Integrating resilience into Monitoring and Evaluation of climate and development practices in Hindu-Kush Himalaya

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Introduction

The Hindu-Kush Himalaya (HKH) landscape shared by eight Asian countries, is the origin point for ten river basins, and support an estimated five billion people through its ecosystem goods and services. The region is geologically unstable and vulnerable to hazards like floods, drought, changes in snowline and landslides. This, coupled with the increasing rates of globalization, industrialization, and tourism stresses the natural resource systems and makes the region more sensitive to the impacts of climate change. The region is also more exposed to climate change due to the phenomenon of elevation-dependent temperature rise, also known as elevation-dependent warming (EDW) (Wester et al., 2019; Sud et al., 2015).

Amid this high sensitivity and exposure elements of vulnerability of the region to climate change, many mountain communities are shifting from traditional modes of livelihood to new sources of income. Our fieldwork in Bhutan, Nepal and Myanmar informs us that such transitions are driven by context-specific combinations of human aspirations, factors driving labor productivity, national policies, development and planned climate adaptation practices and resource bases. Social-ecological systems (SES) framework provides a conceptual lens to investigate such interdependencies between society and eco-systems, and strives to explore the dynamic complexity across scales of household economy, resource systems and landscapes, and policy and development practices (Walker et al., 2006; Sendzimir, et al., 2011, and Partelow, 20018). Though it strives beyond the traditional indicator-based studies the vocabulary of this approach is difficult to translate to policymaking (de Leon and Kopainsky, 2020). There is an urgent need to integrate social-ecological resilience into Monitoring and Evaluation (M&E) frameworks of development and climate adaptation projects in HKH region to avoid maladaptation and sustain the well-being and development of mountain communities. In order to bridge this gap, we look at Systems thinking and Systems Dynamics as a method to explore the dynamics of livelihood transitions in three Himalayan contexts, their tradeoffs and opportunities for human well-being, and draw insights for M&E frameworks.

Case study of Shan state in Myanmar

The market-related-farm-level interventions from an international development agency resulted in an increase in the household economy that drove people's aspirations to earn more and also added to their means to upgrade skills necessary for getting into relatively more profitable secondary vocations. With an improved household economy, exposure to market trends improves with access to mobile phones which leads to aspirations for innovative enterprises and an increase in the number of people involved in secondary vocations. The energy use increases due to the greater use of machines in secondary vocations and after some time the constraints of energy availability limits the number of people transitioning to secondary vocations. Simultaneously, a decrease in energy would cause more people to rely on firewood and increases the overall time spent in gathering firewood and decrease labor productivity. Model testing gives us the insight that if development agencies provide funds for planned interventions in the farm sector and training to move into secondary vocations, the community is unable to grow past a particular stage due to the existing energy poverty. If too many people transitioned to secondary vocations now, the energy poverty situation would cause the economy to collapse. Model testing gives us the insight that. Policy testing in the system dynamics helps us to understand that either diversity has to be maintained between farming and enterprise which will demand lowering of aspirations or the energy situation has to be improved by connecting villages to Myanmar's centralized power grid or else an energy mix has to be looked into through solutions like decentralized smart grids. Thus, it is not enough for a development organization to fix its focus only on farm level interventions but has to understand the interlinkages of aspirations, market linkages and resource systems like energy.

Case study of Dadeldhura in Nepal

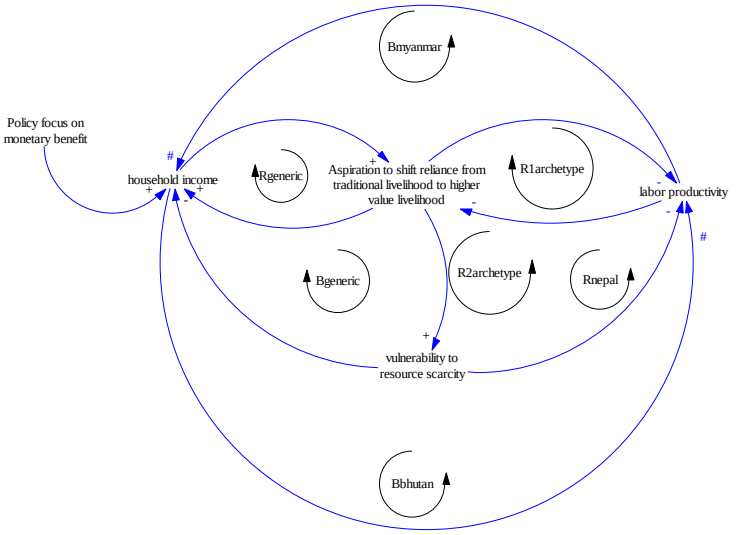
There is a decrease in traditional heat-tolerant crop production like cereals and an increase in heat-sensitive cash crops like vegetable cultivation in Dadeldhura. Such an aspiration to shift crop type is driven interaction of four main factors: public policy and non-governmental organizations' support for vegetable cultivation in terms of subsidies and irrigation infrastructure, high market demand for vegetables, increase in the feminization of agriculture labor caused by outmigration and a comparatively higher rate of wildlife attack on a traditional food crop. Model testing reveals that underestimation of drought risk may increase a false sense of security based on current high returns from vegetable production amongst policymakers and farmers. To prevent the system from collapsing as frequencies of drought hazards increase, a plausible scenario with climate change, policymaking has to start focusing on drought-resistant cereal crops to maintain crop diversity. Some means can be to look at the same level of infrastructure support for cereals as for vegetables and also promote ecological awareness among farm families for managing diversity in their farms.

Case study of Haa in Bhutan

Yak rearing, a nomadic lifestyle practised in the high mountains of HKH has a great cultural significance and plays an important role in the local economy. In recent years, this traditional livelihood practice is on a decline - with the yak population gradually decreasing, low labor availability due to changing youth aspirations in the area, and the increasing adversities of climate change on rangelands and grazing. Model testing reveals that changing aspiration of youth can be the most crucial factor that can trigger a decline in the yak industry and scenarios like reverse migration, which was observed in several localities during the Covid-19 pandemic, helped in understanding that recovery will be gradual and the rate of

increase in the *Yak Rearing Households* is expected to be much faster than the *Yak Product Revenue*. This calls for a policy focus on enough safety nets and investments in the development of alternative local enterprises so that interest can be kept on yak rearing as one of the livelihood options in the ecosystem instead of abandoning it or relying on it completely.

Towards a systems archetype – Three change areas for M&E to focus on social-ecological resilience



From the System dynamics models of the three case studies, we try to derive an archetype to help the design of M&E frameworks of future projects in climate adaptation and development in HKH. This process has helped us to identify three interdependent **Change Areas** which will be key for managing social-ecological resilience and averting a collapse situation of livelihood systems in the future. Change Area 1 is generic and observed in all three cases, Change Area 2 can be case-specific, and Change Area 3 has emerged during this analysis and is plausible.

Change Area 1 - Exchange of reliance and vulnerability

We can visualize that ***policy*** in all three contexts focuses on increasing the *monetary benefit* for households without much attention to limits posed by dynamics of labor, infrastructure or natural hazard situations. As soon as *household income* increases, *aspirations to shift reliance from low benefit and/or highly stressful traditional livelihood to a higher monetary value livelihood* is observed which increases the income even more and is illustrated in R loop of the diagram. However, such an **exchange of reliance** just increases the ***vulnerability*** to either a resource scarcity like in the case of energy in Myanmar or availability of natural feed in a climate change scenario in Bhutan or infrastructure and maybe even loss of memory for growing cereals in Nepal. This increased vulnerability at best balances the household income or worst can lead to collapse.

Change Area 2 - Dynamics of mountain labor

Such exchange of reliance can also influence or in turn be influenced by issues of labor. In Bhutan, as household income increases together with the ***aspiration to shift*** drive migration and as a result decrease in ***productive labor*** which can influence household income negatively together with a *scarcity of resources*, which is illustrated by Bbhutan loop. In Nepal, higher household income can check outmigration of males and facilitate ***productive labor*** which can help to manage interest in traditional crops, inturn manage diversity in crops and decrease vulnerability leading to collapse, which is illustrated by Rnepal. In Myanmar, the limitations of energy can decrease ***productive labor*** as it increases time for women to engage in firewood collection which negatively influences ***household income*** and thereby checks the *exchange*, which is illustrated by Bmyanmar loop. The case-specific loops finally **check aspirations** and can contribute to **managing diversity** in crop patterns like in Nepal or livelihood practices like in Myanmar but can also influence **collapse** of traditional livelihood facilitated household income like in Bhutan.

Change Area 3 – Tradeoff between aspiration and vulnerability

In the process of deriving this archetype, two new loops have emerged which are context or case neutral. The first one is R1archetype which signifies that if ***labor productivity*** increases the ***aspiration to shift reliance*** decreases, which can again increase labor productivity, possibly in the traditional livelihood as aspiration is checked. This loop can also be interpreted with the reverse logic i.e. if ***aspirations to shift reiance*** is high, the ***labor productivity***, again plausibly in traditional livelihood will decline which will reinforce the ***aspiration***. The second is R2archetype which signifies that if ***labor productivity*** for traditional livelihood increases, ***aspiration to shift reliance*** can be checked which decreases the ***vulnerability to resource scarcity*** further increasing ***labor productivity*** for reliance on traditional livelihood. Like the previous loop, a reverse logic can be used to explain that if ***labor productivity*** for traditional livelihood decreases, ***aspiration to shift reliance*** will increase which will increase ***vulnerability*** and reinforce the low ***labor productivity***. The tradeoff is that either aspirations of community will not be fulfilled or if met the vulnerability to resource scarcity will increase.

There is further work needed to design a M&E framework taking the above three change areas are markers of resilience. Four key lessons from this work are as follows:

1. The Change Areas will aid in articulating criteria through which future data can be collected to understand resilience of ongoing projects
2. There is a need for development agencies to collect longitudinal data from ongoing projects to help in such modeling aided M&E
3. There is need for policymaking to have a systemic understanding of interdependencies of livelihoods beyond the market or resource system before investments, otherwise there can be risks of maladaptions or delay in recovery as observed in our model-based tests for Myanmar and Bhutan respectively
4. There is need of policy design such that too much reliance on traditional livelihood or its total abandonment or exchange of this reliance on another livelihood source is balanced such that aspirations are met but vulernabilities are checked.

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