Operationalizing Socio-Ecological Approach to Livelihoods (SEAL)

A Learning Report

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Executive Summary

Dominant livelihood approaches with a singular focus on increasing incomes, based on rationalities of surplus generation, profit maximization and individualization, trigger processes that disregard underlying social-ecological systems and often result in adverse social, economic and ecological outcomes. The Socio-Ecological Approach to Livelihood (SEAL) provides a framework to move beyond mainstream silos of conservation and livelihood development. It provides an approach to integrate social-economic and ecological functions and their dynamic interactions as critical to the livelihood outcomes. This learning report is a culmination of the action based research undertaken to operationalize SEAL, improve its rigour and identify key operational pathways that can help in strengthening resilience of ecosystems and farm based livelihoods in the rainfed regions of India. The initiative has been supported by the David and Lucile Packard Foundation and was undertaken by Foundation for Ecological Security (FES) in partnership with leading experts in systems thinking, natural resources and livelihoods from Boston College and Washington University in St Louis (USA), and NRMC and Shiv Nadar University (in India).

The motivating questions that guided our efforts were (a) how do social, ecological and economic resources influence livelihoods of rural communities in different contexts; (b) what are the commonalities and differences between perceptions and mental models of village communities located in different regional contexts and between village communities and practitioners (such as FES) operating in the same context; (c) how can location specific learning models provide support for stronger decision making and resource management at a micro level; (d) how modeling tools and participatory approaches such as Community Based System Dynamics (CBSD) can help in operationalizing SEAL; (e) what are macro-economic drivers, policies, opportunities and hurdles for operationalizing SEAL.

Building on the work on 'Community Based System Dynamics' and 'Group Model Building' the efforts undertaken over the last year provided a method that can help surface discussions and debates on social-economic-ecological interactions that drive rural livelihoods, decode structure and process and make 'systems thinking' operable. Group

Model Building CBSD workshops undertaken with the village and practitioner communities in the four regional contexts helped in establishing the potential of CBSD as a tool to improve systems thinking amongst diverse groups of stakeholders. It helped identify key cause and effect relationships and prepare village communities (and other actors) to foresee the effect (intended and unintended) of actions undertaken and take more informed decisions. The tool provided a process to map the different mental models and engage the community to understand and enable sustainable socio-economic and ecological processes and outcomes. It helped convene different actors in the village and outside; decide on key resources and interconnections; provided a visual means and a common framework to discuss different mental models; analyse causal factors and structures guiding the behavior; and contemplate designs and interventions to build robust social-ecological livelihood systems.

However, systems thinking is much more than a collection of methods and tools. While CBSD helps surface and brainstorm mental models that drives behavior and actions of individuals and communities, and enables them to 'think' using a systems lens, drawing insights from thinking to influence action and continued learning takes time and will require continued engagement and application of various other methods and tools besides CBSD.

The analysis of macro-economic context, hurdles and opportunities pointed to the structural gaps which have emerged due to a distinct bias in public policy against rural ecosystems and workforce, and highlighted the need for

a. A macro-economic goal of robust and sustainable farm based livelihoods, and socio-ecological criteria for production, distribution and consumption decisions.

b. Context specific social and ecological indicators (both criteria and parameters that may have to differ in different locations/time periods) against which every public policy intervention is gauged, and

c. A composite macro-economic valuation framework of farmers and agricultural livelihoods (including farm labour) which considers not only the value-added outputs (grain, fodder, milk, etc.) but also ecosystem services (volumes and quality of water used/re-used, soil health, biodiversity, common resources etc.).

Improving our understanding of the operational pathways , the CBSD workshops undertaken in the four regional contexts helped in identifying leads for improving health of ecosystems and livelihood resilience. These exercises surfaced multiple leverage points ranging from low or shallow leverage points (intervention areas that are easy to implement but bring about little change in the overall functioning of the system) to high or deeper leverage points (intervention areas that are difficult to implement but have high potential to bring transformational changes). Some of the low leverage points that could be tapped include higher investments for land and water rejuvenation, helping farmers reduce costs and increase savings, increasing investments in improving basic infrastructure, promoting new technology and practices that can help in slowing down the rate of resource degradation. However, in order to bring about transformational changes in the system one would need to act on systemic drivers such as information flows and governance structures that are deeper leverage points in the system. This would involve bringing a change in 'environmentalities' , i.e. the way people see and value nature; strengthening polycentric governance arrangements; and improving information flows such that local communities have a higher power to determine and make rules of the system. At a broader level, operationalising SEAL requires building on both the ecosystem and socio-economic resilience which together ensures that the social, economic and ecological systems are:

(i)   robust – there is a certain level or magnitude of shock that the system can take or absorb and maintain its dynamics or a given state;

(ii)   self-organizing – there is a certain degree of relative independence from the external (macro-contexts) or strength of mutual dependence within the local system, which makes the system capable of self-organization

(iii)   constantly learning and adapting – there is a conscious human component or capacity for learning and adaptation in the system.

The exercise undertaken during the last year also highlighted the potential challenges and areas for future action. Given the nature of problem involving a range of actors working at different scales with different mental models of 'development', the task of building resilient social-ecological systems is not easy. While we may be successful in establishing few cases of robust social-ecological systems in different locations, scaling up such efforts require a multi-pronged polycentric approach at different levels (with community, district administration, state and other stakeholders) and enhancing human capacities at these levels. It needs to build on some key human capacities that include (i) capacities to accept and promote value pluralism in decision-making, (ii) capacities to manage institutional diversity (iii) decentralized knowledge and policy convergence of multiple disciplines with local socio-ecological memory. It needs better representation of the system, how the system operates and improves itself, and how development practitioners working on different component of social or ecological systems can help assist in building resilience of the system. Going forward, we plan to undertake this process at different scales to improve the method for multi-stakeholder engagement, work with a range of organisations to understand the key interventions and system level outcomes, develop multiple scenarios emerging due to different policy actions and evaluate it against context specific social, economic and ecological indicators; and improve understanding of different kind of thresholds which impact the resilience of social-ecological systems.

1. Introduction

1.1. The Problem

Livelihood approaches evolved over the last few decades increasingly focus on 'systems' and 'resilience' thinking, challenging the fundamentally sectoral approaches to addressing livelihood issues and center-staging enhancement of adaptive capacities to make livelihoods stable (Scoones, 2009; Adger, 2000; Speranza et al, 2014). But in the absence of sufficient methods and tools that can help in surfacing discussions and debates on social-ecological-economic interactions that drive livelihoods and make 'systems thinking' operable on the ground, livelihood programmes fail to appreciate the potential offered by robust social and ecological systems to rural livelihoods and continue to be designed with sectoral perspectives often resulting in adverse social, economic, ecological outcomes.

The challenge at this juncture is twofold – (i) to evolve an approach that is ecologically sound, socially just and economically rewarding; and (ii) to develop methods and tools that can help in making 'systems thinking' operable and in decoding the structures and processes that are driving rural livelihoods in diverse contexts.

There is a need to change the lens through which communities, governments, practitioners see and try to address the issue of strengthening rural livelihoods – from a 'linear approach' of income enhancement through 'delivery' of one-size fit solutions to a 'systems approach' that draws on the positive synergies offered by social and natural systems and 'enables capacities' of the local communities to collectively search for 'locally adaptive solutions' that can make their livelihoods more resilient.

1.2. SEAL – An Alternative Approach to Livelihoods

Socio-Ecological Approach to Livelihoods (SEAL) aims to provide an alternative narrative to the livelihood discourse, one that moves beyond seeing livelihood as a solely economic function to incorporate both the ecological and social functions, and the dynamic interactions between these components as critical to the livelihood outcomes. The approach highlights that surfacing and acting on the inter-linkages of natural and social systems through local self-governance institutions offers immense potential to improve the ecological health and the social and economic well-being of rural communities. It focuses on making nature-oriented and (so called) primary-sector-based livelihoods more remunerative (not by monetizing, but by providing a monetary interpretation or economic valuation) and rewarding (by unraveling natural opportunities and influencing market through green opportunities) for the communities who live by it and nurture it. The underlying assumption is that in a world that is predominantly driven by forces of commodification and monetization, it becomes important to build on monetary interpretation / economic evaluation of conservation and collective action.

Table 1: Strategy for Shifting to New Livelihoods Paradigm		
Present Paradigm around rural livelihoods	Strategies to sustain natural resources and livelihoods	Redefined livelihood paradigm
➢ More focus on secondary/ tertiary sectors ➢ Skill based with more focus on urban skills and built around migration ➢ Market-driven ➢ Around primary sector focus on – commodity, scale up, economy of scale: more (surplus) of less (number of products), Value chain based approach ➢ Resource exploitative, individual focused, rural-escaping	Blending socio-ecological concerns to livelihood paradigm Sustain natural resource-livelihoods connection Conserve Commons, build natural infrastructure and collective action around shared natural resources Blending monetary interpretation and influencing market Enable monetary interpretation of ecological and social actions/transactions Unravel capitalize on green economic opportunities – Go Green, Fair trade Increase return not by exploiting more of natural resources but by exploring more and more ways of using natural resources Blending normative concerns Added focus on individual returns to poor (equity) and women, particularly in the context of realization of increased income from natural resources Promoting women self-help groups for livelihood activities embedded in habitation level institutions (organized on principles of universal membership) Emphasizing inter-disciplinarily Blending society, ecology and economics; individual with collective action, political governance with livelihood economics	➢ Targeting vulnerable individuals / households ➢ Livelihoods from natural resources: commons-conservation and private land production activities ➢ Monetary interpretations of ongoing activities around conservation, commons and collective action ➢ More (number of products) of less (surplus) ➢ Influencing market through Green and collective marketing options around eco-social products ➢ Continued focus on individual entitlements, community tenures and capacity enablement through convergence and collaborations ➢ Not compromising with ecological threshold and habitation level governance

1.3. Unpacking SEAL using a Systems Lens

Systems thinking is an approach, an underlying philosophy, a sensitivity to the circular nature of the world we live in; an awareness of the role of structure in creating the conditions we face; a recognition that there are powerful laws of systems operating that we are unaware of; a realization that there are consequences to our actions that we are oblivious to (Michael Goodman, Principal at Innovation Associates Organizational Learning)

Rural livelihoods are embedded in complex self-adaptive systems characterized by fuzzy boundaries and flexible resource architectures (or diverse resources that allows producing innovations and adapting), driven by a set of rules and having an inherent capability to evolve over time. Unpacking SEAL requires us to use 'systems lens', that can help in broadening our thinking and articulating problems in new and different ways; help recognize that there are multiple interventions to a problem and there are no perfect solutions; that the choices we make will impact other parts of the system as well. In order to help communities achieve sustainable socio-ecological livelihoods it is important to first understand the system as it is and how it improves itself. This implies identifying the various elements in the system (within which livelihood is knitted), understanding how the elements are interconnected, what are the key structures and processes that drive livelihoods and how has it evolved over time.

At the outset, it is also important to understand that while SEAL is a framework organizing a general set of variables of natural and community resources, and contextual variables used for diagnostics, scientific inquiry, evaluation and policy, how to achieve sustainable socio-ecological livelihoods is a community theory about how to achieve a desired set of outcomes over a defined period of time. Diversity in community contextual characteristics, resources, and how they are or could be organized represent different theories of how to achieve sustainable socio-ecological livelihoods (Hovmand, 2017). As contexts and interactions between different components of the system differ, the knowledge of the structure of a system and what matters most in a particular context is likely to come from experiences within the locality. Thus, while defining the pathways for livelihood improvement the local communities must become the discoverers and owners of their solutions.

One of the methods that can help in application of systems thinking is system dynamics (SD). System dynamics is the use of informal maps and formal simulation models to understand how complex systems change over time from an endogenous or feedback perspective (Richardson, 2011). It provides a common language and diagraming convention that allows a wide range of participants, including communities and organizations, to visually depict interactions in a connected social, ecological, and economic system.

Community Based System Dynamics (CBSD) is an outgrowth of the system dynamics modeling tradition that builds on the group model building (GMB) process of engaging people in the activity of modeling systems. Unlike System Dynamics that confines modeling from a modeler's perspective, CBSD places an emphasis on communities' perspectives and on building their capacity to understand and use models (Hovmand, 2014). It draws on a mix of methods such as Participatory Rural Appraisal and Group Model Building, offering scope for visual representation of mental models of the community. It recognizes that each person or community has their own mental model or cognitive representation of a dynamic system. These mental models influence how we define problems and affect the decisions we make. Mental models are inherently flawed, but they can be improved (Doyle & Ford, 2000). Group Model Building can be used to explore communities' mental models of their resource systems, including tangible and intangible social, ecological, and economic resources. These can help in in exploring:

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- How are resources configured to produce goods or services?

- How are resources managed?

- Why are there differences in sustained outcomes over time?

- How do resource poor systems grow to dominate a region, system, or market?

- Why do systems with similar resources perform differently?

Having visual theories provides a way for communities to:

- Explicitly describe their current theory of resource systems and how these are related to longer term outcomes;

- Understand how their current theory is / is not sustainable;

- Compare and learn from theories across community contexts and levels of aggregation;

- Contemplate designs for achieving socio-ecological sustainable livelihoods

- Through analysis, identify policies that can help communities deal with uncertainties.

Causal loop diagram developed with community members in Udaipur, Rajasthan
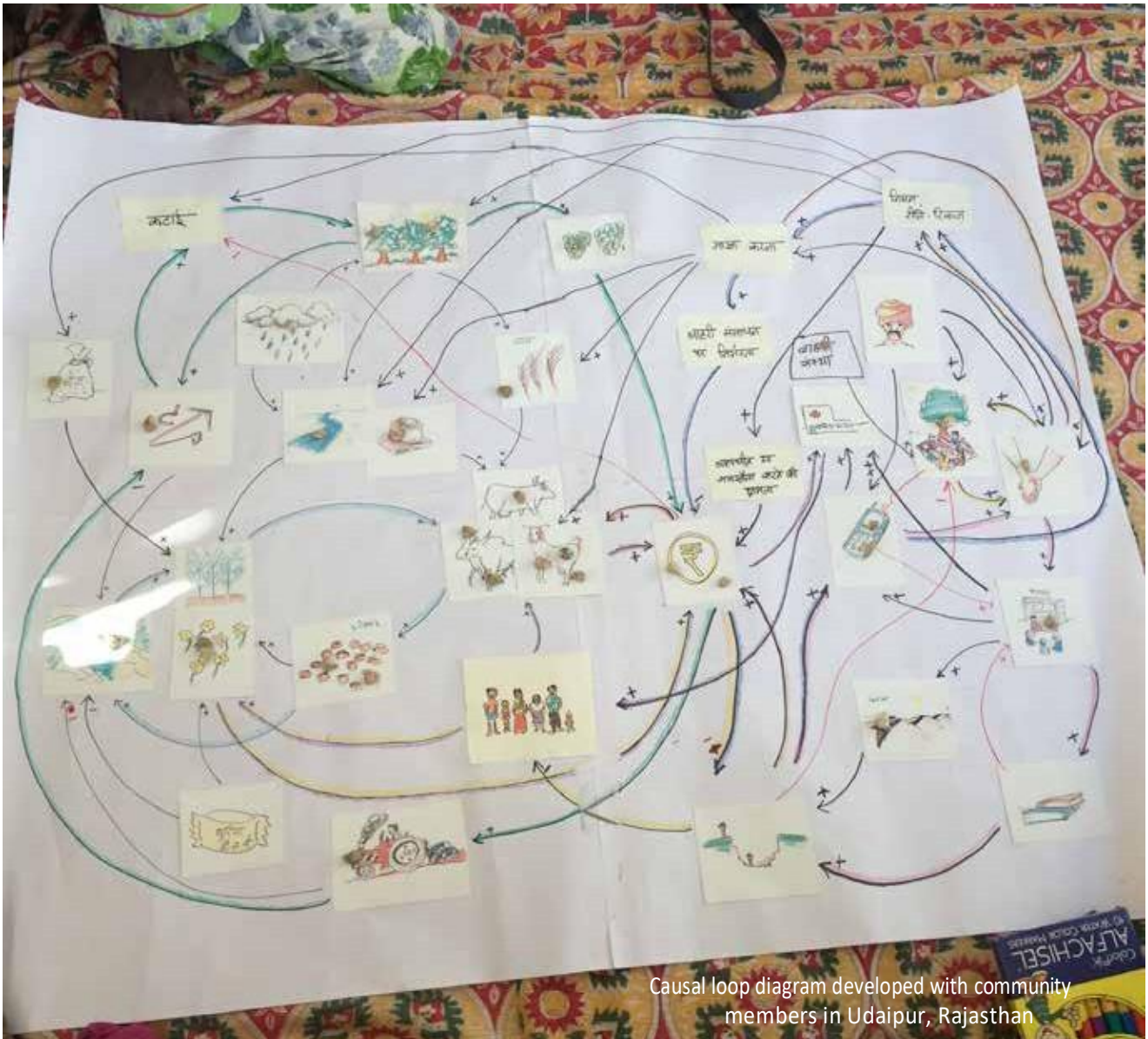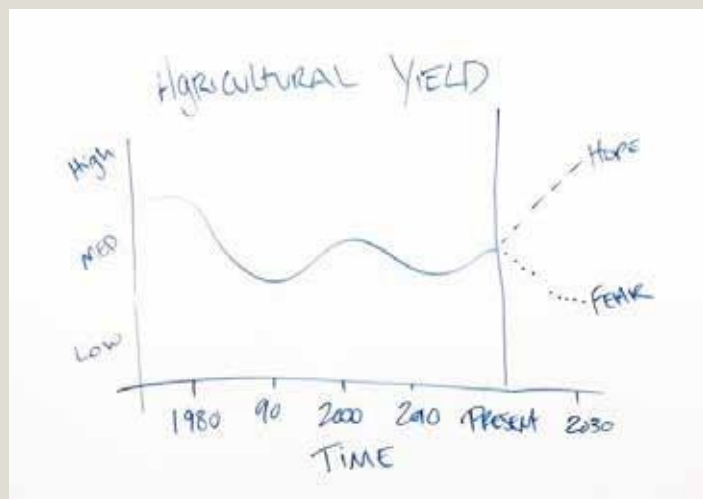
Box 1: Brief on System Dynamics

Figure I: Example Behavior Over Time Graph

System behavior is how a system changes over time. Behavior over time graphs (BOTGs) describe this behavior, including hoped and feared for future behavior. Figure I shows an example BOTG of agricultural yield changing over time.

We want to understand what is generating the behavior over time in the community. System dynamics argues that behavior is driven by feedback loops, or interactions where effects feed back to influence the causes. We can depict those interactions using models.

Figure II shows a causal loop diagram (CLD) that could begin to explain the behavior in Figure I. The words represent variables that can change over time. The lines with arrows represent causal connections. Arrows with a "+" sign indicate a positive causal connection where if the cause increases the effect increases. For example in Figure II, if the amount of fodder increases then the number of livestock increases. Arrows with a "-" sign indicate a negative causal connection where if the causes increases the effect decreases. For example in Figure II, as migrating increases then the number of people in the village decreases. The double lines crossing the line with the arrow represents a delay between the cause and effect. As the number of people in the village decreases, the agricultural yield will decline because there are fewer people to work the land. However, this effect won't be noticed until after some time.

There are two kinds of feedback loops, reinforcing loops and balancing loops. Reinforcing loops are where an action creates more of the same action resulting in growth or decline. For example, as agricultural yield increases, the amount of fodder increases. As fodder increases, the number of livestock increases which increases the amount of manure available. As manure increases, agricultural yield increases,

Figure II: Example Causal Loop Diagram

reinforcing growth. Balancing loops push back or limit more of the same action. For example, as agricultural yield increases, income increases. With greater income, access to education increases resulting in more migration. As migrating increases, people in the village decreases. As the number of people in the village decreases, there are less people available to work the land which limits agricultural yield.
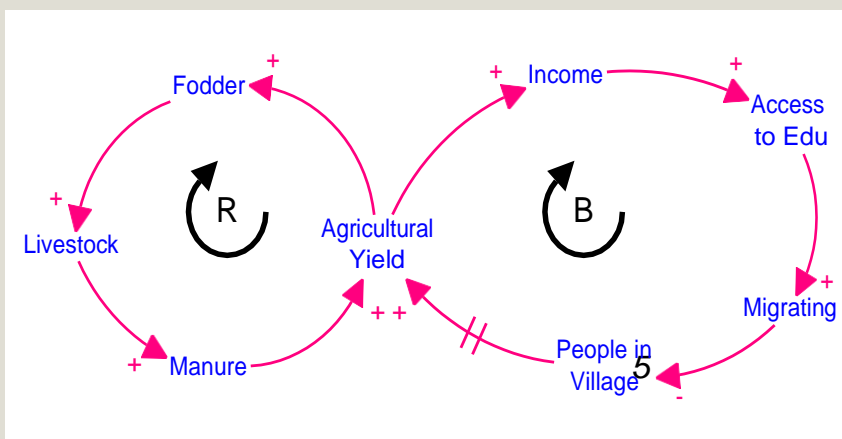
1.4. About this report

With the larger objective of building an argument for socio-ecological approach to livelihoods and develop methods and tools that can help in making this approach operable, Foundation for Ecological Security (FES) with support of David and Lucile Packard Foundation and in partnership with leading experts in systems thinking, natural resources and livelihoods from Boston College and Washington University in St Louis (USA), and NRMC and Shiv Nadar University (in India) undertook an action based research to:

(a) Improve the rigour and validate the SEAL framework in four diverse social-ecological-economic geographies and with men, women and youth so as to position landless, small and marginal farmers at the forefront of sustainable livelihoods and agricultural growth;

(b) Draw out key pathways and operational mechanisms for action on the ground and to support practitioners in efforts towards resilient ecosystems and farm based livelihoods.

This is a learning report that draws insights from application of CBSD at micro (village) level in the four locations to improve rigour and validate the SEAL framework and identifies operational leads for resilient ecosystems and farm based livelihoods. While doing so, we also try to understand the macro-economic contexts, hurdles and opportunities and identify the key stakeholders influencing rural livelihoods.
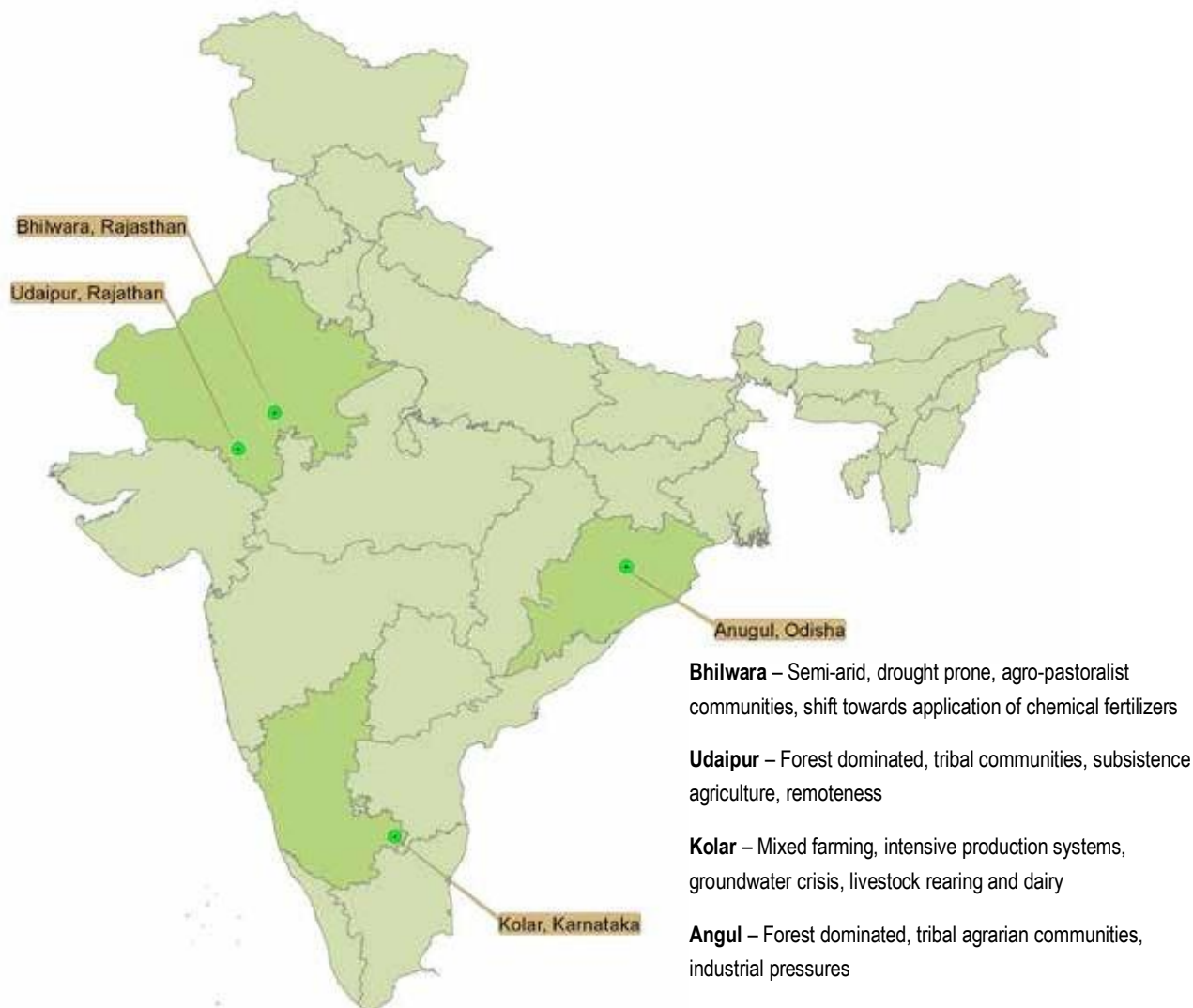
2. Improving understanding of SEAL using CBSD

2.1. Motivating Questions

Advancing SEAL in the context of marginal and small farmers in the rainfed regions of India who constitute about 80% of the farming community in India and provide over 80% of the food consumed, a number of questions emerged that guided the research and provided an analytic frame to contextualize results. These questions include:

- **Heterogeneity v/s homogeneity of resource structures** – How do social, ecological and economic resources influence livelihoods of rural communities in different contexts? Are the interactions and their influence on livelihoods homogenous or consistent across various regional contexts?

- **Mental models of different stakeholders** – What are the commonalities and differences between perceptions and mental models of: (a) village communities located in diverse contexts, and (b) between village communities and practitioners (such as FES) operating in the same context?

- **Generic model v/s location specific models** – How can location specific strategic or learning models provide support for stronger decision making and resource management at a micro level?

- **Applicability of CBSD in operationalizing SEAL** - How can modeling tools and participatory approaches such as CBSD help in operationalizing SEAL on ground?

2.2. Study Locations

Bhilwara, Rajasthan

Udaipur, Rajathan

Anugul, Odisha

Kolar, Karnataka

Bhilwara – Semi-arid, drought prone, agro-pastoralist communities, shift towards application of chemical fertilizers

Udaipur – Forest dominated, tribal communities, subsistence agriculture, remoteness

Kolar – Mixed farming, intensive production systems, groundwater crisis, livestock rearing and dairy

Angul – Forest dominated, tribal agrarian communities, industrial pressures

2.3. Approach

These questions were approached in three phases:

Phase 1 – Planning phase: This phase involved identifying and convening meeting with different partners to develop a common understanding of the objectives and methodologies. Field sites for mapping the social-ecological-economic interactions and gaining deeper insights into structures and processes at micro (village) level driving livelihoods of marginal and small farmers in rainfed regions were identified. Past work of FES in application of CBSD was reviewed to inform the design of facilitation. Facilitation manuals were developed for conducting group model building learning workshops with two stakeholders groups – Village Communities and practitioner communities (in this case FES team members) engaging with the village communities for improving resilience of ecosystems and farm based livelihoods.

Phase 2 – Community learning phase: This phase involved conducting GMB learning workshops with the two stakeholder groups (village communities and practitioner communities) in the four study locations. The primary objectives of these workshops were to: (a) engage with the two stakeholder groups to deepen mutual understanding of SEAL; (b) develop preliminary causal maps of socio-ecological interactions in specific

Box 2: Summary of Sessions of Group Model Building CBSD Workshops

The GMB workshops undertaken with village and practitioner communities were initiated with discussions about socio-ecological approach to livelihoods and the need for systems thinking. The CBSD language was introduced to the participants and the objectives of different sessions were explained. The various GMB activities undertaken included:

a. Resource elicitation – During this session the participants identified and prioritized the key social, ecological and economic resources supporting the livelihoods in their contexts. Social resources included resources such as village unity, village leadership, rules and norms, information, knowledge and skills, access to education, health and government programmes. Economic resources included resources such as agriculture, livestock, income, savings, assets, farm inputs etc. Ecological resources included resources such as forests, rainfall, pastures, water bodies, groundwater, soil health etc.

b. Behavior over time graphs – During this session the participants discussed on the status of the key social, ecological and economic resources from a historical perspective. The participants discussed how the resources had changed over time and also shared their hopes and fears for future. Resource conditions at different points of time were marked on charts as the participants discussed to highlight the shifting trends.

c. Preparing causal maps of socio-ecological interactions – The purpose of this session was to understand the participants' mental models of the structures and processes driving behavior of the key resources. The participants during this session shared their perceptions of social-ecological-economic interactions and mapped these on a chart paper through causal loop or stock flow diagram.

d. Refining and validating the causal maps – During this session the participants refined the connections between resources and variables and discussed on the feedback loops, ensuring that these adequately represented their narratives of the interactions. The participants also discussed on dimensions such as impacts of external drivers on social, ecological and economic systems.

regional contexts; (c) identify commonalities and differences in the mental models of village communities and practitioner organization; and (e) inform the structure of a generalized simulation learning model of SEAL.

Phase 3 – Synthesis Phase: During this phase the causal maps prepared during the GMB learning workshops were validated and comparisons were made between the mental models of village communities across locations and between village communities and practitioners engaging with them. Common resource structures and feedback loops were incorporated into a generic model. Data collection of the various parameters, model calibration and confidence testing is in progress. This phase also involved a review of the macro-economic contexts, the hurdles and opportunities to farm based livelihoods from external forces in one of the locations. Various stakeholders including government, civil society organizations, social entrepreneurs, donors and funding agencies, networks, and micro-finance institutions along with their focus areas and nature of work have been mapped to provide a ground for future engagement to negotiate a common language for SEAL and influence the larger livelihood discourse in India.

3. Insights from CBSD

3.1. Process Insights

CBSD as a tool to improve 'systems thinking' – One of the key objectives for using CBSD in improving rigor and validating SEAL has been to understand the effectiveness of CBSD as a tool to make 'systems thinking' operable. The learning workshops helped in establishing that by giving people a language and diagramming convention to capture inter-connections between social, ecological and economic factors and emphasizing on 'feedback thinking', CBSD helped in visualizing these inter-connections and improving 'systems thinking' among the participants.

CBSD as a learning and diagnostic tool – CBSD provided a structured process to create a shared perspective of cause-effect relationships and examining problems more accurately before acting. It helped in moving beyond observing events or data, to identifying patterns of behavior over time, to surfacing the underlying structures that drives those events and patterns. Being a structured process, this can also be replicated across diverse contexts and with diverse actors.

CBSD as an engagement tool – By using pictures (rather than only words), CBSD provided an effective tool to improve participation particularly in rural community settings where limited literacy levels often prevents the people from participating in discussions. Behavior over time graphs and causal loop diagrams helped in engaging the participants to develop shared pictures, or stories of the various social-ecological-economic interactions in their context. It helped in surfacing and challenging mental models and developing a shared understanding of the structures and processes driving behavior.
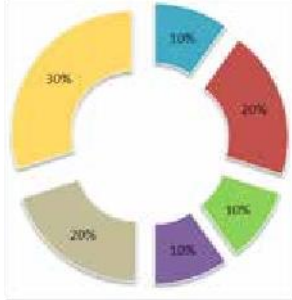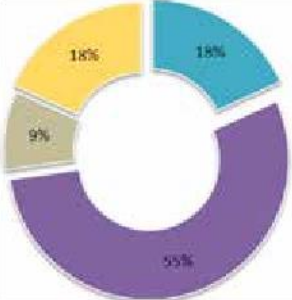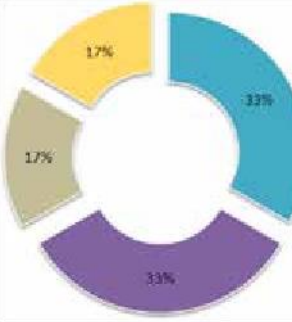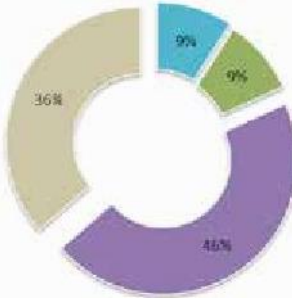
3.2. System Insights

Heterogeneity v/s homogeneity of resource structures – GMB learning workshops undertaken in the four regional contexts helped in understanding how the social, economic and ecological resources interact and influence livelihoods. While some commonalities can be seen in the structure of systems in these diverse contexts, there are some differences in the types of resources and the way they interact. Table 2 lists the resources prioritized by the village communities as being important for their livelihoods in the four regions where the GMB workshops were undertaken. As is evident from the table, the types of resources prioritized are broadly the same in the different regions – agriculture, livestock, forest, water, institutional strength, education. However, there are some differences that can be seen – for instance, in the hilly and forest dominated landscapes of Udaipur and Angul the communities prioritized surface water resources while in the grasslands and undulating lands of Karnataka that are highly drought prone, borewells (which is a source for tapping the groundwater) was prioritized as an important resource for livelihood. Similarly, the agro-pastoralist communities in Bhilwara prioritized wage earning opportunities in the village as one of the key resources for livelihood.

Further, feedback loops reflecting the narratives of the structures and processes driving the social-ecological-economic interactions in the four locations were categorized by social, ecological, economic, or some combination of the three. As is evident, some differences can be seen in the types of interactions across different locations that may indicate different priorities across communities or different pressures in the region. For instance, in the subsistence agricultural economy of the forest dependent tribal communities located in the remote areas of Udaipur, social and social-economic interconnections were more predominant. The feedback loops represented stories of how social interactions have evolved and influenced their livelihoods, stories of how better access to basic infrastructure (roads, health, education) influenced the mobility of these communities in hitherto remote areas and its subsequent impact on livelihoods, information flows and governance structure in the village. The feedback loops also represented stories of how factors such as village unity and village leadership have resulted in evolution of rules, norms and practices that promote resource sharing and thereby reduce the dependence of these communities on external resources and saves costs of cultivation.
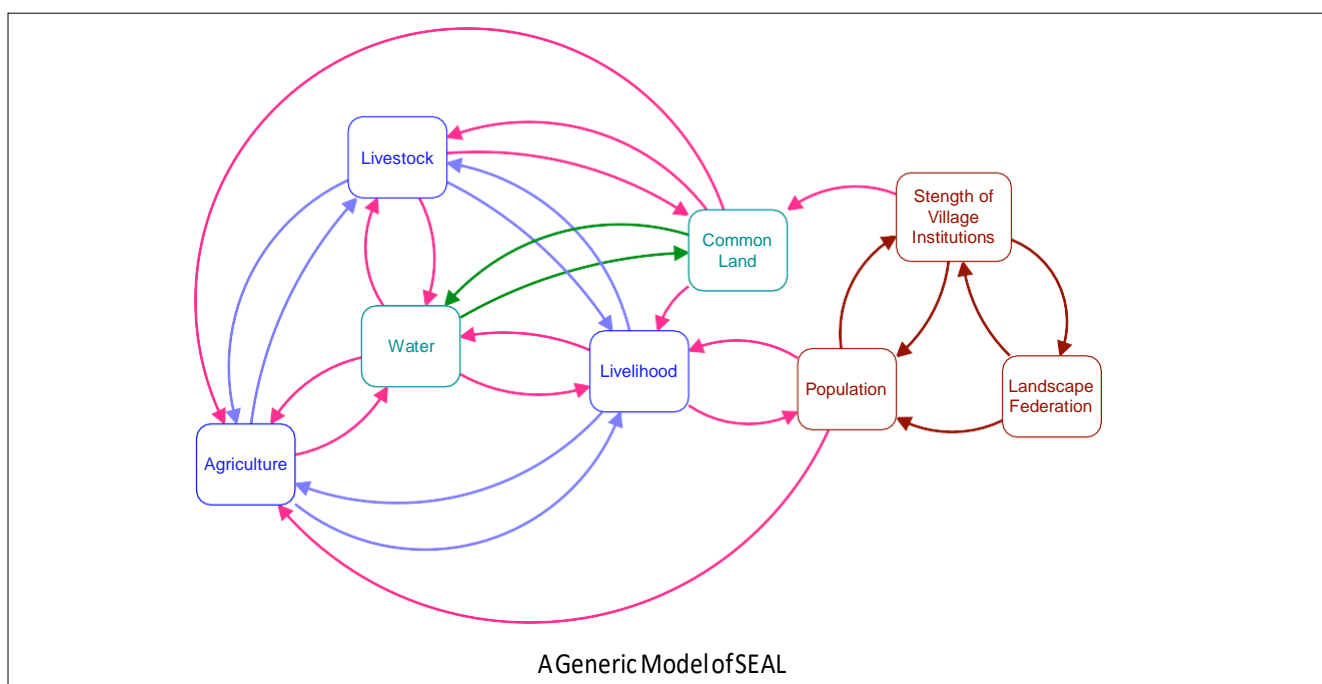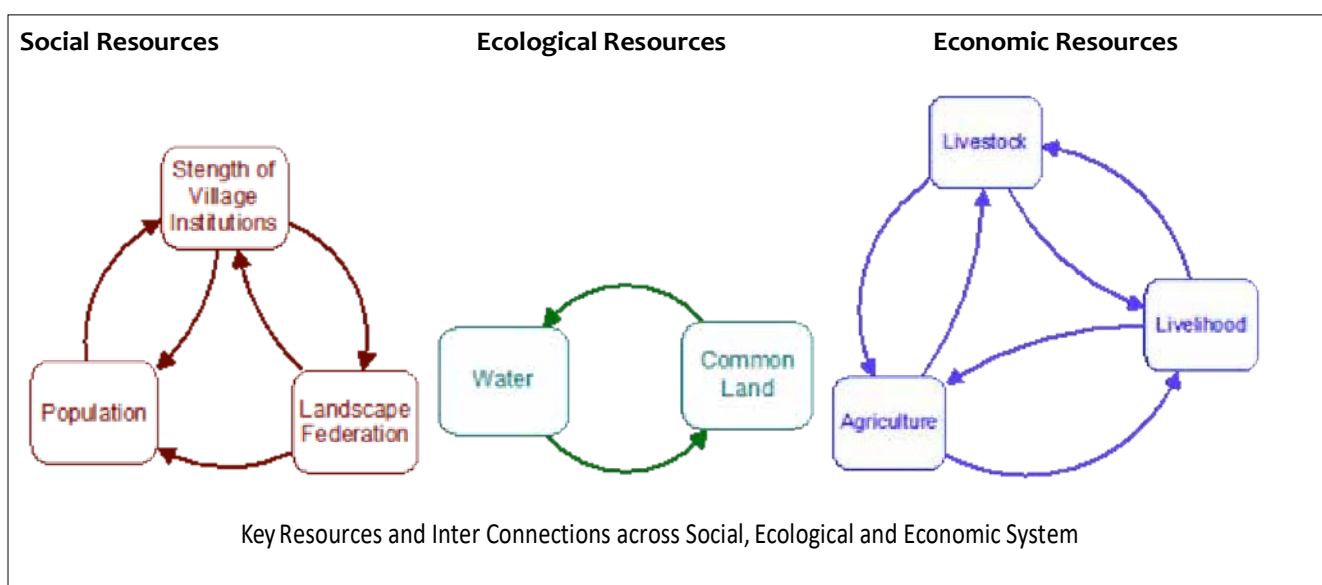
This is somewhat different from the experiences shared by the communities in the village in Karnataka which is very close to the market. Ecological-economic interactions and social-economic interactions were found to be predominant. The feedback loops represented stories of how external factors such as markets, agricultural subsidies, and microfinance institutions have influenced resource conditions and livelihoods. The feedback loops represented experiences of village communities grappling with issues of groundwater stress (subsequent to intensive cash crop cultivation), an increasing dependence on livestock rearing, and an increasing shift towards non-farm employment.

Table 2: Types of Resources Prioritized and Interactions Mapped by Village Communities in Different Contexts		
Landscape	**Resources Prioritized**	**Proportion of Types of Interactions Identified by Village Communities**
Angul, Odisha	Agricultural land Farm implements Farm wells Surface water bodies Forest Livestock Haat (local market) Strength of village institution	
Bhilwara, Rajasthan	Agricultural land Water Livestock Village unity Wage earning opportunity in village	
Udaipur, Rajasthan	Forest Rainfall Water Crops Unity Quality of village leadership Livestock Level of education Agricultural land	
Kolar, Karnataka	Borewell Agricultural land Rainfall Livestock Forest Fodder School	
Index for types of interactions prioritized:		

Index for types of interactions prioritized:

■ Social ■ Economic ■ Ecological ■ Social-Economic ■ Ecological-Economic ■ Social-Ecological-Economic

Generic model v/s location specific models – Related to the question of heterogeneity versus homogeneity of resources, we wanted to understand whether the interconnections between social, ecological and economic resources across locations would be best represented by a generic or location specific model. A generic model implies the way resources are interconnected are more or less the same across locations. There could still be differences in the parameters, or levels of a given resource and related variables, but the underlying structure would remain similar. A location specific model implies that there is a great degree of variety in the underlying structure of the resource system. The way social, ecological, and economic systems were interconnected would vary greatly across locations.

We realized that framing the question as a definitive either generic or location specific model was not appropriate, and requires a more nuanced approach. At a high level, a generic model seemed to be more appropriate as there are broad connections between social, ecological, and economic systems that are apparent across locations. These connections are captured in the high level overview model and remain fairly consistent.

Key Resources and Inter Connections across Social, Ecological and Economic System

A Generic Model of SEAL

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The figure above provides an overview of the key resources within each of the three main sectors of the SEAL framework. These categories of social, ecological, and economic resources were identified as being of primary importance in influencing the overall system through the workshops with village communities and FES staff across four different locations. The arrows between each resource category show the direction of the causal link between the resources. For instance, under the social resources sector, there are mutually reinforcing causal relationships between the strength of village institutions and landscape federation, as well as that of population and the strength of village institutions. The common structures evolving from the GMB workshops have been synthesized to develop the generic SEAL model. The arrows in pink show the direction of causal links between the resources across the different sectors. While it can be theoretically understood that a social ecological system would have all elements connected to one another the above model shows how people see these interconnections.

However, resource architectures may change across locations. Each location has a unique context that could be captured within each of those high level modules. For example, while water is a common resource interacting with other resources across all contexts, there could be differences in rates of recharge and discharge or between type of water source (surface or sub-surface or groundwater) across villages. Masking this variation could be misleading or even irresponsible depending on the end use of the model. If the end use of the model is to design location specific interventions, delving deeper into location specific structure may be worthwhile. Further replication across locations may allow us to identify which modules require location specific structure, such as water modules.

Mental models of village communities v/s practitioners – Comparative assessment of causal maps developed from GMB workshops with village and practitioner communities operating in the same context helped in understanding mental models of resource architecture as perceived by these two stakeholder groups. At a higher level, while both the groups confirmed that social-ecological-economic interactions drive livelihoods, differences were noticed in the following areas:

Collective Action: Both practitioner and village communities recognized the importance of collective action. Communities' models captured a nuanced understanding of collective action not necessarily by including the term but by unpacking what it meant and what implication it had on the system. The village community identified cooperation, mutual understanding, sharing of resources, information sharing, knowledge and skills as all important elements of collective action. Village communities also made clear connections to how these elements were reinforcing in the social system as well as how they connected to the ecological and economic systems. Practitioners, in contrast, had difficulty specifying what collective action meant and generally only made minimal connections to the larger system. They also emphasized the importance of community plans as a resource which did not come up in village communities' models. This difference may indicate that while practitioner focused perceived reality from an outcome perspective, the village communities emphasized more on processes.

Agriculture: Both the groups identified agriculture as a key resource across locations. The village communities spoke in general terms about agriculture but did not go into detail about type of agriculture. Practitioners, on the other hand unpacked agriculture to include multiple facets such as crop selection and corresponding water requirements. This could be due to practitioner's technical expertise and greater degree of comfort in including details about agriculture rather than some of other relevant variables in the social system.

Common Lands: Practitioners expanded to include area of common lands as another important resource. This could point to the village community prioritizing the health of common land because it is more readily apparent to village community than the area of the whole common, a noteworthy insight for promoting management of common land or expansion of area.

Population and Village Infrastructure: Village communities included their own community members as an important resource and how the population was influenced by village infrastructure. They described how roads created physical access to outside resources enabling increased access to information, education, healthcare, and markets. Education in particular opened opportunities for social mobility within their community. They also captured how increased access and social mobility led to shifting aspirations and greater migration which changed existing dynamics within the community. Practitioners on the other hand, did not prioritize these resources and were not clear on how they fed back into social, ecological, and economic systems in the community. This points to a need for stakeholders working in these communities to understand the impact of access and identify additional supports for community members as a key resource that has effects beyond the social system.

External Support: Village communities and practitioners prioritized support for the community in different manners. Village communities emphasized the importance of internal support, like sharing, whereas practitioners only mentioned external support as a crucial resource for community development. Organizations should work to understand internal mechanisms for support and how they can work to compliment them while also ensuring that village communities are aware of relevant sources of external support.

3.3. Key Operational Pathways

The learning workshops undertaken with the village and practitioner communities in the four locations revealed interesting differences between resource configurations of different ecological contexts, as well as the mental models of resource architecture between village and practitioner communities. Diving deeper into the structures elicited through the modeling efforts provided a few operational leads that could help in strengthening resilience of ecosystems and livelihoods. This section aims to provide an indicative list of low and high leverage areas along the key feedback processes that emerged from the models.

Collective management and ecological health

One of the central questions during the learning workshops with the communities was to understand the structures and processes through which communities work together to manage shared land and water resources such as forests, pastures, rivers, streams and groundwater. The insight in this modeling process has been to identify the ways in which strengthening participation and leadership of village committees supports the creation of multiple parallel and complementary collective management processes to protect common resources. Consequently, these collective management processes both preserve the health and integrity of shared natural resources, and also have spin-offs in terms of additional livelihood opportunities and investments. In some cases, these spin-offs in turn feedback to strengthen the village unity and leadership that facilitated the collective action to begin with. The initial investments in building leadership capacity and enhancing participation in village communities thus becomes the impetus for a bottom-up, self-organizing process of adaptive co-management, which in turn contributes to the resilience of the social-ecological system and the promotion of village social cohesion (Olsson, Folke, & Berkes, 2004; Pretty, 2003).

In Bargoth village in Angul District, Odisha, the causal mapping exercises in villages represented story of village committee increasing in strength, creating mechanisms that help in controlling forest fires and improving forest condition. As forests improve, availability of Non-Timber Forest Produce (NTFP) increases that helps people in earning higher income from sale of NTFP and fosters unity in the village which makes village committees more robust. Additionally, as forests improve, NTFP availability increases that helps people in getting more money through sale of NTFP. As the cash available increases farmers are able to invest in tractors and agricultural
tools that reduces their dependence on forest and checks cutting in forest, resulting in better forest conditions.
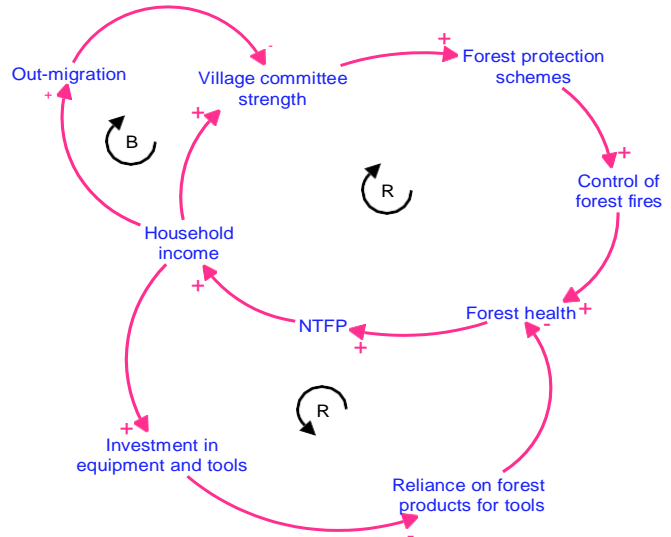
Potential Leverage Points

- Increasing investment for land and water rejuvenation
- Introduction tools for planning and decision making
- Improving access to information on ecological thresholds

Low Leverage

- Strengthening collective tenurial rights over Commons
- Polycentric governance arrangements
- Re-connecting people and nature – changing 'environmentalities'

High Leverage

Commons and farming systems

Less direct than the pathways connecting village unity and management of common lands are the pathways that link the health of common lands and agricultural productivity. Multiple causal maps elicited from village workshops describe processes through which investment in the common management of forests and grazing lands have beneficial and sustaining effects on agricultural livelihoods, which in turn feed back to the health of common lands. These processes primarily operate to support forest and common land health through the intentional and sustained management of forest cutting, livestock grazing, and cultivation. These processes support the health of grazing lands and forests, which then produce healthier land for livestock grazing which complement agricultural processes through the production of manure. Where there has been lack of emphasis on ensuring effective management of the commons, multiple unintended consequences have resulted despite interventions to improve access to diverse livelihood resources (Thulstrup, 2015). This reinforces the importance of understanding the potentially beneficial feedback effects involved in early investments on the management of the commons.

In Mukungarh village in Bhilwara District, Rajasthan, collective action to protect forest health supports the production of more fodder availability. The increased availability of fodder supports grazing by livestock and the production of manure, which is used to fertilize agricultural land and improve the soil health to lead to higher agricultural yields. The increased agricultural yield is used to generate household income, which can be invested in more livestock for use in dairy production as well as agricultural processes. Additionally, the chaff produced from harvesting increases the fodder available to support livestock. As livestock populations increase and they graze in the forest/common lands the health of forest/ common lands improves.
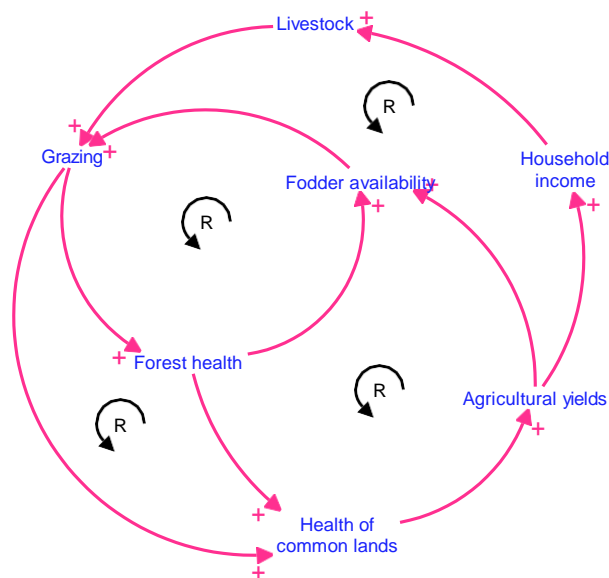
Potential Leverage Points

- Increasing or decreasing subsidies
- Increasing number of wells / borewells
- Promoting sustainable agricultural practices

Low Leverage

- Improving access to information on ecological thresholds, market prices
- Strengthening collective tenurial rights on Commons
- Strengthening institutions for collective management of natural resources
- Challenging popular mindsets of Commons as 'wastelands'
- Reinforcing commons-agriculture-livestock inter connections

High Leverage

Institutions and livelihoods

The role of formal institutional collaboration and access to market structures highlight the pathways through which collective management and village unity may promote livelihoods at the village level in ways that are equitably shared. Village committees and linkages to Panchayats have the potential to open up access to local and regional institutions and markets to provide new avenues for sale of agricultural produce. These linkages not only provide opportunities for economic growth, but also provide linkages to new sources of information and new social and political ties which can be brought back to the village. This may therefore, present a pathway through which community members of the villages may break out of their poverty trap and experience a diversification of livelihood options (Haider, Boonstra, Peterson, & Schluter, 2018).

In Mukungarh village in Bhilwara District, Rajasthan, village meetings provide opportunities for teaming up to create linkages with dairies and other external agencies.

Milk sale in the Dairy brings in money helping people in improving their living and fostering unity in the village, and the frequency of village meeting increases, there are more opportunities for sharing and exchange of ideas, views and information.
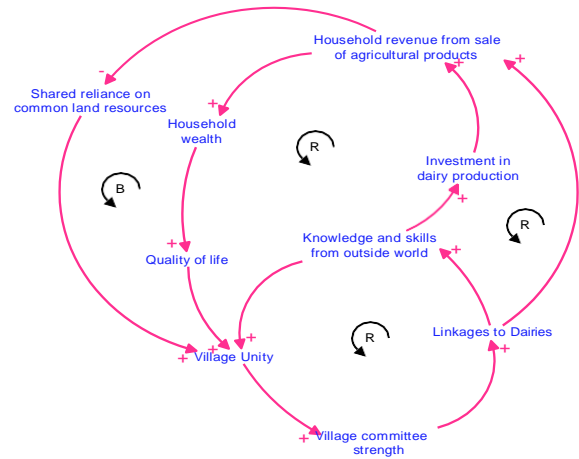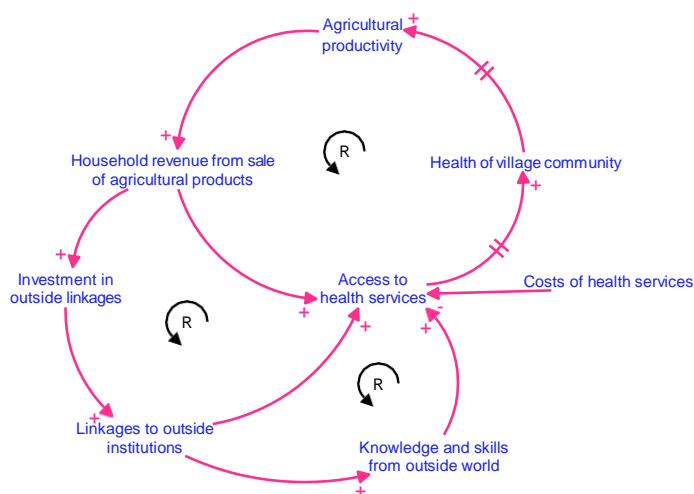

Potential Leverage Points

- Diversifying livelihoods through establishment of institutional linkages
- Opportunities for farm based and rural industrial livelihoods that are simultaneously (and proportionately) income generating and employment generating.

Low Leverage

- Creating an enabling environment to ensure institutions are designed to be open to the potentially transformational learning and adaptation opportunities invoked by crisis
- Shifting paradigm from Gross National Capital to Gross Natural Capital
- Macro-economic valuation of farmers and agricultural livelihoods as contributing to value-added outputs and ecosystem services.

High Leverage
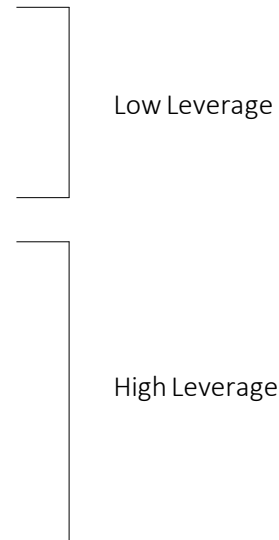
Accessibility and livelihoods

Access to resources and institutions outside of the village community has potential for both significant positive and negative impacts on the nature and trajectory of livelihoods and the cohesion of social institutions (Scoones, 2009). While access to roads and therefore education, markets, healthcare, and political participation all were mentioned as aspirational goals in various village settings, the feedback dynamics and particularly the delays involved in that access represent an important challenge for village communities and outside organizations that are working to support resilient livelihoods. Scoones (2009) therefore cautions organizations aiming to provide support for village communities, to pay keen attention to longer-term livelihood changes, and identify multiple future livelihood pathways that communities may leverage while intervening to mitigate potential short-term risks.

In Velu ka Ket village in Udaipur District, Rajasthan, community members described a dynamic in which increased yields and productivity of livestock increased wealth and availability of cash, which enabled the people to access health services. With improvement in access to health services, the health of the people engaged in farming improves resulting in higher returns from agriculture and livestock, representing a virtuous set of feedback loops.

Potential leverage points

- Investments in building new roads and improving transportation
- Fostering knowledge and information sharing
- Support translation and dissemination of informational resources within village communities

Low Leverage

- Institutional mechanisms for governance learning
- Improving collaborations to support development of regional institutions,
- health and education outreach

High Leverage

4. Macro-economic Contexts, Hurdles and Opportunities

Structural infirmities have been with the Indian economy since the mid-1970s. It has been noted as beginning with dissociation between agriculture and industry (which were predominantly agri-based industries like textiles, sugar, fertilizers till then), with the advent of the chemical, iron and steel, and the modern automobile and pharmaceutical industry (Chandrashekhar, 2011). But what this structural change, the painful shrinking of agriculture in the nation's economy without a comparable shrinking of employment and population within the sector, meant for rural and farm based livelihoods, the state's intervention and knowledge for these livelihoods has not received adequate attention (Raina, 2015). Also, the ways in which farm based livelihoods were conceived as irrigated, chemical intensive production, and the administration of agriculture by the state revamped to suit the supply of these necessary inputs and technologies, led to a gradual and unambiguous neglect of predominantly rainfed agriculture (with less than 40 % arable land under assured irrigation) and a range of farm and non-farm based livelihoods in the drylands (Shah et al 1998; Raina, 2013).

4.1 Consistent burden on farm-based livelihoods

There are two aspects to this burden on farm-based livelihoods. The first, arising from a deeper theoretical framing of sequential growth from agriculture to industrial to service sector led economies, reinforces the structural anomaly discussed above. There are more numbers of people dependent on a rapidly shrinking share of the economic pie. Rajasthan has moved on from over 41% of its GDP coming from agriculture in the 1980s to 17-19% of GDP coming from agriculture now (2012-13 to 2014-15) (SNU-FES team, 2017-draft). The second arises from the macro-economic treatment of agriculture. The state taxes agriculture – especially rainfed, dryland farm livelihoods in Rajasthan. It transfers all the gains from agriculture to other sectors (industry and services some of which also supply inputs for agriculture) and consumers (Ray, 2007) and (going by the chemical-irrigation

intensive package approach) it does not offer the appropriate investments and technological capacities needed to support the diversity of livelihoods in rainfed/dryland agriculture (cultivators, main and marginal workers) (Shah et al, 1998; Rudra, 1988; Chand, 2011). By deciding on public investments that challenge the ecological basis of agriculture, the state consistently increases the burden on agriculture (Raina, 2013; 2015). For instance, an income assurance where the state offers farmers the price difference between market price and cost of production (be it MSP or a price difference calculation) where both the prices do not account for the social and ecological costs of production, just adds another blame on farmers. The key takeaway here, is the need for <u>a macro-economic goal of robust[1] and sustainable farm based livelihoods, and socio-ecological criteria for production, distribution and consumption decisions that support this goal.</u>

4.2 Public policy- "rural" voids

Besides the fact that "rural" is defined in India as (a space/area, population, livelihoods, infrastructure, services) anything that is not urban (Raina and Mandal, 2014), the above macro-economic logic also assumes that any public policy for the "rural" is meant for a sequential evolution (a Rostowian legacy) of the rural to urban. The latter has been evident in India (recently) in projects that provide urban amenities to rural areas, persistently in all the green revolution package investments, irrigation programmes (Rajasthan consistently spends over 75% of its irrigation and flood control expenditure on major irrigation), infrastructure (centralised, power demanding), and in the poor allocation of resources to rural development despite reasonably high (40-48% over 2000-2015) share of social sector programmes (health and education) in the state's revenue expenditure. What is erased in such public policy, is the day-to-day ecological and social interactions that are central to rural livelihoods, especially farm-based. Despite global acknowledgement of agriculture and rural systems linkages with urban areas/consumers, and rural contributions to urban and national ecosystem services (be it through watershed development, common property resources, biodiversity, etc.), the public policy domain is inadequate in its understanding of rural ecological and social systems dynamics. Building on this inadequacy is the search for 'catch-up' solutions (to achieve Western economic development) (Chang, 2002), that invariably legitimize all public policy interventions and investments however evident their disruption of rural social and ecological contexts and interactions with livelihoods. In rural Rajasthan, marked with several important mutual dependencies between arable land, commons, forests, animal and human resources (Sewa Mandir, 2005; FES, 2009), these public programmes contribute to social and ecological disruption and degradation. Animating these are the persistence of the 'supply syndrome' (Raina, 2014), and the denial of 'livelihoods-ecosystems linkages' which have been proven to be more resilient when multiple socio-technical alternatives are supported (Reddy, 1979). The takeaway here is <u>the need for contextual social and ecological indicators (both criteria and parameters that may have to differ in different locations/time periods) against which every public policy intervention is gauged</u>.

4.3 Centralized policy intelligence and policy processes

The need for decentralized integrated Block level planning and peoples participation in these exercises has been articulated in India and in Rajasthan (Dantwala Committee, 1968; Dantwala 1980; Bagchee and Bagchee 1980; Sewa Mandir, 2005). While acknowledging that even the policy intent that was evident in the Dantwala Committee is absent today, we confront the massive centralization and consolidation of knowledge and public administration of agriculture and rural development (Raina, 2015; 2016) where even the RKVY as the best policy innovation (of the XI FYP 2007-12) allocating 25% of the agriculture budget directly to State Governments to design policies

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1   We define robust as an essential feature of a resilient system.

and programmes therein as suitable for their own agriculture (in keeping with the Constitution of the Republic of India, where agriculture is entirely a State Subject), has become another centralized instrument albeit at the State level, with no semblance of decentralization or integration at the Block level. In the SNU-FES field work, we asked people about their aspirations.

What do people want (their aspiration)?

(i)   To move out of agriculture and into RNFS or other urban jobs?

(ii)   To improve agriculture make it yield more crop and more income?

(iii)   To improve agriculture with assured economic gain, without any damage to or disruption to the society and ecosystem?

The social disruptions caused by development policies and programmes were evident in the answers.

(i)   People wanted to move out of agriculture as it exists (policy and practice) now; but would prefer (based on their economic, social and ecological memory) to stay on in agriculture as it existed earlier, with reasonably assured incomes and prestige (not subservient to private dealers and state officials, and with on-farm and village based inputs), quality food and adequate food (it did surprise us that people placed quality above quantity), enough heads of cattle, access to grazing lands, etc.

(ii)   People wanted to improve agriculture; but not just crop yield. Crop-residue, biomass, water conserving crops, pest/disease resistant crops (demanding lesser chemicals to be bought and sprayed), cattle, were just as important; these were the key to better incomes and more off-farm employment.

(iii)   People saw economic gain without any socio-ecological disruption as impossible; agricultural improvement would invariably result in some ecological disruptions and social change. But economic gain can be ensured if the state understands and respects local social and ecological systems too.

The takeaway here is <u>a macro-economic valuation of farmers and agricultural livelihoods (including farm labour), as contributing value-added outputs (grain, fodder, milk, etc.) and ecosystem services (volumes and quality of water used/re-used, soil health, biodiversity, common resources, etc.).</u> This is the essence of the macro-framing of SEAL. It needs human capacity building at all levels.

4.4 Pathways for operationalising SEAL

Based on the pathways followed in the SEAL project, it is possible to enable community mobilisation and co-ordination by a SEAL enabler (a CSO), and take the community through these processes followed in the project:

- Community based resource mapping – data and information processing
- Public discussion of resource changes
- Public discussion of livelihoods changes
- Demonstration of causal relationships and systems dynamics
- Community based planning and SEAL implementation

There may be some quick successes, with some communities establishing their socio-ecological criteria, demonstrating the social and ecological linkages and impacts of various interventions, accepting the causal relationship in the systems model and parameters for each, and operationalising SEAL in the village/Block. But this is likely to be limited. For effective conceptualisation and implementation of SEAL, the changes needed are not just at the community level but ecosystem scale covering diverse landscapes and resource and species distributions. There is a need for human capacities among various actors at the Block and District, and State and Union Government levels.

Literature on socio-ecological systems (SES) and biodiversity, and the few successful cases of socio-ecological transformation ensuring decent livelihoods and ecological health, which we have seen in India (say, the Timbaktu collective, Keystone Foundation, Deccan Development Society) have very specific human capacities that include (i) capacities to accept and promote value pluralism in decision-making, (ii) capacities to manage institutional diversity (iii) decentralized knowledge and policy convergence of multiple disciplines with local socio-ecological memory. Operationalisation of SEAL has to therefore, hark back to the foundational theoretical formulation in political ecology shifting from "people-nature interactions" to "people-people interactions."

The macro-economic logic and takeaways for SEAL help us propose an alternative pathway(s), specifying some key actors and their agency in social and ecological changes, supported by systems dynamics models used by decision-makers with empirical evidence generated by the community.[2]

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2   Some indicators that the community (in the two villages) highlighted are included; there are many more and diverse indicators that are needed, many of these are in the systems relationships we have identified already.

Table 3: Operationalising SEAL: Pathways with capacities, select actors, and indicators			
Select macro-economic hurdles	Opportunities	Actors	Indicators for/of change
Farm based and rural industrial livelihoods-income generating and employment generating	Farm worker's cooperatives, and women's cooperatives SHG/Coops of Seed, biomass/ FYM, inputs, critical irrigation. Primary and Secondary processing Storage and Packaging for bulk and retail sale	Dept of Rural Development District Industries Centre Min of New and Renewable Energy Dept of Agriculture and Cooperation NREGA and PMSY Local venture capital Banks (Coops)	More farm based jobs More rural industrial jobs Overall increase in household and village incomes Specific increase in women's incomes Local value networks Demonstrable multiplier effects from agriculture
Socio-ecological criteria for robust and sustainable farm based livelihoods	Creation of nutritious landscapes (people and ecosystems) Resource conserving technologies Energy, water and soil health accounts/ budgets	BDO and SDAO Panchayat Heads Local CSOs Farmers organizations/ movements Local markets	Living soils- region/ agro-ecosystem specific Water conservation and quality Lower farm production risks Higher and more stable agricultural incomes
Contextual social and ecological indicators to assess public policy intervention	Community knowledge based + data and information on tiers of agricultural and other public administration/ development schemes Co-production of meaningful criteria, compatible and commensurable measures of social and ecological wealth and health	Village and Panchayat committees Local CSOs Farmers and womens organizations / movements	Authentic democratic participation of communities in development decision making Norms or rules of conduct for all public schemes development interventions, private and CSO interventions Indicators of acceptable thresholds of social and ecological change Indicators of anticipation and accountability for each threshold transgressed

Table 3: Operationalising SEAL: Pathways with capacities, select actors, and indicators			
Select macro-economic hurdles	Opportunities	Actors	Indicators for/of change
Value pluralism, starting with farmers as producers of commodities and ecosystem services	Income and prestige for farmers for production and ecosystem stewardship

Consumer awareness of real costs and benefits of each food item (prevalent market price + price of ecosystem services + intrinsic value of ecosystems)

Local and regional research (natural and social science, traditional and local knowledge) with records in locally owned and managed environmental records units. | Communities and environmental knowledge groups

Farmers groups/ organizations

Political and administrative officers involved in development sector decisions

Scientists, environmental and political activists | Increase in real farm incomes with commensurable gains in environmental values

Mapping and community management of high density or high connectivity spots with valuation and compensation for avoiding/reducing economic activity in such spots.

Intrinsic value of environment becomes an accepted norm (replacing instrumental values) |

The entries in table 3 above imply no sequence or priority. In a location , with a good District Industry Center (DIC) and non-farm workforce, it will be a good idea to start with row 1, and estimate using a community based systems dynamics model, the impacts of more rural storage and warehousing infrastructure, and rural processing jobs on farm and non-farm livelihoods. In locations with inhabitants resenting their farm based livelihoods as the sole recourse to get an income, and their acute consciousness of steady erosion in land and water quality, loss of biodiversity, loss of crop-livestock relationships, and loss of older crop varieties, it is ideal to start with context-specific social and ecological indicators to assess all public programmes/ schemes. Similarly, the approach to operationalise SEAL at the District level in a reasonably well irrigated district should be very different from that in a poorly irrigated one. In operationalising SEAL, we have to deconstruct the concept of resilience with respect to ecosystems and farm based livelihoods (see Folke etal 2002). Let us recall that every farmer's suicide, and every tubewell dug for irrigation, is a case where resilience has broken down. When ecosystem resilience and social-economic resilience are combined in SEAL, we ensure that the systems (social, economic and ecological) are:

(i)   robust – there is a certain level or magnitue of shock that the system can take or absorb and main-tain its dynamics or a given state;

(ii)   self-organizing – there is a certain degree of relative independence from the external (macro-con-texts) or strength of mutual dependence within the local system, which makes the system capable of self-organization

(iii)   constantly learning and adapting – there is a conscious human component or capacity for learning and adaptation in the system.

Getting the current state and non-state actors (including CSOs) to accept and reform themselves to the criteria of resilient socio-ecological systems is not easy. So a multi-pronged polycentric approach is crucial in the field involving different stakeholders at different scales(with the community, state and other stakeholders).

Operationalizing Socio-Ecological Approach to Livelihoods (SEAL)

5. Way Forward

The learning report is one milestone in an ongoing initiative to improve understanding of socio-ecological approach to livelihoods, and develop methods and indicators to guide engagement with a range of stakeholders on improving social and ecological systems for rural livelihoods. The efforts over the last year helped in establishing a structured process and methodology through which local communities can become discoverers and owners of their solutions to improve resilience of ecosystems and livelihoods. Engaging with village and practitioner communities at micro level also helped in a more nuanced understanding of the structures and processes driving livelihoods in micro-contexts and identifying the potential pathways for strengthening livelihoods. As with any pragmatic approach, further iterations would be required to improve the approach and make it more applicable for wider use.

As highlighted in previous sections, the nature of problem is complex-it involves a range of actors (with different power structures) working at different scales with different mental models of 'development'. While we may be successful in establishing few cases of robust social-ecological systems in different locations at micro-level, scaling up such efforts require a multi-pronged polycentric approach at different levels (with community, district administration, state and other stakeholders) and enhancing human capacities at these levels.

Going forward, we plan to continue the work to develop an accurate model of the system, improve our understanding of how the system operates and improves itself, and how development practitioners working on different component of social or ecological systems can help assist in building resilience of the system. While this phase focused more at community level engagement, we plan to undertake this process at different scales with diverse stakeholders to improve the method for multi-stakeholder engagement. We have initiated a process of mapping institutions and organisations working on different intervention to improve rural livelihoods. We plan to work with these organisations to understand the replicability of the approach and have a better understanding of how different interventions influence system level outcomes. It would be also helpful to develop scenarios

emerging due to different policy actions and evaluate it against context specific social, economic and ecological indicators.

Specifically, the areas to further operationalize SEAL would include:

- **Engaging with different groups at micro level** – The GMB learning workshops with the village communities were confined to efforts of surfacing and challenging mental models at village level. An important area that needs to be explored in future is to get deeper into how these mental models differ between different groups within the village – for instance, women, youth, marginalized communities etc. With a well-defined methodology already in place, this could be replicated with different groups within village as well as other villages.

- **Engaging with diverse stakeholders –** Operationalizing SEAL requires a paradigm shift from a linear approach to a systems approach. There is a need to engage with diverse stakeholders – government, civil society organizations, social entrepreneurs, networks, corporates, donors and funding agencies, micro finance institutions, to negotiate and influence sustainable socio-ecological livelihood. Various methodologies and tools would need to be deployed to improve systems thinking amongst the different stakeholders.

- **From micro to meso and macro level –** Focusing on villages helped in gaining deeper insights into the social-economic-ecological interactions using 'micro' lens. However, there are several factors at meso and macro level that influence these interactions at the micro level which could not be adequately captured. There is a need to improve understanding of the interactions at meso and macro level that influence the resilience of ecosystems and livelihoods at micro level.

- **Improving facilitation skills –** Making systems thinking 'operable' requires specific set of skills on part of the facilitator. The facilitation manuals for conducting group model building CBSD learning workshops for practitioners and village communities could be used and further refined and disseminated to government/ practitioners engaging with the village communities to achieve sustainable socio-ecological livelihoods.

- **Moving beyond 'system thinking' to 'acting' –** Methodologies used during this action based research helped in surfacing and challenging the mental models that drives behavior and actions of individuals and communities. It enabled different actors 'think' using a systems lens. However, drawing insights from this thinking and enabling different actors to better act on the systems will require not only continued engagement but a refinement in process to enable such transitions. We plan to continue improving the approach building on key principles and processes to develop a method to enable communities and other stakeholder's better act and learn using a systems perspective.