

Identifying Climate Adjacency

Key Findings from four case
studies and a synthesis



India Climate
Collaborative

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Foreword

If 2020 shattered one thing, it was our illusion of control over nature. An invisible virus brought human society to its knees, exposing in its wake our deep vulnerabilities, but also our interconnectedness. We can no longer think our lives are insulated; that while the pandemic affected us all, we can somehow manage our way out of climate change. Climate change is a series of shocks – be it heatwaves, violent weather events, a decline in crop yields or disruptions to our water system – and we are facing a world that is going to be shock-ridden, for which we have few systems of resilience in place.

One popular notion is that climate and economy are locked in a zero-sum game. Thinking that we need to set aside all kinds of environmental constraints to jumpstart the economy is actually a false dichotomy, because environmental degradation eventually catches up. Overfishing provides high incomes in the short run but destroys

the marine ecosystem over time which impacts future livelihood. This is one example among plenty. Climate change and natural hazards undermine development and poverty-reduction gains. Worse, it is the poor and marginalized communities who bear the heaviest burdens of the destructive impacts of both large- and small-scale disasters. Indeed, it is the poor and marginalised that depend most on the environment for resilience in times of scarcity.

Communities often end up mal-adapting to climate change as those solutions work in the short run. Be it residential societies buying water from tankers, or people installing more and more air purifiers in response to rising pollution. Such measures provide relief in the short run, but as their effects compound, these negative loops become more and more expensive.

Now is the time for us to be creative in how we think about the intersections between the economy, society, and the environment, because going back to a model that pits one against the other, is deeply problematic. Samaaj, Sarkaar and Bazaar need to transition from creating separate climate and non-climate silos towards a more seamless integration of climate in all forms of work and decision making. This can only happen when we expand our arena of thinking, enhance team learning and endogenize climate into all our work.

Forests and ecosystems cannot be conserved in isolation and human well-being cannot be achieved if they are separated from nature. Therefore, to achieve sustainable development and build resilience towards climate change it is important that the social-ecological system is seen as one and not separate.

Indeed, there is emerging evidence around this idea. We have seen enough surveys that tell us that the companies that are balancing environmental concerns with their bottom line are succeeding and developing at a rapid pace, which highlights that it isn't an either/or situation. Still, the process of building in the climate lens daunts many. Where and how does one begin?

Rohini Nilekani

**Rohini Nilekani,
Founder, Rohini Nilekani Philanthropies**

Through this report, I am pleased to present one such approach, that is, the use of systems thinking through which one can observe and understand the connections between disasters, development, poverty, and vulnerability. Climate is a space that is new to many of us and perhaps best understood through the lenses of work we already engage in. This was the reason we chose to work with DESTA and our partners to explore, understand and document how their work, important as it is, is adjacent to climate change. Through this, our partners were able to better understand the interconnections in their work, minimize mal-adaptations and focus on high value interactions within their ecosystems.

I hope this report will offer you a way to understand climate through work you are already engaged in as well as illustrate the interconnectedness of us all. As John Muir so beautifully said, "When we try to pick out anything by itself, we find it hitched to everything else in the Universe."

As philanthropists, I believe we have a moral imperative to invest in such climate action. It will positively impact every cause we are passionate about, while ensuring the wellbeing of the communities we aim to serve.



Credits

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We would like to acknowledge the contributions of the following organizations and people with whom these case studies were made. It is their work that has helped us create the body of knowledge as presented in this report. A special mention goes to the team at Rohini Nilekani Philanthropies who believed in us and gave us the freedom to accomplish this work using ways and means we found best suited. If not for their vision this work and its outcomes may not have manifested the way they have. We would also like to thank the team at India Climate Collaborative for their inputs and helpful insights.

Suggested Citation - Identifying Climate Adjacency: Key findings from four case studies and a synthesis, Report by DESTA Research & Rohini Nilekani Philanthropies, India, January 2021.

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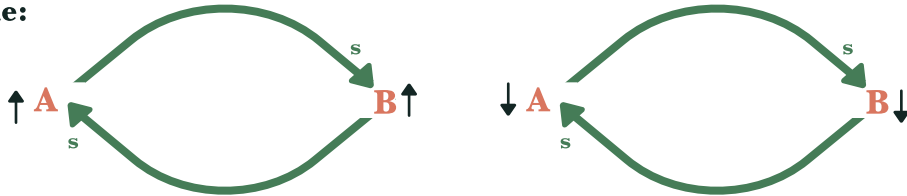
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Notes on how to read the causal loop models:

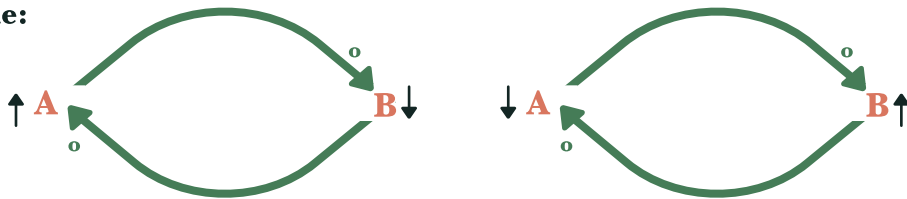
S = Similar Direction, $\uparrow\uparrow/\downarrow\downarrow$ i.e. cause and effect is in similar direction.

Example:



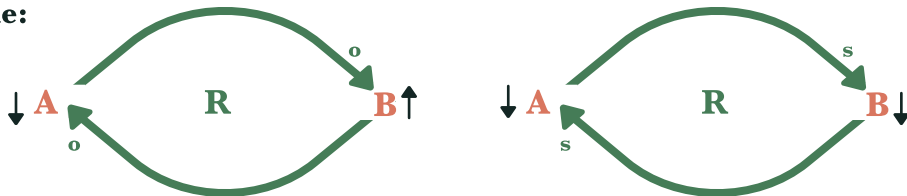
O = Opposite Direction, $\uparrow\downarrow/\downarrow\uparrow$ i.e. cause and effect in opposite direction.

Example:



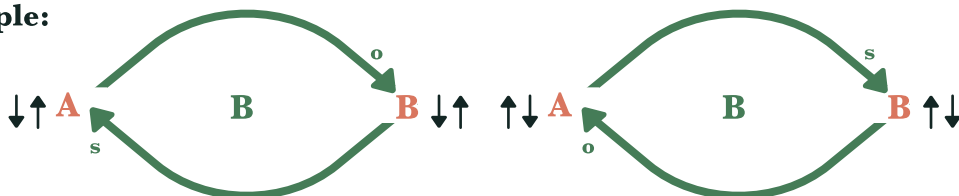
R = Reinforcing loops, where the variables are amplified either positively or negatively.

Example:



B = Balancing loops, where the dynamics of variable are kept in check thereby not allowing amplification.

Example:



Denotes Time Delay between cause and effect



Executive Summary

This report is an outcome of four workshops that were conducted with the aim of identifying climate linkages in non-climate focused projects.

The workshops were done with four different agencies working on pastoralism, community conserved areas, rainforests and the Orans (community-conserved areas) of Rajasthan respectively.

The aim of these workshops was to identify how each agency's projects linked to climate change adaptation and mitigation, and what the impact of that link was on the community and local ecology. These linkages--which are usually considered outside a project's boundaries--were identified through the use of systems thinking tools. And in doing so, it helped initiate the process of internalizing climate within non-climate focused projects.

Our experience tells us that by engaging people through a participatory system thinking process, they begin to test their

own assumptions about climate change and how their project activities influence or get influenced by climate change.

As the impact of climate change varies across local ecosystems, communities adapt differently, which in turn affects emissions and their own future adaptive capacity. Factors that influence adaptive capacity include community governance and collective action, economic changes, market changes, government policies, cultural practices, and the emerging aspirations of individuals.

There is also a strong causality between environment conservation and climate change adaptation and mitigation. Forests and ecosystems cannot be conserved in isolation and human well-being cannot be achieved if they are separated from nature. Therefore, to achieve sustainable development and build resilience towards climate change it is important that the social-ecological system is seen as one and not separate.

Understanding these systemic linkages as well as the benefits of conservation on human development could make advocacy more impactful. Advocating for protection of mangroves that protect communities from cyclones, for example, can be more powerful than advocating for them just as carbon sinks. Advocating for protection of Orans may be more widely accepted if the linkages and benefits to local agriculture and water availability are made clear. Thus, conservation and climate benefits when seen together, form a systemic recipe for securing human wellbeing and the environment while adapting to a fast-changing climate.

Similarly, it is not possible to work on improving livelihoods without factoring in environment conservation and climate change adaptation and mitigation. One needs to look at all three of them together; too much emphasis on one could create potential side effects for the rest of the objectives. For instance, promotion of high yield species of livestock or crops, could lead to loss of indigenous species that are better suited for local climate conditions. Short term benefits of improving income do provide resources to people to adapt to climate change but it is important to account for their long-term consequences in terms of changes in land use and impact on local diversity. Changes in local livelihoods also end up changing people's relationships with their local ecosystems and thereby their perceived value in the eyes of the young. Preventing a loss in value is critical if we are to ensure an intergenerational culture of conservation and protection of local resources.

Businesses, governments, non-profits and communities need to transition from creating separate climate and non-climate silos towards a more seamless integration of climate in all forms of work and decision

making. However, this can only happen when they expand their arena of thinking, enhance team learning and internalize climate into their work.

The use of systems thinking tools could help them test their own assumptions about the short- and long-term impacts of their work on climate. Making these adjacencies explicitly clear, being able to communicate them clearly and planning ways of enhancing the climate co-benefits while countering the potential side effects are key to how they move ahead on this path.

This report documents some of the key findings and learnings from each of the four case studies. It also presents the "Theory-in-Use" for developing the climate adjacency framework that guided the process of mapping these adjacencies.

The diversity of the case studies provides a glimpse of how climate adjacencies can exist beyond their physical presence. They can take the form of impacts on ecosystems and livelihoods, as well as in conversations and dialogues between stakeholders. For instance, when the objective is to develop a dialogue around an issue, the reference to climate can strengthen or weaken the argument.

Through this report we hope to motivate organizations who could benefit from teasing out the systemic linkages of their work with climate change, encourage philanthropies and funders to consider what kind of climate adjacent work to fund, and help policy makers appreciate how to apply systems thinking to better internalise the intended and unintended consequences of their decisions. Other readers may perhaps benefit from this report and consider having a similar approach or applying similar tools for enhancing their own climate awareness and actions



Introduction

Learning about Climate: The Systems Thinking Way

THE NEED

More often than not, people are aware that their work and actions have climate adjacencies. Farmers agree that the excessive use of pesticides and fertilizer reduces the soil's ability to remain fertile and makes farming more vulnerable to rainfall changes. Pastoralists are finding it hard to cope with the increased climate stress, partly attributable to growth in livestock populations and sedentarization. And organizations working with farmers and pastoralists realize that some of their interventions that improve livelihoods also cause an increase in emissions.

Despite this, climate change, as a sector, is seen in isolation. **To make people take cognizance of the climate linkages that exist across sectors and projects, we need to make these linkages explicitly clear.** Doing so would help people and organizations use a climate lens for their work, thereby allowing for more climate-focused action and constructive dialogue.

THE RESPONSE

Through this collaboration between RNP²

and DESTA³, an effort has been made to generate evidence that such climate adjacencies exist and, importantly, that people themselves can identify them.

Based on a series of four workshops--conducted with agencies working on pastoralism, community conserved areas, rainforests and the Orans of Rajasthan--we have seen what the impact of using a climate lens can be.

Using systems thinking, each agency was provided with a framework to express their climate change assumptions as well as the perceived impact of their work. Based on this, the teams mapped out the climate linkages for their projects--an activity that helped them explicitly see the connections between their project activities, climate change, and its potential implications in the short and long term. In turn, becoming aware, as a team, of the linkages and implications strengthened each agency's climate change focus in their non-climate focused projects.

We believe that this is the start of the process of endogenizing climate change into non-climate context work.

¹Incidental linkages which may not appear to be directly related but exist in parallel

²Rohini Nilekani Philanthropies

THE PROCESS

The complex task of mapping the climate adjacencies of socio-environmental projects was initiated with the goal of identifying the climate linkages for non-climate focused projects: How do the project activities positively or negatively influence climate change? Can climate linkages be monitored and their evidence generated over time? Will this evidence drive climate action in socio-environmental projects?

Making people aware of climate linkages necessitated a participatory engagement process. A systems thinking approach was found to be an appropriate fit for understanding the interplays between natural resources, people's livelihoods, emissions, and their own adaptive capacities.

Through four workshops, participants explored:

- **Their perceptions of climate-related changes taking place in their projects and local areas** The workshops encouraged participants to narrate their perceptions about changes taking place in their projects and local areas: What are the reasons for these changes and how do they see these changes further evolving? These narratives were the foundation for developing system stories that depict the structural reasons for the changes observed.
- **The design of the present system and why things are happening the way they are.** If these stories continue to prevail, what would the future look like in terms of the state of ecosystems, livelihoods and people's ability to adapt to climate change? Responses to this formed the system stories which enabled the progression towards viewing the interplays between different factors and how these have shaped the past and could influence the future.

Moving from looking at parts to viewing the whole through the interplays of parts, made it possible to expand the mental boundaries of participants and start exploring what lies at or beyond these boundaries. For example, factors like weather, market prices and government policies are typically looked at as aspects that are beyond the project boundary. However, it is important to recognize that even if projects don't necessarily have an influence or control on these aspects, they can still influence local outcomes.

Climate is one such aspect. Mapping a project's influence on the local ecosystem and livelihoods helped agencies understand how they related with the adaptive capacity of people to deal with climate change, reduced emission sources, or improved sequestration. Such mapping brought out the implicit connections between project work and climate change that existed in people's minds more explicitly.



³DESTA Research LLP

⁴Community-conserved ecological units in Rajasthan

Climate Adjacency Framework: Theory in Use

The framework shown below worked as our Theory-In-Use for mapping the climate adjacencies of environmental projects. It illustrates our view of the linkages between ecosystems, adaptive capacity, emissions, weather changes, impacts, and people's response, as a set of interconnected feedback loops. Evaluating activities by keeping such an interconnected view becomes essential for mapping the climate adjacencies.

Importantly, this framework emerged from our work and was developed in retrospect, after a careful reflection of what we did and how.

Below we present the framework by describing its interconnections in a step by step fashion.

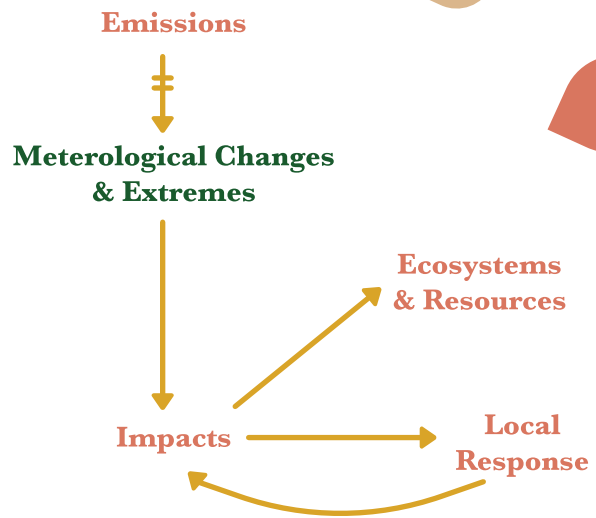
In the framework below, the variables in peach are the ones which are at the interface for mapping climate adjacencies. They allow us to interpret the impacts of a project's activities on people's income, local ecosystems and emissions, along with the role that non-project activities (like macro forces) play in either improving or reducing the adaptive capacity of people.

01

As emissions increase, they impact the changes in local meteorology, including the frequency and extent of weather extremes, which create localized impacts on people and ecosystems.

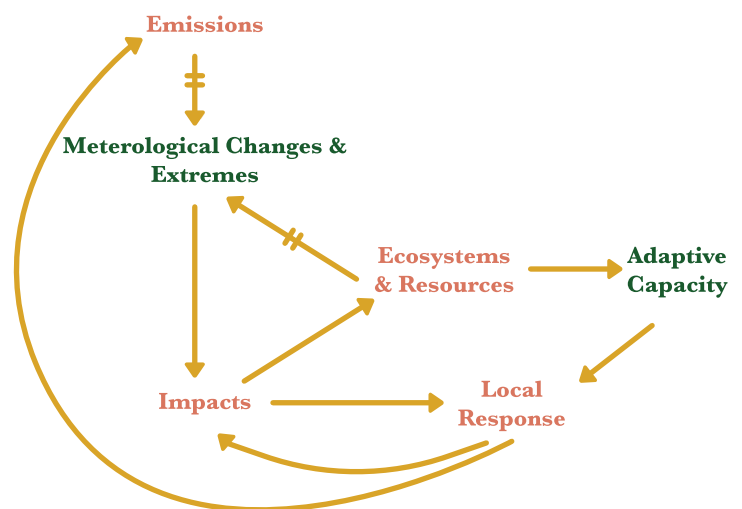
02

In order to cope with these impacts, people develop their own local responses and response mechanisms. They often take support of their local ecosystem and resources available. Through various activities they are able to negotiate the impacts of weather and climate changes/extremes.



03

However, the way they respond impacts the local ecosystems and resources—either by further degrading or enhancing them. For example, degradation of the forests reduces the carbon sinks, alters micro-climate, changes soil fertility, water flows, and biodiversity, all of which impact the local weather. Further, accumulation of many such localised changes reflect as the global impact on the climate of our world -- the impact of which is felt differently by different people at different times.



04

The way people choose to respond also impacts their emissions. For example, we put on our air conditioners as a response to an increase in temperature. However, by doing so, we are causing an increase in emissions. On the other hand, if we instead built houses using local materials that promoted passive cooling, we would not be adding any emissions to the environment, and additionally, might help with mitigation (through a reduction in electricity use).

05

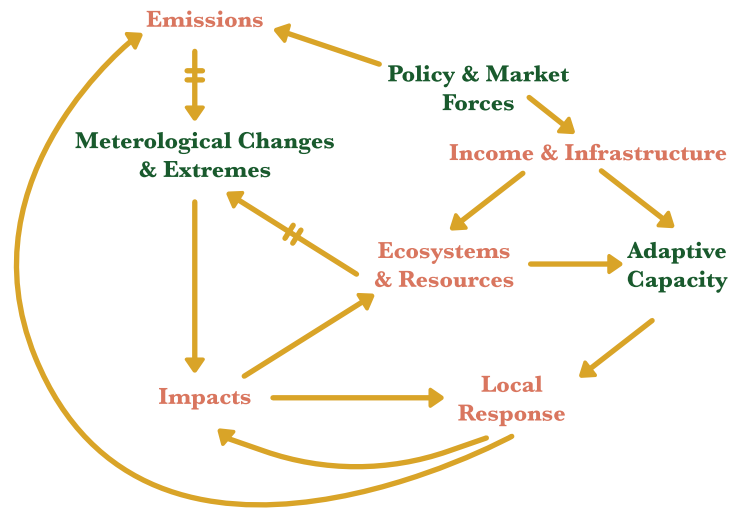
A change in emissions impacts the atmospheric concentrations of gases and thereby meteorology, but this has long time delays. Thus, people's lifestyles and choices create slow but lasting impacts on the climate change process.

06

Alterations to local ecosystems and available resources also influence people's ability to adapt to the impact, such as changing weather and climate. This is adaptive capacity. It is determined by the state of the local ecosystem, its accessibility and resources (including people's own health and community well-being). The dual causality makes it a reinforcing relationship between how people treat their local ecosystems and how in turn, local ecosystems impact people (through services like provisioning, cultural, regulating, supporting). The nature of such relationships makes it either pro-active or a mal-adaptive system.

07

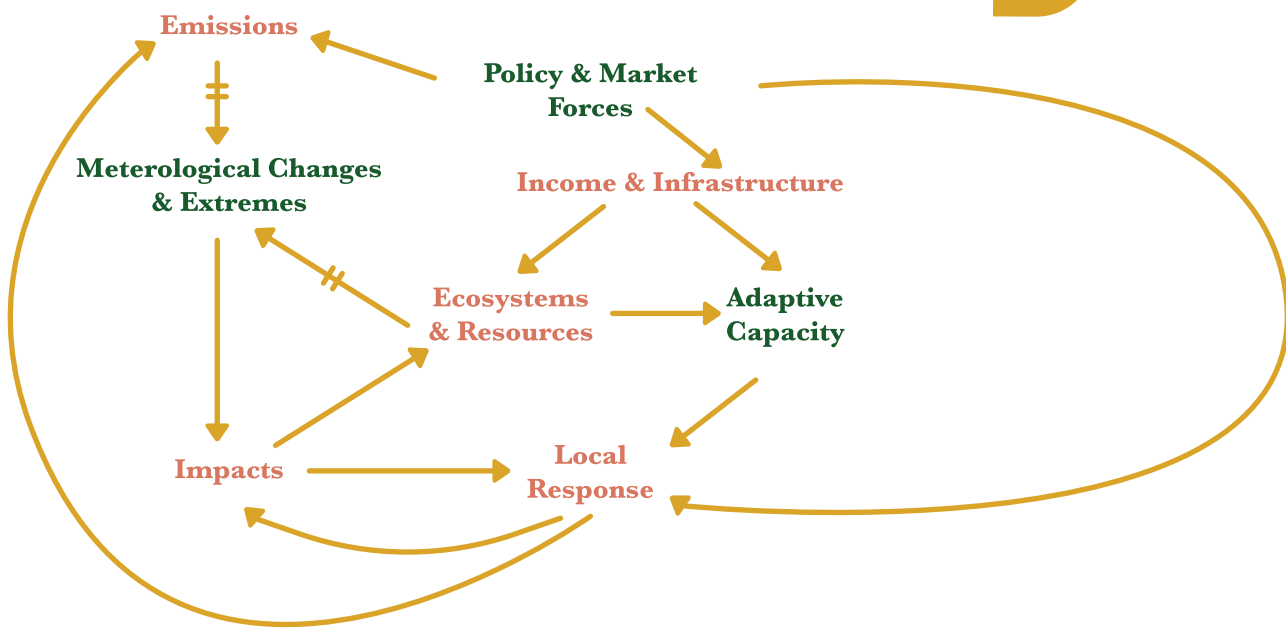
There are macro activities, such as infrastructure development, economic growth, markets, policy, and so on, which also influence the state of local ecosystems and income of people.



The income and infrastructure coming from these activities influence the local system in both positive and negative ways-

- On one hand, the money people earn through market linkages and jobs helps them build their adaptive capacities to cope with climate change and extremes.
- On the other, projects like the development of highways, dams and other large infrastructure could cut through a forest, divert a river, split a wildlife habitat into two or take away portions of community land. Such outcomes do not always improve a local community's adaptive capacity. Thus, these can lead to long term mal-adaptation in indirect ways, and can wane off the advantages that they bring in the short term.

⁵Refer glossary



08

The changes in market, economy and policy often influence the behaviour of people -- the skills they aspire to acquire, the crops they choose to cultivate, their agricultural practices, land ownership, livestock composition, use of technology, language and local culture. All of these get influenced as the local systems get integrated with macro-economic systems.

09

This, in turn, plays a big role in how people choose to respond to weather and climate change. Even if they are aware of the potential negative side effects of their own actions, they may continue to act in the same way due to the larger forces in the system which provide an incentive to continue or disincentivize change.

10

As the state of local ecosystems and resources changes over time due to weather and people's use, the local culture also starts evolving in different ways. The traditional cultural practices, local know how, skills,

livelihoods and learning systems all undergo a transition. This transition impacts people's adaptive capacities in known and unknown ways.

11

Even if the changes in people's behaviour are an outcome of non-climate forces (market, policy, development etc.), they impact the weather and climate systems. Thus, it becomes practically impossible to separate climate from economic development and environment.

12

All activities aimed at conserving or improving the state of local ecosystems have strong influences on weather and climate and people's adaptive capacities. All projects aimed at improving people's wellbeing, securing their livelihoods, land rights, restoring degraded ecosystems, and wildlife conservation have a strong climate influence. And climate change has an even greater influence on outcomes of these projects.

13

Thus, identifying adjacencies of projects focused on a non-climate context becomes an important activity. To be able to build the capacity to integrate climate linkages into all forms of work and objectives is an essential step in moving towards developing a collaborative climate agenda and enhancing our climate actions.

14

There is another important factor that determines the adaptive capacity of people: their collective action, or how cohesive the community is and whether they share a common vision for the future. This becomes especially important if they are to self-serve their ecological landscapes, (for example sacred groves), or community conserved areas. Examples of social fragmentation

leading to a breakdown in traditional norms and cultures for preserving local ecosystems exist. They show us that collective action can move in both directions (preserving or exploiting the local resource base), depending on the emerging collective vision of the community.

15

The beginnings of such transformations and changes are subtle. It is difficult to generate evidence about these changes early on since they are rooted in the changing individual aspirations of people. Over time, these aspirations manifest through behaviour change, which then alters the community’s vision and local practices.

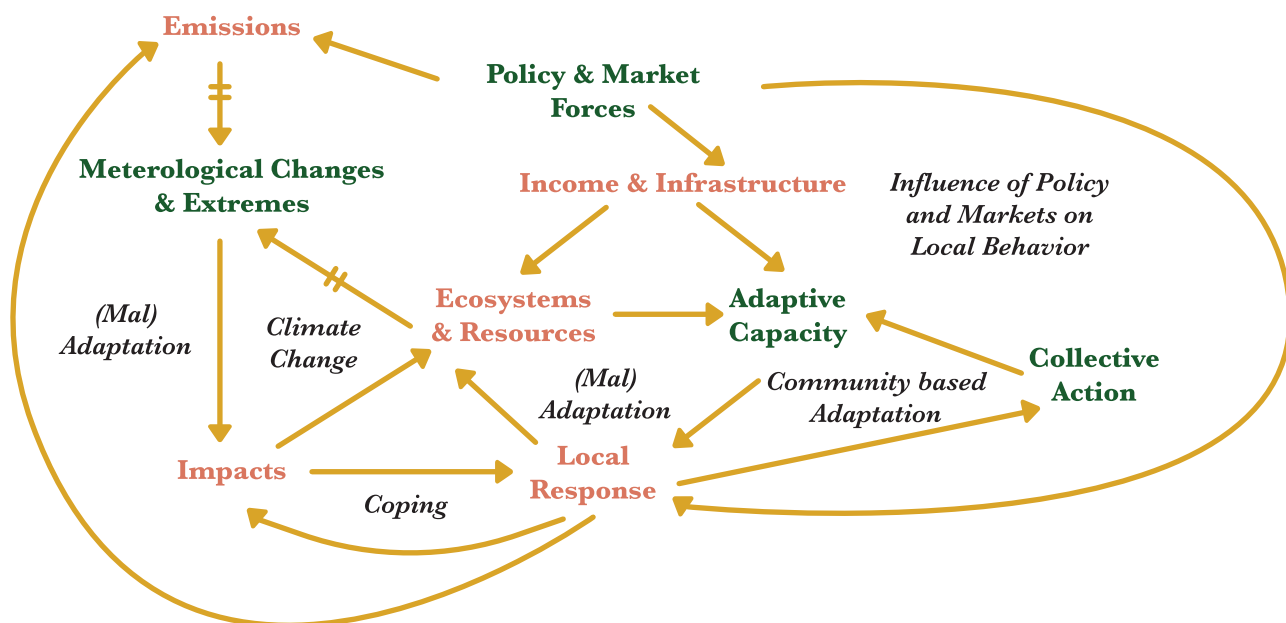


Figure 1 Climate Adjacency Framework: Theory-in-Use



Sustainable community-based adaptation to climate change requires communities to have social cohesion, collective vision, and awareness of the long term impact their own actions have on their adaptive capacities.

Examples of how individual actions, combined with a lack of community governance is causing the erosion of traditional community-conserved areas are fast emerging.

These hint that while community-based actions are the bedrock for sustainable adaptation to climate change, they do get influenced by the factors explained in the above framework.

It is because of this that mapping climate adjacencies is a complex but necessary task for evidence building and creating awareness on climate actions.



Mangroves in Bhachau, which provide a base to the livelihoods and culture of pastoralists, also provide them with adaptive capacity

Securing Pastoral Futures

SAHJEEVAN, CENTRE FOR PASTORALISM

Context

Sahjeevan's work on securing pastoral futures faces a unique challenge of improving livelihoods, securing land rights, and preserving the traditional way of life (i.e. semi-nomadic pastoralism.) Given this, their key focus is on:

- Conserving indigenous livestock breeds
- Securing people's land rights on commons
- Establishing market linkages for secure livelihoods, and
- Enabling participatory management for conservation of natural resources, includ-

All efforts at improving livelihoods come with some level of integration with modern technology to secure income and create market linkages. These initiatives tend to push the community's traditional way of life and culture out of its known equilibrium. However, given the fact that pastoral livelihoods are fast eroding and threads of inter-generational knowledge are breaking

up, there seems to be little choice. If current and future generations have to continue with their pastoral forms of livelihood, there is a need to adopt modern technology and market linkages that allow for integration with evolving socio-economic systems.

Traditional forms of pastoralism were inherently adapted to the vagaries of local weather and climatic changes. The paths pastoralists chose to travel and the landscapes they visited were in sync with the changes in weather and weather conditions. Thus, their adaptive capacity relied on continuance of their nomadic way of life and on some certainty in weather variations. With time both these important factors are changing – the alterations in weather are becoming more unpredictable and there is a shift of pastoralists towards sedenterization.

Given this, it is important to position interventions in the context of interactions between pastoralists, land, livestock, and climate.

We need to think about how interventions can improve the community's current adaptive capacity without creating side effects that could erode these capacities in the long run. Knowing these trade-offs and their potential co-benefits is important as it allows us to enhance the project's climate actions. Additionally, an evaluation of how macro-forces determine adaptive capacities needs to be taken into account.

Systems Stories

SIDE EFFECT OF DAIRY IN BANNI GRASSLANDS

Interventions in a complex social-ecological system, such as that of pastoralism, have both intended consequences (improving livelihood and income), and unintended impacts (sedentarization of pastoralists and overstocking of livestock). Each of these has implications for the adaptive capacities of pastoralists.

This is specifically more visible in the case of buffalo rearing, as seen in the Banni grasslands and depicted in the model below. The diagram shows how proliferation of dairy has incentivized milk-based income, which then has replaced traditional forms of pastoralism.

In order to save pastoral livelihoods, initiatives such as dairy production had been introduced. This led to increase in the milk-based income of pastoralists, and an exponential growth in the buffalo population. It also led to sedentarization of the pastoralists in order to remain close to the dairy collection centers and chilling units.

While this is just one of the side effects of the introduction of dairy as a source of livelihood, similar potential side effects could occur for other livestock breeds where a similar model is adopted and where there is a possibility of overstocking the herd size, which can lead to sedentarization and overgrazing or degradation of forests/grasslands.



Figure 2 Impact of dairy on sedentarization of pastoralists in Banni grasslands

IMPACT OF POLICIES ON LIVESTOCK COMPOSITION

The side diagram shows a generic structure of how macro-policies with a singular focus on improving incomes could result in a loss of livestock genetic diversity. Policies that focus on improving livestock productivity (for example, increase in milk and meat production) create incentives for pastoralists to change their livestock breeds and composition to favour animals that have higher productivity (for example cross-bred cows, buffalo and poultry).

This then leads to a shift in dominance of a livestock species which may not be fit for the local agro-ecological system. For example, the animals may have higher water and fodder requirements, or may be unable to support climate-stress related migration. All these create new problems for pastoralists who then have to adapt their local environments, which often results in migrating in newer and more expensive forms, like transporting animals in trucks. It also promotes interbreeding between local and hybrid livestock, working against traditional breeding practices and resulting in a reduction in numbers of local, indigenous breeds. This works against their traditional breeding practices where the best indigenous breeds were preserved.

While these factors provide short-term benefits like an increase in income, a better standard of living, and therefore stronger short term adaptive capacity, in the long-term it has a negative effect on pastoralists' resilience towards weather extremes and long term climate change.

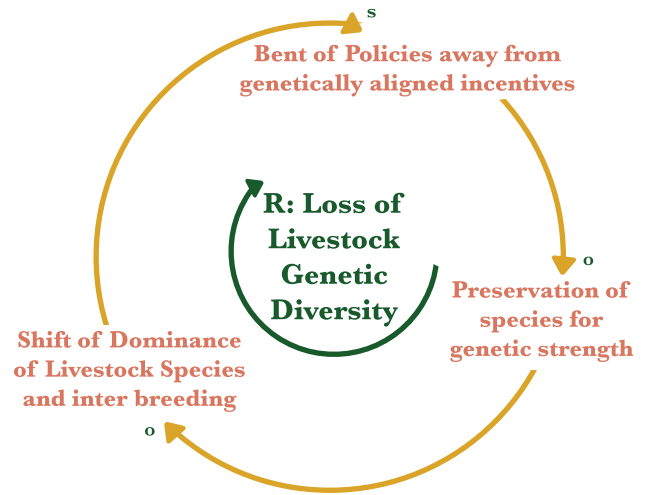


Figure 3 Policy's impact on livestock composition and breed

ROLE OF MANGROVES IN LIVELIHOOD, CLIMATE MITIGATION AND RISK REDUCTION

Mangroves in the Bachchau block of Kutch district act as common grazing grounds for the Kharai Camels and form the livelihood base for the pastoralists. The mangroves play a crucial role in sustaining multiple livelihoods and providing innumerable climate benefits.

- They provide food and fodder for Kharai camels, maintain a habitat for fish, and provide enough biodiversity for the fish population to survive and thrive.
- They create flood resilience and work as carbon sinks (fixing carbon from the atmosphere through photosynthesis and also into the soil).
- Because of their dense root systems, mangroves trap sediments which help in stabilizing coastlines, prevent erosion from waves and storms, and protect the coasts during cyclones.

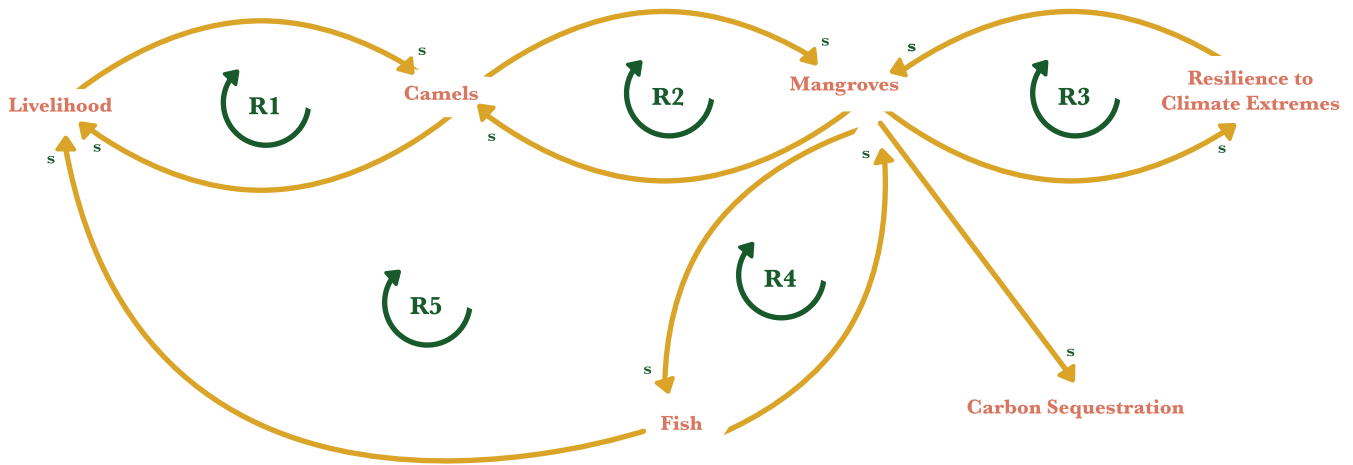


Figure 4 Mangroves, Livelihood and Climate

As such, mangroves are integral to their community's adaptive capacity. They play the critical function of regulating the micro-climate (including water filtration, prevention of coastal erosion, biodiversity protection), and provide disaster risk reduction.

Despite this, mangroves are being destroyed by the privatization of coastal land, which is being done to develop salt pans. Through the combined efforts of Sahjeevan and KUUMS (Kachchh Camel Breeders' Association), local communities have managed to get stay orders on the development of these salt pans, putting a stop to the losses.

MANGROVES AS THE INTERFACE OF CULTURAL EXCHANGE

Social-ecological systems are co-evolved. Community cultures are formed based on people's interactions with local biodiversity, land type, ecosystem services and the emergent livelihoods. This is evident in the relationship that Jat and Rabari communities of the Bachchau district share with their camels and mangroves.



Figure 5 Mangroves, Livestock and Cultures

Kharai camels can swim in water and graze fodder from mangroves. They belong to the Rabari community, and are given to the Jat community for rearing. This is part of their traditional association and informal cultural setup -- the male calf belongs to a Jat family and female calf is part of the herd of Rabari family. And since this breed is mainly dependent on mangroves, which is a common resource, it makes the two communities coexist peacefully.

Mangroves and Kharai Camels form the cultural interface between both these communities. The lifestyle, diet and livelihood of the Jat and Rabari revolve around their camels with the mangroves being their resource commons.

Degrading mangroves therefore, have a direct impact on the break-down of traditionally strong and mutually beneficial links between these two communities.

COLLECTIVE ACTION AS A DOUBLE-EDGED SWORD

Sahjeevan's model of developing pastoral livelihoods takes the form of creating community based organizations like the Banni Breeder's Association (BBA). As seen with the BBA, when communities come together to sustain a mutually beneficial livelihood (like the milk dairy), they have an incentive to operate under a common umbrella. Their collaboration then leads to the growth of the livelihood opportunity, for example the doubling of the Banni buffalo population and subsequent milk production.

However, community cooperation and collective action is a double-edged sword. Depending on the nature of their shared belief, communities can either sustain or exploit their common resource base. This is rather difficult to predict or cannot be known with certainty beforehand. However, a sensing must be developed towards what are the emerging aspirations of the people and how these aspirations could manifest into different forms of community initiatives.

Thus, **collective action, which is the bed-rock for community based adaptation towards climate change, can move in both directions leading to either pro-active adaptation or maladaptation.**

This is particularly important in the case of pastoralists who have their livestock as assets which can give them returns when integrated with markets delivering value added products. In some cases, this can create an incentive for them to overstock the livestock population with an aim to increase returns. Understanding this pattern served as an insight that it is important to develop a sense of how the community wishes to develop their livelihoods, even if it is difficult to predict or control what the community would desire to do with it in future. Thus, it was realised that community-based adaptation through collectives, for pastoralist livelihoods, do in fact have the possibility of causing maladaptation in the long run.

Conclusions

SOCIAL FRAGMENTATION

A delay in obtaining land rights is leading to land insecurity and social fragmentation amongst the pastoral community. This is resulting in increased conflict within communities and challenges in the process of collective decision making. Additionally, changes in traditional grazing routines and habits are creating a loss of biodiversity.

The social fragmentation is breaking the community's spirit of collective action, which is a key element for securing their commons, which provide them with the adaptive capacity. More worrying is the fact that **a socially fragmented system is fertile ground for proliferation of mal-adaptive practices such as the privatization of the commons.** Not only are the commons the most critical resource for pastoral sustainability, but their privatization will lead to ecological changes in biodiversity, soil fertility, grass species, and more, all of which are difficult to restore after they have crossed a degradation threshold.

Additionally, a change in livestock composition is resulting in a change in local dietary habits. For example, the increased sale of milk has led to acute shortages of local ghee and milk products, which were earlier found in abundance.

Lastly, the loss of traditional knowledge transfer is taking the younger generation away from pastoralism. This leaves them without the skills and know-how needed to adapt to weather extremes and climate change.

The pastoralists of Banni grasslands have begun to recognize that maintaining the commons as a communally managed and grazed landscape is important because of the enormous financial gains that can be made by sustaining their livelihoods through it. The work of the BBA also shows that the communities still value the grasslands as a common economic resource base which must be protected and sustained. This highlights the creative tension running among the communities who wish to fulfil their economic aspirations but still value their common resource base as a collective means to fulfil their individual aspirations.

ECONOMIC INCENTIVES

Economic incentives and policies are leading to changes in local cultural practices taking them towards intensification of livestock (like artificial insemination, cross breeding, increasing dairy cattle, and so on). This results in a loss of indigenous breeds that tend to adapt to the local weather and climate conditions.

Factors like food security, genetic livestock diversity, health of local ecosystems such as mangroves and grasslands, and traditional knowledge all play a part in providing pastoralists with adaptive capacity. With each of these aspects fast eroding, Sahjeevan's work on securing pastoral futures and developing ecologically balanced livelihoods becomes all the more important.

KNOWLEDGE AND PERCEPTIONS

Developing an understanding of community aspirations is an important but ambiguous endeavour. Tools and methodologies that can help understand these deeper nuances are rare to find. Moreover, communities themselves are sometimes unaware of their assumptions, beliefs, and what they want to create.

Overcoming these challenges requires applications of systems thinking and deep listening. Linear research methods or inquiries relying on questionnaires and group discussions may fall short of eliciting their deep seeded beliefs and shared vision. **Sometimes, people are not consciously aware of their own assumptions, beliefs, and notions of the future they wish to create. Thus, this poses a challenge for development practitioners and climate change programs** to sync their activities in

line with local priorities, in order to build adaptive capacities of communities and secure their livelihoods.

Efforts must be made to develop pedagogies that can uncover some of the latent forces in the system which are shaping the community's actions and perceptions. The stories that people believe in, how they interact with each other, what their goals are, and how they relate to climate change, are all factors that are important to understand.



Mangroves of Bhachau, Kutch, Gujarat seen with grazing Kharai camels which provide livelihoods and food security to pastoralists, and are the only Camels which can swim

Democratizing Conservation Policy and Practice

KALPAVRIKSH

Context

Kalpavriksh addresses the complex interface between wildlife/biodiversity conservation policies and programs, and the livelihoods and rights of local communities dependent on this wildlife/biodiversity.


With the hope of making the conservation discourse more inclusive for local communities, the organization works on influencing policy discourse and practice around environment conservation at both, a regional and national level. Their work responds to the need to document, network and advocate for community-based and inclusive conservation practices. The aim is to use this to pave the way for a decentralized and democratic conservation praxis through the empowerment of local communities.

The current prevalent theory of creating “protected islands” for conserving natural resources, forests, and wildlife tends to separate human beings and settlements from nature.

However, Kalpavriksh’s theory of change believes that human beings and communities play an integral role in sustaining local ecosystems.

Kalpavriksh recognizes that cultures, livelihood, and economy are dependent on local ecosystems, and that the community’s interaction with forests and wildlife helps the ecology thrive. They believe that communities are capable of self-organizing for the sustainable management of community conserved areas. This is even true in instances where systems may have broken down under the current global economic and conservation model.

Historical references show that human settlements and forest dwelling communities have lived in sync with nature, and that separating them through law and force, is an unnatural method of sustaining nature in isolation.



Today the urgency to halt ecological decline has resulted in efforts to secure forests by any means, including separating human settlements from them. Doing so however, has a significant impact on the people that rely on the forest for fuelwood, food, water, and fodder. The wild foods provide them with food security when crops fail due to weather extremes. Fodder from the forest and free grazing land help sustain their livestock. The local biodiversity helps them maintain the regulation of nutrient flows, fresh water and fertility of soil, which is key for agriculture. All the ecosystem services help the community form a culture of lifestyles and livelihoods. Separating them from their own ecosystems could come at a great cost of human wellbeing. This then could also have impacts on the ecosystems that need protection.

Weather and climate extremes pose increased pressure and stress on this fragile relationship. **People would fail to derive their adaptive capacities if separated from forests and other ecosystems.**

For the forests too, the loss of interaction of plant species with livestock and humans could have potential negative impacts on their growth and sustenance. Both these factors combined could then reduce the resilience of the social-ecological system.

Thus, it served as an insight that combining community conserved area narratives with climate change adaptation is essential for achieving the dual goals of conserving forests and securing people's wellbeing. This can happen at two levels:

- 1) at the local level where community conserved areas are made more sustainable and maladaptive practices are countered, such as their work in the Bhimashankar wildlife sanctuary on livelihoods and food security through conservation of wild foods, and
- 2) by influencing the discourse on conservation to include communities as essential elements for sustaining their wellbeing and securing landscapes.



Trek to Village on Hill Top at Bhimashankar, Maharashtra

Systems Stories

ADAPTATION AND COMMUNITY CONSERVATION

Ecosystems depend on their interplay with communities and on the local weather. Similarly, people depend on their access to healthy ecosystems and know-how of local weather changes. Understanding this relationship is central to knowing that there is a strong coupling between adaptation and community conservation. Ecosystems cannot be conserved if weather changes become extreme, and people cannot build their adaptive capacities if they are separated from nature.

Figure 6 shows that an improvement in Community Conserved Areas (CCAs) contributes towards improving people’s adaptive capacity, through Community Based Adaptation (CbA) and Ecosystems based Adaptation (EbA). This then further strengthens and reinforces the conservation and sustenance of CCAs. The assumption here is that communities have the ability to govern the CCAs in a sustainable manner.

It is essential that we document evidence of how community conserved areas provide crucial adaptive capacities for people. Documenting these climate adjacencies is important in challenging the belief system that separating people from nature is desirable for both community and forests. And knowing this can challenge the dominant narrative of creating protected islands, thereby strengthening the CCA discourse.



Figure 6 Causal Loop Diagram relating CCAs and EbA/CbA

MITIGATION, ADAPTATION AND CONSERVATION LINKAGES

The below model shows how focusing on mitigation through external interventions alone could lead to mal-adaptation and reduced adaptive capacities of the communities.

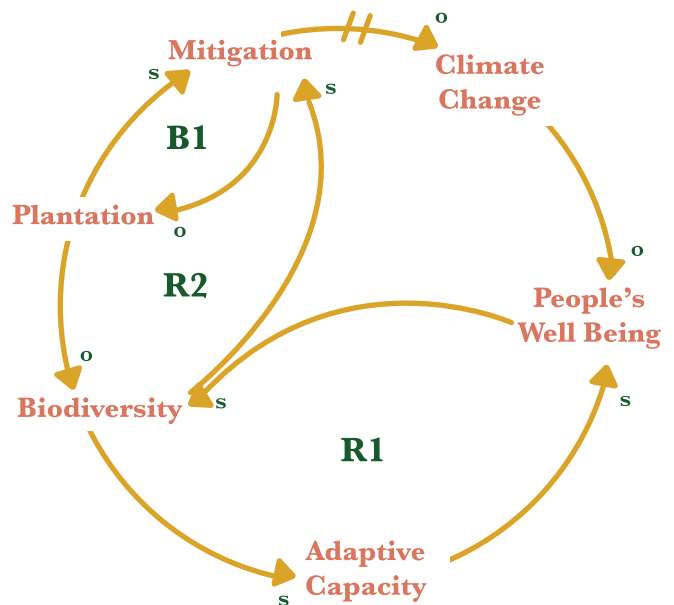


Figure 7 Impact of plantations on people’s well being



For example:

- Large scale plantations created with the aim of improving carbon sinks to mitigate the extent of climate change sometimes leads to dominance of certain plant species creating an imbalance in the local biodiversity of the landscape.
- Over time as more area is converted into tree plantations, the existing biodiversity reduces. This then limits the landscape's potential to sequester carbon.
- This again results in adding more plantations for increasing mitigation, thus creating a vicious cycle that is ultimately self-defeating in purpose.

In addition, loss of biodiversity can have negative impacts on communities and livestock:

- It can lead to a reduction of provisioning services like food, fodder and water, which reduces the communities' adaptive capacities and perhaps also changes their own behaviour towards this new ecosystem. More consumptive practices could emerge within the communities as an outcome of the shortfall ecosystem

provisioning. This could further reduce their adaptive capacities as a result of the degraded ecosystem.

- These cumulative changes create a new system which is consumptive and maladaptive, despite it being able to potentially meet the mitigation goal. In turn, when a commons starts degrading or portions of its landscape are redone, it breeds anxiety amongst the community, creating a race for the fewer available resources, thus working against the common goal of conservation.

Thus, such changes in local practices and community behaviour are detrimental to the sustenance of conservation efforts and community conserved areas. That's why **the linkages between mitigation and adaptation must be properly understood before any interventions with a singular focus are implemented.**



Conclusions

KEY INVESTIGATION AREAS TO BUILD EVIDENCE FOR CCA

Key questions on community conservation, climate change, markets and policy formations emerged during the workshop with Kalpavriksh. These questions can be answered through scientific research on the ground, but the popular narratives around them should also be documented in the conservation discourses that happen at the regional or national level. These questions are:

- Do plantations as a measure of mitigation lead to loss of biodiversity, impacting a community's ability to adapt to climate change?
- How effective are mono-plantations in sequestering carbon as compared to a forest?
- What is the impact of centralized decision making for land with limited community participation?
- How do communities deal with social inequity in the use of ecosystem services?
- How much does the “(infinite) growth at all costs” mindset influence local behavior?

It also emerged that adaptation to market forces and climate change are closely linked, and difficult to separate. For example, it is not explicitly clear how much changes in the nature of markets alter the local livelihoods that are linked with the local ecosystem. Given this, we need to think about the following questions:

- Does diversification of local livelihoods into market-based livelihoods lead to mal-adaptation?

- Are the livelihood changes a result of adaptive response to climate change, or to changes in the nature of markets?
- How do shifting world views, values, and resulting ways of life impact the local ecosystem and weather?

CONTRADICTIONS IN CONSERVATION DISCOURSES

There was an observation that the relationship between the two schools of thought (community-based conservation of nature, and isolated conservation of nature), was escalating efforts from both sides.

The struggle to win the argument created more push from the other side, ultimately creating a runaway effect of escalation. There were anecdotal references for these, on how amendments to forest policies were wearing off the advantages that communities had gained through the Forests Rights Act; and, how pressure to include communities in the conservation or land rights conversation creates an opposite effect, which makes the process more exclusionary. At times, a collaborative dialogue may create unintended outcomes where knowledge about the intentions of stakeholders could be used to create counter structures which act as barriers for them to achieve their goals. The end result of this escalation is often a breakdown in the discourse.

These escalations are counterproductive to achieving the goals of sustainable development, including adaptation to climate change. If the common goals of achieving SDGs are to be achieved then it necessitates first achieving goal 17, which pertains to partnerships.



Wild Foods Festival in Bhimashankar



Conservation and Management Strategy for ‘Orans’ in one of the world's oldest mountain ranges ‘Aravali’ in Rajasthan”

KRAPAVIS



Oran in Alwar, Rajasthan. Orans provide Ecosystem Services to local communities

Context

Orans are community conserved and managed areas in Rajasthan which have been in existence for more than 500 years. Traditionally used for livestock grazing and fodder collection, they support communities by providing them with food, fodder, fuel wood, and water and other environment regulatory services. The communities have the joint responsibility for sustainably managing the Orans, also known as Dev Bani. By being associated with local deities, they play a role in the cultural and spiritual identity of local communities.

As per a Supreme Court decision in 2018, the Orans have been deemed as forests. In addition, the first Rajasthan state forest policy (approved by the Rajasthan Cabinet in 2010), acknowledges their conservation value, and promotes financial and legal support, as well as collaboration with local non-profits and religious trusts, to develop a district inventory, and demarcate them on cadastral maps and on the ground.

Today, an estimated 25,000 Orans exist in Rajasthan, and they support numerous communities. These special ecological units are part of the Aravali mountain ranges of Rajasthan. The harsh weather conditions in parts of Rajasthan make **these Orans an ecological oasis and a marvel of community conservation practices.**

Despite this, the Orans are under threat from multiple local and non-local forces, resulting in their depletion and area shrinkage. The loss of the Orans poses a great threat to the communities who depend on them. Given this, KRPAVIS is working with communities to help conserve and manage these Orans in a sustainable manner.

The work of KRPAVIS focuses on documenting information on 100 Orans across the Aravali districts of Rajasthan, and the subsequent creation of an atlas.

They aim to do this using surveys, GIS, and micro-climate monitoring. In addition, the organization will work on the ecological restoration of one Oran to increase awareness of people and the government towards their ecological, economic and social importance. Their overall goal is to halt the depletion of Orans, create awareness about their importance, and develop sustainable conservation and management practices for them.

Orans provide all four ecosystem services, including food, fodder, fuel wood, and water-- to communities and are as such the source of a number of livelihoods, including honey making, ethno-medicines, timber-based agriculture implements, house construction and handicrafts, and soil for pottery. In addition, they provide water for domestic, livestock and agricultural purposes. They also play a role in regulating the local micro-climate. For example, during times of low rainfall, Orans have historically proven to be a source of fresh water, food, fodder and livelihoods for communities, thus providing adaptive capacity to people.

As it emerged from our discussions with KRPAVIS, many of the livelihoods also lead to restoration and conservation of the Orans. For example, the lopping of branches for wood aids in regrowth of new branches, and cattle grazing improves grass regeneration. Thus, **livelihood activities improve Orans, and Orans help to sustain livelihoods, even in times of climate stress events like drought.**

This connection between the ecosystem and livelihoods provides resilience to, and reduces the vulnerability of local communities, with regards to climate change. As a result, Orans and these associated livelihoods qualify as activities for Ecosystem based Adaptation (EbA).

This generic relationship is depicted below as a Causal Loop Diagram.

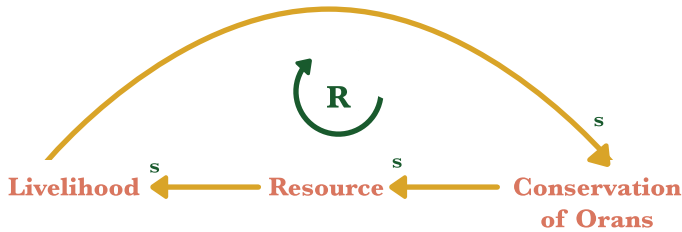


Figure 8 Livelihood Conservation Loop

As seen in the diagram, the conservation of Orans is driven by the extent of livelihoods people derive from the resources they provide -- better the flow of resources, better the conservation -- with livelihood being the critical interface. This makes it a reinforcing relationship that strengthens both, community livelihood and Oran conservation. The key assumption in this case is that the nature of livelihood and the community governance allows for this relationship to be positively reinforcing.

Changes observed in local governance and people's behavior indicate that this relationship is undergoing a change. The reasons are many but the end outcome is that depletion of Orans is also depleting people's adaptive capacities to cope with climate change.

Systems Stories

BIODIVERSITY AND LIVELIHOODS FROM ORANS

The biodiversity of the Orans makes them highly resilient to weather extremes and climate change. This is because almost all of the trees present in Orans are native; they have evolved in this landscape and are thus fit to survive the traditionally harsh climate of Rajasthan. This, in turn, makes the livelihoods dependent on these resources also resilient to climate change.

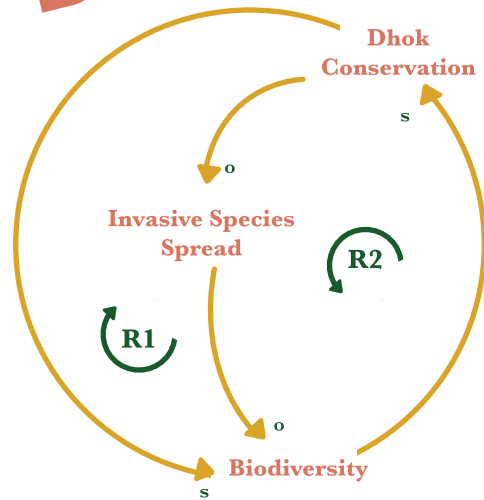


Figure 9 Countering Invasive Spread and fostering biodiversity

In addition to providing livelihoods, the biodiversity of Orans also counters the spread of invasive species. For example, one of the most prominent tree species in Orans, the Dhok trees (*Anogeissus pendula*), when densely populated, do not allow the spread of invasive species inside the Orans. This is an important function because the spread of invasive species like Vilayati Babul (*Prosopis juliflora*) is relatively high in Rajasthan.

Trees like Dhok also help maintain the biodiversity of Orans. A single Dhok tree works as a habitat for many birds and insects, making it a biodiversity hot spot.

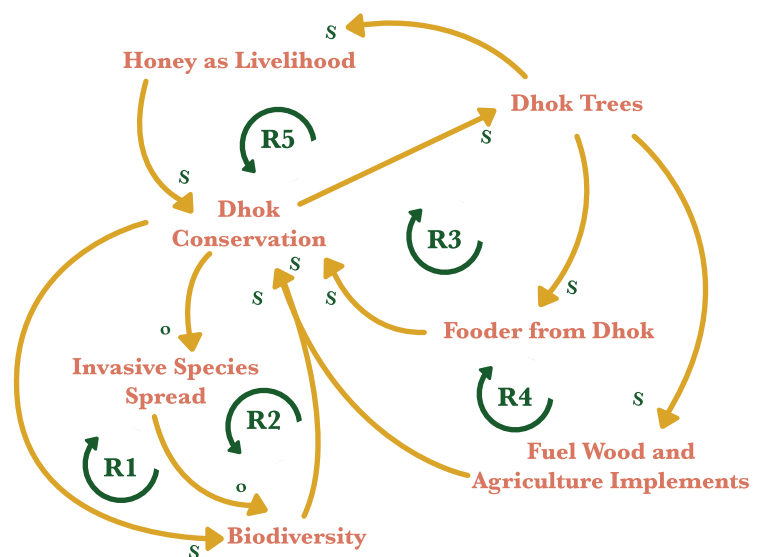


Figure 10 Livelihood from Dhok tree

In addition, Dhok trees also provide resources like honey, fodder and fuel wood, which help communities sustain their livelihood and make agriculture implements. The present relationship between community consumption of these resources and the conservation of Dhok is a positive one and thus facilitates their sustenance.

MAL-ADAPTATION IN ORANS

There are instances of mal-adaptation happening in and around the Orans. Agricultural activities are beginning to take place inside them, which in some sense is equal to privatizing the land, its soil fertility, and water. These activities are an extension of the existing agriculture happening on the borders of Orans and thus are an encroachment. Similarly, settlements on the peripheries of the Orans have been observed to be encroaching on its boundaries.

All this disturbs the ability of the Orans to provide the ecosystem services it used to. This then changes the mindset of the community youth towards their value. And when people don't see as much value in the Orans, they weaken their governance of the Orans and promote activities in its place that are often influenced by non-local forces such as sand and stone mining.

Unearthing of Orans is a highly damaging activity as it not just erodes the vegetation but also destabilizes the landscape. The effects of which are felt during intense rainfall events. Sustenance of such maladaptive practices leads to the emergence of different kinds of livelihoods upon which people and families start depending for their income. Such activities, if not stopped at their early stages, can lead to irreversible changes in the relationship between people and the Orans. Especially the young generation who gets conditioned to viewing Orans in their degraded states and fails to acknowledge their value since the flow of ecosystem services is insignificant.

CLIMATE AND NON-CLIMATE DRIVERS OF LOCAL CHANGE

The factors that drive mal-adaptive practices are multifold, but could be classified into two buckets: climate stressors and non-climate factors.

For example, the issue of overgrazing in the Orans is an outcome of increase in dairy cattle (buffalo). However, the drivers of the increase in dairy cattle are changes in milk prices, promotion of dairy cattle, and introduction of milk collection centers. All these have led to increase in population of dairy cattle (mainly buffalo).

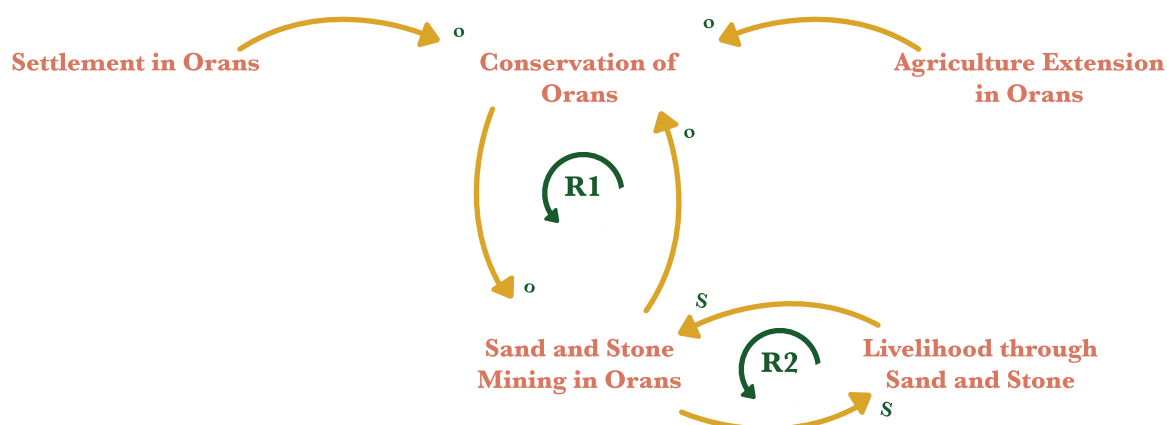


Figure 11 Maladaptation in Orans: Sand mining and agriculture

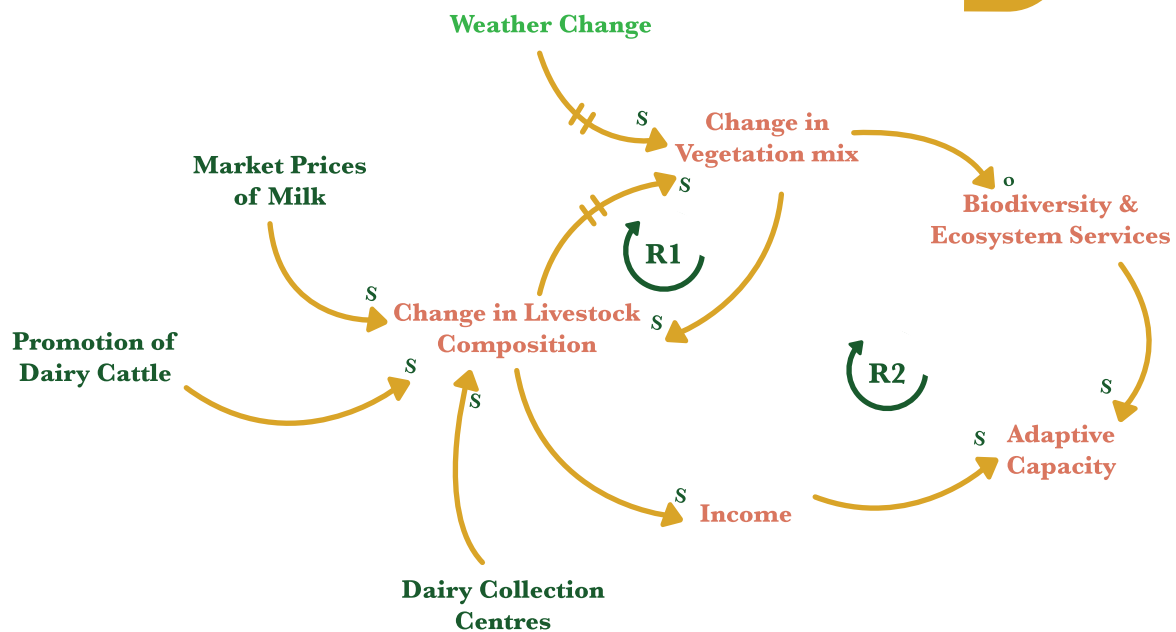


Figure 12 Links between climate and non-climate factors impacting adaptive capacity

In turn, this impacts the local vegetation in Orans. Overgrazing by cattle negatively affects grass regeneration and results in changes in the vegetation mix in response to the change in livestock composition. In addition, the change in vegetation is driven by changes in local weather like increase in intensity of rainfall but reduction in number of rainy days.

These vegetation changes then influence the livestock change, thereby creating a new system, the drivers of which are both climate and non-climate induced.

The changes in market signals which promote the rearing of dairy cattle, introduction of livestock species by animal husbandry department, and the proliferation of dairy collection centers lead to changes in the livestock population and composition. All this leads to income gains which provides the community with some adaptive capacity.

However, the changes in vegetation also change the biodiversity and the ecosystem services. This impacts the other forms of livelihoods and flow of services like water via local springs, which in turn reduces the adaptive capacity of people. In addition, the overstocking of buffalos to increase the dairy income, also negatively impacts the Orans and challenges local governance systems.

Hence, there is a tradeoff here: **The maladaptive practices induced due to non-climate factors create more stress on the ecosystems, micro-climate and people's adaptive capacities.** Given the significant linkages with climate change, it is important that these two are seen together for them to be in sync.

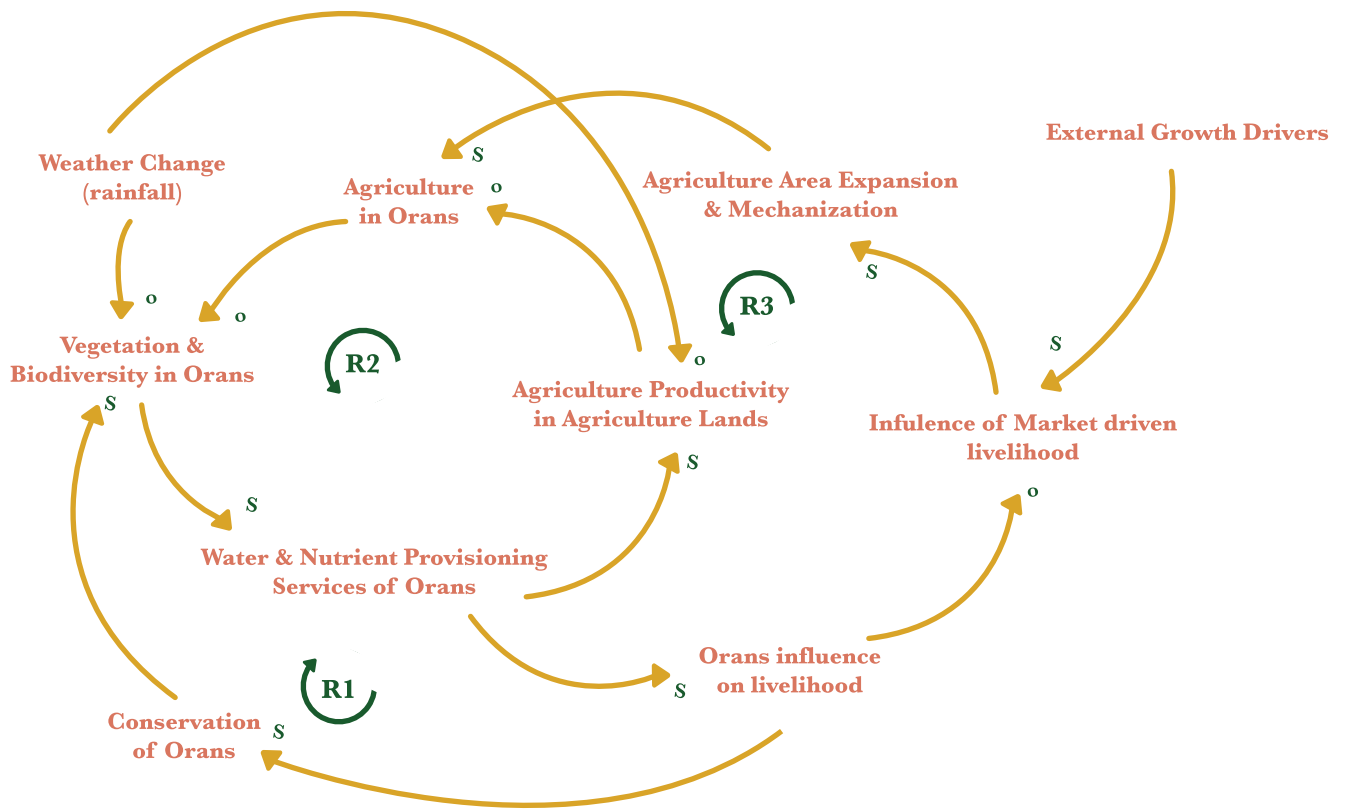


Figure 13 Agriculture driven Maladaptation in Orans

AGRICULTURE DRIVEN MALADAPTATION

The above model depicts the story of change in the agricultural practice and encroachment of Orans for land.

Traditionally the conservation of Orans was driven by the flows of resources it provided for livelihood, forming an incentive for strong community governance. Agriculture on lands outside Orans benefited from the flow of water and soil fertility which maintained the agriculture productivity. This sustained both the agriculture and Orans.

Two factors have influenced the shift in the agriculture practice and encroachment of Orans.

- **Weather changes, mainly rainfall, have led to a reduction in agriculture productivity and water availability.** This has created the need for either drilling borewells or moving closer to/inside the Orans (which are tradition high fertility zones due to rich biodiversity and water availability) for agricultural activities. As the land of Orans is

reduced it also reduces its vegetation and thereby flow of ecosystem services. This then reduces the ability of farmers to maintain their agriculture productivity outside of the Orans, thus creating a reinforcing loop of escalating pressure on farmers to move closer to and inside the Orans or perhaps encroach the land for agriculture. Instances of borewells being drilled in Orans have also been found.

- **A change in market forces.** Market prices which drive demand for crop variety also create an additional demand on resources such as water and land, and pressure on soil fertility and agriculture. In order to increase their income, farmers are incentivized to move towards farm mechanization, and to expand their practice, both of which are incentives to encroach on the Orans. This creates another reinforcing loop which makes the situation go from bad to worse.

Reduction in the area of Orans reduces its provisioning services for water and nutrient flows, reducing the agriculture productivity (outside Orans) and then producing the need for encroaching the Oran land. Market forces incentivizing changes in agriculture practice and crop choices also creates a simultaneous pressure for expansion and thereby encroachment of Oran land.

Changes in local weather add to these reinforcements making the system move in the direction of rapid encroachment, depletion of Orans, reduction in water availability, and falling productivity of land outside Orans. All these together leads to an emergence of a mal-adaptive system which reduces the adaptive capacities of the people to cope with increasing weather changes.

The very act of encroaching into the Orans is a form of coping that creates more stress on the communities and incentivizes them to resort to such maladaptive forms of responses. Over time the value of Orans in the eyes of people, especially the younger generation, goes down, which weakens its governance thereby creating a social-ecological system fit for mal-adaptation and erosion of their own adaptive capacities.

Conclusions

The Orans of Rajasthan are a living example of how community conserved areas can facilitate cultural, livelihood and climate related well-being of communities as well as healthy ecosystems. They provide landscape connectivity and nourish human communities, livestock and abundant biodiversity: birds (e.g., peacocks, bustards, vultures and cranes); wild fruits and medicinal plants; vulnerable and endangered wildlife (e.g., leopards, tigers, the caracal); and endemic animal and plant species that disappeared elsewhere.

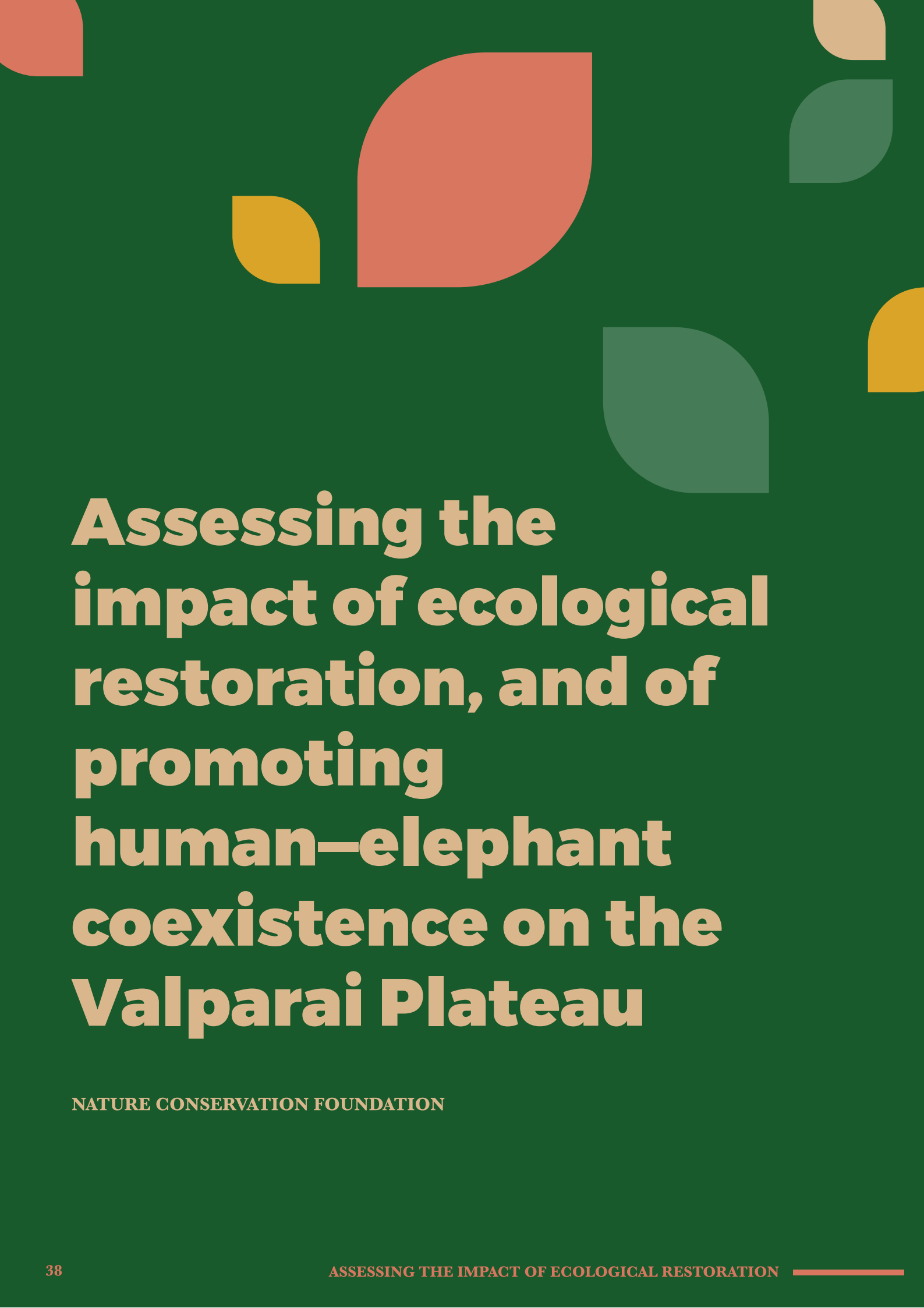
Despite this, the Orans are fast eroding. Efforts have to be made to manage the local changes and specifically counter the effects of non-local forces that bring about these changes. **The younger generation has a big role to play in the sustenance of their relationship with Orans. This is their only inheritance that provides them with free of cost services which are truly renewable in nature.** This could potentially become the most important resource which can give them resilience towards climate change and continue to fulfil the contemporary needs of local communities.

In addition, the policy discourse also needs to be influenced. The impacts of large-scale developments on Orans need to be made explicitly clear to planners. The GIS based atlas of Orans could come handy for infrastructure development planning. But the change has to begin in the local spaces first. The communities need to lead by example. KRPAVIS's work on rejuvenating and conserving an Oran could stand out as the model which others can adopt and adapt.

So far, KRPAVIS has promoted and led the movement to recognize and revitalize Orans throughout Rajasthan, including recognizing the ecological and cultural value of Orans, and the collective rights and responsibilities of their custodian communities. Scaling up of their efforts is required if these traditional community conserved areas are to be sustained and if the well-being of these fragile communities have to be secured in a fast-changing climate.



Oran in Alwar, Rajasthan



Assessing the impact of ecological restoration, and of promoting human–elephant coexistence on the Valparai Plateau

NATURE CONSERVATION FOUNDATION

Context

Nature Conservation Foundation's (NCF) efforts in the Valparai plateau are aimed at restoring rainforests and fostering the co-existence of humans and wildlife, along with rigorous monitoring of outcomes. Rainforest recovery following restoration is an uncertain and decades-long process. Hence, building evidence of ecological change takes time. NCF's efforts over the past two decades have resulted in patches of rainforests being rejuvenated and a substantial reduction in human-elephant conflict.

The organization's work is unique and challenging because they work with multiple actors: wildlife, local community and residents, and the private companies running plantation estates in Valparai. Because of this, their interventions need to maintain a balance between people, nature, and profit. However, given the fact that the land they work on is privately owned, there are limited opportunities for organic human-nature interaction. This puts their work outside the purview of the traditional social-ecological systems landscape, and makes their entry point that of wildlife and forests with limited elements of human interactions such as wildlife conflict, poaching, tourism, and so on.

Changing community perception and tolerance levels to co-exist with wildlife is a social challenge that their work has to overcome. To do so, they must build evidence of the benefits of restoration, and use it to create stakeholder buy-in. In this light their current work on assessing the impact of restoration and conflict mitigation can build evidence for expanding their work in Valparai and other similar landscapes.

Rainforests are one of the most effective forms of carbon sinks. Their role in climate change mitigation is significant. The biodiversity they bring to the landscape can benefit communities through the increase in tourism, improved provisioning of water, reduction in pest attacks on crops, and fertile land, regulation of the micro-climate and soil stability, especially at times of climate extremes. All this can contribute to improving the adaptive capacities of people. Healthy rainforests also provide habitat for the wildlife, thereby creating a niche for them to co-exist. Companies benefit from improved water flows, and fertile soils and native shade trees help their plantations grow.

The emergence of the effective 'Valparai Model' for reducing elephant-human conflict could also be a key outcome that enables other similar landscapes to adopt the effectiveness of their work and scale up their efforts in network mode.

There are various weather and climate changes being observed in Valparai. The frequency and magnitude of very high rainfall days have gone up. Single-day rainfall of as high as 30cm and 90 cm has been witnessed in recent times. The frequency of dry days has also gone up with some of the dams going dry for the first time. The average temperature of Valparai has increased and with that the mosquito population has also gone up. Pest attacks in the landscape have increased. The forests are observed to be more 'stressed' -- there is a higher mortality rate and they are drying up much faster.

Climate Linkages

NCF's research on mitigation has shown **that ecological restoration is an effective strategy for reversing biodiversity loss, enhancing recovery of forest structure, tree diversity and enhancing terrestrial carbon sequestration in degraded tropical forests.** Other research has also shown that rainforest restoration improves the carbon sequestration as compared to plantations.

Results from this ongoing work are expected to illustrate the dynamics of degraded and intact rainforests, their resilience in light of climatic variation. It will also quantify the extent to which these rainforests act as carbon sinks under varying climatic conditions over the years. Additionally, NCF's research and conservation efforts directed at various animal groups could also have a climate change mitigation link, since there is evidence that defaunation (loss of animal populations) can lead to gradual losses of carbon in forests as well.

Rainforest restoration also leads to improved stream functioning and groundwater recharge. This has been seen to an extent in the landscape. Improved stream functioning and groundwater recharge would increase the regions' adaptive capacity to respond to low rainfall related events such as meteorological droughts, thus improving the overall adaptive capacity of the system.

Another potential impact of rainforest restoration is soil stabilization, which could increase the region's adaptive capacity towards landslides and other possible high rainfall related disasters. It is not known whether the forests are stabilizing the soil; however it could be postulated as it makes logical sense and has been seen elsewhere. Should this indeed be the case, restoration could reduce disaster risks of the region for high rainfall related events. Additionally, healthy rainforests help in reducing the spread of invasive species, which in turn can benefit the local ecosystem and people.

Rainforests also perform microclimate regulation. The forest fragments provide microclimate regulation within them, and in their vicinity, however the extent of this effect outside forest fragments is still uncertain and unmeasured. Instances in reduction of forest fires due to regulation have also been observed. This could be attributed to increase in the shade around restoration zones, which led to rainforest regeneration and the development of a microclimate around the rainforest fragments. Microclimate regulation could also build adaptive capacity towards impacts of high temperature (such as future heat waves or forest fires).

All of the impacts discussed above increase the resilience of the region through nature-based solutions, of restoration, and improve people's adaptive capacity for adapting to impacts of climate change.

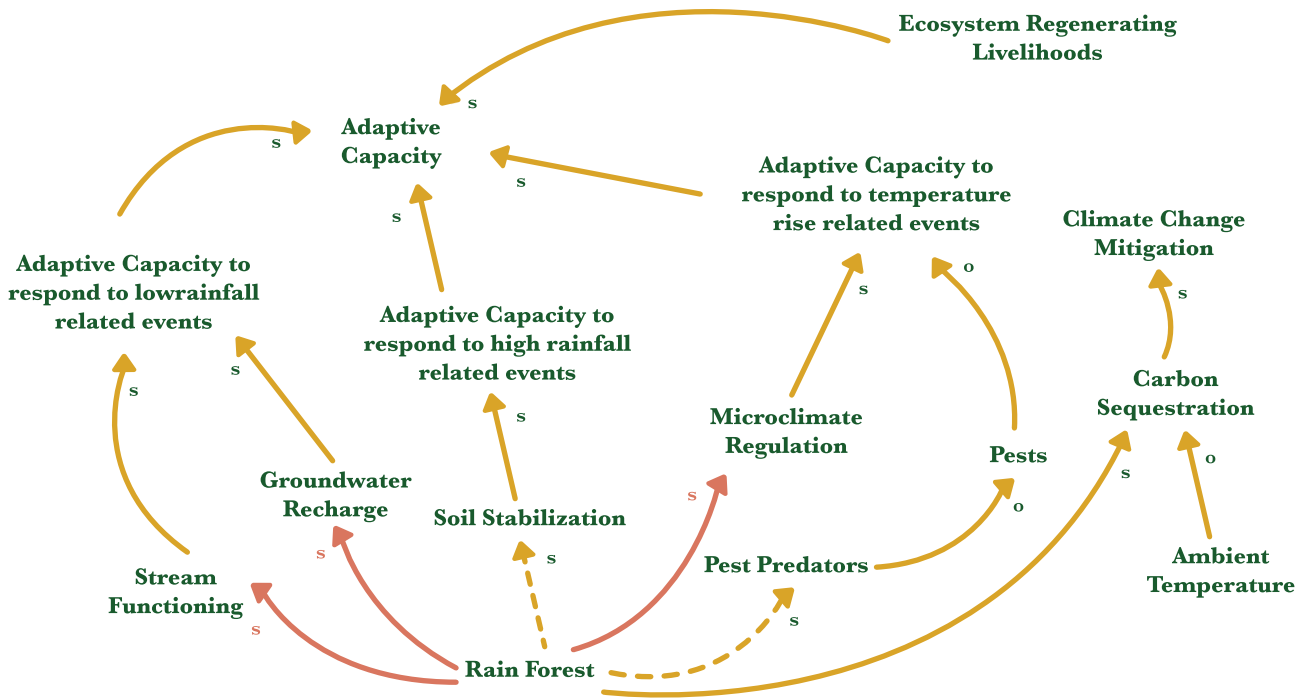


Figure 14 Climate Adjacencies of NCF's Work in Valparai

In above figure, anecdotal evidence of the existence and the direction of polarity (increase/decrease) exists for the links in peach, but it would take a long term scientific comparative study for them to be conclusively established. For the arrows shown as dotted lines, studies would be needed to establish both existence and validity of link (as well as the direction of polarity). Links in solid yellow are those that can be established along with polarities, through logic or evidence (as relevant in each case).

Systems Stories

CO BENEFITS TO PLANTATIONS

The restoration of a rainforest brings with it many intended and unintended benefits. The regeneration of a rainforest would have to begin with planting native trees/saplings developed through seedlings in a rainforest nursery, like the one run by NCF. The choice of species and the desired vegetation mix plays an important role in development of the rainforest. The endogenous seed dispersal mechanisms proliferated by wildlife help the forest to grow over time. Thus, there is a positive feedback loop between wildlife and forest.

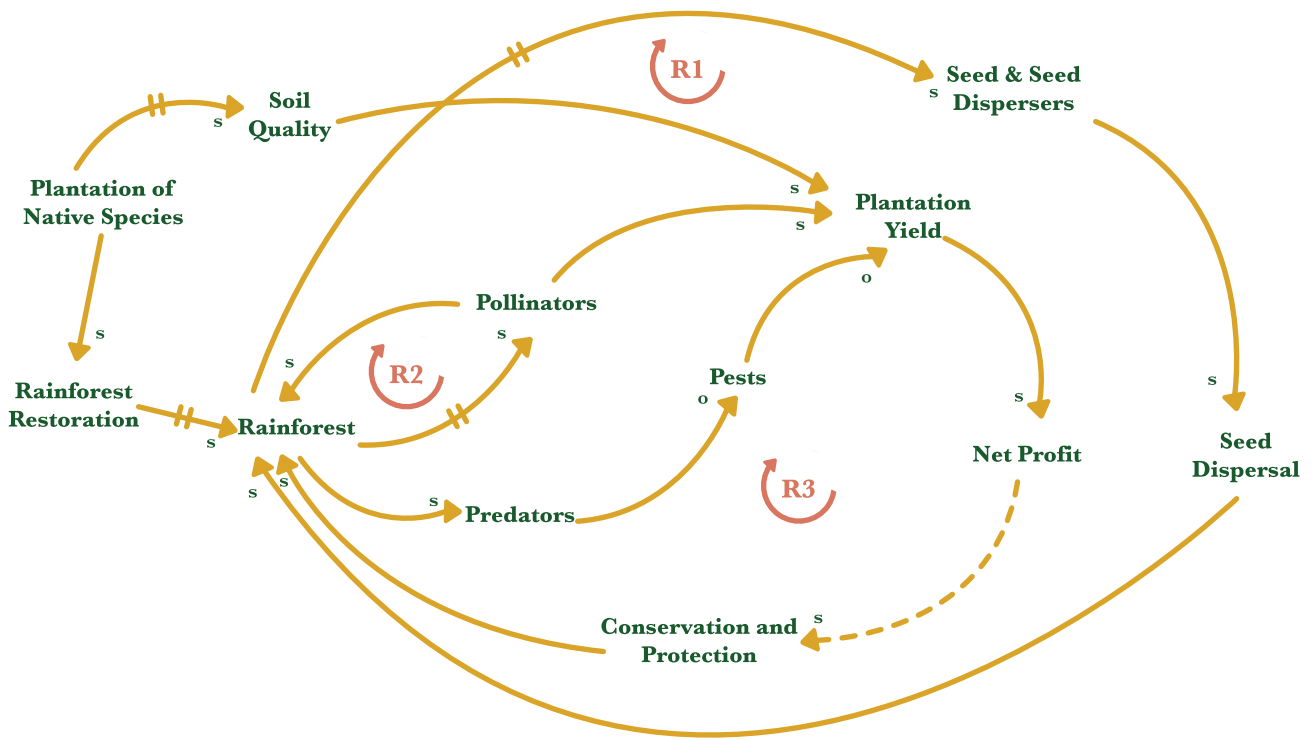


Figure 15 Benefits of Rainforest Restoration to Plantation Companies

However, the wildlife, which is crucial for forest growth, needs protection against potential poaching and hunting. Similarly harvesting of fuelwood, for domestic and local use, needs to be regulated and governed. If not controlled it can lead to failure of the restoration effort. In Valparai, the plantation of native trees is done in partnership with plantation companies but the scope of planting native species in the larger plantation areas is limited. Thus, conscious efforts need to be put in to create dominance of native trees. **Native trees in plantations can also help improve soil fertility over time. As native shade trees grow, they create an increase in the population of pollinators. These are the catalysts which can improve plantation yields of crops**, including tea gardens.

The native shade trees also bring in the predator population which then puts a check on the pest population. This reinforces the predator-prey system which regulates the growth of the pests. A control on the pest population can reduce the extent of pest attacks on the crops and tea estates.

Coupled with increase in pollination, this could reduce the need for the use of fertilizers and pesticides. Additionally, it also improves the yield.

Together, this could help the plantations to increase their yield with potential savings in cost of fertilizers and pesticides. This would then also improve the health of the overall environment (soil health, water quality, reduced pest populations) which is essential in building resilience of the local system towards climate change. Additionally, it could (potentially) also help them improve their profitability in the long term, in a sustainable manner, while restoring the rainforest and contributing to climate change action (mitigation and adaptation).

Through this, two goals of a triple bottom line – people, planet and profits – are met, as the benefits of rainforest restoration provide the community with benefits of ecosystem services, thereby also indirectly fulfilling the third goal – people.



Visit to a rainforest restoration site in Valparai

Conclusion

CO-EXISTENCE

NCF's efforts towards restoring rainforests, protecting wildlife and reducing elephant-human conflicts all work towards maintaining a peaceful co-existence between humans and nature. All their interventions to this effect are community driven and participatory in nature, like working with the companies running the plantation estate, and working with communities to achieve the restoration goals. Developing wildlife corridors and early warning systems has brought down instances of human-animal conflict in the landscape, and is enabling people to co-exist with wildlife without hampering their livelihoods or endangering lives.

Further, NCF's efforts on conservation education are helping to build the knowledge, awareness and appreciation within the community towards wildlife and conservation. All these in turn play an important role in sustenance and strengthening the culture of co-existence between people and nature. Thus, from providing ecosystem services to people and plantations to disaster risk reduction and enhancing climate change mitigation, the work of NCF has all round linkages with climate change.

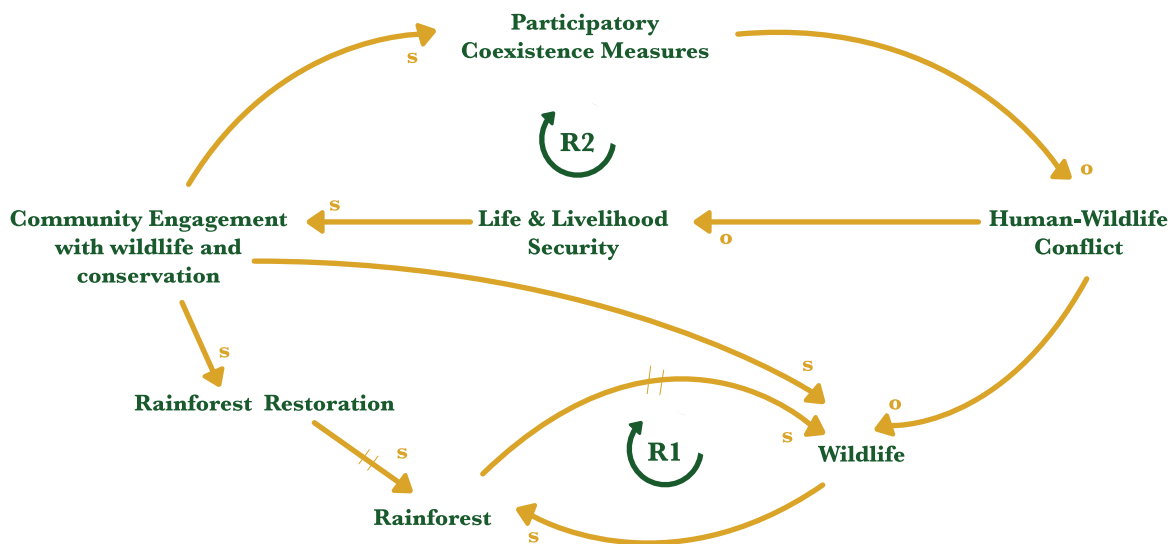


Figure 16 Wildlife and Community Co Existence



A wild elephant roaming in the Valparai Landscape

Concluding Remarks

Below are the generic findings that these case studies offer.

01

Resilience towards climate change cannot be developed in isolation. All local social-ecological systems need to factor in the non-local influences which macro-forces bring. Resilience has to be built not just for climate but also for market and economic uncertainties. The interplays between local and non-local systems needs to be understood and their effects need to be internalized in the project design.

02

By mapping the multiple linkages of climate work with the entire ecosystem, one is able to visualize the second and third order effects of the work on climate. For organizations working in the environment space, the synergies between them and other climate-based organizations could become more apparent. Thus, such exercises also open up possibilities of seeking collaborations to enhance climate action.

03

Climate change mitigation and adaptation should not be seen as separate goals.

One cannot be achieved without the other. All adaptation activities must necessarily lead to mitigation. And all mitigation activities need to be evaluated for their impact on adaptive capacities and on the environment. Too much focus on only one of these goals could lead to mal-adaptation and ultimately defeat its own climate goal.

04

The likelihood of mal-adaptation is highest when the local system is under stress (degraded resources, social fragmentation) and when it is integrated with the macro forces of the larger system (markets, investments, infrastructure).

Changes in the local system are driven by both internal and external factors. When these factors get aligned rapid changes take place. In such conditions it becomes practically impossible to halt them. Thus, identifying mal-adaptation in its early stages is important and developing counter measures is essential for any project. Otherwise, it can create a path of dependence and some level of irreversibility.

05

The nature of collective community action depends on individual aspirations and a shared vision.

While this may not be evident -- even to the communities themselves -- it plays a big role in determining whether a community conserves or degrades their local ecosystems, and thereby their own adaptive capacities. Sensibilities towards this must be developed and projects/interventions must be adjusted according to the community's priorities, aspirations and shared vision. This is not to say that activities must fall in line with these to the detriment of the environment. Instead, all interventions must be aware about the potential side effects (including those on the climate), and must be strengthened accordingly.

Way Forward

Enhancing climate actions requires three things:

- Improved awareness about the climate linkages of our own actions
- Identifying ways of countering mal-adaptation and enhancing proactive adaptation and mitigation, and
- Collaborative networks for leveraging collective capacities

These steps require social, technological, economic and ecological resources. No one resource is a silver bullet or is 'the' leverage point. But the process of enhancing climate actions requires leveraging of systems thinking, deep listening, and creating a shared vision. These cannot be achieved in isolation. It calls for a sharing of learnings, ideas and methods that can help us know our own impacts on climate and then reflect on it together.

Thus, many more such applications of identifying climate adjacencies need to be done. These applications need to be diverse; they need to be done by both the people living in those systems, as well as the external agencies including businesses, local governance bodies and policy makers that intervene in the systems. Making people and agencies aware of how their interventions impact adaptive capacities can change their relationship with the local ecosystem.

Given that the entire social-ecological system is impacted even if an intervention is done only in one part of the system, we need to endogenize climate into our way of living and working, and break the artificial boundaries created between development, environment, and climate.

This can happen only when the interlinkages between them are understood and taken into consideration during the decision-making processes and intervention design. A collective effort in this direction, even if initiated at an individual or entity level, can create a sea change over time. This will ultimately result in improved climate awareness, the benefits of which will be reaped within our lifetimes or by the generations to come.





Glossary

CLIMATE CHANGE

Change in the statistical mean of 30 year climate, Non Normal Variations in weather and shifts in seasons, increase in frequency and extent of extreme climate events

ADAPTATION

Adjusting to the changes in the surrounding environment

PROACTIVE ADAPTATION

- Community Based Adaptation (CBA) – where the whole community works collectively to improve their ability to adapt to climate change
- Ecosystems Based Adaptation (EBA) – where the community, either collectively or individually, uses local ecosystem services for their living and/or livelihood in a manner that conserves the ecosystem’s ability to continue to provide such services, also referred to as “nature-based solutions”

MALADAPTATION

Where the community, either collectively or individually, or any other agency uses ecosystem services for their living and/or livelihood in a manner that does not conserve the ecosystem’s ability to continue to provide such services

SERENDIPITOUS ADAPTATION

Where a decision is taken in a non-climate context but ends up improving resilience and/or adaptive capacity, serendipitously!

COPING

Where a decision is taken as a reactive response to environmental change of any magnitude

ADAPTIVE CAPACITY⁶

The ability of social systems to adapt to multiple, long-term, and future climate change risks, and also to learn and adjust after a disaster.

⁶<https://www.igi-global.com/dictionary/building-adaptive-community-capacity-to-meet-the-challenges-of-global-climate-change/51290>

RESILIENCE⁷

The ability of a social, ecological, or socio-ecological system and its components to anticipate, reduce, accommodate, or recover from the effects of a hazardous event or trend in a timely and efficient manner

ECOSYSTEM SERVICES⁸

Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth.

COMMONS⁹

Collectively owned and governed natural resources – like water, land, forest, air, fisheries - with no private ownership.

MICRO CLIMATE¹⁰

Microclimate is the suite of climatic conditions measured in localized areas near the earth's surface. These environmental variables—which include temperature, light, wind speed, and moisture—provide meaningful indicators for habitat selection and other ecological activities.

GIS¹¹

A geographic information system (GIS) is a computer system for capturing, storing, checking, and displaying data related to positions on Earth's surface. GIS can show many different kinds of data on one map, such as streets, buildings, and vegetation. This enables people to more easily see, analyze, and understand patterns and relationships.

SYSTEMS THINKING

A process of understanding interplays that lead to emergence of change

FEEDBACK LOOP

Where the cause and effect are related with each other through a circular causality

REINFORCING LOOP

Where the variables are amplified either positively or negatively

BALANCING LOOP

Where the growth of variables is kept in check thereby not allowing amplification. Sometimes balancing loops are also goal seeking in nature.

⁷Denton, F, T.J. Wilbanks, A.C. Abeyasinghe, I. Burton, Q. Gao, M.C. Lemos, T. Masui, K.L. O'Brien, and K. Warner, 2014: *Climate-resilient pathways: adaptation, mitigation, and sustainable development*. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1101-1131.

⁸Chapter 2, *Ecosystems & Their Services from Ecosystems and Human Well-being: A Framework for Assessment*

⁹<https://iasc-commons.org/about-commons/>

¹⁰<https://www.sciencedirect.com/topics/earth-and-planetary-sciences/microclimate>

¹¹<https://www.nationalgeographic.org/encyclopedia/geographic-information-system-gis/>



