

Has the Adaptation-Mitigation Binary Outlived its Value? Indigenous Ways of Knowing Present an Alternative

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Abstract

Actions addressing anthropogenic climate change are paramount to survival; however, there are limitations to the current binary approach which considers adaptation and mitigation as separate actions. Insights from Indigenous pluralistic ontology reveals anticipatory capacity to include components of adaptation as well as mitigation. Drawing from our research in the Pamir Mountains of Tajikistan, ecological calendars build anticipatory capacity for climate change. Anticipatory capacity, having the ability to envision possible and sustainable futures, occurs in response to the changes in the environment. It includes elements of foresight as these actions are simultaneously in preparation for upcoming uncertainty. These two aspects are elements of the adaptation-mitigation binary respectively. As illustrated by the ecological calendars in the Bartang Valley of Tajikistan, this approach has been carried out for many generations and is founded upon context specificity, intellectual pluralism, and relations between the agropastoralists and transformations in their habitat. Reconceptualizing the adaptation-mitigation binary is not bound to the borders of the Pamir Mountains, rather it is a practice that is relevant globally.

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Key Points:

- The adaptation-mitigation binary, while conceptually useful, is limiting because it does not reflect how human societies make decisions about climate change.
- Anticipatory capacity, the ability to envision possible futures, includes elements of adaptation and mitigation to describe human responses more accurately.
- For generations, Indigenous communities have utilized ecological calendars as a form of anticipatory capacity for climatic variation.

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Indigenous pluralistic ontology reveals anticipatory capacity to include components of adaptation as well as mitigation. Drawing from our research in the Pamir Mountains of Tajikistan, ecological calendars build anticipatory capacity for climate change. Anticipatory capacity, having the ability to envision possible and sustainable futures, occurs in response to the changes in the environment. It includes elements of foresight as these actions are simultaneously in preparation for upcoming uncertainty. These two aspects are elements of the adaptation-mitigation binary respectively. As illustrated by the ecological calendars in the Bartang Valley of Tajikistan, this approach has been carried out for many generations and is founded upon context specificity, intellectual pluralism, and relations between the agropastoralists and transformations in their habitat. Reconceptualizing the adaptation-mitigation binary is not bound to the borders of the Pamir Mountains, rather it is a practice that is relevant globally.

Plain Language Summary

Adaptation and mitigation are related components of anticipatory capacity which informs a community's action to secure its livelihood and food systems. Anticipatory capacity to anthropogenic climate change needs to be grounded in the local ecological and sociocultural context to be effective. It relies on diversity of knowledge systems, that consider the complex connectivity of relations between humans and their habitat within a specific context. In this reflective essay, we make a strong case for Indigenous knowledge systems as providing a foundational base for strategic action to the climate crisis while also engaging complementary knowledge sources from the biophysical and social sciences. This grounded and “thick” understanding can be brought to bear on actions that simultaneously mitigate and adapt to anthropogenic climate change. We have argued that ecological calendars are an important sociocultural and ecological mechanism to anticipate this change. In an upcoming special issue of *GeoEarth*, we will be presenting international research that will explore the role of ecological calendars in diverse international Indigenous contexts.

1 Issue: Adaptation-Mitigation Binary

In scientific literature, actions addressing the global climate crisis generally have been categorized as either adaptation or mitigation. Currently, IPCC working groups for the 2022 Sixth Assessment Cycle continue to be divided in this manner (IPCC, 2021). Adaptation measures are taken in response to changing circumstances. Rather than pursuing to solve a problem, the adaptation framework adjusts to the new normal. Alternatively, mitigation is the flip side of this coin as actions proactively work to prevent the causes of climate change, minimizing its effects. Similarly, to adaptation, the mitigation response is striving to reduce the impact (IPCC, 2014). While conceptually useful, this binary does not convey the complexity of considerations, subtlety, and nuance related to human responses to environmental change. Therefore, like all notions constructed by humans to help their understanding, they need re-examination to see if their relevance has waned.

The goal of this paper is to demonstrate how anticipatory capacity considers aspects of both adaptation and mitigation. Section II highlights the inspiration stemming from Indigenous pluralistic ontology, a way of being, while Section III considers the respective role of ecological calendars. Examples are drawn from two Indigenous communities in the Bartang Valley of GornoBadakhshan Autonomous Oblast, Tajikistan, illustrating the communities' generational use of ecological calendars and the method in which they build anticipatory capacity. In light of this analysis, Section IV concludes with a brief discussion of future directions for addressing actions related to the climate crisis.

2 Insights from Indigenous Pluralistic Ontology

Most Indigenous and rural communities do not view their climate as in need of strictly either adaptation or mitigation approaches because their perspective towards the planet and its “gifts” (resources) is not based on human dominance but action that is in tandem with rhythms of the earth (Kassam, 2021; Kimmerer, 2013). As a matter of practice, Indigenous communities are constantly responding and adjusting to their fluctuating environment (Norton-Smith et al., 2016; Whyte, 2017). The seasonal variations are not only an integral foundation to food and livelihood systems but extend to all cultural aspects embedded in the local ecology. Therefore, they influence human behavior in a quantum connectivity with their habitat illustrating

that humans exist within their ecosystem, not outside it (Kassam, 2021). Transdisciplinary scholarship engaging Indigenous ways of knowing is questioning, not ignoring, modern climate science by presenting an emerging conceptualization that builds upon and embraces both aspects of adaptation and mitigation as part of an ontologically pluralistic pathway for effective climate action.

Imagine a connected range of actions rather than two distinct approaches. As adaptation requires an element of mitigation and vice versa, this can be visualized as a two-dimensional system containing counterbalances on either end of the extremes (Figure 1). Most Indigenous and rural societies do not undertake actions addressing climate change in a sterile binary. Their perspectives reveal new, intellectually complex, vistas from which to imagine potential actions and solutions. This is precisely where one can simultaneously be mitigating a crisis while building adaptive capacity.

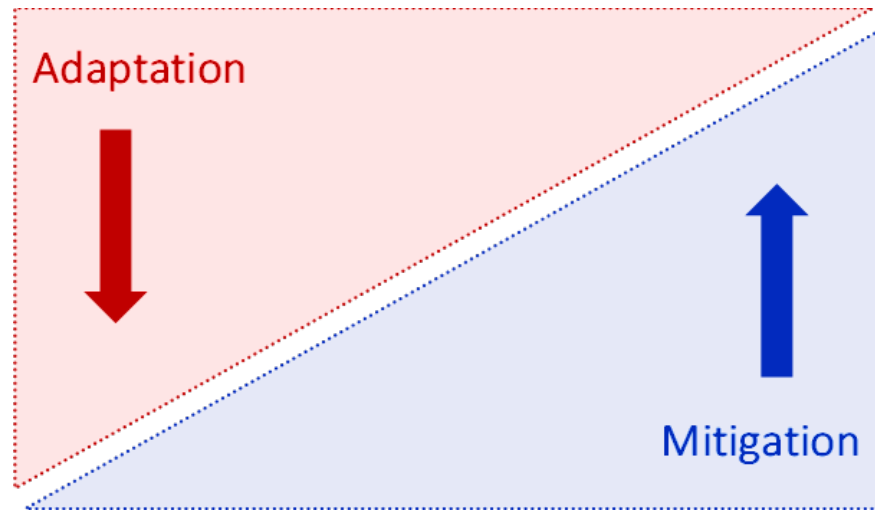


Figure 1 . Adaptation and mitigation can be illustrated as a two-dimensional figure showing higher intensity of adaptation on the left side (in red) and greater intensity of mitigation on the right side (in blue). Achieving overall stability requires the counterbalance (arrows) between these respective elements. This is context dependent. Certain situations will require greater adaptation measures with less mitigation or conversely greater mitigation and less adaptation measures. Mitigation relies on a component of adaptation, and equally, adaptation also requires an aspect of mitigation. In climate action, both co-exist based on the context.

3 A Case for Anticipatory Capacity: Role of Ecological Calendars

The foundation of anticipatory capacity, which views adaptation and mitigation as a process, is influenced by the comprehensive and holistic attributes of Indigenous knowledge systems (Kassam, 2021; Norton-Smith et al., 2016). Anticipation of an event requires preparations to take place in advance. Under conditions of anthropogenic climate change, such actions would be: (1) in response to the shifting environment; and (2) include aspects of foresight. Exhibiting anticipatory capacity, the capability of visualizing and planning for a sustainable future, therefore rests within the adaptation-mitigation continuum. Adaptation and mitigation are conceptually distinct but not mutually exclusive. This relational comparison of the two states is necessary for a discussion of anticipatory capacity, which can be visualized as being situated in a fluid third space between the x- and y-axis (Figure 2). The expanse created between adaptation and mitigation emphasizes ontology, a way of being, and therefore the behavioral change necessary for transformation. These elements are related and dynamic, focusing on action today for an outcome affecting the future.

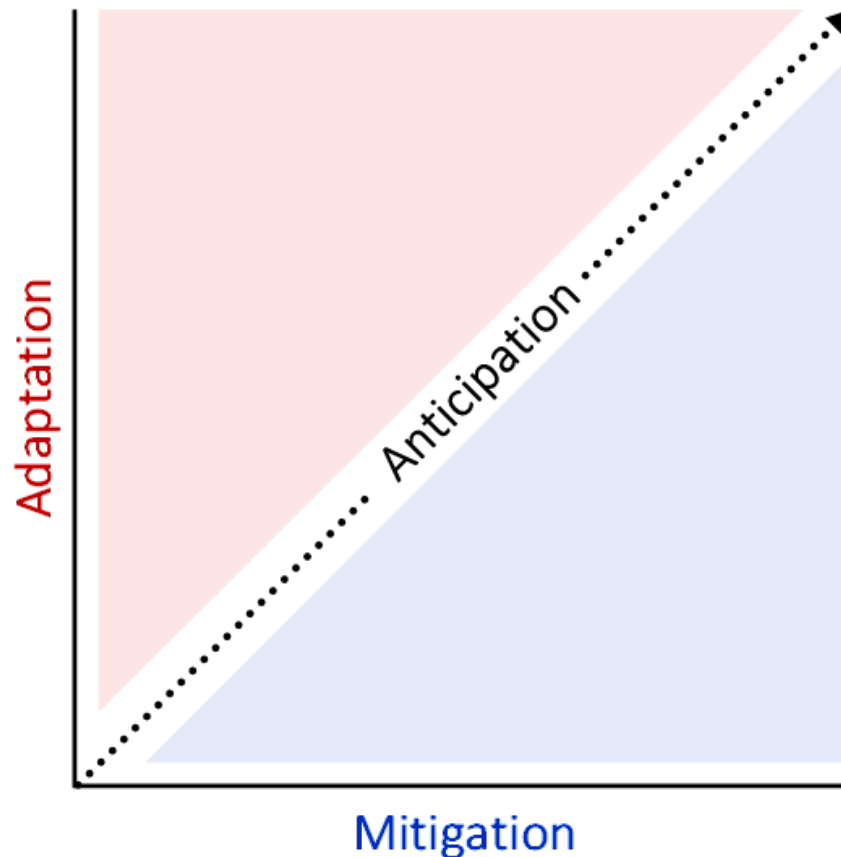


Figure 2 . In this graphical representation of adaptation and mitigation, where adaptation (in red) rests on the y-axis and mitigation (in blue) on the x-axis, anticipatory capacity falls within the expanse between the two elements. This region is characterized by the mutual relationship between adaptation and mitigation. This third dimension is driven by action. The process, revealed through our behavior, not only impacts the outcome but also enters a causal loop that re-informs future actions. It is therefore a matter of reforming our practice to create change.

The adaptation-mitigation continuum, specifically anticipatory capacity, is not solely a thought experiment. It reflects real-world struggles for food security and survival. Imagine the magnitude of anxiety a subsistence agropastoral farmer endures under climate change. The unpredictability is threatening their livelihoods, only to be heightened by the SARS-CoV-2 pandemic (Kassam & McDonald, 2021). Furthermore, being in a state of anticipation can be cause for additional anxiety if remediation is not underway. Rather than awaiting the consequences, being proactive is a method of lowering anxiety. This preemptive condition, precisely located within the adaption-mitigation continuum, manages fear of uncertainty, and maintains human well-being.

Take two agropastoral communities located in the high altitudes of the Pamir Mountains of Tajikistan as an example. The villages of Savnob and Roshorv, nested within the Bartang Valley (Figure 3), are subsistence agropastoral communities. Specifically, each village consists of various households that primarily engage in agricultural activities supplemented by maintaining small livestock herds, cultivating orchards, and gathering from the land. Members of Savnob and Roshorv historically utilized ecological calendars encompassing the diversity of opinions and experiences based on their respective ecological professions and locations. The calendars were formed by the accumulation of knowledge. Actively passed down, the knowledge is creating possibilities for the next generations (Kimmerer, 2013; Whyte, 2017). Indigenous knowledge, cumulative in

nature, accepts plurality and builds on our understanding thus far (Kassam 2009a).

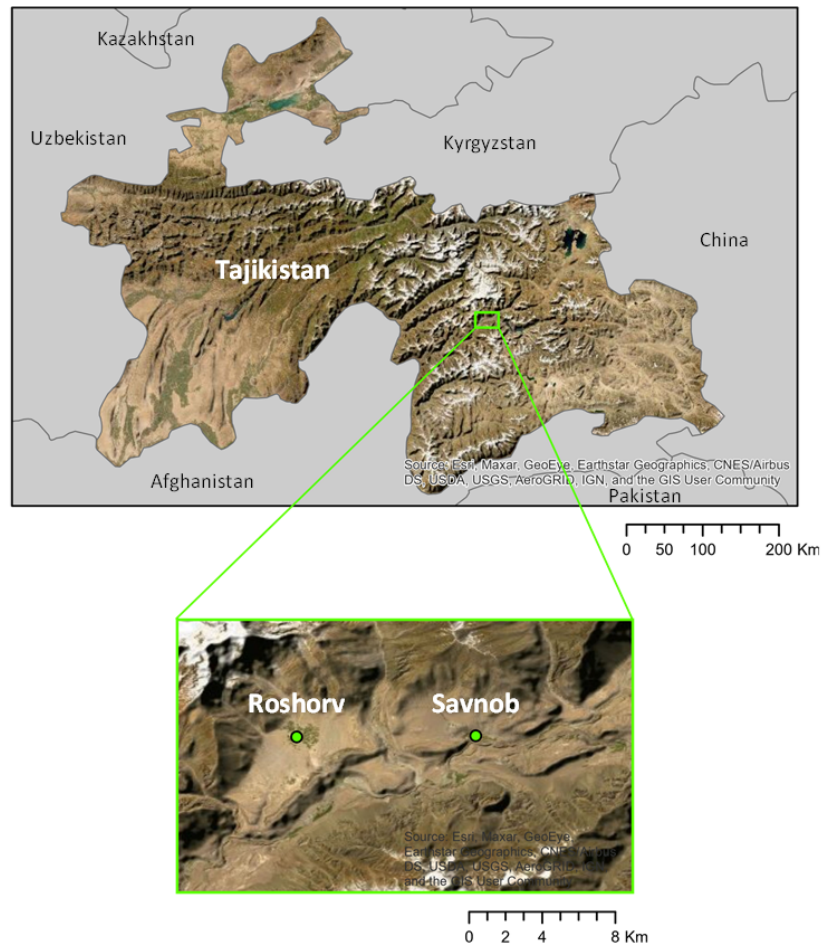


Figure 3 . Visual contextualization of the villages of Savnob and Roshorv, located within the Bartang Valley of Tajikistan (Kassam et al., 2021).

Historically, these villages utilized ecological calendars to anticipate variation of their local environment. Key livelihood activities commenced in response to biophysical cues critical to their survival. This included listening for the call of an arriving migratory bird to initiate plowing in the spring or watching for the blossoming of a flower instructing herders to drive their livestock to summer pastures. In following these ecological signs, rather than the rigid structure of the Gregorian calendar, the likelihood of a successful harvest increased. This method of tracking the passing of time was paired with another traditional ecological calendar: the Calendar of the Human Body. Key to the foundation of Indigenous knowledge, is the element of performative action. This is revealed in the Calendar of the Human Body as it tracks the passing of time through the body in accordance with the changes occurring in the habitat, not only linking the human to the ecology but also to agricultural activities. It is an embodied expression of the passing of time, a way of being (Kassam et al., 2018). However, the prevalence and use of their ecological calendars has diminished largely as a result of colonization and war.

Efforts to revitalize Indigenous and rural communities' ecological calendars are currently underway to test their efficacy and role in building anticipatory capacity to anthropogenic climate change. In particular, as the villagers in the Bartang Valley are among the most vulnerable to extreme weather events, their historical

ecological calendars have been updated to reflect how animal and plant behavior continues to inform their perception of seasons (Kassam, 2021). Thus far, the revitalization of ecological calendars has been framed as an adaptation approach where one would be responding to the environment's undergoing transformations to diminish the impact. However, this also includes a component of mitigation through the importance of foresight. One cannot completely predict the impacts of the climate crisis, but it can be anticipated. The strategy to develop anticipatory capacity is therefore concurrently reacting to the altered climatic state and preparing to minimize the damaging effects of anticipated biophysical events.

The reconceptualization of a fluid third space recognizes that a response holds characteristics of adaptation and mitigation, yet it is non-binary. For instance, despite hardships and challenging conditions the villagers of the Bartang Valley exhibit agency through their experimentation and modifications to farming practices in accordance with cycles of their local environment. To survive and respond to the climate crisis, the local food system is undergoing adaptation that includes an element of foresight. Warming temperatures are increasing the length of the growing season at high elevations. In other words, not only is the period of crop productivity extended, but the altitudinal range over which crops can be planted has also increased. Farmers responded to the warming temperatures by attempting to grow wheat at higher elevations. Given frost damage is no longer a significant concern relative to the recent past, their attempts were successful. Villagers recalled that within three generations, a transition occurred from barley to wheat. This coincided with records comparing the upper elevational limit for wheat to have risen by 150 meters from 1893 to 1916 in the Pamirs (Kassam, 2009b). This behavior counters the narrative that Indigenous communities lack the intellectual infrastructure to apply their knowledge systems to implement adaptation-related actions. Unfortunately, there are physical limits to arable land at high elevations, but their actions demonstrate a capacity to observe and act. Not only is this an alternative, context specific form of strategic action to the climate crisis, but it is already built into the fabric of their culture.

Farmers are responding to ecological signs and adjusting their sowing and harvesting behavior accordingly. This does not take place over one season, rather it is a long-term experimental process that is also contingent on preparations for upcoming seasons. This foresight is within an effort to proactively work towards mitigating food insecurity caused by the climate crisis. The majority of actions taken by the community members are aimed at mitigating food insecurity. This includes food for their families as well as having enough fodder to support their livestock. It also extends to observing cues in the environment regarding the most opportune hunting and gathering times. In all the above-mentioned scenarios, the risk is high, but failure to act has perilous consequences. Responding to the new conditions and anticipating the next season is a matter of survival.

The community members' effort to revitalize their ecological calendars is a form of mitigation in itself. Not only in addressing their food insecurity, but they are also proactively working to prevent the causes of the climate crisis. In an effort to stay in tune with their environment and limited resources, they are relying on appropriate agropastoral approaches such as preparing the land with an ox and plow which proportionally emit less greenhouse gasses. By keeping their small-scale subsistence farming techniques in sync with the rhythms of the land, community members are not expanding nor implementing practices that could otherwise be emitting increased levels of greenhouse gasses. Furthermore, these ecological calendars are alive. They organically evolved through an intense web of human-environmental relationships. Historically, they were updated over multiple generations of Indigenous peoples – each current cohort building on and adjusting the vast knowledge of the previous. Therefore, the calendars continue to hold promise and relevance for maintaining anticipatory capacity to changing environmental conditions. This process of improving accuracy and adjusting the calendars overtime is a form of mitigation as efforts are preventing the calendars from becoming outdated or calcified. To put it succinctly, by updating the ecological calendars overtime, it is possible to envision sustainable futures.

4 The Bigger Picture: Universality and Next Steps

Viewing the adaptation-mitigation binary as a continuum opens-up possibilities for considering optimal solutions based on local ontological practice. Such an approach is applicable to various ecological and

sociocultural contexts. While our example pertains directly to the smallholder farmers in the Bartang Valley, it has significant implications for food security worldwide. This has direct global relevance as 70-80% of the world's food system is dependent on production by small landholders and herders (FAO, 2014; Lowder et al., 2016). The continuum's qualities are simultaneously particular to a specific context and universal to human behavior demonstrating the relevance and necessity of Indigenous knowledge. Actions taken in the continuum apply across time horizons, addressing the short- and long-term impacts of climate change. This methodology, grounded within the local context, provides tangible hope for future possibilities and survival.

The villagers' way of life occurs within the adaptation-mitigation continuum, revealing the dichotomy between adaptation and mitigation may no longer be useful. The ontological process of engaging the fluid third space necessitates being mindful of the particular environment in which one resides. Savnob's and Roshorv's ecological calendars are context specific. As a result, each calendar reflects the unique diversity of life and knowledge generated in the villages respectively. This includes the interconnectedness between their habitat and livelihood activities, illustrating that cumulative Indigenous knowledge remains relevant through day-to-day action. The continuum features anticipatory capacity, the ability to envision sustainable futures under conditions of anthropogenic climate change, a central element of living ecological calendars. These calendars reveal how Indigenous communities are simultaneously responding to the impacts of climate change while working to mitigate the crisis. This third fluid space, the expanse within the adaptation-mitigation continuum, not only emphasizes the connection between the social and the ecological, but it also speaks to human agency and action.

Acknowledgments

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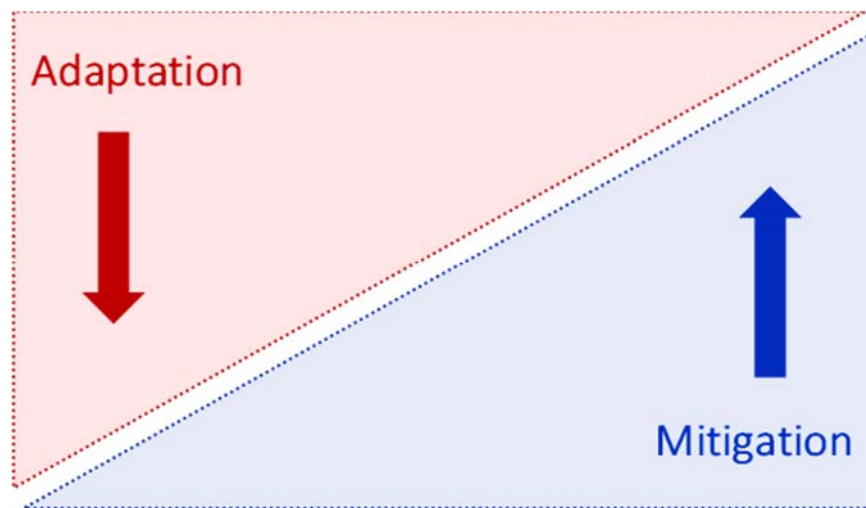


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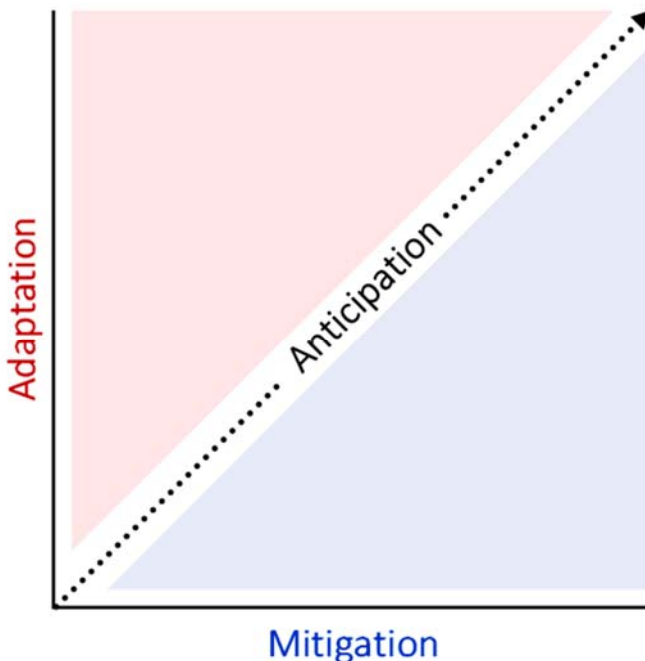


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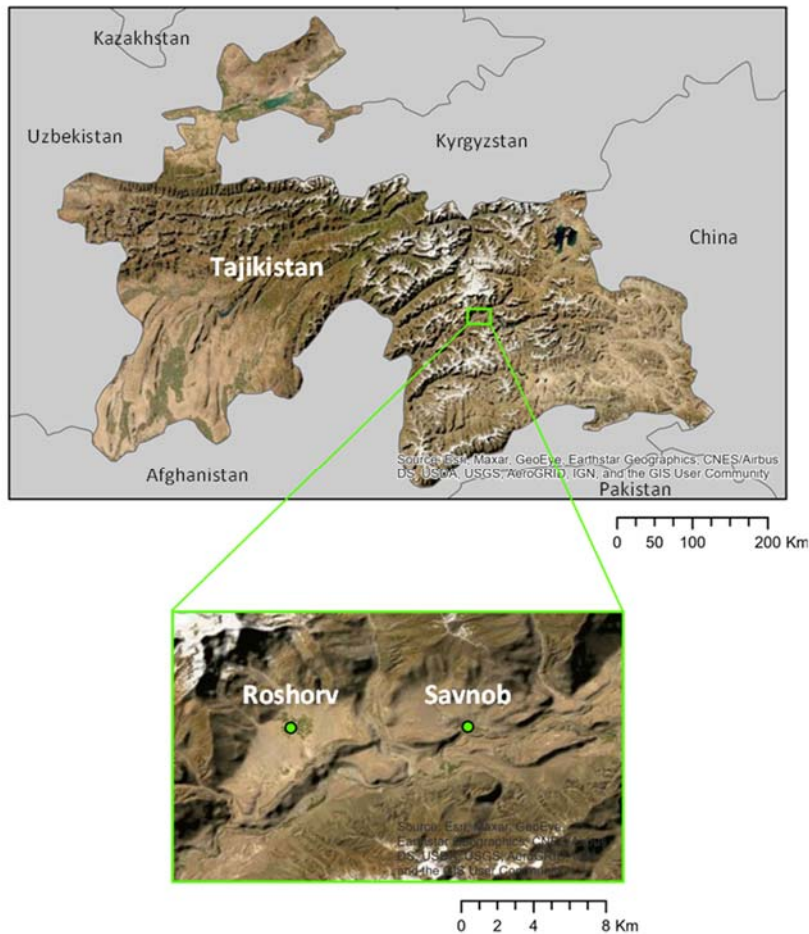


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Efforts to revitalize Indigenous and rural communities' ecological calendars are currently underway to test their efficacy and role in building anticipatory capacity to anthropogenic climate change. In particular, as the villagers in the Bartang Valley are among the most vulnerable to extreme weather events, their historical ecological calendars have been updated to

reflect how animal and plant behavior continues to inform their perception of seasons (Kassam, 2021). Thus far, the revitalization of ecological calendars has been framed as an adaptation approach where one would be responding to the environment's undergoing transformations to diminish the impact. However, this also includes a component of mitigation through the importance of foresight. One cannot completely predict the impacts of the climate crisis, but it can be anticipated. The strategy to develop anticipatory capacity is therefore concurrently reacting to the altered climatic state and preparing to minimize the damaging effects of anticipated biophysical events.

The reconceptualization of a fluid third space recognizes that a response holds characteristics of adaptation and mitigation, yet it is non-binary. For instance, despite hardships and challenging conditions the villagers of the Bartang Valley exhibit agency through their experimentation and modifications to farming practices in accordance with cycles of their local environment. To survive and respond to the climate crisis, the local food system is undergoing adaptation that includes an element of foresight. Warming temperatures are increasing the length of the growing season at high elevations. In other words, not only is the period of crop productivity extended, but the altitudinal range over which crops can be planted has also increased. Farmers responded to the warming temperatures by attempting to grow wheat at higher elevations. Given frost damage is no longer a significant concern relative to the recent past, their attempts were successful. Villagers recalled that within three generations, a transition occurred from barley to wheat. This coincided with records comparing the upper elevational limit for wheat to have risen by 150 meters from 1893 to 1916 in the Pamirs (Kassam, 2009b). This behavior counters the narrative that Indigenous communities lack the intellectual infrastructure to apply their knowledge systems to implement adaptation-related actions. Unfortunately, there are physical limits to arable land at high elevations, but their actions demonstrate a capacity to observe and act. Not only is this an alternative, context specific form of strategic action to the climate crisis, but it is already built into the fabric of their culture.

Farmers are responding to ecological signs and adjusting their sowing and harvesting behavior accordingly. This does not take place over one season, rather it is a long-term experimental process that is also contingent on preparations for upcoming seasons. This foresight is within an effort to proactively work towards mitigating food insecurity caused by the climate crisis. The majority of actions taken by the community members are aimed at mitigating food insecurity. This includes food for their families as well as having enough fodder to support their livestock. It also extends to observing cues in the environment regarding the most opportune hunting and gathering times. In all the above-mentioned scenarios, the risk is high, but failure to act has perilous consequences. Responding to the new conditions and anticipating the next season is a matter of survival.

The community members' effort to revitalize their ecological calendars is a form of mitigation in itself. Not only in addressing their food insecurity, but they are also proactively working to prevent the causes of the climate crisis. In an effort to stay in tune with their environment and limited resources, they are relying on appropriate agropastoral approaches such as preparing the land with an ox and plow which proportionally emit less greenhouse gasses. By keeping their small-scale subsistence farming techniques in sync with the rhythms of the land, community members are not expanding nor implementing practices that could otherwise be emitting increased levels of greenhouse gasses. Furthermore, these ecological calendars are alive. They organically evolved through an intense web of human-environmental relationships.

Historically, they were updated over multiple generations of Indigenous peoples – each current cohort building on and adjusting the vast knowledge of the previous. Therefore, the calendars continue to hold promise and relevance for maintaining anticipatory capacity to changing environmental conditions. This process of improving accuracy and adjusting the calendars overtime is a form of mitigation as efforts are preventing the calendars from becoming outdated or calcified. To put it succinctly, by updating the ecological calendars overtime, it is possible to envision sustainable futures.

4 The Bigger Picture: Universality and Next Steps

Viewing the adaptation-mitigation binary as a continuum opens-up possibilities for considering optimal solutions based on local ontological practice. Such an approach is applicable to various ecological and sociocultural contexts. While our example pertains directly to the smallholder farmers in the Bartang Valley, it has significant implications for food security worldwide. This has direct global relevance as 70-80% of the world's food system is dependent on production by small landholders and herders (FAO, 2014; Lowder et al., 2016). The continuum's qualities are simultaneously particular to a specific context and universal to human behavior demonstrating the relevance and necessity of Indigenous knowledge. Actions taken in the continuum apply across time horizons, addressing the short- and long-term impacts of climate change. This methodology, grounded within the local context, provides tangible hope for future possibilities and survival.

The villagers' way of life occurs within the adaptation-mitigation continuum, revealing the dichotomy between adaptation and mitigation may no longer be useful. The ontological process of engaging the fluid third space necessitates being mindful of the particular environment in which one resides. Savnob's and Roshorv's ecological calendars are context specific. As a result, each calendar reflects the unique diversity of life and knowledge generated in the villages respectively. This includes the interconnectedness between their habitat and livelihood activities, illustrating that cumulative Indigenous knowledge remains relevant through day-to-day action. The continuum features anticipatory capacity, the ability to envision sustainable futures under conditions of anthropogenic climate change, a central element of living ecological calendars. These calendars reveal how Indigenous communities are simultaneously responding to the impacts of climate change while working to mitigate the crisis. This third fluid space, the expanse within the adaptation-mitigation continuum, not only emphasizes the connection between the social and the ecological, but it also speaks to human agency and action.

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