over time. SDA provides a structured way to understand and simulate the feedback loops, delays, and interdependencies that exist within complex systems. SDA is valuable for addressing complex problems, anticipating unintended consequences, and making informed decisions in various fields. Through computer modeling, users can produce outputs that show how different variables change dynamically.

Using SDA to Model the Impact of Tourism in Maldives to Waste Generation



This relatively "simple" SDA illustrates the impact of changes in tourism variables on the generation and flow of waste, and the feedback implications of increased waste on the tourism sector. As the effects of tourism and waste simultaneously impact one another, computer modeling and simulation can bring SDA to life to predict and show these impacts. SDA is, however, a relatively complex undertaking that involves specialized, relatively expensive software; it's use in development fields remains limited at this time.

PURPOSE

- Identify the root causes of problems in complex systems and help to better understand and manage the system.
- Predict the impact of changes to a system.
- Design and evaluate policies to improve the performance of a system.
- Communicate the behavior of a complex system to stakeholders more clearly and concisely.

HOW CAN SDA BE USED IN RESILIENCE ACTIVITIES?

- Identify the vulnerabilities of a system to different types of disturbances, helping to prioritize resilience investments and develop targeted strategies to reduce vulnerabilities.
- Assess the overall resilience of a system by measuring the system's ability to absorb, adapt, and recover from disturbances.
- Design and evaluate resilience strategies to determine the most effective ways to reduce risk and improve the system's ability to withstand and recover from disturbances.
- Communicate the resilience of a system its stakeholders, building trust and confidence in the system and securing support for resilience investments.
- Model urban systems to assess their resilience to natural disasters and to develop strategies for improving infrastructure, emergency response, and recovery efforts.
- Analyze supply chain dynamics to identify vulnerabilities, disruptions, and recovery strategies in the face of disruptions like pandemics, natural disasters, or geopolitical events.
- Examine the long-term impacts of climate change on ecosystems, agriculture, and communities, and developing strategies for adaptation and mitigation.
- Modeling community dynamics to understand how social capital, resources, and decision-making processes influence community resilience in the aftermath of disasters or economic

shocks.

- Analyze the dynamics of food supply systems to enhance resilience to factors such as droughts, pests, and market fluctuations.
- Model the dynamics of disaster preparedness and response systems to enhance the coordination of resources, logistics, and communication during and after disasters.

WHAT SDA TOOLS DO I NEED?

SDA is a more complex, demanding tool than others included in this guide, and it may incorporate the use of some of these tools in its analysis. SDA requires the use of computer modeling software to help users see how dynamics can emerge from feedback loops and as they change in strength and importance. SDA is less used in the development field, but has much wider applicability in the private sector for production, supply chains, engineering, and economics fields. System dynamics models are built using one of the software applications in the table below to create causal loop diagrams and stock and flow diagrams, which are then used to simulate the behavior of the system over time. Key components of SDA that are incorporated into analyses include:

- **Stocks and Flows:** System dynamics models are built around stocks (accumulations) and flows (rates of change). Stocks represent quantities that accumulate over time, while flows represent the rates at which those quantities change.
- **Feedback Loops:** System dynamics emphasizes the identification and analysis of feedback loops within a system. Feedback loops can be reinforcing (positive feedback) or balancing (negative feedback) and play a critical role in system behavior.
- **Time Delays:** Time delays are inherent in many systems and can lead to non-intuitive behavior. System dynamics models capture these delays and their impact on system behavior.
- **Causal Loop Diagrams:** System dynamics models often begin with causal loop diagrams, which visually represent the cause-and-effect relationships within a system. These diagrams help in understanding the structure of the system.
- **Simulation:** System dynamics models are typically implemented in simulation software. These models allow analysts to experiment with different scenarios and observe how the system's behavior changes over time.

SDA Software Comparison		
Software	**Source**	**Description**
Vensim	Download Variety of Paid Plans	• Powerful system dynamics software, offering a user-friendly interface for constructing CLDs, running simulations and analyzing system behavior. Configurations and plans support a range of users. • Contains industry-leading technical advances in simulation technology: Causal Tracing™, Reality Checks™, subscripting, optimization, resource-allocation algorithms.
iThink	Download Paid Plans (higher cost options)	• System dynamics software that supports CLD creation. Offers features for modeling dynamic systems, visualizing feedback loops, and running simulations. • Create causal loop diagrams and stock and flow diagrams, which are then used to simulate the behavior of the system over time. • User-friendly interface suitable for both beginners and experienced modelers.

[Powersim Studio]()	Download Variety of Paid Plans Free "Express" Version	• Advanced features available in higher cost paid versions. • Good choice for users who need to create large, complex system dynamics models. • Similar to iThink in terms of features and functionality.

STEPS FOR SDA

While the SDA process depends to large extent on the application and objectives, here is an overview of the typical steps involved:

Step 1: Identify Issues and Research Objectives: Define the problem or issue, clearly articulating the objectives of the analysis and the boundaries of the system.

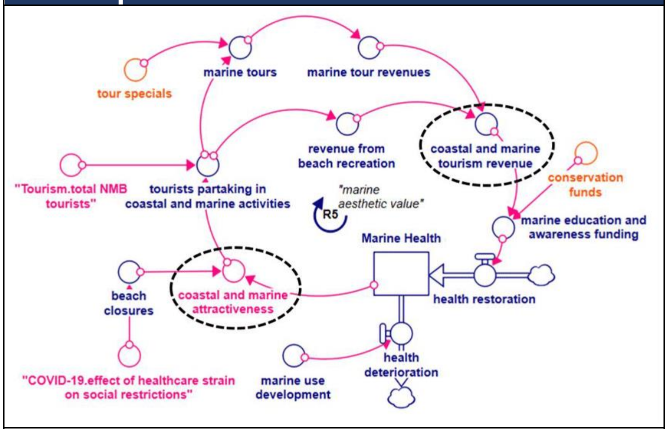
Step 2: Gather Data and Information: Collect relevant data and information about the system; this may involve conducting literature reviews, interviews, surveys, or historical data, as outlined previously in this guide.

Step 3: Develop Causal Loop Diagram (CLD): Create a CLD to visualize the cause-and-effect relationships within the system.

Step 4: Create Stock and Flow Diagram: Based on the CLD, develop a stock and flow diagram that represents the system's dynamics. Define stocks (accumulations) and flows (rates of change) and specify their relationships. (See inset.)

Step 5: Formulate Equations: Formulate the equations that govern the flows and changes in stocks. This often involves using mathematical functions to describe how stocks change over time. This step illustrates the complexity of SDA, as there are unlikely to be established mathematical relationships for many of the human-centered variables applicable in the resiliency field. Computer models and simulations, however, require these mathematical relationships as inputs.

Stock and Flow Diagram for Impact of COVID on Tourism Sector



This stock and flow diagram shows the impact of COVID on the tourism sector. In this example, encircled variables represent the key output variables of interest, which were chosen based on their importance for decision-making and policy analysis. Variables in pink are those connected to another sub-model, and orange variables are applied in scenario analysis or in the visual user interface. Source materials [here]().

Step 6: Calibrate and Validate Model: Calibrate the model by adjusting parameters and initial conditions to match historical data or expert knowledge. Validate the model to ensure it accurately represents the system's behavior.

Step 7: Conduct Simulation and Scenario Analysis: Run simulations to explore how the system behaves over time under different scenarios. Modify variables, policies, or parameters to assess the impacts of different interventions.

Step 8: Conduct Sensitivity and Policy Analysis: Conduct sensitivity analysis to understand the robustness of the model to parameter changes. Identify which variables have the most significant impact on system behavior. Use the model to evaluate the effects of various policies or interventions on the system's behavior, helping to design effective strategies for addressing the identified issues. SDA is generally an iterative process; revisit and refine the model as more data becomes available or as a deeper understanding of the system's behavior is gained.

Communicate and Report: Present the findings and insights in a clear and accessible manner to stakeholders and decision-makers. Visualization of model results, like graphs and charts, can aid in communication.

6. LIST OF EXTERNAL REFERENCES

SOCIAL NETWORK ANALYSIS (SNA)

Strengthening Local Systems through Network Analysis LINC: Learn more about how applies Network Analysis to understand and map complex systems and strengthen local systems and actors.

PACT Organizational Network Analysis (ONA) Handbook **(2011):** A practical guide to the ONA tool created for practitioners and development professionals. While it assumes the reader's general familiarity with networks, the handbook provides practitioners and managers with the information they need to understand how ONA works, and how best to incorporate it in their country strategy or program.

University of Michigan School of Information Social Network Analysis online course: Professor Lada Adamic of the University of Michigan teaches an online course that introduces basic concepts in network theory, discusses metrics and models, and ways to use software analysis tools to experiment with a wide variety of real-world network data. The online class utilizes Gephi, NetLogo and R tools to cover network theory, analysis and application to help learners observe and understand different networks as well as their structures.

Video on Network Theory: Created by Complexity Labs, this video provides a simple and tangible explanation of Network Theory and discusses the most common terms.

NGO Network Analysis Handbook: how to measure and map linkages between NGOs (Save the Children, 2011**):** This handbook is designed to aid practitioners to understand what network analysis is; how network data is collected; how to create visual maps of the network, and how to analyze the network data for program/project development or evaluation.

Not everything that connects is a network (Overseas Development Institute, 2011**):** This paper seeks to address the following questions: Are networks always the most appropriate vehicle? Where they are appropriate? How can we make the best use of them? The paper argues for a more rigorous understanding of networks' nature, particularly their value (and costs), and presents a revised Network Functions Approach as a model for rationalized investment in networks.

Learning about Analyzing Networks to Support Development Work (2011**):** This paper presents four cases where social network analysis was used in a development program. It focuses on the analysis of connectivity in real world networks, particularly in cases that were unintentional networks.

Catalyzing Networks for Social Change (Monitor Institute and Grantmakers for Effective Organizations, 2011**):** This guide is for grant makers who are just beginning to explore and experiment with networks and for those who are further along and want to reflect on their practice.

A Bird's Eye View: Using social network analysis to improve knowledge creation and sharing (IBM Institute for Knowledge, 2002**):** This guide provides four different network relationship dimensions which are important for effective learning. The research discusses and analyzes how applying these dimensions to important groups of people within an organization can facilitate and improve knowledge creation and sharing. This guide provides four different network relationship dimensions which are important for effective learning. The research discusses and analyzes how applying these dimensions to important groups of people within an organization can facilitate and improve knowledge creation and sharing.

Social Network Analysis Handbook (International Rescue Committee, 2016**):** This handbook provides a step-by-step guide to the application of SNA. The approach draws on Social Network theory, discussion-based tools, and graphical software applications.

Social network analysis of multi-stakeholder platforms in agricultural research for development: Opportunities and constraints for innovation and scaling (PLOS One, 2017**):** This paper explores three multi-stakeholder platforms (MSPs) in Burundi, Rwanda and the eastern part of Democratic Republic of Congo (DRC). The researchers apply SNA and Exponential Random Graph Modeling (ERGM) to investigate the structural properties of the collaborative, knowledge exchange and influence networks of these MSPs, and compare them against value propositions derived from the innovation network literature. Results demonstrate a number of mismatches between collaboration, knowledge exchange and influence networks for effective innovation and scaling processes in all three countries. The results illustrate the potential of Social Network Analysis and ERGMs to identify the strengths and limitations of MSPs in terms of achieving development impacts.

CAUSAL LOOP DIAGRAMS (CLD)

Systems Thinking Applied: A Primer (ANSER, one of the LSP Consortium Partners): Reference source on systems thinking for beginners that explains key methods of systems analysis, including causal loop diagrams.

Leverage Points: Places to Intervene in a System (Donella Meadows, 1999): Seminal work by Meadows that identifies 12 types of levers within a system and discusses their effectiveness in bringing about change.

Business Dynamics: Systems Thinking and Modeling for a Complex World (John Sterman, 2000): Key textbook in which a MIT professor discussed the system dynamics approach and its application to problem solving efforts in business, organizational, social and physical science domains.

Guidelines for Causal Loop Diagrams (Daniel Kim, 1992): Offers some suggestions on the mechanics of creating causal loop diagrams, and general guidelines that should help lead you through the process.

Systems Grantmaking Resource Guide: Causal Loop Diagramming: Brief profile on Causal Loop Diagramming, and how it relates to systems grantmaking.

ETHNOGRAPHY

Qualitative Methods in Business Research (Eriksson and Kovalainen, 2008): Chapter in a textbook detailing ethnographic research including an overview on the methodology, ethical principles, conducting field work and analyzing and interpreting ethnographic research materials.

Ethnography: Problems and Prospects (Martyn Hammersley, 2006): This article reviews a range of difficult issues that currently face ethnographic research and offers some reflections on them.

Video on Ethnography: Created by the University of Utah's Sorenson Center for Discovery & Innovation, this video details the importance of conducting ethnographic research and how it can help craft a digital solution to target users.

Qualitative Research Methodologies: Ethnography (Scott Reeves, Ayelet Kupper, and Brian Hodges 2008): This article reviews key features of ethnographic research.

Understanding Social Research: Ethnography (Alan Bryman, 2005): This textbook gives an overview of the method and its methodology, the research process, analysis, interpretation, and presentation of data, and finally the many uses.

PARTICIPATORY SYSTEMS ANALYSIS (PSA)

Cynefin Framework (Snowden and Boone, 2007): The framework is currently undergoing improvements, but this article provides the basics.

The Operational Guide for the Making Markets Work for the Poor (M4P) Approach: A guide to thinking about who benefits, and who likely loses out.

Systems Practice Workbook (Omidyar Group): This workbook aims to fill the gap between the promise of a systems approach for making social change and putting it into practice.

Participatory Systems Analysis an Introductory Guide (Tim Lynam, 2001): This report provides a general overview of participatory systems analysis.

Participatory Systems Analysis Methods to Measure Impact (Karin Reinprecht, 2016): This report uses participatory approaches to understand the effect and impact of an International Labor Organization training intervention for rural women in Tanzania, Uganda and Kenya on their livelihoods.

SYSTEM DYNAMICS ANALYSIS

Video on System Dynamics: Created by the System Dynamics Society this video highlights what Jay W. Forrester Professor of Management at the MIT Sloan School of Management, has to say about System Dynamics.

Loopy a Systems Dynamic Tool: This web based SD tool is an easy to use basic way to have a quick understanding of how to model dynamic systems. It can be used as a practice space, or it can be used to build simple models that can be shared.

On the Differences Between Theoretical and Applied System Dynamics Modeling (Vincent de Gooyert & Andreas Grobler, 2019): This article gives a general overview of SD and provides evidence on the differences between theoretical and applied system dynamics modeling.

System Dynamics Modeling in Health and Medicine: a Systematic Review(Negar Darabi & Niyousha Hosseinichimeh, 2020): This article is a systematic literature review of Systems Dynamics and its application in health and medicine from 1960 to 2018.

Systems Dynamics Helps Farmers Escape Poverty Trap in Guatemala (Systems Dynamic Society, 2023): This article highlights the successful application of system dynamics analysis through the implementation of policies supporting small-scale farming and counteract effects of climate change.

Online Course Catalog for Systems Dynamics: This catalog by the systems dynamic society is a comprehensive list of courses surrounding basic to advanced modeling and understanding systems dynamics.