

## Chapter 6: Economic Development: Renewables, Sustainable Economies, & Carbon Offsets

*This chapter reviews economic development issues and opportunities that Tribes face in the age of climate change. It includes summaries pertaining to Tribal histories and trauma, harmful federal policies and subsequent land tenure issues, and the surge of economic sovereignty through renewable energy development on Tribal lands, including carbon offset markets. Recommendations are offered to reinforce and expedite Tribal economic self-determination on Tribal lands in the context of climate change. The chapter opens with the narrative of the Ute Mountain Ute Tribe of southwest Colorado, describing how this Tribe developed a large-scale solar economic development project to reduce their Tribal energy bills and decrease their dependence on fossil fuel usage. A researched overview of Economic Development as it relates to Tribes and climate change follows these narratives, beginning with the Key Messages and Recommendation that the authors have identified.*

**Ute Mountain Ute Tribe's Energy and Economic Development Nexus** (excerpted and adapted from [ITEP's Tribes and Climate Change profile](#)<sup>28</sup>)

**Written by: Ute Mountain Ute Tribe and Dara Marks-Marino, ITEP**

The Ute Mountain Ute (or Núchíú) reservation lies in the Four Corners region of the Colorado Plateau covering portions of southeast Utah, southwest Colorado, and northwest New Mexico. Traditional Ute people were nomadic and utilized natural and cultural resources in these areas and beyond. Ute history, passed through generations, says that the people have lived here since the beginning of time.

Our Tribal reservation lands are located in the wide-open expanses of the semi-arid desert encompassing canyons and segments of the San Juan and Mancos Rivers. The dominant geographic landmark is the Ute Mountain, and the southern section of Mesa Verde National Park borders the reservation. This area, known as the Ute Tribal Park, provides opportunities for tourists to visit undeveloped ancestral Pueblo cliff dwellings with a Ute Mountain Ute guide. Other Ute initiatives include a farm and ranch enterprise, a construction company, two travel centers, and a casino with a hotel and RV park.

The majority of the 2,200 Tribal members reside in the capital of Towaoc near Cortez, Colorado, and there is a smaller community of 250 residents in White Mesa, Utah. The only school on the reservation is

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<sup>28</sup> Ute Mountain Ute People: Preparing for a Warmer Climate. Profile on ITEP's Tribes and Climate Change website. [http://www7.nau.edu/itep/main/tcc/Tribes/sw\\_utemountain](http://www7.nau.edu/itep/main/tcc/Tribes/sw_utemountain)

for early childhood education. A culturally focused charter school for kindergarten and first grade students will open in the fall of 2021. Students from 1st through 12th grades are bussed to the towns of Cortez, Colorado, and Blanding, Utah.

The Ute Mountain Ute Tribe has undertaken and is undertaking many climate change mitigation and adaptation actions that are also important economic development opportunities for the Tribe. We recently constructed a 1-megawatt (MW) community solar project,<sup>29</sup> which offsets a portion of our community members' and Tribal government electric bills. The reduction in energy bills is a welcome respite, as is the reduction in fossil fuel usage. Commissioned in March 2020, the 3,600 photovoltaic (PV) panel solar power system generated close to 2 million kWh of electricity in its first 10 months of operation. Additional community scale solar projects are scheduled for the White Mesa and Towaoc communities.



*Towaoc Community Solar power plant—over 3,600 PV panels, creatively net-metered; Ute Peak in background.*

A cornerstone of the Tribe's response to climate change is a transition from its former economic development model that relied heavily on fossil fuels (oil and gas) to a greener alternative. The Tribe has worked with the Department of Energy and its national labs: Sandia Labs assisted with energy planning and strategy, and the National Renewable Energy Lab assisted with youth outreach and other technical assistance. The Department of Energy Tribal Program cost-shared energy efficiency planning and the Towaoc Community Solar project and is poised to cost-share the White Mesa Solar Initiative in 2021. As envisioned by its Renewable Energy Team and the strategic planning with Sandia Labs, the community solar projects are a stepping stone to embrace the technology and look toward larger commercial-scale projects. The

Tribe is actively working with multiple entities to plan, fund, and build commercial-scale solar and energy-storage projects thousands of times the size of the Towaoc project. The Tribal Councils have committed to cost-sharing approximately \$1.5 million in community solar projects in the last five years. Commitment of land and other resources to commercial-scale renewable energy development is anticipated on a large scale in the next five years. Our Tribal Leaders are embracing the transition to greener revenue sources.

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<sup>29</sup> The Journal, "Solar power comes to Ute Mountain Tribe": <https://the-journal.com/articles/131295>

## **Economic Development: Renewables, Sustainable Economies, & Carbon Offsets**

### **Key Message**

Indigenous science, knowledges, philosophies, and heritages guide Tribal self-determination in rediscovering economic sovereignty through pursuing, among other sustainable enterprises, renewable energy development, carbon sequestration via carbon markets, water and food security, and subsistence-based enterprises.

### **Recommendations**

- Address complex land tenure, fractionation, and checkerboard jurisdictional boundary issues that persist on reservation lands and may constrain Tribal economic sovereignty.
- Invest in capacity building that increases in-house legal, technical, vocational, and varied fields of research expertise to strengthen Tribal economic self-determination while mitigating the effects of and adapting to a changing climate.

## **Early Federal Policy, Forced Assimilation, and Resurgent Self-Determined Tribal Economies**

Federal policies have dramatically impacted Tribal economies. In many cases, early treaties between Tribal nations and the U.S. government dramatically reduced ancestral lands, while other legislative actions relocated Tribal nations from their ancestral homelands to reserved lands held in trust by the federal government. Such federal policies were designed to assimilate Tribal nations to resemble European culture and economies, which relied heavily on resource extraction for timber, minerals, and agricultural production (see *Chapter 7: Energy & a Just Transition*). Fueled by the industrial revolution during the Treaty-Making Era (1778–1868), these economies followed a linear flow of production, distribution, point of sale, consumption, and ultimately disposal of goods and services. Much of the economic development activity on Tribal lands was overseen by these forces and driven by a paradigm of steady increases in gross domestic product, job creation, and increased per-capita income. With increasing popular interest in the environment during the latter half of the 20th century in the Self-Determination Era (1968–present), and particularly with pressures to mitigate and adapt to climate change during the 21st century, more economists are proposing sustainable or “circular” economic activities. Such activities recirculate or recover limited resources (making them unlimited) (Steen-Adams et al., 2020) rather than dispose of or waste materials and goods (Prieto-Sandoval et al., 2018; Araujo Galvão et al., 2018; Geissdoerfer et al., 2017).

Through a resurgence of self-determination, guided by Indigenous science, knowledges, philosophies, and heritages (Whyte, 2015), Tribal nations are rediscovering their economic sovereignty through sustainable and climate-resilient enterprises. Such enterprises aim to avoid resource depletion, improve human wellbeing and social equity, and preserve their culture and the natural environment for future generations (Indigenous Phenology Network, 2020; Trosper, 2005). In fact, the relational approach of Indigenous peoples to their economies is immersed in Indigenous knowledge that is relational and reciprocal with the environment (Chisholm Hatfield et al., 2018; Pierotti & Wildcat, 2000; Trosper, 2005; Trosper, 1995).

Global interest in Indigenous science, expressed as Indigenous knowledge, to mitigate and adapt to climate change is facilitating its integration into the evolving, and increasingly mainstream, field of sustainable science and related policy (Cajete, 2012). While a reawakening of Indigenous knowledge provides opportunities for Tribal nations to innovate, transform, and sustain their community-based

economies into the 21st century (Cajete, 2012), it also incentivizes Tribal nations to take steps to protect sensitive Indigenous information (Whyte, 2015).

### **Property Rights and Fractionated Interests as Obstacles to Economic Development**

Tribal governments have been successful in exercising self-determination legally following the 1975 Indian Self-Determination and Education Assistance Act, Public Law 93-638 (Act). This Act authorizes federally recognized Tribal nations to enter into contracts with the U.S. government, generally called “638 contracts,” to support greater Tribal autonomy and responsibility for those government programs and services administered to them through the Secretary of the U.S. Department of the Interior (Bureau of Indian Affairs, 2020). The strengthening of this relationship over recent years has led to successful economic transformations that are adaptive to climate change. However, legal barriers still remain that are largely the result of 19th century federal policies implemented during the Removal (1830–1850), Reservation (1850–1887), and Allotment and Assimilation (1887–1934) Eras to relocate, dominate, and assimilate Indigenous peoples (Miller, 2006; Miller, 2012). The Dawes or General Allotment Act of 1887, for example, resulted in a complex system of property rights on reservation lands that continues to impact Tribal economies today (Indian Land Tenure Foundation, 2020; Dippel et al., 2020; Leonard et al., 2020; Anderson, 1995).

The following are examples of Tribal land tenure types:

- Tribal trust land, which is inhabited and governed by Tribal nations for their beneficial use with the legal title held by the federal government. A Tribe cannot sell or lease trust land without federal government approval. Tribes may purchase additional land that can be held in trust with federal government approval. A Tribe may assign parcels of trust land to Tribal members to use for periods that last for the lifetime of an individual or family assignee. The assignment can be passed on to heirs for continued beneficial use, with Tribal approval. These lands are exempt from state or federal property taxes.
- Allotted trust land, in which the federal government also holds the legal title, but beneficial interest of a specific surveyed land parcel is allotted to Tribal individuals and heirs per the General Allotment Act. These lands are exempt from state and federal property taxes.
- Fee-simple land, which refers to formerly allotted Tribal trust lands of individual Tribal members, per the General Allotment Act, later converted from trust status to fee-simple status. Fee-simple lands may lie within, adjacent to, or outside the boundaries of Tribal or reservation trust lands (Regan & Anderson, 2014). Tribal governments, individuals, or non-Tribal individuals or entities may purchase fee-simple lands. These lands are subject to state and federal property taxes.

The concept of trust land derives from the Trust Doctrine, which expresses a fundamental principle of 19th century federal policy that established federal rights in perpetuity to lands reserved for Tribal nations (Miller, 2012). The Trust Doctrine describes the federal government’s role to act as trustee for Tribal nations and, as such, assume a fiduciary or trust responsibility for Tribes. While trust land status affords Tribes the right to occupy lands for their beneficial use, it prohibits Tribal governments from mortgaging these lands—a restriction that severely limits a Tribe’s ability to secure financing for construction or infrastructure investment pursuant to economic development projects (Anderson et al., 2016; Anderson, 1995). Historical and ongoing federal oversight of Tribal lands, and related natural resource management decisions on these lands, can hinder Tribes’ economic development initiatives (Anderson et al., 2016; Anderson & Leonard, 2016), including renewable energy development (Ravotti, 2016). It is challenging for Tribal governments to pursue economic sovereignty if their land and related resource assets are subject to federal intervention and approval, particularly because such oversight can complicate and delay economic development projects in many instances.

In addition, the General Allotment Act, which facilitated non-Indian settlement of high-quality agricultural lands initially reserved for Tribal occupancy, ultimately resulted in fractionated land ownership (Leonard et al., 2020; Banner, 2005). A significant developmental challenge resulting from the General Allotment Act is that today single tracts of allotted trust lands often have large numbers of undivided interests from dispersed inheritance. The term “undivided interest” means that each of the beneficiaries share the tract equally—which over time becomes a meager fraction of interest. For example, on allotted trust land tracts, which can have dozens or even hundreds of owners, the majority (51%) of interest holders must be in agreement for any decision or action to be taken on that land (Shoemaker, 2015). This can be a huge undertaking for tracts with large numbers of interest holders. This constraint on land transferability makes it difficult to acquire private financing needed for land improvements and can disincentivize investments (Dippel et al., 2020). Additionally, there is no practical way for Tribes to obtain required federal approvals for land leases for economic development that require federal administration.

Tribes encounter challenges at the allotted-tract scale while also battling barriers when performing actions on a broader scale on adjacent fee-simple lands, formerly trust lands. That is, less productive agricultural lands that were allotted to Tribal individuals, combined with a lack of access to operating capital and technologies, yielded few benefits from agriculture and forestry (Anderson & Lueck, 1992) (see *Chapter 7: Energy & a Just Transition*). Subsequently, once allotments were converted to fee-simple lands following the 25-year alienation period stipulated in the General Allotment Act, a substantial number of allotted land tracts passed out of Tribal ownership (Russell, 2000; Kappler, 1902). While reservation lands are subject to both federal law and Tribal authority, state and other local law and authorities do not apply. On the other hand, because fee lands are not held in trust, they are subject to federal, state, and other local law and authorities (Jones, 2016). On many reservations, both trust and fee lands coexist side by side, creating a checkerboard pattern of multiple jurisdictional oversight and conflicting land-holder perspectives (Miller, 2012). These checkerboard jurisdictional issues greatly limit Tribes’ resource management decision-making authority on land parcels within their reservations, challenge their improvements to the ecological health of surrounding lands and waters, and can ultimately derail the sustainability of their economies (Indian Land Tenure Foundation, 2020).

### **Federal Policies and Energy Development on Tribal Lands**

While the federal government recognizes Tribal nations as sovereign entities, their utilities (i.e., electricity, water, and natural gas) are regulated by state governments, and power interconnections may be subject to inspection by state and local authorities. This jurisdictional complexity can often delay or prevent Tribal nations’ pursuits of renewable energy development on Tribal lands. To further complicate matters, the development of different types of renewable energy is governed by different laws at the Tribal, state, and local jurisdictional levels. One example impacting Tribal energy development initiatives is that, as federal tax-exempt sovereign nations, Tribes are not eligible for federal financial incentives to develop renewable energy (Jones, 2016). These federal policy barriers, and ongoing ambiguity in Tribal property rights and resource institutions, deter Tribes from pursuing large-scale energy development projects. For example, Tribes must undertake 49 steps to receive federal approval to execute energy-development projects on trust lands. Even if projects successfully complete these steps, many become stuck in the pre-development phase due to lack of financing, transmission access, and tax structures that include both Tribal and state taxation (Kronk-Warner, 2013). Thus, while Tribal governments may desire to develop and execute their own energy projects, many ultimately have chosen federally approved longer term leases with outside developers (Jones, 2016) to avoid confusing taxation structures due to checkerboard jurisdiction.

The Indian Long-Term Leasing Act of 1955 requires the U.S. Secretary of the Interior to approve Tribal trust land leases for up to 25 years, with an option to extend for an additional 25-year term, for public, religious, educational, recreational, residential, or economic development purposes (Kronk-Warner, 2013). Because this federal approval also involves a lengthy process, and in order to promote Tribal self-determination, the Indian Tribal Energy Development and Self-Determination Act (ITEDSA) was passed in 2005. This federal legislation provides a framework for developing renewable energy infrastructure on Tribal lands by allowing Tribal nations to regulate the conveyance of their own energy resources. It authorizes preapproved Tribes to enter into land leases and similar agreements without federal oversight for the construction of renewable energy networks. The U.S. Department of the Interior subsequently created the Division of Indian Energy Policy Development, while the U.S. Department of Energy created the Office of Indian Energy Policy and Programs. Authorized by ITEDSA, both programs provide grants, technical assistance, low-interest loans, and loan guarantees for Tribes to these ends. Tribes are authorized to enter into Tribal Energy Resource Agreements (TERAs) with the U.S. Secretary of the Interior as long as those projects are executed pursuant to the TERA and the terms are less than 30 years (National Archives and Records Administration, 2019). While ITEDSA removes federal approval requirements for these leasing purposes, TERAs are still required (Bronin, 2016).

Less than a decade after the passage of ITEDSA, Congress enacted the Helping Expedite and Advance Responsible Tribal Home Ownership (HEARTH) Act in 2012. This federal legislation aims to streamline the environmental review process by allowing preapproved Tribes to voluntarily execute and regulate land leases on Tribal trust lands prior to completion of a federal environmental review (Warner, 2013). To date, the HEARTH Act has been used primarily for leasing of trust lands for business, agricultural, residential, public, religious, educational, or recreational purposes. However, the legislation does not authorize Tribes to execute leases for the exploration, development, or extraction of any mineral resources on their Tribal trust lands. It also extends terms to a total of 75 years maximum on existing leases (Bureau of Indian Affairs, 2014). Between 2013 and 2020, the U.S. Secretary of the Interior approved 58 Tribal agricultural and other business leasing regulations (Bureau of Indian Affairs, 2021a).

While environmental review processes and land tenure issues continue to challenge sustainable economic development on Tribal lands, this chapter presents examples of Tribal nations pursuing their economic sovereignty. Examples focus on initiatives to create sustainable Tribal economies through the development of renewable energy and carbon offset market projects.

### **Sustainable Tribal Economies via Renewable Energy**

Historically, energy development for the purpose of developing Tribal economies has been limited to the few Tribes and Native corporations that possess fossil fuel reserves. However, the rapid growth in renewable energy markets, including wind and solar, offers a growing number of Tribes the opportunity to participate in renewable energy markets. It is estimated that Tribal lands represent approximately 6.5% of the U.S. total national technical potential for utility-scale renewable energy development (Milbrandt et al., 2018). Figure 12 and Figure 13 demonstrate that wind and solar renewable energy resources are much more widely distributed on reservation lands than nonrenewable energy resources, affording more Tribes the opportunity to develop renewable energy as sustainable economic enterprises.

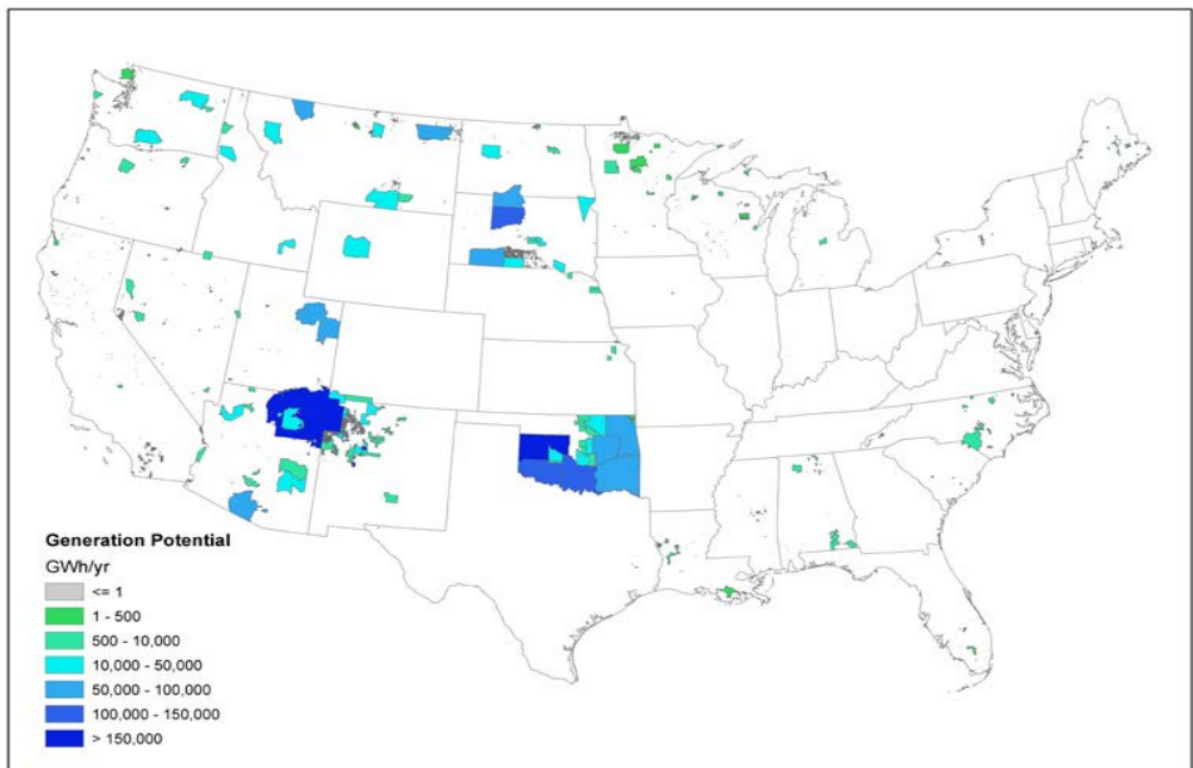


Figure 12. Wind Generation Potential by Reservation. Sources: Milbrandt et al., 2018; U.S. Department of Energy, 2018. Tribal Energy Atlas. <https://maps.nrel.gov/tribal-energy-atlas/>

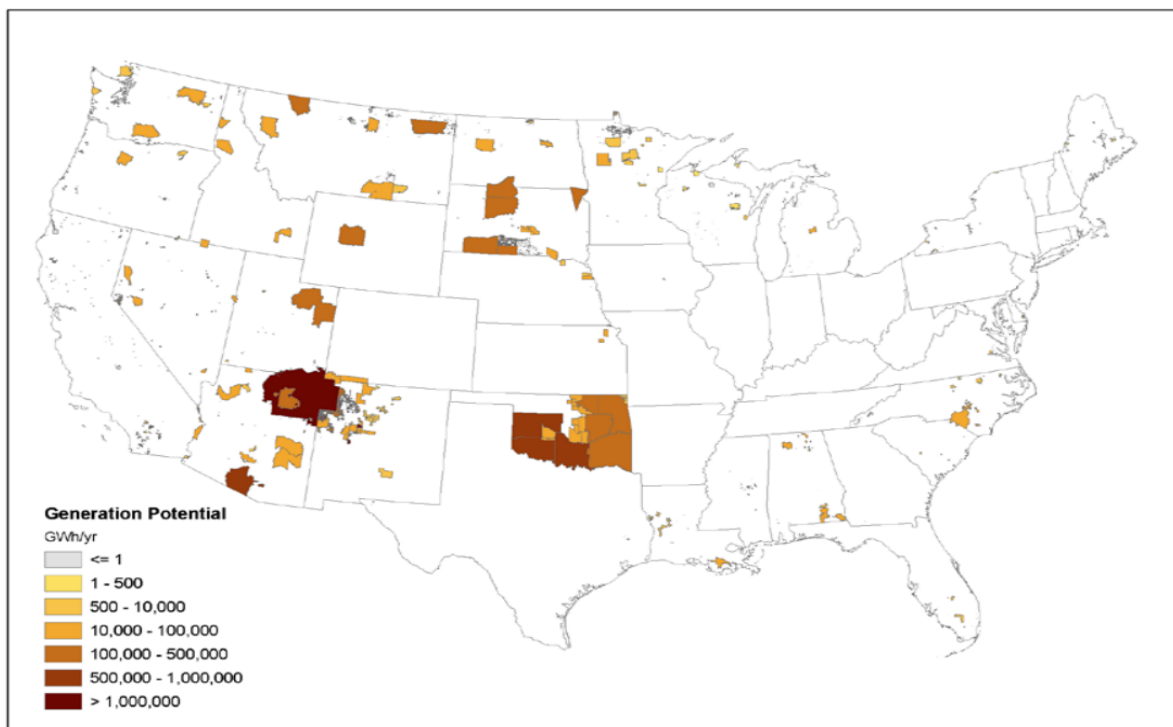


Figure 13. Solar Photovoltaic Generation Potential by Reservation. Sources: Milbrandt et al., 2018; U.S. Department of Energy, 2018. Tribal Energy Atlas. <https://maps.nrel.gov/tribal-energy-atlas/>

Renewable energy technologies can be developed either for self-consumption or for sale through the interconnected electrical grid. While distributed energy resources<sup>30</sup> and behind-the-meter<sup>31</sup> development each may have economic impacts, such as energy price reduction or increased energy resilience, they do not typically generate significant revenue. Utility-scale generation, however, can diversify Tribal revenue streams while helping to transition to a clean energy economy and enhance Tribal economic sovereignty. Utility-scale generation is renewable energy developed to sell at market or directly to an off-taker. The rapidly decreasing costs of solar photovoltaic (PV) technology and wind energy technologies have made this development cost-competitive when compared with conventional options such as natural gas power plants. Both an increase in available transmission line capacity due to increasing numbers of coal plant retirements and the increasing market demand for renewable energy generation from states, municipalities, and corporations have presented new economic opportunities for Tribal nations. At the same time, past investment in technical assistance and project-development education, through the U.S. Department of Energy and U.S. Department of the Interior, have prepared many Tribes to participate in larger, more complex, innovative projects to leverage the energy market for economic diversification.

One such example is the Moapa Band of Paiute Indians' solar project with First Solar. The 250-megawatt (MW) solar array displaces over 341,000 metric tons of CO<sub>2</sub> annually while generating new income revenues for the Tribe in the form of lease payments, consulting fees, and jobs. At peak construction, the project generated roughly 600 temporary jobs (filled first by Tribal members and then the local community more broadly), with five positions turning into long-term operation and maintenance roles (First Solar, 2020).

Solar PV can generate revenue streams at smaller scales as well. Picuris Pueblo—a community of roughly 300 members and fewer than 100 homes—has also developed solar economic enterprises. In 2015, in partnership with the Northern Pueblos Housing Authority and with grant funding from the U.S. Department of Energy, Picuris Pueblo entered into a 25-year power-purchase agreement with Kit Carson Electric Cooperative to provide electricity to the utility. The project generated over \$130,000 for the Tribe in 2018 alone and provided new and likely sustainable economic opportunities for the Tribe and its communities (Kit Carson Electric Cooperative, 2017; Quanchello, 2018).

Solar is not the only opportunity for Tribal renewable energy development. In 2007, the Forest County Potawatomi Community established the goal of becoming carbon neutral in their energy generation through increased energy efficiency and the implementation of renewable energy projects. The Forest County Potawatomi Community was one of the first communities in the U.S., including non-Tribal jurisdictions, to set such a goal. Through a grant from the U.S. Department of Energy in 2010, the Tribe built a biogas facility. The Tribe worked with a local utility offtaker, which helped the Tribe reach its own energy goals while also aiding the local utility in reaching state-mandated clean energy targets. The project generates revenue through the sale of electricity to the local utility as well as through tipping fees and heat sales (Ricci, 2018; Drescher, 2020). In addition, the Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians and the Coquille Tribe are pursuing offshore wind energy development in Oregon.

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<sup>30</sup> Distributed energy resources refer to energy generation and storage technologies that are not connected to the bulk power grid and are capable of exporting active power to a local electronic power system (Institute of Electrical and Electronics Engineering, 2018).

<sup>31</sup> Behind-the-meter energy generation and/or storage denotes the placement of distributed energy sources that are on the customer side of the meter (Institute of Electrical and Electronics Engineering, 2018).



## Sustainable Tribal Economies via Carbon Offset Market and Renewable Energy

Examples of sustainable Tribal economies include carbon sequestration via carbon markets, green or sustainable enterprises, ecosystem services, and natural resource-based or subsistence-based economic enterprises. Table 2 demonstrates 20 Tribal nations and Alaska Native corporations that have pursued economic development opportunities to execute Tribal self-determination, establishing sustainable offset and energy projects. The following list, although not exhaustive, highlights projects established as early as 2003 and includes wind, hydroelectric, methane capture, and carbon offsets.

Table 2. Tribes and Alaska Native corporation carbon offset and renewable projects, locations, and dates that agreements were either established or projects were completed.

Tribe or Corporation Name	Project Type	Location	Dates Established or Completed
Rosebud Sioux Reservation <sup>1</sup>	Renewables-Wind	SD	2003
Kasigluk Traditional Elders Council <sup>1</sup>	Renewables-Wind	AK	2006
Village of Toksook Bay <sup>1</sup>	Renewables-Wind	AK	2006
Confederated Salish and Kootenai Tribes <sup>1</sup>	Renewables-Hydro	MT	2008
Southern Ute Indian Tribe <sup>1</sup>	Renewables-Methane	CO	2009
Rosebud Sioux Reservation <sup>2</sup>	Renewables-Wind	SD	2010
Round Valley Indian Tribes <sup>3</sup>	Carbon Offsets-Forest	CA	2013
Yurok Tribe <sup>3</sup>	Carbon Offsets-Forest	CA	2013
White Mountain Apache Tribe <sup>4</sup>	Carbon Offsets-Forest	AZ	2014
Yurok Tribe <sup>5,7</sup>	Carbon Offsets-Forest	CA	2014
Confederated Tribes of the Colville Reservation <sup>6</sup>	Carbon Offsets-Forest	WA	2015
Confederated Tribes of the Warm Springs Reservation <sup>7</sup>	Carbon Offsets-Forest	OR	2015
Mescalero Apache Tribe <sup>3</sup>	Carbon Offsets-Forest	NM	2015
Passamaquoddy Tribe - Joint Tribal Council <sup>6</sup>	Carbon Offsets-Forest	ME	2015
White Mountain Apache Tribe <sup>4</sup>	Carbon Offsets-Forest	AZ	2015
Chugach Alaska Regional Corporation <sup>3</sup>	Carbon Offsets-Forest	AK	2017
Spokane Tribe of Indians <sup>6</sup>	Carbon Offsets-Forest	WA	2018
Confederated Salish and Kootenai Tribes <sup>2,8</sup>	Renewables-Hydro	MT	2020
Ahtna, Inc. (Regional Corporation) <sup>6</sup>	Carbon Offsets-Forest	AK	Unknown
Huna Totem Village Corporation <sup>6</sup>	Carbon Offsets-Forest	AK	Unknown
Nanwalek (English Bay) Village Corporation <sup>3</sup>	Carbon Offsets-Forest	AK	Unknown
Port Graham Village Corporation <sup>3</sup>	Carbon Offsets-Forest	AK	Unknown
Sealaska Regional Corporation <sup>6</sup>	Carbon Offsets-Forest	AK	Unknown
Seldovia Native Association (Village Corporation) <sup>3</sup>	Carbon Offsets-Forest	AK	Unknown
Tyonek Native Village Corporation <sup>6</sup>	Carbon Offsets-Forest	AK	Unknown

Sources: NativeEnergy (2018a, 2018b, 2018c, 2018d, 2018e)<sup>1</sup>, U.S. Department of Energy (2013, 2015)<sup>2</sup>, New Forests (2020)<sup>3</sup>, Spatial Informatics Group (2020)<sup>4</sup>, Yankel (2014)<sup>5</sup>, Finite Carbon (2020)<sup>6</sup>, California Environmental Protection Agency (2020)<sup>7</sup>, Montana Public Radio (2020)<sup>8</sup>.

The Alaska Native Claims Settlement Act (ANCSA) of 1971 extinguished aboriginal land title in Alaska, dividing that state into 12 geographic regions defined by Indigenous common heritage and interests.

This division initiated the creation of 12 private, for-profit Alaska Native regional corporations and 200 village corporations. Regional corporation lands are essentially fee-simple lands with individual shareholders, and therefore individual Alaska Natives who are enrolled in these regional corporations may generate revenue from land resource assets (Resource Development Council for Alaska, Inc., n.d.). Ahtna Incorporated, one of the 12 regional corporations, is Alaska Native- and shareholder-owned with more than 2,000 shareholders, the majority of whom are Ahtna Athabascan or Alaska Native descent. Ahtna Incorporated demonstrates the largest carbon offset economic development project in the U.S. to date. Utilizing more than a half-million acres of forested lands to sequester carbon, this project has sold more than 14.8 million offset credits (Finite Carbon, 2020). Its shareholders manage the carbon offset project, creating new jobs in building carbon offset markets and renewable energy markets in general, as well as increasing economic returns on investments for Alaska Natives. The potential for growth in this new field may facilitate more Alaska Natives remaining on their ancestral homelands (Finite Carbon, 2020).

A comparatively smaller example of carbon offset economic development is in progress on Round Valley Indian Tribal lands. While this project encompasses only 5,550 acres, in 2020 it managed to sell over 500,000 offset credits. The project supported ongoing sustainable forestry objectives, such as protecting old growth while improving the health of Douglas fir and pines, reducing wildfire risk, and enhancing local livelihoods and traditional cultural uses of the forests (New Forests, 2020). The success of a project this size affirms that other Tribal nations with small-forested land bases may forge collaborative agreements to achieve economically feasible and sustainable project investments and returns.

The Confederated Salish and Kootenai Tribes (CSKT) provide a prime example of renewable energy innovation via their hydroelectric project. The dam and related infrastructure to create the Kerr Project, a federally licensed hydropower project located on CSKT land within the boundaries of the Flathead Indian Reservation, was constructed in the early 1930s. One of six CSKT enterprises, Energy Keepers, Inc., was able to acquire Kerr Project interests in 2015 (Confederated Salish & Kootenai Tribes, 2014). That is, the CSKT exercised their “unilateral and exclusive right to acquire the project” through occupation and use of the project for 20 years—through 2035—as sole licensees (Energy Keepers, Inc., 2014). In February 2020, CSKT signed a 15-year contract with a Washington state utility, Puget Sound Energy, to supply the utility with hydroelectric power. Several more prospective large customers based in Montana are also seeking to secure energy from the Tribal corporation in the near future for energy supplied by the CSKT, who renamed Kerr Dam the Seli’s Ksanka Qlispe’ Dam (Montana Public Radio, 2020). Recent figures indicate the hydroelectric plant has the capacity to generate 208 megawatts annually, equating to 1.1 million megawatt hours, or electricity for 100,000 to 110,000 homes (Energy Keepers, Inc., 2020).

A final example of a Tribal renewable energy project is the capture and use of methane on the Southern Ute Reservation. The Southern Ute Indian Tribe’s Growth Fund Department of Energy partnered with NativeEnergy to establish emission reduction credits. The project aids in preventing the release of roughly 23,000 to 60,000 metric tons of methane annually through the implementation of 28 interceptor wells piped to a compressor station located on the reservation. These wells are tied into an existing gas pipeline, with the captured gas later injected into the natural gas distribution grid and burned for thermal energy or power energy downstream (NativeEnergy, 2018e). Between 2009 and 2017, the project captured about 379,000 metric tons of methane, or the equivalent of annual energy use for about 41,000 homes. Both Wyoming- and California-based energy development entities have considered the Tribe’s project as an example that can be replicated elsewhere to balance environmental budgets in the voluntary carbon market (Mullane, 2019).

Some Tribal nations situated in more remote locations have taken part in developing renewable energy projects. In the Alaska Native Village of Kasigluk, for example, the Kasigluk Traditional Elders Council oversees three wind turbines. The developer, NativeEnergy, worked with the nonprofit Alaska Village Electric Cooperative to purchase, operate, and maintain renewable energy for both Kasigluk and the Native Village of Nunapitchuk (U.S. Department of Energy, 2009; NativeEnergy, 2018b). A combined system, incorporating a modern diesel plant with wind–diesel production, supplies power to these Alaska Native villages. High maintenance costs due to the remote location of the project include those of importing technical experts and parts needed to repair and maintain the turbines (Anonymous, 2020). Nevertheless, these and other remote communities are pursuing ways to integrate varied energy sources, reducing the overall cost of power and heating for community members. So, while some communities have faced challenges, such as maintenance costs, wind energy integration has been possible for others.

## **Conclusion**

After two centuries of forced assimilation leading to linear economies that tend to deplete natural resources to generate jobs and income, Tribal nations are rediscovering their economic sovereignty through the pursuit of circular and self-sustaining economies. These circular economies include innovative technologies and practices for reducing and reusing waste to protect and preserve their natural environment (Prieto-Sandoval et al., 2018; Steen-Adams et al., 2020). Tribal nations are also increasingly pursuing green enterprises to enhance their climate resiliency, including renewable energy, carbon offsets, and subsistence-based trade. Such enterprises reflect the relational and reciprocal connection of Tribal nations with their environment, marking a rediscovery and resurgence of Indigenous heritages, philosophies, sciences, and knowledges (Whyte, 2015; Cajete, 2012).

While self-determination continues to transform Tribal economies, 19th century federal policies to assimilate Indigenous peoples produced a complex system of property rights on Tribal lands, challenging this transformation. For many Tribal nations, the land on which they reside, held in trust by the federal government, is the only land available to pass to future generations. The General Allotment Act (1887) in particular resulted in highly fractionated land ownership, which can hinder economic resilience on Tribal trust lands (Leonard et al., 2020; Shoemaker, 2015; Anderson, 1995; Dippel et al., 2020), disincentivizing individuals from investing in land improvements. Yet the trust relationship that the federal government established with Tribal nations early on has persisted, requiring federal approvals even today for Tribal nations to develop their energy and other natural resources on Tribal lands. Despite this federal oversight, increasing numbers of Tribal nations are pursuing substantive and innovative climate adaptation pathways, including renewable energy development, carbon sequestration via carbon markets, green or natural resource sustainable enterprises, and subsistence-based enterprises.

## **Recommendations**

The search for solutions to enhance the world’s climate resiliency is fueling research into the potential role of Indigenous knowledges to inform climate mitigation and adaptation strategies. This increased interest inspires a resurgence among Tribal nations to embrace their unique heritages in efforts to realize sustainable economies. The concern for these priorities also suggests the need for Tribal nations to formulate policies to protect and preserve the authenticity and integrity of their Indigenous knowledges (Whyte, 2015). Tribal nations will thus likely need protocols and/or internal review boards to approve and oversee all research proposed to occur on Tribal lands or that involves their citizens and traditional knowledge holders (National Congress of American Indians Policy Research Center, 2019; Steen-Adams et al., 2020). An internal review process can help Tribes determine whether it is in their

best interest to enter into legal agreements at the beginning of any research to ensure that Tribal intellectual property rights are protected. This may include requirements that researchers assign their invention and patent ownership rights over to a respective Tribal nation. It may require nondisclosure agreements, between Tribal employees and prospective research or business partners, in order to protect sensitive information. Tribal nations may also determine when and whether it is necessary to protect their intellectual property at the federal level through patents and/or trademarks (National Congress of American Indians Policy Research Center, 2019).

Public policy to increase Tribal citizen access to public collegiate and vocational education programs is key to increasing the numbers of Indigenous research scientists, educators, resource planners, technicians, and other professionals needed to support climate mitigation and adaptation (Fillmore et al., 2018). This includes training and education to provide in-house technical expertise, further advancing the efforts of Tribal communities and Alaskan Native villages to develop and maintain renewable energy projects. Yet federal funding levels for Tribal colleges and universities have remained relatively flat (Fillmore et al., 2018). These institutions require adequate funding that supports targeted student recruitment, increases graduation rates, and facilitates greater Tribal access to vocational and four-year degrees.

Additional recommendations for policy to support Tribal self-determination and secure climate-resilient economies include addressing the complex land tenure system, including fractionation and checkerboard jurisdictional boundary issues, that persists on reservation lands today. Tribal economic sovereignty might be better achieved through the freedom to establish property rights institutions that complement the cultural heritage, philosophies, and histories of respective Tribal nations while also incentivizing Tribal citizen individuals and/or collectives to invest in Tribal lands. This requires addressing equitably the pervasive issues surrounding the transferability of highly fractionated trust lands as well as the sustainable management of checkerboard lands.

Additionally, increased access to both public- and private-sector opportunities, whether financial or through procurement, may help to build the legal infrastructure necessary for Tribal-resilient economic growth. For example, Tribes may obtain a third-party analysis of potential Tribal business opportunities through the use of currently available resources, such as the Bureau of Indian Affairs' Division of Economic Development's Pathways and other such similar resources (Bureau of Indian Affairs, 2021b). To reduce the impacts of checkerboarded lands, Tribes may desire to acquire fee-simple lands to convert to trust status through the Bureau of Indian Affairs federal fee-to-trust conversion program. The benefits of converting adjacent fee-simple lands to trust status can include granting rights-of-way; entering into leases necessary to negotiate the use, sale, or protection of natural resources; developing renewable energy resources; and protecting subsistence, hunting, and traditional agricultural practices. All of these goals can benefit long-term climate-resilient economic development projects. In general, interagency collaboration can assist Tribes in leveraging funding for their economic development opportunities by providing a comprehensive inventory of available funding and technical resources, particularly those resources dedicated to renewable energy, offset markets, or other sustainable enterprise opportunities.

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