

# Synthesis of Traditional Ecological Knowledge and Climate Change

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As a Graduate Research Assistant with the North Central Climate Adaptation Science Center at CU Boulder, Phurwa Dondrub synthesized findings from 42 sources to describe the state of knowledge on integrating Traditional Ecological Knowledge (TEK) in understanding climate change. Additionally, he summarized 30 selected sources, including 28 peer-reviewed articles and book chapters, one journal special issue, one guideline, and one PhD dissertation. This included works by ecologists, anthropologists, geographers, conservation and marine biologists, professionals such as forest service members and policy-makers, and a half dozen Indigenous scholars to ensure a well-rounded representation of knowledge. He wrote this synthesis report, as well as a bibliography consisting of 70 sources and a detailed summary of 28 selected works; based on his work, the NC CASC created a storymap and Zotero library (all available on the NC CASC website).

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# Definitions and Terminologies

**Guiding question:** who has the power and resources to define and study Traditional Ecological Knowledge (TEK), through what methodologies and frameworks, and whose interest does that serve?

Some use the term “local” to emphasize the localness and context-specific nature of the knowledge. Others use the word “indigenous” to specifically point out that it refers to unique knowledge systems of a particular community or cultural group. Some prefer the phrase “traditional knowledge” because it better reflects the ancient roots of knowledge and the central idea that knowledge can be passed down from one generation to the next. However, some Indigenous groups find the term “tradition” problematic insofar as it reifies a distant past and does not account for their knowledge as dynamic and embodied (Simpson 1999).

## Common definitions include:

- UNESCO definition— “Local and indigenous knowledge refers to the *understandings, skills and philosophies developed by societies with long histories of interaction with their natural surroundings*. For rural and indigenous peoples, local knowledge informs decision-making about fundamental aspects of day-to-day life. This knowledge is integral to a cultural complex that also encompasses language, systems of classification, resource use practices, social interactions, ritual and spirituality. These unique ways of knowing are important facets of the world’s cultural diversity, and provide a foundation for locally-appropriate sustainable development.”
- World Intellectual Property Organization (WIPO)— “Traditional knowledge (TK) is *knowledge, know-how, skills and practices that are developed, sustained and passed on from generation to generation* within a community, often forming part of its cultural or spiritual identity.”
- Berkes et al. (2000) (most popular and widely used definition)— TEK refers to “a *cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission*, about the relationship of living beings (including humans) with one another and with their environment” (1252).

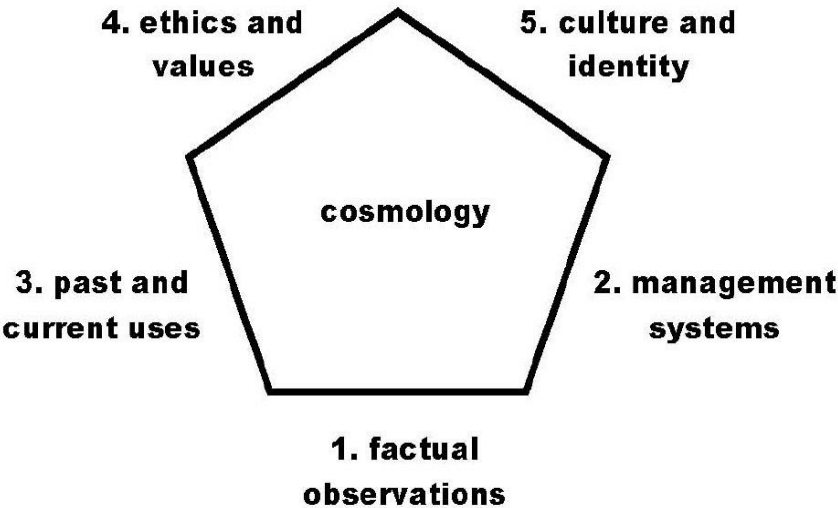




These mainstream definitions broadly treat TEK as a substance or things that can be passed down from one generation to another. Simpson (1999, 2004) and Hardison and Williams (2013) critiques these definitions as framed within Western epistemology and materialistic frameworks. They argue that such definitions do not account for the spiritual dimensions, values, and cosmologies nor conform to the cultural contexts and laws of Indigenous Peoples. Native scholars also warn about the potential misinterpretation and misuse of Indigenous knowledge by non-Indigenous scholars, especially when they ignore the “governance value” (Whyte 2018) of TEK.

### Critical Conceptions of TEK:

- Kyle Whyte (2018)— “Indigenous Knowledge are *that can provide trustworthy and useful wisdom for planning that supports collective self-determination in the face of change...* Indigenous knowledge are **not** backward looking repositories of information that are about historic or waning ways of life. Instead, they have a special value in Indigenous planning efforts that is different from the supplemental value of Indigenous knowledge for scientists” (10).
- Houde (2007)— identifies six interconnected and mutually informing faces of traditional ecological knowledge that can be used in co-management: *factual observations, management systems, past and current land uses, ethics and values, culture and identity, and cosmology*. Non-natives tend to understand and use the first three faces but Houde argues that all faces must be acknowledged in order to have a complete picture of TEK.





- Leanne Simpson (1999) does not provide a definition of TEK per se but notes that the term and the concept of TEK has been invented by and defined in non-Indigenous terms and scholarship: “It is often the case that Indigenous people do not necessarily use the term TEK to describe what they are doing. When they do, they are explicitly drawing on external framings of their knowledge and as a medium of communication.”
- We need to think of Traditional Knowledge "not as a commodity, but as a process, to be developed and nurtured differently in each context" (Stevenson 1998: 10 cited in Simpson 1999).
- Tim Ingold (2004) contends that TEK should not be viewed as a *substance* or mental content that is transmitted but as a *process* and *embodied practice* of people in their everyday lives. He differentiates between MTK (traditional knowledge in modernist conception) and LTK (traditional knowledge in local conceptions). In contrast to MTK, LTK is not stored in memory but is generated through interactions between persons and the environment. Tradition should not be viewed as the polar opposite of modern but as dynamic and continuous. Hence, any efforts to integrate traditional knowledge into scientific systems must treat TEK as dynamic systems of knowledge rather than reifying them as rigid rules or procedures.

In sum, these critical approaches view Indigenous knowledge not as “backward looking repositories of information that are about historic or waning ways of life” (Whyte 2018). Instead, they approach TEK as embodied, place-based, and process-oriented ways of life that have a special value to Indigenous planning efforts, their collective flourishing and the pursuit of self-determination.





# “Braiding” Knowledges: Themes and Issues

Guiding question: how is Traditional Ecological Knowledge used and to what benefits to science? How does that benefit Indigenous Peoples?

I identify two major approaches to integrating TEK in Science and vice-versa: Mainstream approach and critical approach.

Mainstream approach, often advanced by non-Indigenous scientists and scholars, is utilitarian in scope and appreciates the value of TEK as a source of data within scientific research and epistemological frameworks.

The critical approach, often advanced by Indigenous scientists and communities, seeks to approach TEK on its terms.

## Mainstream Approaches to Braiding Knowledge

### 1. Complementarity of Western Science and TEK

Majority of the articles agree that TEK is complementary to Western Science insofar as TEK refers to local observations and historical forms of information that can fill gaps in scientific data. However, some Indigenous scholars argue that the potential for complementarity can expand beyond seeing TEK as just a source of data.

Cochran et al (2013) notes, for example, that TEK is radically different from Western science because TEK emphasizes relationships (how to) rather than just facts (what is).

TEK constitutes multigenerational “deep spatial knowledge” of empirical landscapes and seascapes (Wildcat 2018). It focuses on relationality, sensitivity to small scale interactional changes, and therefore, can profoundly contribute to our understanding of climate change.

### 2. TEK as Data (Utilitarian approach)

This theme emphasizes the supplemental value of TEK to Western science in the sense that it can fill gaps in scientific data, improve scientific research, and facilitate environmental management and problem solving.

Most works on the use of TEK in environmental, climate, conservation, and ecological sciences (for example, UNESCO report *Weathering Uncertainty*, Weatherhead et al. 2010) stresses the value of Indigenous knowledge as local or historical data to fill gaps in data or scientific research; in these cases, Indigenous knowledge is utilized as “supplemental value” (Whyte 2018).

While this can improve science and inform policy and planning, it ignores the “governance value” of Indigenous knowledge.





### 3. “Saving” TEK by ex-situ documentation

Development organizations often frame Indigenous knowledge through the narratives of loss/disappearance due to the inevitable and incompatible force of modernization (Simpson 1999, 2004; Agrawal 1995). Recognizing its utilitarian value to Western science and development efforts, these organizations thus advance the imperative to “save” disappearing Indigenous knowledge through ex-situ documentation— that is, by collecting, documenting, storing them in the archives.

But critical scholars like Simpson and Agrawal argue that this only creates “caged knowledge”. Moreover, the narratives of loss and salvation don't account for the impact of colonialism on Indigenous people, land, and their knowledge. The appropriate thing to do, Agrawal suggests, is to support tribal members themselves to carry out in-situ documentation and to nurture political systems that respect and promote Indigenous self-determination.

### 4. TEK in Multi-Evidence Base (MEB) Research

One of most successful use of TEK by scientists and Indigenous scholars has been through multi-evidence based approach that treats TEK as an equally valid form of knowledge vis-à-vis scientific knowledge and frameworks. Hopping et al (2018), for example, combines local ecological knowledge of harvesters in the Himalaya with ecological modeling to come to a more complete understanding of the causes of the decline of caterpillar fungus. Likewise, Makondo and Thomas (2018), identifies areas of African indigenous knowledge that can be integrated in other forms of knowledge through a MEB approach. Although this approach doesn't always take Indigenous ontologies and governance systems into account, it nevertheless disrupts the dichotomy between Western knowledge and TEK.

### 5. Indigenous People as Stakeholders

Most efforts to integrate TEK into Scientific research and environmental Management take Indigenous partners as “Stakeholders”, not self-determining nations (Latulippe and Klenk 2020). Taking Indigenous partners as stakeholders often brackets out Indigenous sovereignty, land-based practices and cultural protocols.

—“tribes are sovereigns, not stakeholders” (Whyte 2013)

—exchange of knowledge should occur through a governance mechanism that treats traditional knowledge holders as members of sovereign tribal governments, not just a stakeholder group (Hardison and Williams 2013)





## 6. Different Epistemologies and Ontologies

“Braiding” knowledge often happens within Western frameworks that privilege Western ways of knowing. This is demonstrated, for example, by different terminologies scientists use to describe indigenous knowledge such as “information, data, intellectual property, public domain, secular and open knowledge”. In contrast, Indigenous people may use different terms like “guardianship, cosmivision, customary law, reciprocity, kinship, relationality” (Hardison 2014). Viewing TEK from Western frameworks also filters out spiritual and governance contexts within which TEK is embedded.

Cameron argues in the context of Arctic Indigenous Peoples that TEK and Climate Change in the Arctic perpetuates “colonial assumptions, knowledge, and practices” in at least three specific ways. — 1) by delimiting the Indigenous to the “local” and the “traditional”, 2) by framing climate change as anti/apolitical and largely a field of technical intervention, and 3) by obscuring or excluding the broader colonial political-economic contexts that have produced, and limited Indigenous peoples’ ability to respond to, climate change.



### Critical Approaches to Braiding Knowledge

#### 1. Recognition and respect for multiple ways of knowing

Traditional ways of knowing are not just valid, they are also built upon different epistemological and cultural contexts that need to be considered on their own terms (Hatfield et al 2018). Thus, TEK should not be framed within Western scientific epistemologies; consideration should be made to take it as an epistemology in itself. Respectful partnerships and collaboration requires the creation of “social and cultural climate change” (Wildcat 2018), that is, fostering a relationship based on justice.

#### 2. Indigenous knowledge is more than data

It is embodied and place-based, and therefore, cannot be separated from the people and the governance context.

#### 3. Use a framework of justice

Indigenous people are often most vulnerable to climate and other ecological changes. A justice framework recognizes this and “considers why it is morally essential for leaders, scientists and professionals to support tribal climate adaptation efforts” (Whyte 2013).



#### 4. Do not erase Indigenous people and institutions

Ironically, Hardison and Williams (2018) note that the majority of engagements with TEK and climate change tend to be extractive and do not adequately recognize Indigenous institutions and people. This occurs because of the assumption that TEK are data that can be extracted by detaching them from the knowledge holders as well as the geographical and cultural context of its production. Engage with diverse Indigenous people and recognize their institutions and systems of governance.

#### 5. Respect the “entire system of responsibilities” and appreciate “governance value” of TEK

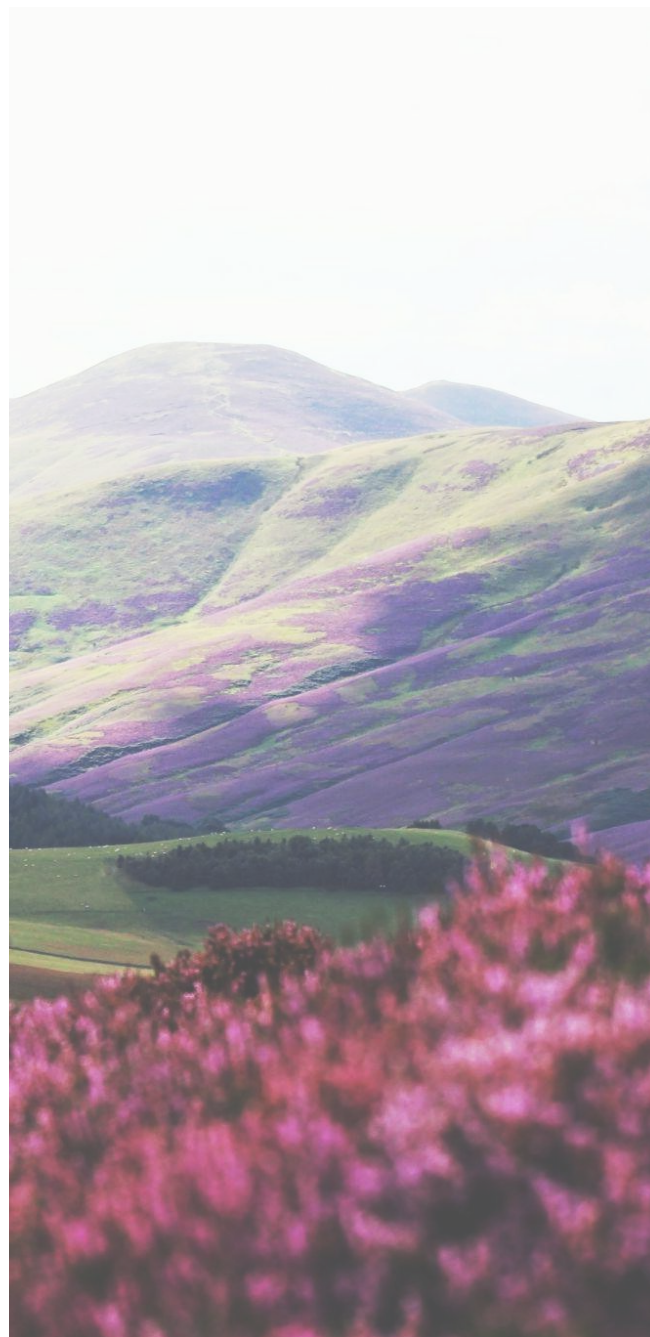
The integration of TEK in adaptation and management practices should *not just treat TEK as observational data, but as respecting “the entire systems of responsibilities* that are intrinsically valuable insofar as the systems are at the very heart of communities’ worldviews and lifeways” (Whyte 2012: 527). This means that Scientists should not just appreciate the “supplemental value” of IK but also its “governance value” (Whyte 2018). The appropriate form of knowledge exchange should involve scientists learning about the governance value and reflect upon their own positionalities in relation to whether and how their initiatives and frameworks advance the ideologies and governance systems of non-Indigenous settler states.

#### 6. Engage anti-colonial Indigenist Framework for the recovery of Indigenous Knowledge

Leanne Simpson champions this approach which, she argues, should focus on active strategies to dismantle colonial thinking and recover Indigenous Intellectual Traditions, Indigenous self-determination and control over their territories. As Simpson states, “the recovery of Indigenous self-determination and the recovery of Indigenous national territories are crucial elements for the renewal of Indigenous Knowledge” (375). This includes in-situ efforts to strengthen oral traditions, revitalize Indigenous language and cultural conceptions, land-based pedagogies that engage children with elders and teach them how to learn from the land. To make Indigenous knowledge relevant, efforts must be made to teach children how to live their cultural knowledge rather than documenting and storing in archives (Simpson 2004).

#### 7. Consider the linguistic-cultural context of TEK

It is important to draw on Indigenous management practices as well as the knowledge and worldview in which they are embedded and governance mechanisms that guide them in order to design effective alternative management systems (Burkett 2013). In other words, the linguistic-cultural contexts and expressions and governance systems are what drive Indigenous knowledge and therefore they should be taken into account. This might allow scientists to think outside the box of settler state laws and policies.





# What Does Indigenous Knowledge Do for Indigenous People?

*Based on Kyle Whyte's (2018) book chapter of the same title.*

When IK is valued for its role in supplementing scientific data, the potential benefits to IP is improved science that IPs can use. But when IK is valued for its governance role, it can enhance Indigenous capacities for resurgence and collective continuance.

For Indigenous Peoples, Indigenous Knowledges therefore (should) enable them to:

1. Advance the past, present, and future well being of Indigenous persons, families, communities, and nations;
2. Protect Indigenous knowledge sovereignty, or the internal capacity to cultivate, transmit, and exercise Indigenous knowledge;
3. Guide scientific research, not just the other way around; and
4. Define what Indigenous knowledge is and how it can be shared (Whyte 2018).

Ultimately, Indigenous knowledge have “governance value” for Indigenous people-- that is, it is an integral component of collective self-determination and of how Indigenous communities and nations plan for the future (Whyte 2018).







## How Do We Collect, Exchange, and Disseminate TEK?

Latulippe and Klenk (2020) outlines five aspects that need to be considered in our engagements with TEK:

1

### Legal Aspects

- Intellectual property rights
- Freedom of Expression Act
- Copyright laws treat traditional knowledge as being in the public domain which has the adverse effect of stripping away the beliefs and customary laws associated with it (Hardison and Williams 2013).

Respectful partnerships may be difficult without reforms in legal systems that take indigenous ways of knowing and being into account. Moreover, the sharing of indigenous knowledge should not just be governed by frameworks of property rights as this renders IK as secular, open and in public domain (Hardison 2014). Instead, IK should be protected for its value for Indigenous governance that advance Indigenous collective continuance (Whyte 2018).



## 2 Methodological Aspects

- What are the common methods used?
- Is there a Risk-benefit analysis?
- Is Free, Prior and Informed Consent followed?
- What are the procedural safeguards for accessing traditional knowledge?

## 3 Axiological Aspects

- Accounting or ethical aspects.
- How do we remain accountable in our engagements with TEK and the knowledge holders?

## 4 Epistemological Aspects

- What frameworks guide our ways of knowing?
- To make collaboration fruitful, there must be adequate sharing (but not a complete resolution) of epistemological underpinnings, maintaining respect across all knowledge holders (Hatfield et al 2018).

## 5 Ontological Aspects

- Linguistic-cultural-spiritual context and governance systems.





# NC CASC and Traditional Ecological Knowledge

These are some preliminary questions that NC CASC can use to reflect upon and design its climate adaptation efforts that involve tribal partners:

- How can NC CASC include TEK in its Request for Proposals? How can NC CASC have more tribal partners as co-PI's on future proposals and engage them through the project process?
- Are there any mechanisms in place at NC CASC for direct transfer of resources to tribal partners?
- What is the decision-making process in NC CASC's partnerships with tribal communities?
- How can NC CASC take its tribal partners as not just "stakeholders" but as sovereign nations with attendant rights and responsibilities?
- How does NC CASC approach TEK? Do we take it as an observational data to supplement scientific research, or recognize it as intrinsically valuable in and of itself by respecting "the system of responsibilities"?







## Traditional Ecological Knowledge and Climate Change

**“About Indigenous Peoples, not by them”**  
(Cochran et al., 2013)

“About Indigenous Peoples, not by them” (Cochran et al 2013)— Cochran et al (2013) points out that most national and international synthesis efforts on climate change have been about Indigenous Peoples rather than by them. This echoes much of the mainstream work on TEK stemming from fields as diverse as ecology, conservation biology, wildlife management, and climate science. Indigenous scholars are few and far between in these studies, though this summary will highlight works by Indigenous scientists too.

### Under-funded and Under-utilized

\*IPs widely acknowledged but under-funded and utilized (Makondo and Thomas 2018)— Although it is a widely acknowledged fact that indigenous people are most likely to be vulnerable to the impacts of climate change, and that their knowledge can contribute to design mitigation and adaptation measures, Makondo and Thomas (2018) points out that TEK and lived experience of Indigenous Peoples largely remain absent from climate change response to reduce vulnerability.

### Culturally Appropriate Understanding of Climate Change

TEK enables a culturally appropriate understanding of climate change that often involve contrasting conceptions of time, seasonality, scale, and relationship to other changes and the longer arc of colonialism (Hatfield et al 2018)



## Contributions to Understanding Climate Change

“TEK can profoundly contribute to our understanding of climate change given its focus on relationality, sensitivity to small scale interactional changes, and in-depth knowledge of landscapes” (Hatfield et al 2018)

## Experience of Climate Change

Indigenous people approach climate change “less as a future trend, and more as the experience of going back to the future” (Whyte 2017), referring to the North American Indigenous Peoples’ *deja vu* like past and present experiences of colonialism.

## “Renewing Relatives” (Whyte, 2017)

CC threatens contexts and systems of relationalities, hence Indigenizing CC should focus on “renewing relatives” (Whyte 2017) which involves “both restoring persisting relationships... but also creating new relationships that support Indigenous peoples’ mobilizing to address climate change.”





# Ethical Frameworks and Methodologies

- Tribal Adaptation Menu— provides a framework for incorporating indigenous knowledge, language, culture and history into climate adaptation planning process and natural resource management
- Hardison and Williams 2013— Examples of climate adaptation efforts from Waswanipi Cree in Northern Quebec where they are documenting TEK on their own to produce detailed community “family maps” detailing the past, present and future desired land use. They share these maps with the government and other actors for collaborative planning, while retaining the sensitive cultural knowledge internally.







## Moving Forward

Recently, there have been overwhelming calls requesting to establish partnership between Tribal and non-Tribal entities to design climate mitigation and adaptation strategies. One way to do so is to include Indigenous scholars and members in the process (Wildcat 2018).

Furthermore, we must integrate forward-looking justice in adaptation program frameworks to advance Tribal collective continuance, or the Tribe's ability to fight colonial hardship and foster robust living (Whyte 2018).

Throughout this process, we must facilitate respectful partnering and collaboration between Indigenous people and non-Indigenous governments and organizations by establishing a "social and cultural climate change." Collaboration and partnership should shelter and amend the systems of responsibilities or reciprocities in the relationship.

Additionally, we must promote "Indigenuity" and Indigenous Leadership for good relations (Wildcat 2018). "Indigenuity" refers to the suite of traditional knowledge and TEK practices that upholds the standard of maintaining good relationships in the complex and diverse life-systems of this planet:

*"The Indigenous Peoples or the First Nations of America must not only assume the leadership roles in addressing climate change adaptation strategies on their present colonially determined reservations, but for their extensive ancestral territorial lands... in order to maintain good relationships with our 'other-than-human' natural relatives." (Wildcat 2018, 514-15).*

It is essential to move beyond the dichotomy of Indigenous vs scientific knowledge; Agrawal argues that any productive engagement with Indigenous knowledge should move beyond the dichotomy of "Indigenous vs scientific" and advance greater autonomy for Indigenous peoples themselves (1995). Instead of documenting Indigenous knowledge as some form of reified substance, the more appropriate efforts, he suggests, might be to *engage politics* by "attempting to reorient and reverse state policies to permit members of threatened populations to determine their own future, and attempt thus, to facilitate in situ preservation of indigenous knowledges" (Agrawal 29).



Additional strategies for partnerships between Tribal and non-Tribal organizations include:

- **Make room and move over** (Latulippe and Klenk 2020)

Non-Indigenous actors should “make both substantive investment in relationships that value Indigenous ways of knowing and being (to make room) and transfer resources and authority (decision-making power) to Indigenous-led projects and indigenous research leaderships (to move over).

Making room and moving over, in other words, is to respect Indigenous knowledge sovereignty— which refers to the entitlement of Indigenous peoples’ to practice their intellectual traditions in line with their governance processes, sovereignty, and legal orders. However, making room and moving over have limits.”

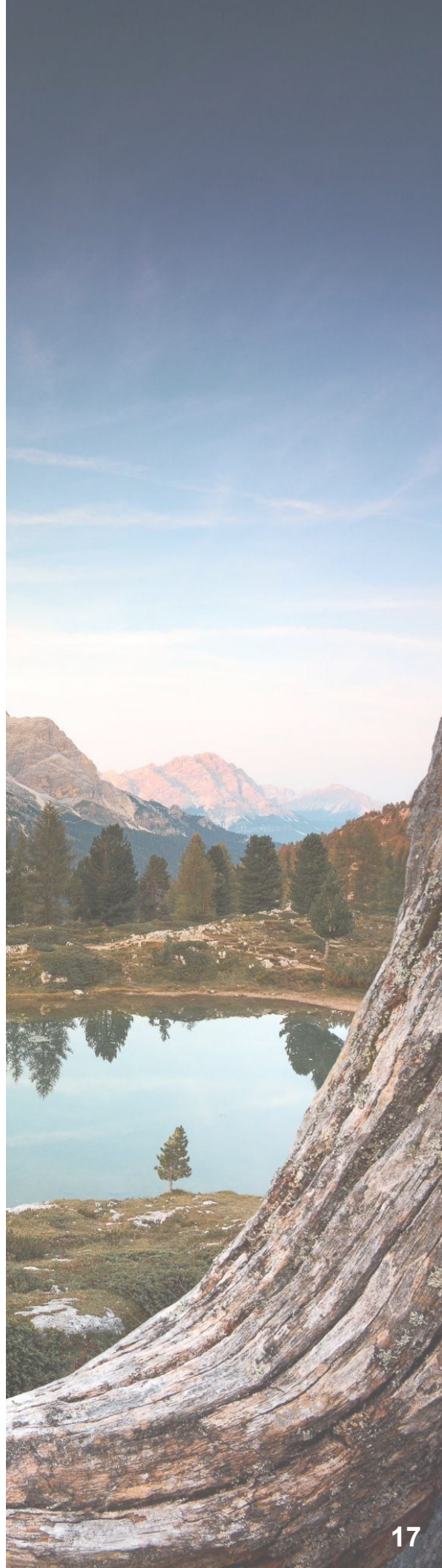
Decolonization is not a metaphor. It requires nothing less than concrete, material actions to rematriate Indigenous lands (land back).

- **Respect Indigenous ethical guidelines and protocols for research**

Many Tribal communities have their own ethical guidelines and protocols for research. Identify and respect them. When they don’t have ethical guidelines, develop or follow guidelines that protect data sovereignty, and respect Indigenous cultural contexts and governance mechanisms.

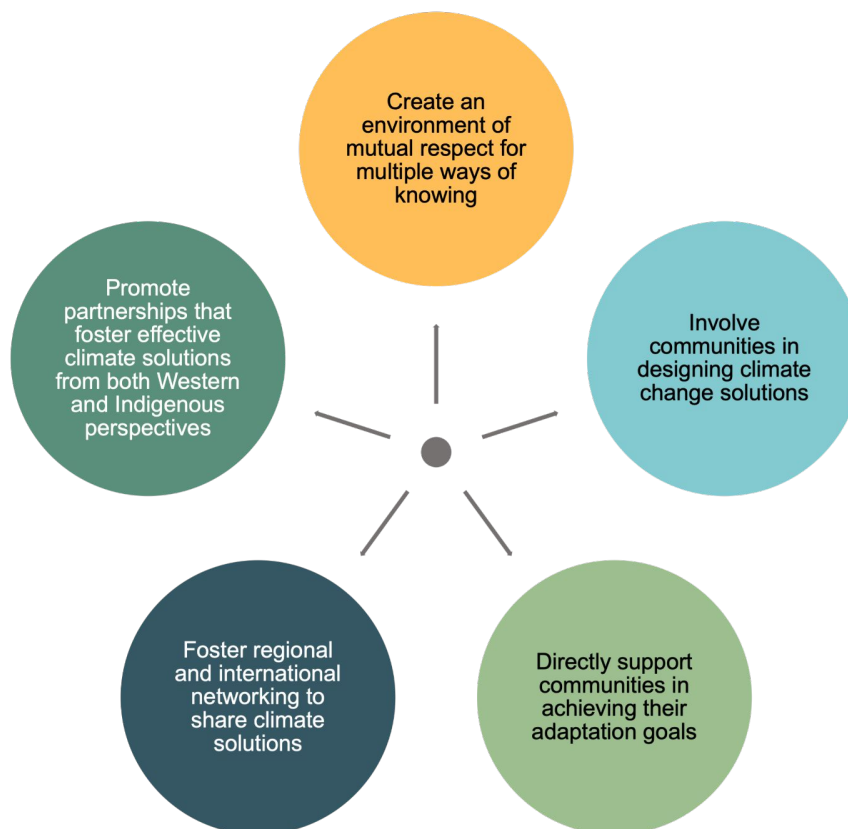
As an example, the Tribal Climate Adaptation Menu provides a framework for incorporating Indigenous knowledge, language, culture and history into the climate adaptation planning process and natural resource management. It contains guiding principles for interacting with Tribes and culturally appropriate actions such as:

1. Developing a language of parity between human-nonhuman relationships;
2. Recognizing histories of erasure and revitalize tribal language and culture
3. Considering specific cultural paradigms, such as offering tobacco in Anishnabee culture);
4. Proper community engagement; and
5. Recognizing colonial histories including the violation of treaty rights.





Five approaches for collaboration and partnership between IPs and scientists, governments (P. Cochran et al. 2013):



## Literature Gap

- **Global South Resources:** TEK and CC literature is dominated by Global North context; there is very little on Global South, if any. These sources tend to be very uncritical and therefore marginal (e.g. Shimrah 2018; Lemi 2019).
- **Sovereignty:** TEK literature is also primarily dominated by natural sciences, although there is also social science literature, particularly from the fields of geography, anthropology and Indigenous studies. The natural sciences tend to integrate TEK as data in scientific research whereas the social sciences tend to be critical assessments of the politics of TEK.
- **Social Sciences:** Hardly any work by non-Indigenous actors that take TEK beyond its utility to science as data-- to advance Indigenous knowledge sovereignty and their pursuit of self-determination.



# Best Practices to Integrate TEK and Western Science

- The Indigenous Peoples' Global Summit on Climate Change held in Anchorage in 2009 ([www.un.org/ga/president/63/letters/globalsummitoncc.pdf](http://www.un.org/ga/president/63/letters/globalsummitoncc.pdf))
- The Exchange for Local Observations and Knowledge in the Arctic (ELOKA; [www.eloka-arctic.org](http://www.eloka-arctic.org)) which fosters the “collection, preservation, exchange, and use of local observations and knowledge of the Arctic,” in partnership with indigenous communities, researchers, and others.
- United Nations & Framework Convention on Climate Change. 2013. Best practices and available tools for the use of indigenous and traditional knowledge and practices for adaptation, and the application of gender-sensitive approaches and tools for understanding and assessing impacts, vulnerability and adaptation to climate change. Technical Paper. <https://unfccc.int/resource/docs/2013/tp/11.pdf>





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