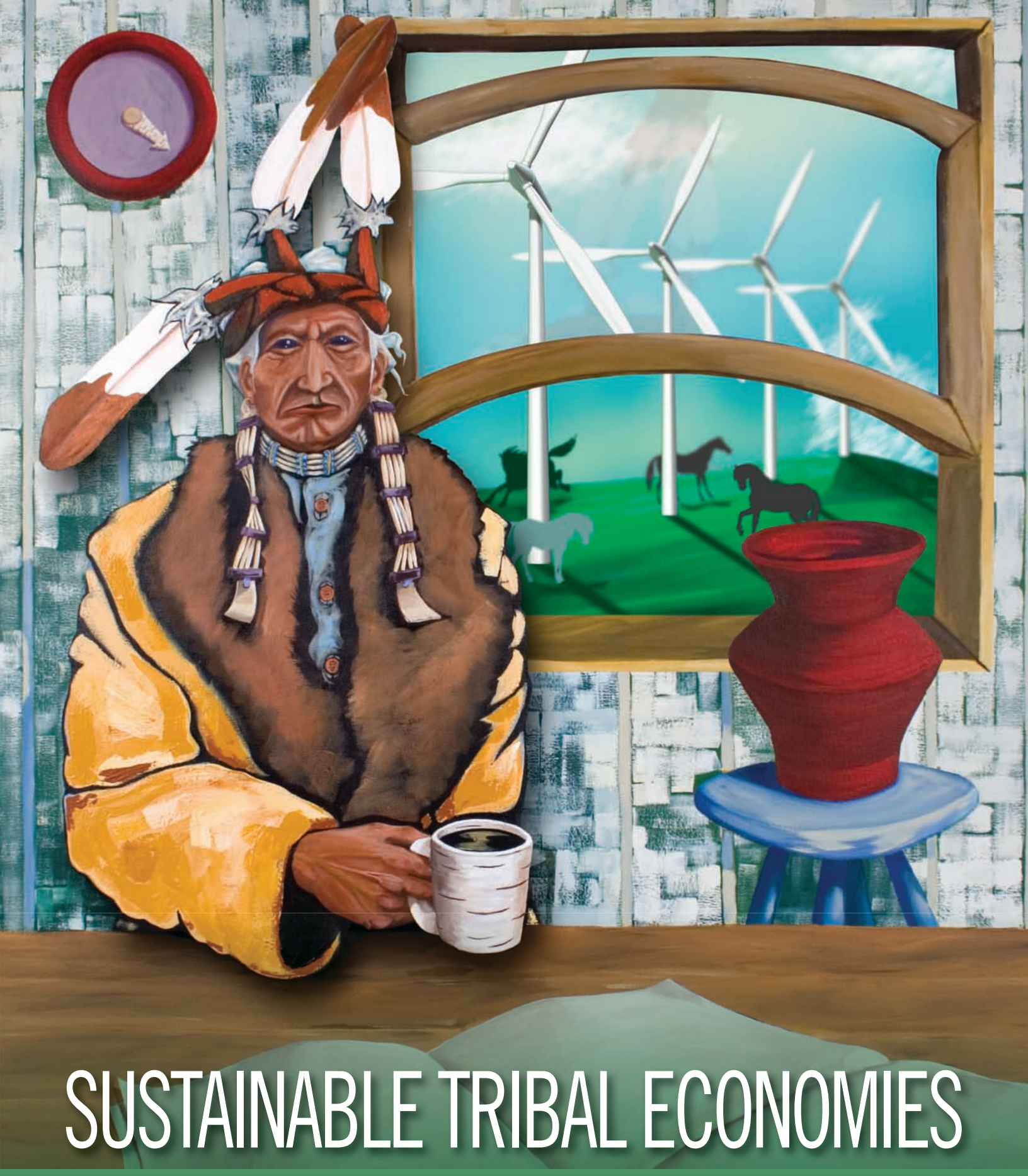


SUSTAINABLE TRIBAL ECONOMIES

A Guide to Restoring Energy and Food Sovereignty in Native America

A PUBLICATION OF HONOR THE EARTH

"We are the Keepers of this Earth. Those are divinely mandated instructions to us. We are at an incredible challenge at this point of our journey. We have been blessed by being Indigenous. What a blessing, and what a responsibility."

— Dr. Henrietta Mann
at the Native Peoples Native Homelands
Climate Change Workshop,
November 2009

HONOR THE EARTH'S MISSION

Our mission is to create awareness and support for Native environmental issues and to develop needed financial and political resources for the survival of sustainable Native communities. Honor the Earth develops these resources by using music, the arts, the media, and Indigenous wisdom to ask people to recognize our joint dependency on the Earth and be a voice for those not heard.

ACKNOWLEDGMENTS:

Cover Art: Jonathan Thunder

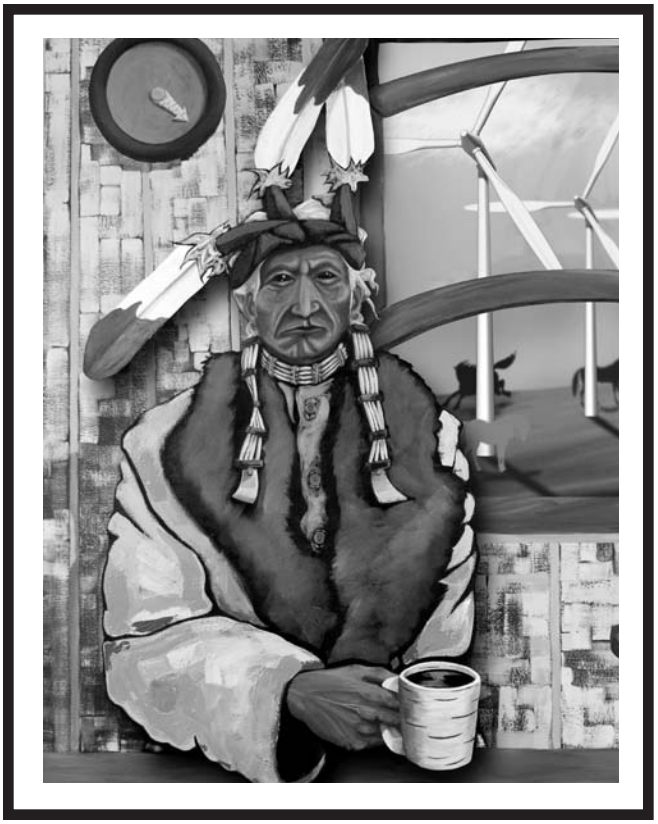
Researched and written by Honor the Earth staff and volunteers: Winona LaDuke, Faye Brown, Nellis Kennedy, Tom Reed, Luke Warner and Andrea Keller.

Design: Kevin Brown, Smart Set, Inc.

Special thanks to the Shakopee Mdewakanton Sioux Community, Surdna Foundation, Nathan Cummings Foundation, Solidago Foundation, Turner Foundation, Carolyn Foundation and the Unitarian Universalist Veatch Program at Shelter Rock for funding Honor the Earth's Energy Justice Initiative and this booklet.

Thanks to Reed Aubin, PennElys Goodshield, Bob Gough, Chase Iron Eyes, Kim Knutson, Christopher Reed, and Lisa Ringer for their contributions to this booklet.

Thank you to our Advisory Board, representing the Indigenous Environmental Network and Indigenous Women's Network, for years of collaboration, commitment and leadership: Charon Asetoyer, Faith Gemmill, Tom Goldtooth, Heather Milton-Lightening and Anne White Hat.



Sustainable Tribal Economies

A GUIDE TO RESTORING ENERGY AND FOOD SOVEREIGNTY IN NATIVE AMERICA

A PUBLICATION OF HONOR THE EARTH

2104 Stevens Avenue South
Minneapolis, MN 55404
(612) 879-7529
info@honorearth.org
www.honorearth.org

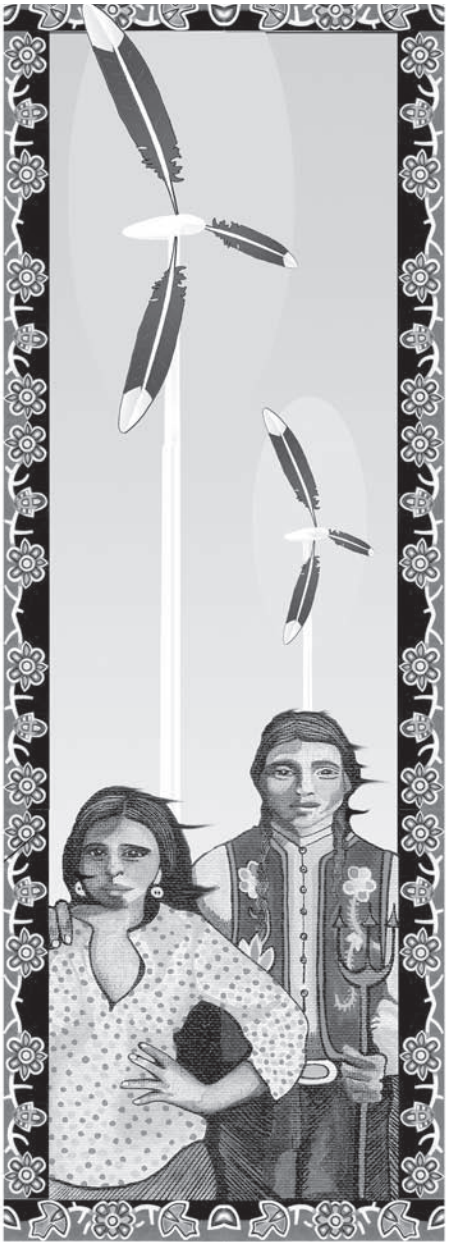
Why This Booklet?

The process of determining our destiny is at the core of our survival as Indigenous peoples. As tribal communities grow and we deepen our strategies and infrastructure for our Nations, it is essential for us to look at the world's economic and environmental realities in order to make critical decisions about our future. That means we must address issues such as climate change, peak oil and food insecurity. Food and energy consume huge portions of our tribal economies and must be considered in relation to tribal sovereignty and self-determination.

This new millennium is a time when we are facing the joint challenges of an industrial food system and a centralized energy system, both based on fossil fuels, and both of which are damaging the health of our peoples and the Earth at an alarming rate. In the US— the largest and most inefficient energy economy in the world— tribal communities have long supplied the raw materials for nuclear and coal plants, huge dam projects, and oil and gas development. These resources have been exploited to power far-off cities and towns, while we remain in the toxic shadow of their lethal pollution and without our own sources of heat or electricity. Our communities have also laid the groundwork for agriculture on this continent. Yet today, we produce less and less of our own food and instead rely upon foods imported from factory farms and monocropped fields far away. This is not a sustainable way to live. This booklet is about the process of recovering control of these two economies as a way to ensure the stability of our tribal communities, our environments and our cultures.

This booklet explores food and energy issues in tribal communities, recognizes their linkages, provides examples of tribal innovation and outlines options for tribal communities to create sustainable energy and food economies for this millennium and for the generations yet to come. In all cases, we are looking at the creation of local economies, using the resources available to each Indigenous community. We are hopeful that some of these strategies will not only be viable for tribal self-determination, but also, when appropriate, be a possible source of export revenues for tribal communities.

Recovering and restoring local food and energy production requires a conscious transformation and set of technological and economic leaps for our communities. We must decide whether we want to determine our own future or lease it out for royalties. In the end, developing food and energy sovereignty is a means to determine our own destiny.



Art by Camille LaCapa; Border by Star Wallowing Bull

Sustainable Tribal Economies

A GUIDE TO RESTORING ENERGY AND FOOD SOVEREIGNTY IN NATIVE AMERICA

Notes:

Part One:

THE BASICS OF A SUSTAINABLE ECONOMY

BREAKING THE CYCLE OF DEPENDENCY

An economy is the creation and distribution of wealth in a community. Wealth could be in the form of wampum, corn, energy, or other items, such as cash. The industrial economy is not the only economy. In fact, the cash reliance of an industrial economy is a relatively new addition to Indigenous economic and trade systems. Indeed, the fur traders, agency offices, annuity payments, trading posts and other cash-based institutions that became so significant in our post-contact history were major elements in the unhealthy transformation of our economies from wealthy and self-reliant to poor and dependent.

To put it plainly, cash is not essential to an economy. Yet, we have become increasingly cash-dependent in Indigenous communities, exchanging labor, natural resources and our gifts of art for cash in order to purchase goods and services. Some of this cash wealth is exchanged inside of our communities, but a substantially greater portion is spent outside our tribal borders.

We not only spend most of our cash outside the reservation, but also secure almost all of our tribal income from outside sources— such as federal revenues or royalties from resource extraction— and are thus totally dependent upon outside markets. We have become accustomed to a cycle where outside sources of cash come into the reservation and our cash is spent off-reservation.

The structure of a dependent economy puts Indigenous communities at risk of constant destabilization and often at the mercy of outside forces, whether those forces are large mining companies or renewable energy developers seeking to profit from the resources of a tribal community, or whether they are unpredictable federal allocations. As the US economy becomes increasingly destabilized as a result of the recession, wartime expenditures, peak oil, and climate change, our tribal economies will face even greater destabilization and more risk.

To become self-sustaining, we need to break the cycle of dependency. Our people suffer from a history of dependency resulting from the confiscation of our lands, the General Allotment Act, the stock reduction programs, the mass slaughter of the buffalo, the War on Poverty, the theft and sale of natural resources and other aspects of colonization. This created dependency only hinders our sustainability.

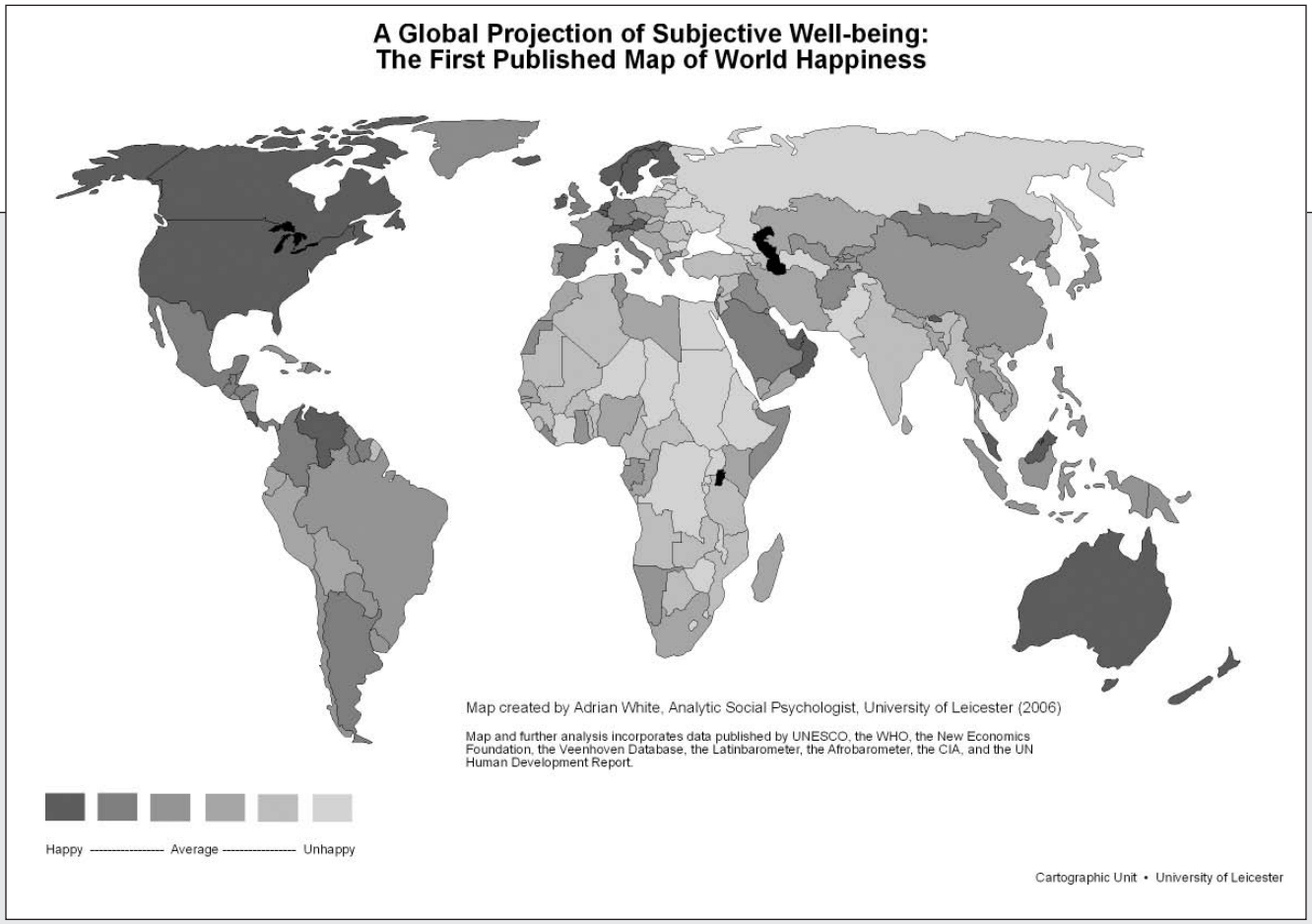
In a world where tribes have been pushed to create cash-driven economies, there is another more resilient way to live and it begins with valuing who we are and reclaiming our own definition of wealth. We believe that restoring a local economy rooted in our own knowledge as Indigenous peoples is essential to revitalizing the health and sustainability of our communities.

A CASE FOR RE-LOCALIZING ENERGY AND FOOD

Honor the Earth collaborated with the White Earth Land Recovery Project to perform a study on the White Earth Reservation analyzing the tribal energy economy while also recommending an innovative program of energy efficiency and renewable energy. A separate study was undertaken on the food economy. ***These studies revealed that approximately 50% of the tribal economy's money is being spent outside the reservation on food and energy.*** This expenditure represents a substantial and disconcerting portion of our tribal income. In fact, it is the largest drain on our tribal wealth.

Dependency at this scale is unhealthy. Native communities, already facing crisis situations of poverty, cannot afford this output of money.

Initial studies completed on the White Earth Reservation reveal the figure for a tribal energy economy alone consumes a phenomenally large portion of the entire economy: an estimated one-fourth of tribal household income is spent on energy-related expenses whether for transportation,



HIGH GDP OR A HAPPY COUNTRY?

Is it possible to have a happy country that is not cash rich?

The New Economics Foundation has devised a system called the Happy Planet Index to rank the life-satisfaction of citizens in countries around the world. Instead of using economic wealth measures, such as the Gross Domestic Product (GDP) of a country, the index used measures such as life expectancy and happiness to determine life satisfaction."[1] The findings demonstrate that, on a whole, rich countries with high rates of resource consumption are the saddest countries in the world. In fact, the happiest countries in the world are those with high rates of renewable energy and lower rankings of GDP!

After examining nearly 200 countries, the 2009 index declared Costa Rica as the happiest country in the world, and two additional studies corroborated these results. Costa Rica gets over 99% of its energy from renewable sources.[2] Costa Rica also has a great deal of organic agriculture, culturally based tourism, and a vital export crop of coffee. All of this, according to the index, means that Costa Rica is the most successful country in the world at converting "the planet's natural resources into long and happy lives for [its] citizens." [3]

In 2006, the index listed the South Pacific island, Vanuatu, as the happiest country in the world.[4] Surviving on small-scale agriculture and tourism, Vanuatu's GDP per head was a mere $290 in 2006. Living according to tradition, the Vanuatu, like all other Indigenous peoples, have a unique relationship with the land. Their strong sense of culture and community played a significant role in putting them at the top of the index.

Tribal nations can follow these examples. By keeping strong cultural traditions, restoring local food systems, increasing efficiency and creating renewable energy sources, tribal nations can be some of the happiest nations in the world without having a high GDP.

heating, or electricity.[5] This figure is due to the relatively remote location of the White Earth Reservation in northern Minnesota, and the lack of resources for efficiency, combined with a lower average income than the general population. But the situation is not unique to the White Earth Reservation. Many tribal communities find themselves in the same or similar circumstances, making the study increasingly relevant for all tribal nations. Across the board, remote reservation communities have subpar weatherization in much of their housing and are hit especially hard by the high cost of energy to heat and cool their homes, as well as the cost of traveling long distances.

The energy predicament draining tribal economies is augmented by unstable tribal food plans. The tribal food economy represents another source of wealth and loss of wealth in a tribal economy. Traditional food production keeps wealth in the community, while purchases from border towns in multinational food supply enterprises and chain grocery stores drain income and wealth from the tribal economy. The crisis situation facing tribal food economies is a major contributor to tribal poverty.

Our economic analysis on the White Earth Reservation, completed in 2008, found that $7 million out of every $8 million of tribal household and agency expenses (excluding casino purchases) were spent immediately off-reservation. When we spend money at a Walmart or Food Service of America, those dollars go outside of our communities, the goods are produced far away, money is required to transport them, and profit goes to far away owners and/or stockholders. However, a locally owned business, selling goods harvested and/or made locally, keeps our dollars local, supporting our community's economy.

We can stabilize our tribal economies through localization. By developing our own energy and food sources, we can create vibrant and resilient tribal economies that will ensure our survival in the face of the economic and environmental challenges ahead.

LOCAL ECONOMIES STRENGTHEN AND REGENERATE COMMUNITIES

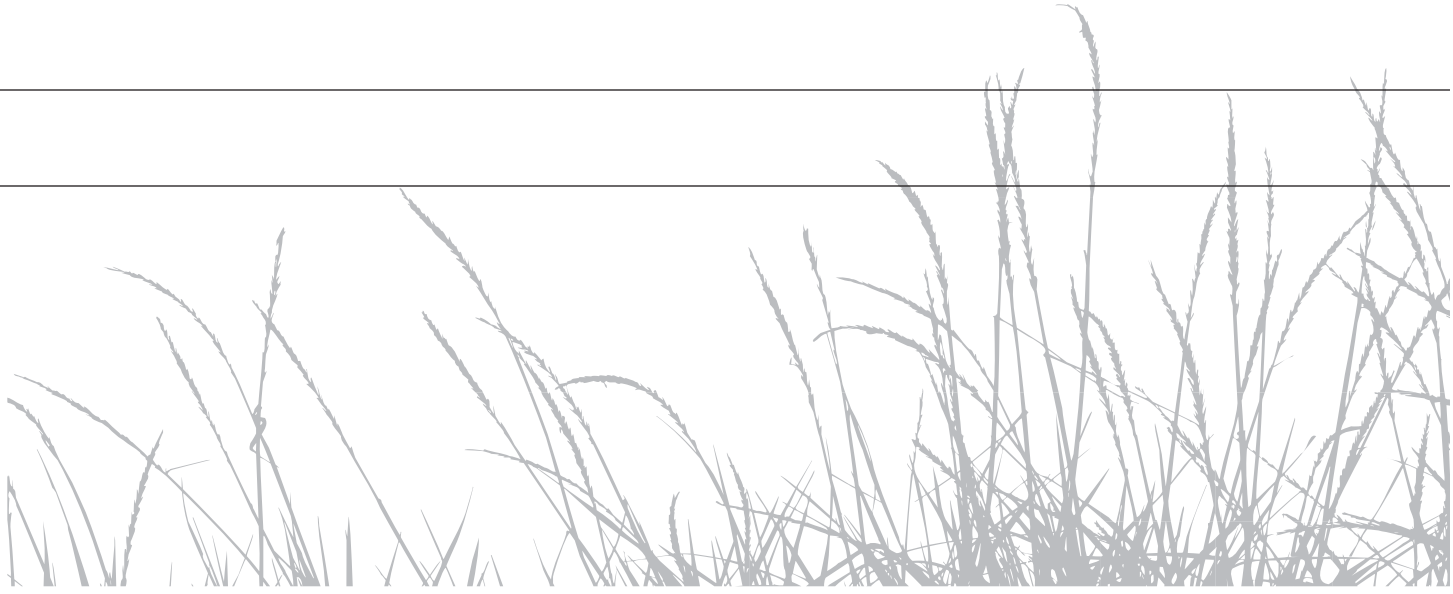
In economic terms, there is a figure called a "multiplier." This figure reflects how many times a dollar circulates in any given local community until it moves into a larger economy far away. A 2008 study regarding the elements of the Puget Sound, Washington area food economy revealed that, "The more dollars circulating locally, the greater the number of community linkages and the greater their strength. The research indicates that more and stronger linkages provide for a healthier, more diverse and resilient local economy."[6]

Simply put, keeping our dollars local strengthens and regenerates the health of our economy and our communities. By developing community resources and goods to meet our own community needs, we become less vulnerable to outside markets, and more self-reliant and self-sufficient.

Re-localizing food and energy economies means taking responsibility for our future generations. This requires a paradigm shift back to our traditional knowledge systems. We cannot erase the process of economic colonization and the deliberate creation of dependency. But we can join with others and take action to reclaim our future.

Left: Artwork by Rabbit Strickland

Notes:



Part Two:

CHALLENGES FACING INDIGENOUS COMMUNITIES: CLIMATE CHANGE, PEAK OIL, FUEL POVERTY AND FOOD INSECURITY

Climate change, peak oil, fuel poverty and food insecurity are four interrelated challenges that Native communities face in this millennium, challenges that stem from industrial society's level of consumption and the corresponding exploitation of lands, natural resources and peoples.

Globally, we are presented with a new set of difficulties in the face of a warming planet, the depletion of world oil supplies and an industrial agriculture system that relies on massive energy inputs. These realities are complex and have vast impacts on Native communities. Our communities, while at the center of the storm, also have unparalleled potential to reduce the negative impacts of a destabilizing climate and energy and food insecurity. We discuss solutions to these concerns later in this booklet, but as a starting point it's important to understand the causes of climate change, peak oil, fuel poverty and food insecurity and the distinct threats they present for Native America.

Challenge One:
CLIMATE CHANGE

The Earth naturally goes through cycles of warming and cooling over time, but a climate that's rapidly warming and changing because of human behavior is another thing altogether and indeed a dangerous and very real scenario.

Human activity has already raised the average surface temperature of the Earth more than one degree Fahrenheit. Scientists at the Intergovernmental Panel on Climate Change (IPCC) calculate that the Earth's temperature will continue to rise at least another degree, even with drastic mitigation efforts.[7] While these temperature increases appear small, the consequences of a warming globe are huge.

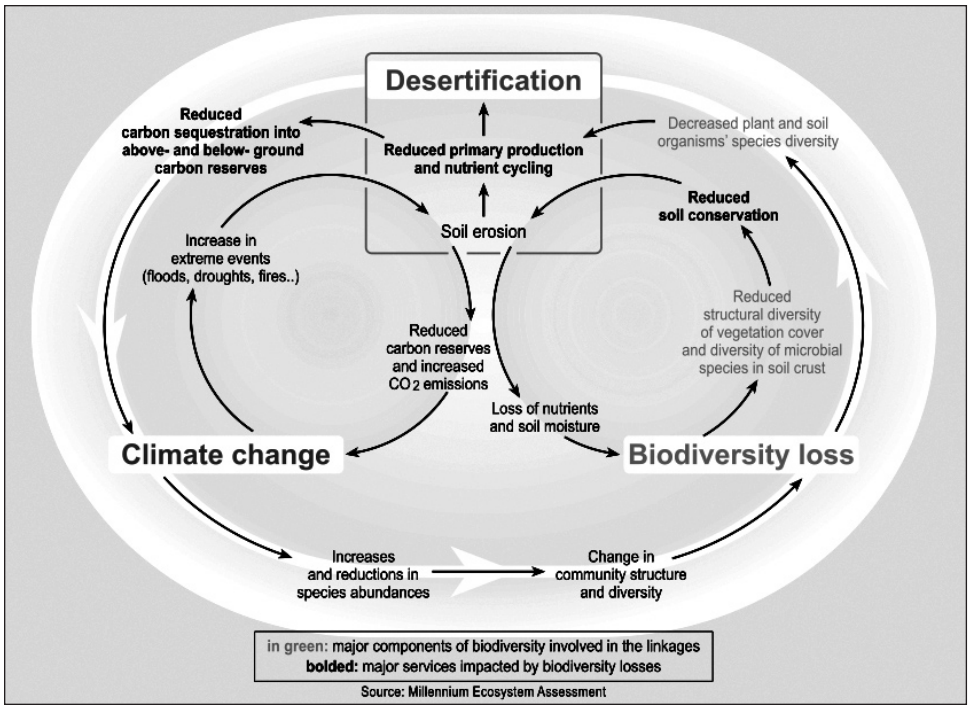
By definition, climate change is the "long-term significant change in the weather patterns of an area."[8] It turns out that 'significant change' means significant problems. Climate change creates a myriad of ecological crises, from more extreme and volatile weather, such as extended droughts, massive floods and intense storms,[9] to the destruction and loss of biodiversity. With a warming globe, many of our foods and medicines (plants and animals) must adapt, seek cooler climates or face extinction. The IPCC has already confirmed certain ecosystem shifts,[10] from earlier bird migrations to habitat changes for fish and wildlife, that will disrupt our relationship to the land and species we have relied on for millennia.

At its essence, climate change seriously and adversely transforms the way we live, and in this interconnected world, impacts in one geographic region reverberate internationally. If wheat or corn production in the Midwest is compromised due to drought or flooding, it affects prices and food availability across the globe. None of us are immune to climate change's effects. And none of us are completely removed from contributing to it.

CAUSES OF CLIMATE CHANGE

Unsustainable energy and industrial agriculture are the primary culprits behind climate change. The US Global Change Research Program (USGCRP), the leading domestic body tasked with researching climate trends, lays out the situation clearly:

FEEDBACK LOOPS: DESERTIFICATION, CLIMATE CHANGE & BIODIVERSITY LOSS



Millennium Ecosystem Assessment, Desertification Synthesis Report (2005), p. 17

Left: A coal plant near the Northern Cheyenne Reservation

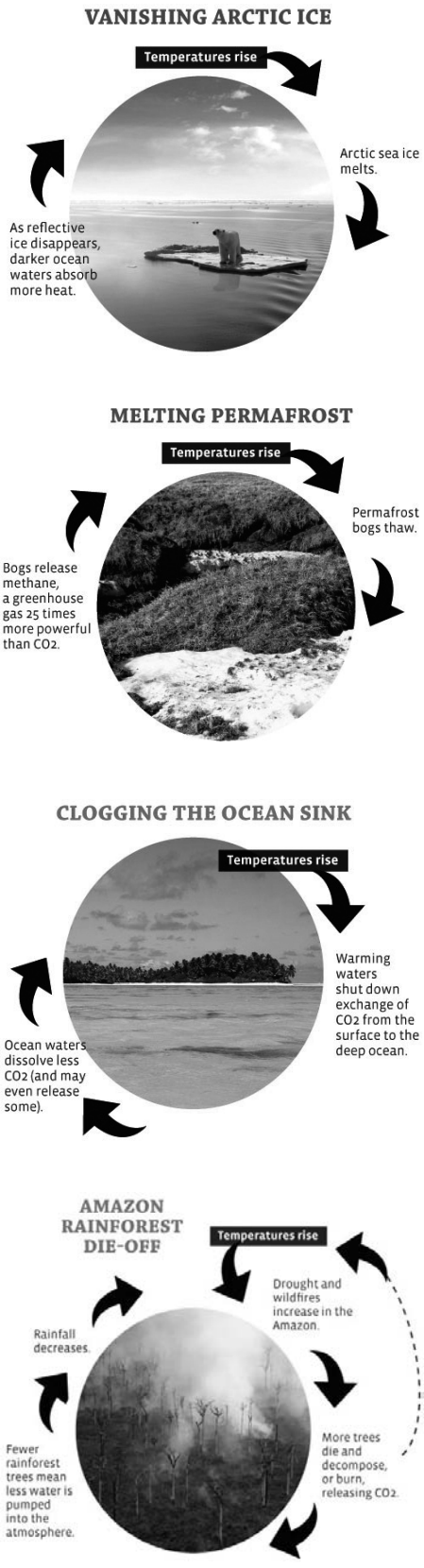
GREENHOUSE GASES

The Environmental Protection Agency (EPA) explains the primary greenhouse gases that enter the atmosphere because of human activities:

Carbon Dioxide: Carbon dioxide enters the atmosphere through the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood, and also as a result of other chemical reactions (e.g., manufacture of cement). Carbon dioxide is also removed from the atmosphere when it is absorbed by plants as part of the biological carbon cycle.

Methane: Methane is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices and by the decay of organic waste in solid waste landfills. Melting permafrost as a result of climate change releases mass amounts of methane as well.

Nitrous Oxide: Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.[14]



"The global warming observed over the past 50 years is due primarily to human-induced emissions of heat-trapping gases. These emissions come mainly from the burning of fossil fuels (coal, oil, and gas), with important contributions from the clearing of forests, agricultural practices, and other activities."[11]

The main heat-trapping gas (also called a "greenhouse gas") responsible for climate change is carbon dioxide (CO_2), often referred to as 'carbon.' In the energy sector, the worst carbon offenders are electric power production and transportation. In fact, electric power plants and transportation were responsible for 73% of our total energy-related carbon emissions in 2006.[12] In terms of industrial agriculture, our food system is not only petroleum-intensive, but also relies on massive clear cutting, destroying remaining forests that absorb the Earth's carbon. With added greenhouse gas emissions and shrinking storehouses for carbon, heat from the sun increasingly becomes trapped in the atmosphere, warming the globe.

The effects of climate change alter carbon absorption cycles. For example, the oceans, the world's largest carbon storehouse, no longer take in as much carbon dioxide when they warm,[15] and as a result, more carbon remains in the atmosphere, warming the Earth and the oceans even more. A vicious cycle continuously repeats itself making problems exponentially worse. These cycles are called feedback loops. Melting ice caps that no longer reflect heat,[16] growing deserts that have less vegetation to store CO_2,[17] and melting permafrost that emits methane[18] are other examples of the feedback loops accelerating climate change.

In the coming decades, increased atmospheric concentrations of greenhouse gases will continue to raise average global temperatures. Melting polar ice and glaciers will further raise sea levels, dramatically change precipitation patterns and increase the volatility of our climate. Water, essential for all life, will be gravely affected. A 2009 report by the USGCRP[19] found that water quality problems, waterborne diseases and shrinking water supplies will all intensify. Changes in

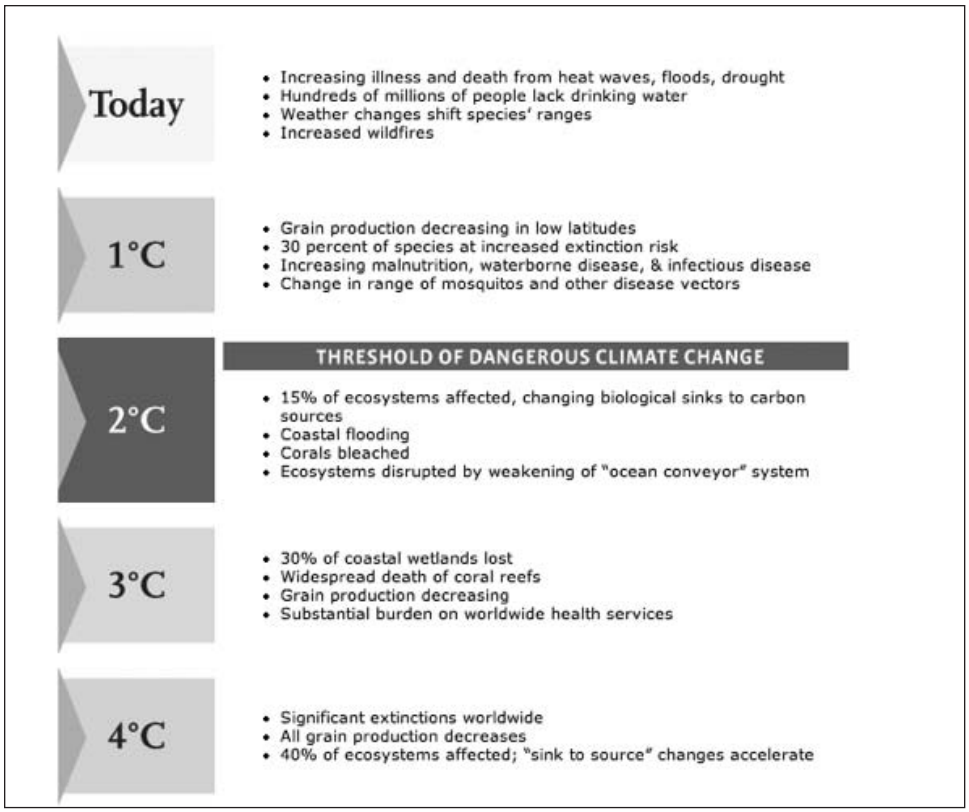
FOSSIL FUELS: DIRTY POWER

Fossil fuels literally come from fossils— the remains of prehistoric plants and animals that lived millions of years ago. Burning fossil fuels, such as coal, oil and gas, releases carbon dioxide (CO_2) into the air, and CO_2 emissions are the principal cause of climate change.

According to the Department of Energy, fossil fuels are currently used to power over 85% of the energy needs in the United States.[13] Significantly reducing our reliance on fossil fuels is essential to mitigating climate change.

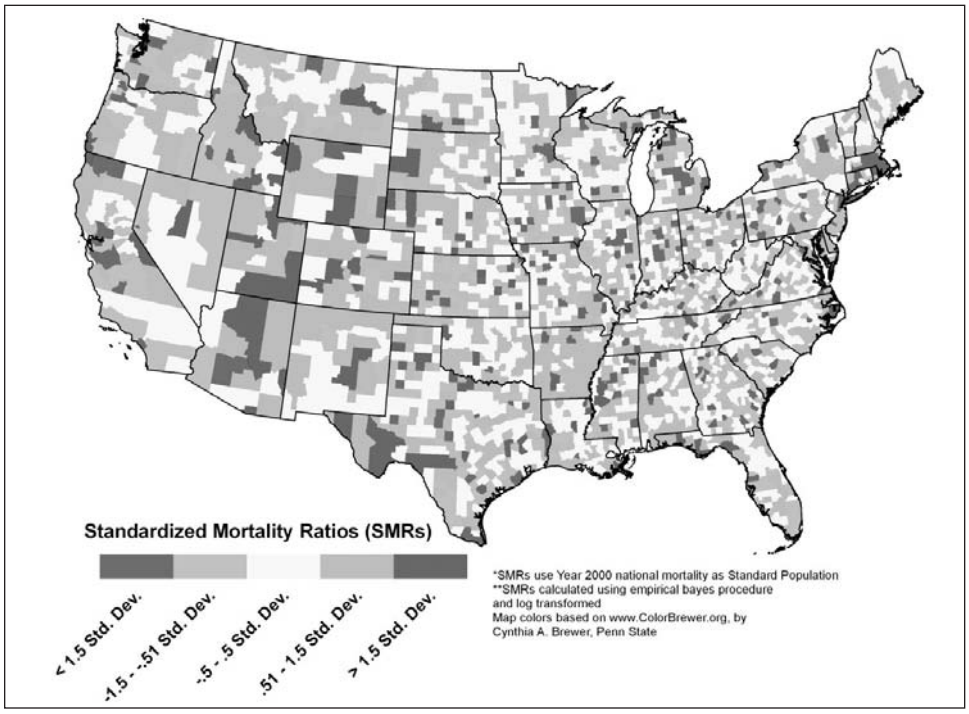
Left: Reprinted from "Stop Global Warming,", the Spring 2008 YES! Magazine, www.yesmagazine.org

TWO DEGREES FROM DISASTER



From YES! Magazine by Doug Pibel, Madeline Ostrander, Jan 29, 2008

NATURAL HAZARDS AND MORTALITY

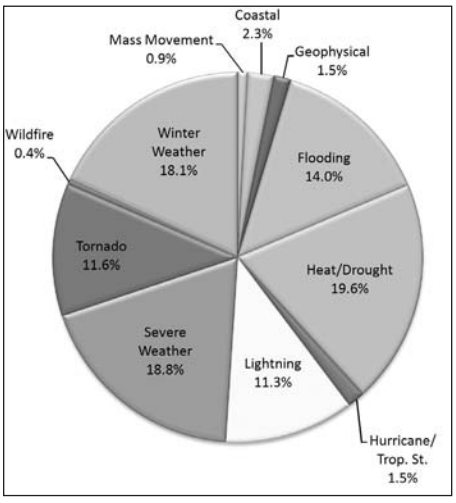


water and other climate impacts are predicted to pose adaptation problems for crop and livestock production, meaning our current food system is vulnerable.

We need to take action. Native communities are already disproportionately experiencing the adverse impacts of a warming globe. As the section below describes, it is clear that climate change strikes our communities first and worst.

CLIMATE CHANGE IMPACTS IN INDIGENOUS COMMUNITIES

Native peoples are already witnessing dramatic changes in our territories. From fishing and salmon run impacts in the Northwest, to raging wildfires in Colorado and California, to storm surges and flooding along the Eastern seaboard to severe drought in the Southwest, present and future



Kevin A. Borden & Susan L. Cutter. "Spatial Patterns of Natural Hazards mortality in the US" International Journal of Health Geographics. 7:64 Dec. 17, 2008.

Waves pounding against the sandbagged seawall in Kivalina, Alaska. Photo credit: Mary Sage/AP

Alaskan coastal village of Shishmaref falls into the sea. Photo credit: Shishmaref Erosion & Relocation Coalition

changes in the climate imperil our homelands, our lifeways and our very survival.

Our communities are at serious risk from climate change related disasters. One-third of reservation residents in the Great Plains live in substandard housing, as does much of Native America, meaning that we have little protection from the increase in torrential rains, tornados, wind shears, extreme heat, and extreme cold that climate change brings.[20] We are in danger of freezing or cooking to death in our own homes. Not to mention that much of Native America has limited telephone and telecommunications access— meaning those most exposed won't be warned and won't have a way to call for help in extreme weather.

In 2008, USA Today reported on newly created maps, referred to as 'Death Maps,' indicating projected mortality from extreme weather is expected to increase in the face of climate change. The maps demonstrate that natural hazard deaths happen and will continue to happen in more rural and remote areas, like reservation communities. We are not prepared.

ALASKA: A SIGN OF CHANGE TO COME

Temperatures in the Arctic are rising twice as fast as they are elsewhere in the world.[21] Arctic ice is melting and rupturing and the polar ice cap as a whole is shrinking at a frighteningly rapid rate. As a result, numerous Indigenous coastal villages, once protected by the coastal sea ice, are in danger of being washed away by harsh storm surges.

At least 184 of Alaska's 213 villages face significant erosion and flooding, according to a 2003 report by the US General Accountability Office.[22] Today, government agencies have identified at least six Native villages that must immediately respond to severe erosion and flooding, including the villages of Shishmaref, Koyukuk, Kivalina, Newtok, Unalakleet, and Shaktoolik.[23] In most of these villages, relocation is essential for survival.

The relocation costs for such violent climate change damages represent significant costs. Relocation for the Inupiat village of Kivalina alone has been estimated at $400 million or more.[24] Putting a price on a homeland, however, is impossible.

The people of Kivalina are taking a stand.[25] In 2007, Kivalina filed a federal suit in US District Court against Exxon Mobil Corp., BP PLC, seven other oil companies, 14 power companies and one coal company,[26] charging these corporations with the destruction of their village. Although the court dismissed the case,[27] it provides a moving example of Indigenous people standing up for what is right and drawing attention to the severity of climate injustice.

Other Indigenous groups have been appealing to international human rights organizations to halt and remedy climate change. In 2005, the Inuit Circumpolar Conference (ICC) filed a complaint with the Inter-American Commission on Human Rights (IACHR) against the United States.[28] The

complaint argued that American carbon emissions are destroying Inuit habitat, and that catastrophic environmental and social disintegration caused by climate change constitutes a human rights violation. Like the courts in the Kivalina case, the IACHR decided not to proceed with the complaint,[29] but, by putting human rights concerns front and center, the complaint changed the tenor of the debate concerning climate change in a way that has had lasting effects.[30]

The experience of Indigenous peoples in the Arctic is just the beginning as Native peoples across the country increasingly find themselves forced to cope with massive ecological and health challenges directly resulting from climate change.

It's undeniable that climate change is happening and that if we don't take action there will be serious financial, ecological and cultural consequences. There are several choices ahead: 1) Do nothing, and let governments and businesses make market-based decisions at a pace that does not mirror the urgency of the problem; 2) Be involved in mitigation, or reduction of carbon, as communities and Nations, and 3) Adapt for climate change and ultimately a climate-challenged world. The second and third options provide real opportunities to make a better future.

THE FINANCIAL COSTS OF CLIMATE CHANGE

The costs of climate change are astounding. The US General Accounting Office warns that because "the frequency and severity of damaging weather-related events, such as flooding or drought" are expected to increase, economic losses will be significant. Swiss Re, a major international reinsuring company cautions that, "climate change presents an increasing risk to the world economy and social welfare."[32] In fact, climate change-related expenses could rise to 20% of world Gross Domestic Product (GDP), according to a British government-commissioned report.[33]

INDIGENOUS PEOPLES' SUMMIT ON CLIMATE CHANGE

In the spring of 2009, the Indigenous Peoples' Summit on Climate Change released a declaration demanding immediate action by governments and developed countries to reduce CO_2 emissions and support adaptation strategies. A major challenge at the summit was addressing concerns by some delegates who felt that potential revenue and jobs might be lost by limiting fossil fuel development. Nonetheless, delegates found a consensus and are now calling for action in response to the critical reality of climate change.

Key Demands From the Indigenous Peoples' Summit on Climate Change:

1. Create a binding emissions reductions target for developed countries of at least 45% below 1990 levels by 2020 and at least 95% below 1990 levels by 2050.

2. Support all national and global actions to stabilize CO_2 concentrations below 350 parts per million (PPM) and limit global temperature increases to below 1.5 Celsius.

3. Demand effective, well-funded adaptation safety nets at the national and international levels.[31]

Challenge Two:
PEAK OIL

Human beings have used close to half of the world's known oil reserves in the last fifty years. We are approaching the "peak" of worldwide oil production and the depletion of conventional supplies. Some experts in the field project that world demand will outpace conventional oil production in the next decade.[34]

The US consumes 20 million barrels of oil a day. That's 25% of world supplies. We import 2/3 of the oil we use at a cost of $1 billion a day, representing a huge transfer of wealth outside our borders.[35] With supplies in decline and demand increasing, the price of oil will continue to rise. Price spikes will particularly impact the cost of liquid fuels, such as gasoline, diesel and propane.

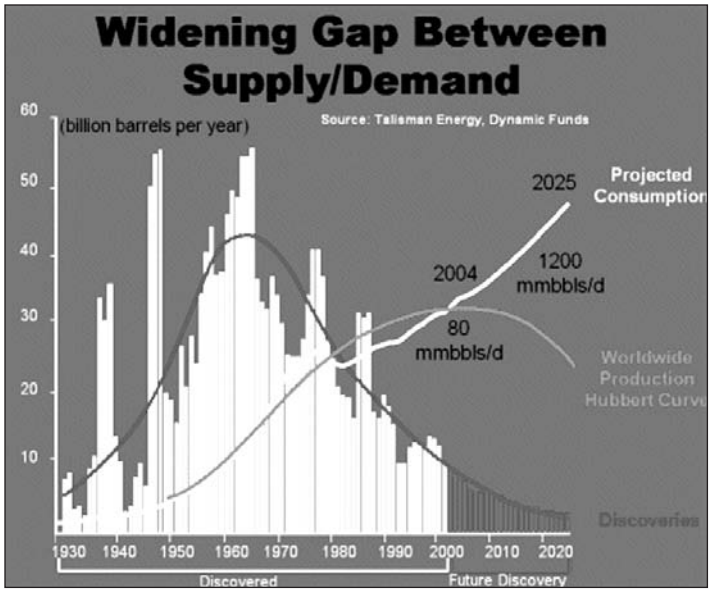
The fact is that we have an economy dependant on petroleum consumption, not only in our transportation, but also in our food system, and this dependence has significant implications in the face of our loss of access to cheap petroleum. The economic hardship wrought by peak oil will be profound.

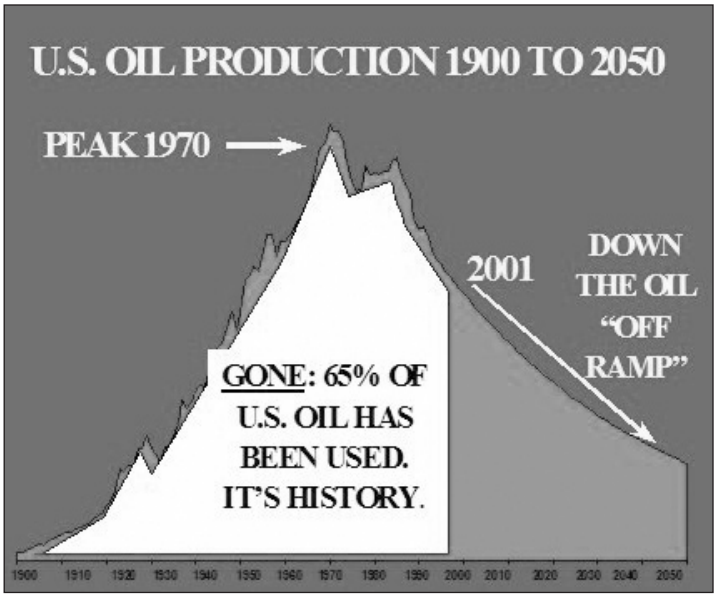
The Department of Energy's "Hirsch Report," a widely respected analysis of peak oil concerns, notes that it will take about 20 years just to prepare a transition to mitigate the effects of peak oil.[36] Currently, we don't have much of a plan on a national level, let alone at a tribal level. We need to get started.

OIL REALITY: PRODUCTION DOWN, PRICE UP

The four largest oil fields in the world, located in Kuwait, Mexico, Saudi Arabia and China, are all showing declining production and US production doesn't come close to meeting domestic demand.[37] Other oil resources exist, but they are located in either hard to reach locations requiring high-cost, energy-intensive extraction technologies, or in politically unstable regions. Securing these deposits carries a large military and human rights price tag. What oil remains is going to cost a lot to get– not just financially– but also in terms of the cost to the environment and human lives.

In North America, the present lay of the land is that major oil companies are moving into remote and primarily Indigenous areas to extract and secure new oil to offset declining production and increasing demand. Offshore drilling in the Arctic along with the tar sands development in Canada are two examples of Indigenous territories disproportionately impacted by the search for remaining oil supplies. These projects are incredibly destructive to land, life and people.





The graphs above depict Hubbert's Peak, a theory of peak oil named after the late Dr. M. King Hubbert, a geophysicist who predicted patterns of oil discovery and depletion. Hubbert predicted a global oil peak between 1995 and 2000, and all evidence points to the fact that he was close to the mark.

On the frontlines in Alaska. Photo credit: REDOIL

OFFSHORE DRILLING IN ALASKA

In the Arctic, both the oil deposits in the North Sea and Alaska are now past peak production and lie in depletion. Despite this, the US Geological Service estimates that almost one quarter of the world's remaining undiscovered, recoverable oil reserves are in the Arctic.[38] As a result, companies, with governmental support, have been pushing hard to open areas off Alaska's shore to oil drilling, but it's going to be challenging to get to the oil. The oil lies deep below frigid Arctic ice and water, under the sea floor, on the way to the Earth's core. Shell Oil has set its sights on drilling 14,000 feet below the Arctic sea floor to extract this deeply buried oil.[39]

The Alaska Native group REDOIL is on the front lines, fighting new oil drilling. REDOIL joined a lawsuit with conservation organizations to stop proposed offshore drilling in the Beaufort Sea of Alaska. Citing the subsistence rights of Alaska Natives as a big factor in the decision, the 9th Circuit Court of Appeals found that the US Department of Interior's Minerals Management Service (MMS) illegally approved plans by Shell Offshore Inc. to drill in the Beaufort Sea.[40] That ruling forced Shell's drilling plan back to the MMS, where the agency will need to meet legal obligations to fully analyze and disclose impacts from drilling on the rapidly changing Arctic environment.[41]

TAR SANDS OIL: A WASTELAND IN THE MAKING

In Alberta, Canada, rather than drilling to the Earth's core, oil companies have another idea: squeeze crude oil out of the tar sands. Tar sands development places Canadian First Nations and US tribes face-to-face with multinational energy companies who are resorting to desperate measures to produce more oil. Indigenous communities are threatened in every step along this path, from the extraction to the refineries to the pipelines slated to cross our homelands.

Tar sands oil is one of the most environmentally destructive new fuels for our gas tanks. To get one barrel of oil, the boreal forest must be stripped away, and it takes four tons of earth and two to three barrels of fresh water as well as large amounts of energy to extract and convert the tarry earth

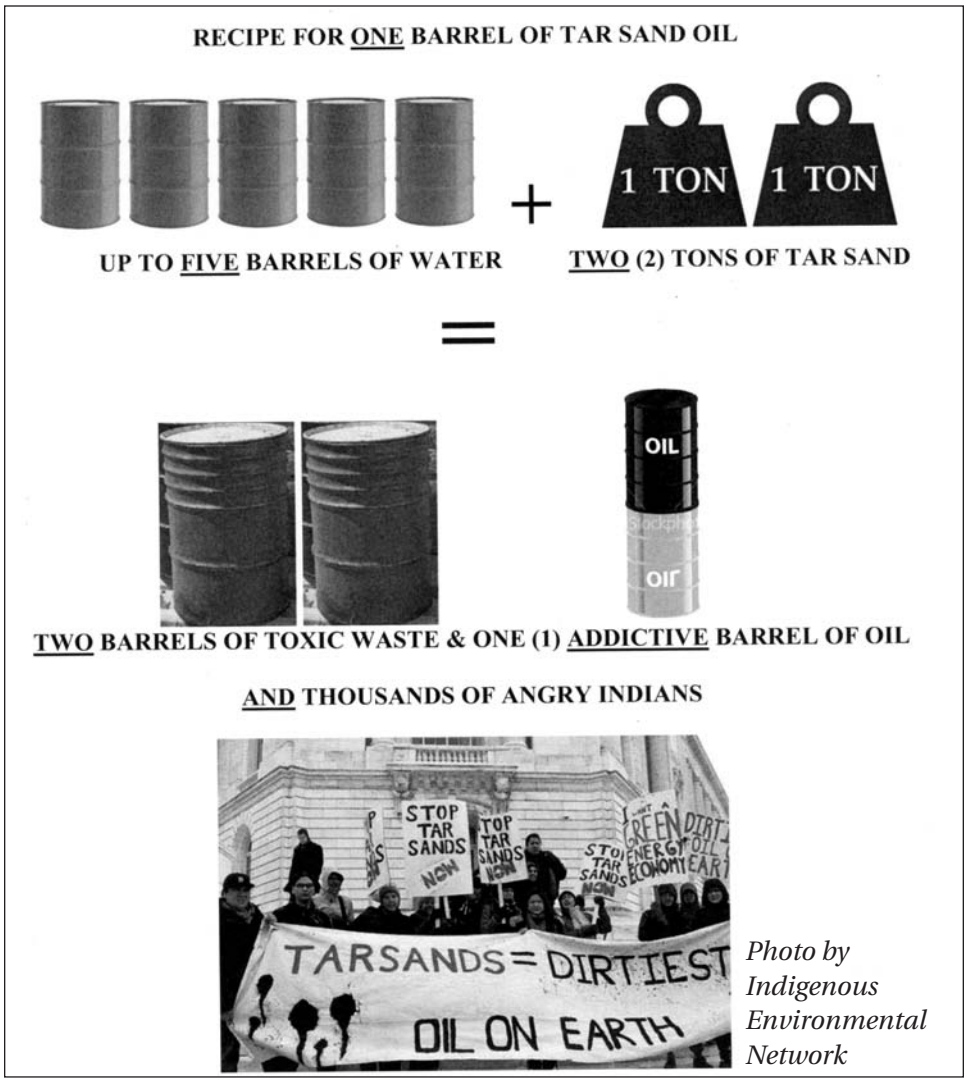
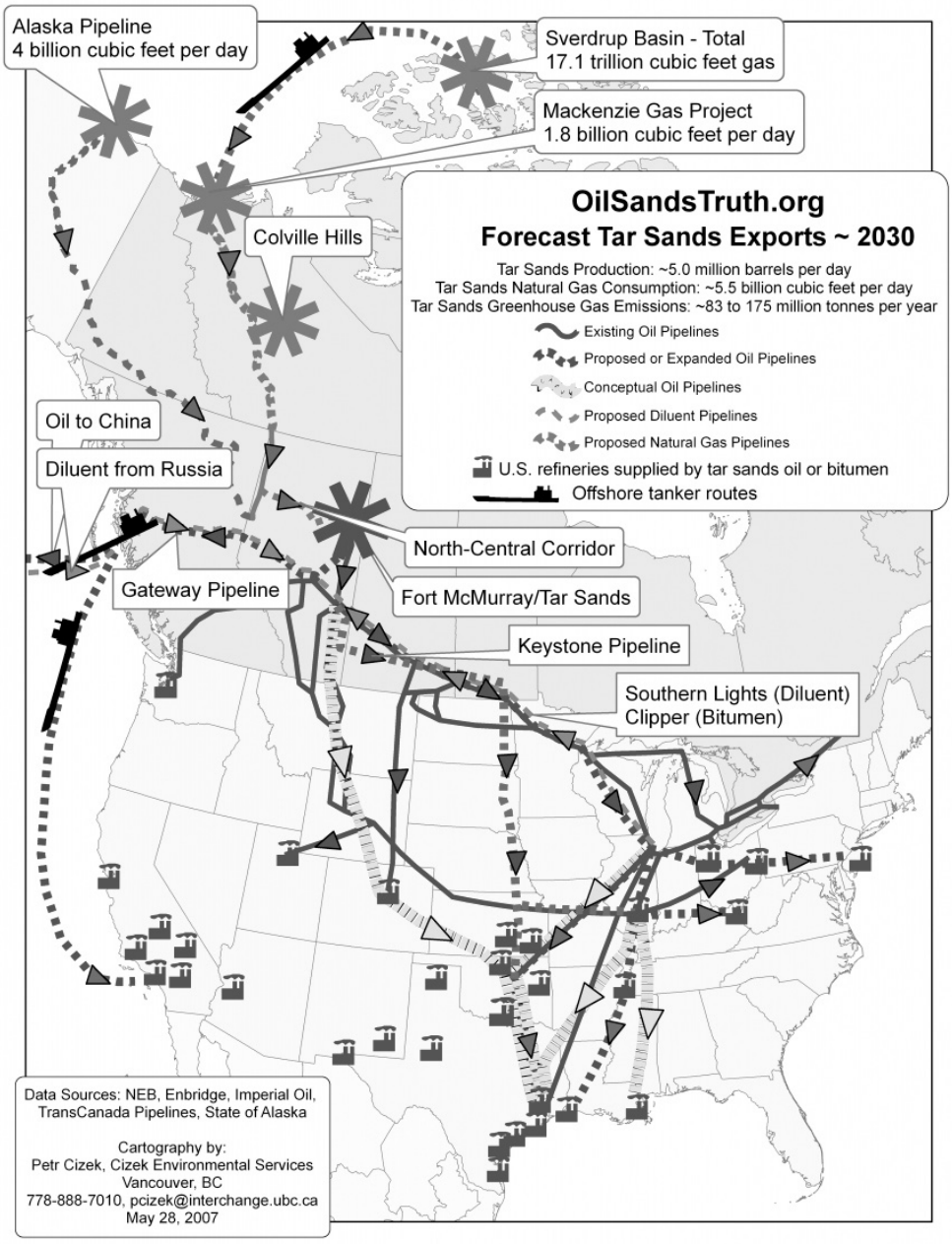


Photo by Indigenous Environmental Network

into crude oil. Extensive devastation is already underway in Cree, Métis and Dené Territory where an area the size of Michigan is slated for tar sands development.

Then there is the transportation problem. After the energy intensive process of extracting and upgrading tar sands crude, the oil is mixed with toxic thinning agents in order to be piped to markets in the US. Plans for a vast network of tar sands pipelines cut across numerous Native communities in the US, exposing them to the potential for toxic spills and contamination.

The Alberta Clipper oil pipeline is slated to cross the Leech Lake and Fond du Lac Ojibwe Reservations in northern Minnesota. A group of Leech Lake tribal members have filed a civil action in tribal court as well as petitioned for a local referendum vote on the pipeline. Another pipeline, the Keystone pipeline, is threatening Dakota and Lakota territories in Nebraska and South Dakota. The Sisseton-Wahpeton, Rosebud, Santee and Yankton Sioux tribes together filed suit to stop the Keystone pipeline, arguing that there has been no consultation with tribal communities in the drafting of the environmental assessment for the project. Unfortunately, the case was dismissed.[42]



Map of existing and proposed tar sands pipelines

Tar sands development has given Canada an international reputation as a "climate criminal" for undertaking such a devastating energy strategy in light of the dire circumstances of global warming. The tar sands are the largest greenhouse gas emitter in the country.[43] The project is also destroying one of the worlds' most important storehouses of carbon, the Canadian boreal forest.[44]

As Elizabeth May, Executive Director of Sierra Club Canada, said, "Tar sands oil is to conventional oil what crack cocaine is to ordinary cocaine powder. [It creates] more harm to the global climate through increased greenhouse gas emissions, more destruction of boreal forests, more toxic tailings, and more air and water pollution."[45]

Going to extreme lengths to find oil, and ignoring climate and cultural impacts, only highlights how the industry is responding to peak oil by doing everything possible to extend supplies rather than find alternatives. The bottom line is that our continued reliance on oil makes us vulnerable.

Notes:

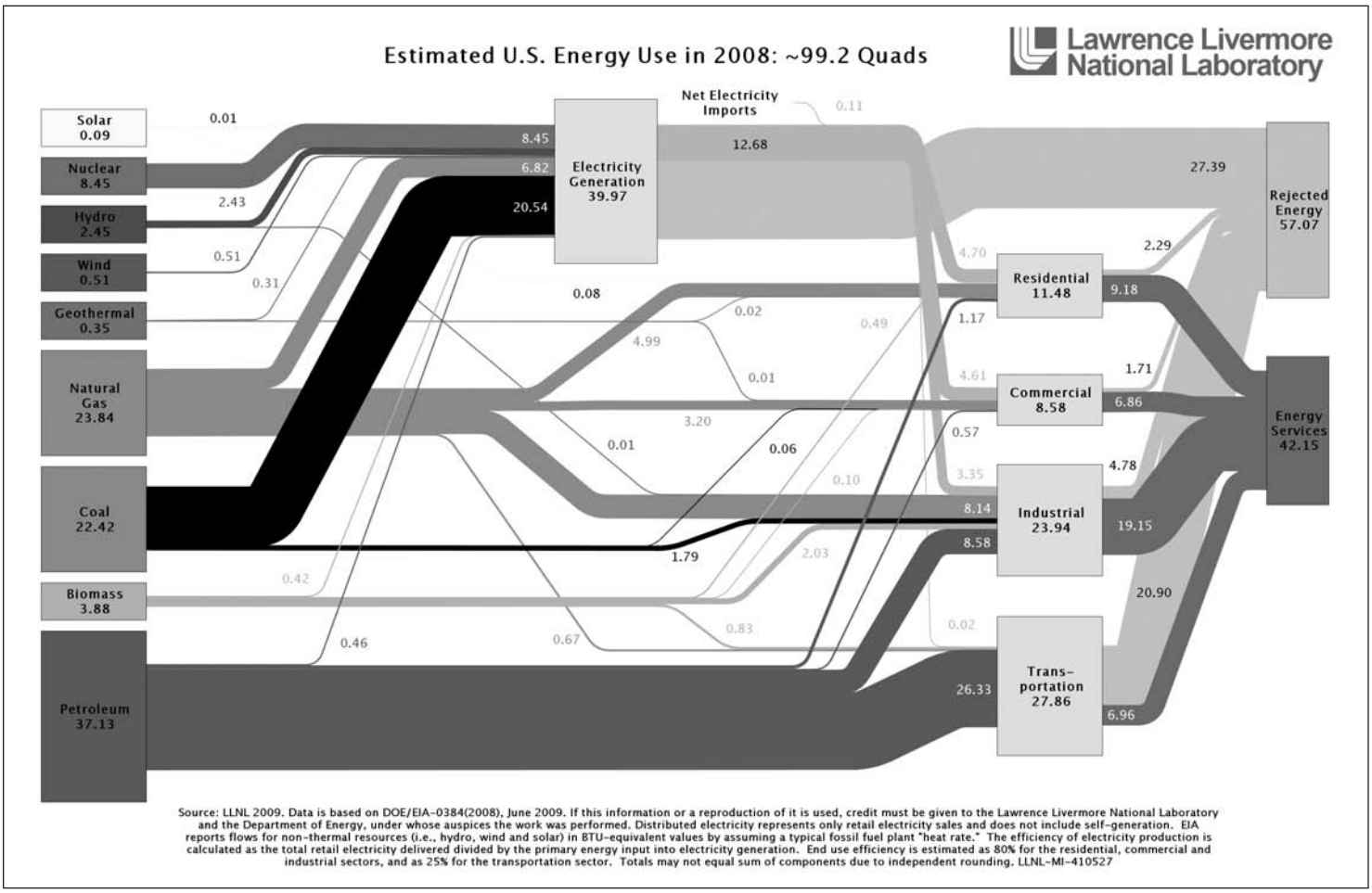
Challenge Three:
FUEL POVERTY

Our climate change and peak oil problems are exacerbated by our inefficient energy practices. We produce great amounts of power at huge environmental and cultural costs and waste much of it. An average coal plant wastes more energy than it generates; only 1/3 of the fuel's energy is put to use, the other 2/3 is wasted.[46] Our infrastructure has become so inefficient that annual wasted energy from American electric power plants could fuel the entire country of Japan.[47]

Along with wasting vast amounts of energy in power production, we waste a great deal in transmission and in our inefficient buildings and homes. Twenty percent of the energy used in American industry and in commercial and residential buildings is wasted because of poor insulation and ventilation.[48] The cost of wasted energy in our tribal communities, and in particular, our housing, contributes to our poverty.

FUEL POVERTY AND HOME HEATING

"Fuel poverty" is a term that describes the disproportionate cost of heating a home for a low-income family. In 2006, more than 13 million households in poverty spent an average of 25% of their annual income on their energy bills to maintain their modest levels of usage.[49] For tribes in northern regions, a good portion of this energy income is spent on heat, and most families cannot afford the rising cost. About 1/3 of reservation homes are trailers, many of which were originally built as temporary housing for warm climates but ended up as permanent housing in bitterly cold areas. These trailers, along with most reservation homes, lack adequate weatherization. In fact, roughly 90% of reservation homes are without adequate weatherization.[50] That means much of the money and energy spent to keep our homes habitable during the long winter months is wasted.



As illustrated, the United States wastes 57.07% of the electricity it generates. Graph by Lawrence Livermore National Laboratory and the Department of Energy.

The sad reality is that the need for government assistance to combat fuel poverty far outstrips the resources of the federal Low Income Heating and Energy Assistance Program and other payment programs combined. In Minnesota, for example, 43,139 households applied for fuel assistance and qualified, but were turned away due to lack of funding.[51] As a result, low-income households often sacrifice other necessities, like food and medicine, just to stay warm.

Nationally, tens of millions of dollars in fuel assistance are spent to support our low-income tribal members. Some of the cost of fuel assistance has been subsidized with a 2007 CITGO petroleum project carried out in conjunction with US partner Citizens' Energy. The company provided a subsidy of $21 million in fuel assistance to 220 tribes in 13 states.[52]

CITGO's support is needed, generous and gracious, but as electricity and fuel prices continue to rise and we continue to waste what we buy, the dollars we spend on energy will increasingly outpace all subsidies. In the 2005-2006 winter season, projections suggested that energy costs for American Indian homes on reservations would total $1.2 billion; an increase of 10-35% depending on the type of heating system.[53] We need to create long-term, sustainable solutions to fuel poverty by creating a renewable, energy-efficient future.

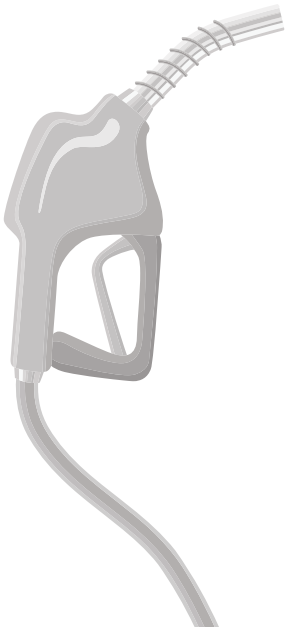
FUEL POVERTY AND TRANSPORTATION

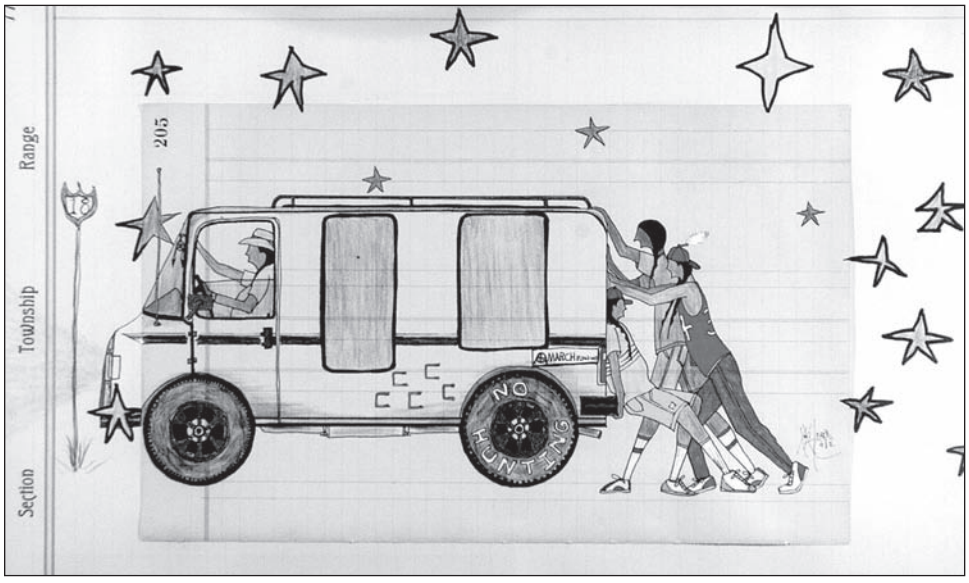
"Fuel poverty" also applies to the poverty caused by high transportation costs in reservation and other rural communities.

Most of our communities consist of a set of remotely situated villages, far from commercial centers. No infrastructure for public transportation exists on the vast majority of our reservations, and there are few sidewalks for walking or biking. We drive long distances to work, to procure services or visit family on the reservation, and we drive even longer distances off-reservation for groceries, clothing and other necessities.

The Federal Highway Administration estimates that those living in rural areas travel an average of 3,100 miles a year more than urban dwellers.[54] This, combined with the older average age of vehicles and lower incomes of residents, contributes to people in rural areas spending as much as 16% of their monthly family income on transportation.[55] This is much, much higher than the 2% of monthly income people living in urban areas spend on transportation costs.[56]

Our communities are increasingly challenged by the rising cost of gas and diesel, underscoring the need to become more efficient in how we travel. Peak oil will drive up the price of gas and diesel even more over the next decade. Tribes must take a hard look at efficiency and consumption in order to repair leaks in our local economies and protect our communities against unpredictable outside markets.





"Van Go," by Dwayne Wilcox

Challenge Four:
FOOD INSECURITY

"Food sovereignty is the right of Peoples to define their own policies and strategies for sustainable production, distribution, and consumption of food, with respect for their own cultures…and is considered to be a precondition for Food Security."

— Declaration of Atitlan, First Indigenous Peoples' Global Consultation on the Right to Food and Food Sovereignty, Guatemala, 2002

Our tribal land base represents an enormous potential food resource. Almost 47 million of the over 54 million acres of tribal and individual Indian trust lands are rangeland and cropland. [57] However, approximately 70% of our cropland and 20% of rangeland is leased to non-Indians.[58] This high percentage of leased land reduces Native control of tribal food systems at its source.

We are producing less and less of our own food. While more than 8,000 Native farms operate on reservations, only a handful of these farms produce food for local tribal members.[59] For example, the Fort Berthold Reservation and the Pima Tohono O'odham, once agricultural foundations for their region, now produce export commodities for outside markets.

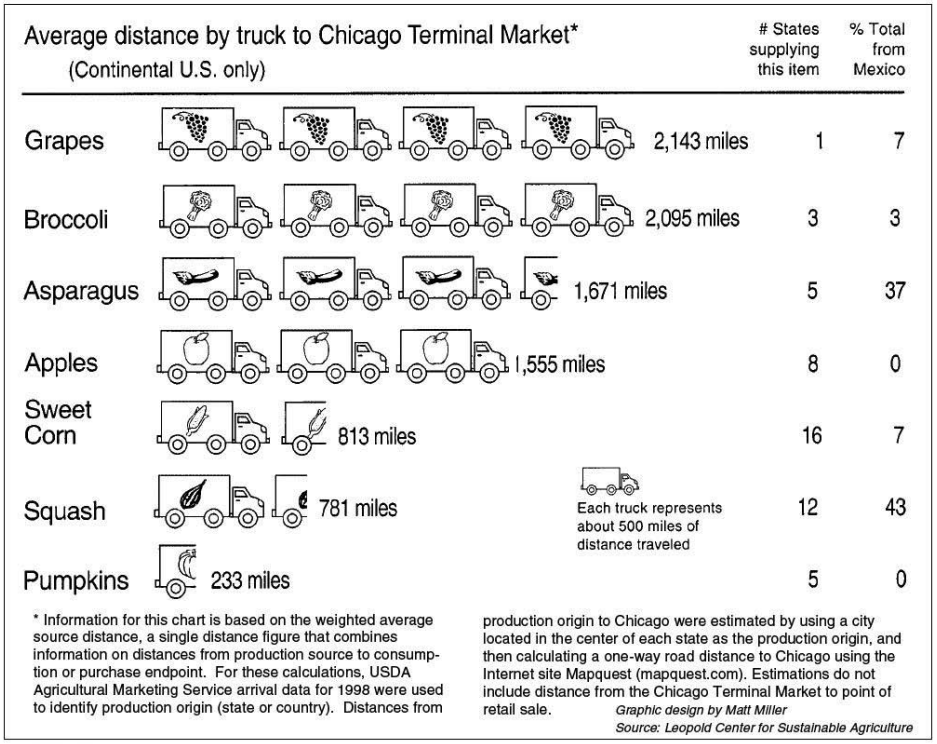
Studies of tribal food security indicate that just one hundred years ago, we produced nearly all of our own food locally on our reservations. Today, we produce less than 20%. Tribal communities are now reliant upon the same food systems and stores as the dominant population. In other words, our food economies have become increasingly dependent upon the external, industrialized food economy.

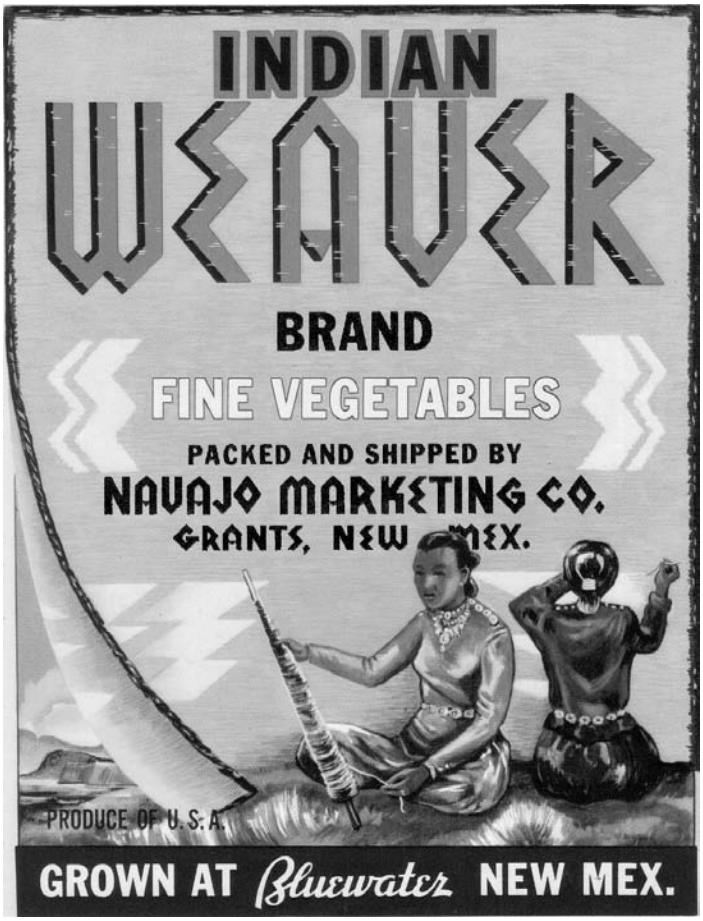
Industrial food is expensive, insecure and unhealthy. In June of 2008, the Food and Agriculture Organization (FAO) Food Price Index, which measures the cost of a basket of food, stood at its highest level ever.[60] The increase in the cost of food has caused a huge loss in food security for people on a worldwide scale. Based on the factors contributing to the high price of food, including peak oil and climate change, this trend is likely to continue. Tribal communities cannot afford the rising cost.

INDUSTRIAL FOOD, CLIMATE CHANGE AND PEAK OIL

Industrial agriculture has a huge carbon footprint. Overall, agriculture and land use changes are responsible for about one-third of all greenhouse gas emissions.[61] The introduction of mechanized farm equipment and of petroleum-based pesticides and herbicides following World War II made growing and raising food extremely fuel intensive. Today, the food industry is the single largest consumer of energy in the US economy.[62]

Industrial food is shipped and trucked tremendous distances. In the US, food travels an average of 1,546 miles from the producer to the kitchen table.[63] The system is so inefficient that it now requires ten fossil fuel calories to produce a single food calorie.[64] For example, the US imports 270 million





At one time, we produced sufficient food for our own communities and for export. Above left: Navajo vegetable company label; Above right: Ricing on the White Earth Reservation.

pounds of grapes from Chile every year, releasing 7,000 tons of pollution along the way that contributes to global warming. And trucking, shipping and flying food from across the globe isn't the only problem. To keep food products from rotting in transit, manufacturers rely on petroleum-based plastic packaging that also requires tremendous amounts of fossil fuels to make. [65]

Industrial meat operations are also big greenhouse gas emitters. Livestock alone accounts for 18% of worldwide greenhouse gas emissions.[66] In fact, eating a kilogram (2.2 lbs) of beef from the grocery store produces more greenhouse gas emissions and other pollution than driving for three hours while leaving all of the lights on at home.[67] Industrially produced beef also relies on fertilizer compounds like sulfur dioxide and phosphate, and consumes massive amounts of energy for every pound of meat produced.[68]

The carbon footprint of factory farmed livestock is compounded by the deforestation conducted to increase grazing lands. To meet the growing demand for meat, the US imports about 200 million pounds of beef from Central America annually.[69] But it's not just the greenhouse gases from transporting the meat that is of concern. To make room for cattle, corporations in the Amazon Basin are clear cutting forests and uprooting Indigenous peoples. Seven football fields worth of trees are cut each day.[70] Approximately 55 square feet of forest are destroyed for every hamburger that comes from Central America.[71] Deforestation for livestock is also happening in the US. More than 260 million acres of forest have been clear cut for animal agriculture.[72] Such massive deforestation accelerates climate change, as forests, like all plants, sequester carbon, helping to keep it out of the atmosphere.

INDUSTRIAL FOOD SAFETY

In February of 2008, 143 million pounds of beef were recalled in the federal school lunch program because of contamination.[73] And that is just the tip of the iceberg when it comes to health issues related to industrial meat production and distribution. Most of our meat today comes from factory farms, also known as Concentrated Animal Feeding Operations (CAFOs), where animals are kept confined in inhumane conditions while being pumped with antibiotics and hormones. Diseases like E. coli, mad cow and swine flu spread quickly because of these factory farming practices.

PETROLEUM-BASED PESTICIDES, FERTILIZERS AND THE POLLUTION AND EROSION OF OUR LAND

The industrialized food system relies on petroleum-based pesticides and fertilizers, which have wreaked havoc on our soil, water, and air. Since 1950, US pesticide use has increased from 15 million pounds to more than 125 million pounds annually, yet over the same time period, the amount of crops lost to insects has doubled.[74] It is estimated that less than 0.1% of applied pesticides reach their intended targets, causing damage both on and off site.[75] This compounds the agricultural dilemma, and large amounts of pesticides are repeatedly added to battle weeds and insects. These fossil fuel-based chemicals are not easily washed away. Agriculture is the largest source of water pollution in the world.[76] A 1999 report by the National Water Quality Assessment Program reported at least one pesticide in virtually every water and fish sample collected from streams.[77]

Modern agricultural practices, and in particular, large-scale monocropping (growing one crop on the same land year after year) are causing us to lose our topsoil as well. 90% of the nation's cropland continues to lose its soil faster than any expected replacement rates.[78] As a result, nearly one-third of the world's arable land has been lost to erosion in the last 40 years.[79] In addition, since the life cycles of monocropped annual crops are not well synchronized with annual climatic and soil conditions, they compete poorly with weeds for water and nutrients. Up to 45% of precipitation can escape to subsurface soil out of reach of annual plants.[80] This is five times that lost by natural perennial prairie plants, which are deeply rooted and alive throughout the year. As a result, annual crops lose 35% more nitrogen than indigenous plants.[81] The nutrients that leave the farm's soil eventually reach the ocean via a series of groundwater aquifers, streams, and rivers. In the ocean, the concentrated nutrients have created an increasing number of dead zones, areas where fertilizer and other runoff has created hypoxia, the choking out of oxygen from the ocean water. There are now 150 of these dead zones in the world.[82] One of the largest dead zones can be found where the Mississippi River drains into the Gulf of Mexico. That dead zone is larger than the state of New Jersey.[83]

ACCESS TO FOOD AND FOOD SECURITY

Access to food is a concern. Native peoples often live in food deserts, meaning we have very few places we can easily get to that sell healthy foods. Climate change threatens to increase our lack of access to food. Changes in weather patterns and erratic droughts and frosts that come with climate change all affect the viability of a food economy, particularly if it is monocropped with hybrid crops. Hybrid crops created for an industrial food system are unable to adapt quickly to volatile climate changes. And monocropping by definition makes food systems more vulnerable because only one variety of crop is grown year after year on the same land. If that particular strain gets diseased one year or is hit especially hard by certain weather, the entire food crop is jeopardized.

In contrast, it turns out that many of our traditional foods are drought and frost resistant. That's because our traditional seeds and foods were produced in a pre-fossil fuels world. Our traditional foods do not need petrochemical fertilizers or giant irrigation systems and don't need to be transported across the country. Restoring traditional foods is a means to restore our food security.

FOOD COLONIZATION: THE CREATION OF FOOD INSECURITY AND ILL-HEALTH

Our ancestors would not recognize most of the foods we consume today. That's because the majority of the food we now eat is not indigenous to North America. Beef, dairy products like milk and cheese, wheat and flour, white sugar, and lard were all introduced by Europeans post-contact. These western foods have properties foreign to our bodies, such as high levels of saturated fats and glucose.

The lack of access to our traditional foods has had a devastating impact on the health of our communities. We

are paying astronomical bills through our Indian Health Service and contract health to combat the high rates of obesity, diabetes and heart disease we face as a result of the industrial food complex. The hefty costs of addressing these diet-related illnesses will not diminish unless we take action by restoring our traditional foods.

Simply put, a western diet has made us sick. The Food Distribution Program on Indian Reservations, introduced in the 1930s to provide surplus commodities and agricultural products to tribes, has left our peoples more disease ridden than most other racial groups in the United States. Twenty years ago, in 1989, a study conducted by the Government Accountability Office concluded that the continuing increase in obesity, diabetes, heart disease and hypertension is "likely to continue" unless federal food packages distributed to Native Americans are improved.[84] Our commodity foods never improved and today, they still constitute a significant part of the modern Native diet– one study found that Navajo women get 43% of the calories they eat each day from commodity foods.[85]

Prior to the introduction of commodity foods, diabetes was almost nonexistent in Native communities. Today, some tribes have diabetes rates of over 50%.[86] Native peoples are 25% more likely to develop diabetes than non-Natives and a full 30% of the Native population suffers from the disease.[87]

The process of colonization not only deteriorated our bodies, but also our knowledge of food. Children that were forced into boarding schools were fed greasy, salty, sugary foods,[88] none of which had been in the Native diet before. Knowledge "about medicinal foods, agricultural techniques, seed preservation, and blessings that corresponded to planting, growing, and harvesting," was deliberately suppressed.[89] With parents forced away from growing traditional foods and children removed from their communities and life ways, Native peoples were left with a future of food dependence and ill health.

There is a better way and it begins with restoring our traditional foods. The recovery of the people is tied to the recovery of food, since food itself is medicine, not only for the body, but for the soul, and for the spiritual connection to history, ancestors and the land.

False Solutions:

"CLEAN" COAL, CARBON CAPTURE AND SEQUESTRATION, NUCLEAR POWER & UNSUSTAINABLE BIOFUELS

Climate change, peak oil, fuel poverty and food insecurity place us at a crossroads. Industrial society can choose to address the fact that the root cause of our planetary crisis is found in a system of centralized, polluting power based on extraction, combustion and inefficiency, or we can maintain this model and continue to rely on technologies that endanger and exploit the Earth and her peoples. This choice has very significant implications for our continued survival. There are several prominent false solutions that mirror the existing paradigm of energy conquest, and simply extend our reliance on a fossil fuel and nuclear economy.

"Clean" Coal: A Dangerous Oxymoron

Some coal proponents suggest that burning coal can have a place in a climate challenged world. They suggest that using new technologies to remove carbon and other greenhouse gases from coal emissions makes coal a 'clean' energy source. This logic is fundamentally flawed. Coal is never clean. Coal is mined by ripping huge holes in the Earth, leaving behind toxic messes and destroying landscapes, ecosystems and groundwater. Even when toxins are removed before they are burned and released into the air, they don't disappear and must be put somewhere. Every stage of coal power production brings environmental damage.

Carbon Capture and Sequestration: Theoretical and Misguided

Carbon Capture and Sequestration (CCS) is a process that removes carbon from coal emissions and then pipes it to a storage site, either deep underground, in vegetation or in the oceans. Coal companies hope to store carbon in the biosphere to keep it out of the atmosphere, but continuing to burn coal means continuing to produce pollution that will go somewhere that's likely to cause problems. CCS has never been tested on the large scale required to make a dent in global warming emissions. There is no way to know if it will work over hundreds or thousands of years on a global scale. In addition, CCS uses a great deal of energy, meaning that power production would need to be increased just to manage the process of reducing emissions, making it much more expensive than renewable options that are already proven and have very minimal carbon impacts. CCS is unproven and simply perpetuates the dirty business of mining coal and coal combustion.

Nuclear Power: Expensive, Carbon Intensive, Unsafe

Nuclear power has left a deadly legacy in Native America. From uranium mining's radioactive tailings to nuclear waste storage, at every stage of the nuclear cycle Native communities have been disproportionately impacted. In addition, nuclear power is anything but carbon neutral. Arguments that nuclear power provides a solution to global warming ignore the carbon intensity of the uranium mining and upgrading process and the transportation of fuel and waste, which are significant. Nuclear power is fundamentally dangerous; it relies on fuel that is highly radioactive and lethal for tens of thousands of years after use.

Unsustainable Biofuels: Irresponsible, Carbon-Intensive Agriculture

Unsustainable efforts to replace gasoline with other fuel sources can be found in the big bio-fuels market. In the US, ethanol dominates the so-called 'alternative' fuel market. Ethanol is primarily made from corn. It can take more energy to grow, process and transport the ethanol than is contained in the fuel. And the practices by which the corn is grown often include the irresponsible overuse of toxic agrochemicals and the use of genetically modified (GM) seed. Monocropped GM corn is petroleum-intensive to grow and adds to erosion and agricultural runoff on the prairie. Corn-based ethanol also drives up the price of food as land and resources shift away from food production to fuel production.

Outside the US, agribusiness companies are devouring tropical regions by creating fuel crop plantations in South America, Southeast Asia, the Pacific and Africa. Palm oil expansion for biofuels is a primary cause of deforestation in Indonesia[90] where forests are disappearing at a rate of up to 1.2 million hectares a year, triggering vast forest fires that spew massive amounts of CO_2 into the air.[91] The impacts of large-scale biofuel production often threaten Indigenous cultures and lands, and the transportation of such fuel thousands of miles simply adds to climate change.

Notes:

Part Three:

OPPORTUNITIES FOR TRIBAL ACTION

Tribal communities are uniquely positioned to lead the way in developing a clean food and energy economy, one that doesn't depend on constant resource extraction, the burning of dirty fossil fuels, and the invasion of other peoples' territories to meet our food and energy needs. Harnessing our renewable potential, utilizing Indigenous knowledge to build resilient local food economies and increasing efficiency will create meaningful jobs and a community infrastructure that will benefit our tribal members and the coming generations. This section of the booklet showcases opportunities to affect these important changes.

TRIBAL RENEWABLE ENERGY POTENTIAL

Tribes have some of the most abundant renewable energy potential in the world. Tribal lands are incredibly rich in solar resources, holding an estimated 17,600 Billion kWh/year of solar electricity potential. That's almost 4.5 times total US annual electrical generation.[92]

Tribal lands in the lower 48 states alone hold more than 535 Billion kWh/year of wind power generation potential, equal to about 14% of US annual generation in 2004.[93] This potential, calculated at a turbine hub height of 50 meters above the ground, may be more than doubled when measured for modern wind turbines, which are mounted at 85 to 100 meters above the ground, as higher turbine heights capture wind speeds that are much greater.[94]

Along with tremendous renewable potential, we also have an infrastructure of tribal colleges to train a green workforce. Our lands, renewable resources and colleges provide a strong foundation for building resilient local economies.

RENEWABLE ENERGY PORTFOLIO STANDARDS

The economy of the future is a green economy. The rising price of fossil fuels is creating a mandate for efficiency and the challenge of addressing climate change will require a reduction in carbon emissions from power generation, transportation and agricultural sources.

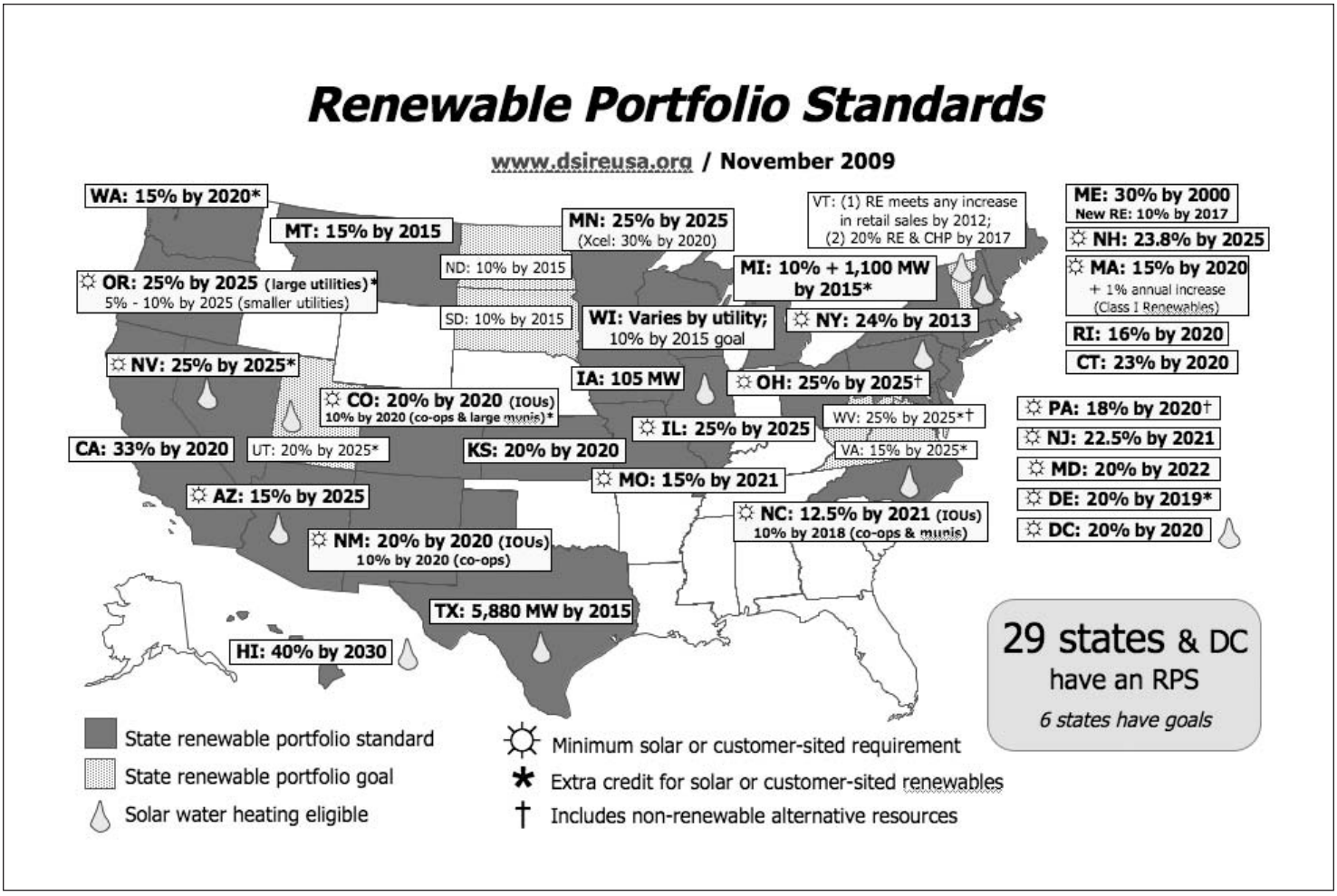
With lack of action by the federal government on climate change, many cities, states and a number of tribal communities have adopted policies to limit and reduce their carbon emissions. At least 31 states have mandated that a certain percentage of utilities' power generation come from renewable sources by a specific date.[95] Those mandates, called renewable portfolio standards (RPS), have had far-reaching impacts. Research at Berkeley Lab, for example, suggests that over 50% of the total wind additions that took place between 2001 and 2006 in the US were motivated at least in part by state RPS policies.[96]

The state of Minnesota has adopted a strong goal of reducing carbon dioxide emissions from fossil fuel based power production 25% by 2025, and 80% by 2050. Meeting the state's portfolio requires aggressive action into a new, renewable and efficient energy arena. We are keenly interested in having our communities at the center of this transition across the country.

RENEWABLE ENERGY GROWTH

Wind energy is the fastest growing energy source in the world.[97] In 2008, US wind power production shattered all previous records with the installation of 8,358 MW of new wind generating capacity,[98] the equivalent of producing power for two million households. This represented 42% of the newly installed power-generation capacity in the US for the year and an infusion of some $17 billion into the economy.[99] Growth in all sectors of the wind industry, from manufacturing to installation, is projected to continue.[100]

The solar power industry boomed globally between 2004 and 2008, with a 51% compound annual growth rate.[101] In 2008, the industry grew by 17% in the US alone.[102] While the economic recession and shrinking capital and credit has slowed solar growth recently, technological advances continue to offer breakthrough demonstrations that solar is a cost-competitive and reliable source of power.[103] Market analysts are forecasting robust growth in the solar industry over the coming years.[104]



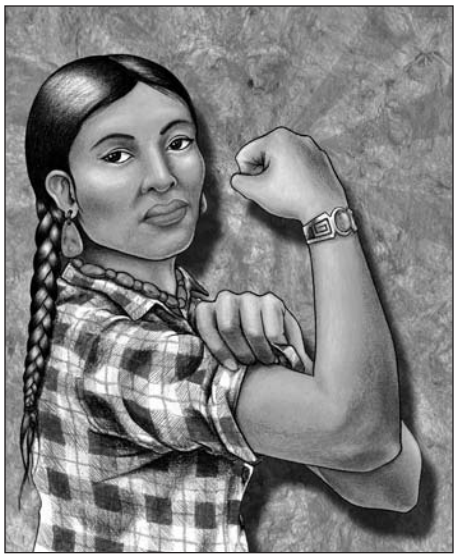
GROWTH OF LOCAL AND ORGANIC FOODS

One of the biggest current growth markets is in local and organic foods. Although the recession has slowed the previously explosive growth of the organic food market, overall sales continue to rise, which is rare in these tough economic times.[105] Part of that growth stems from that fact that the idea of buying and consuming locally grown food increasingly resonates with consumers.[106] [107] A growing number of consumers are simply willing to pay for ethical and healthy products, even if they are more expensive.[108] In fact, the "ethical products" market in the United States is expected to approach $62 billion in 2014, up from $38 billion today.[109] Food is expected to remain the biggest portion of that market.[110]

GREEN JOBS FOR BROWN PEOPLE!

Policies that drive a transition toward a carbon-free economy will create immense job potential. Building renewable energy projects, updating our electrical grid, and improving efficiency will employ millions of people in the coming years. In addition to addressing climate change, investments in clean energy and efficiency create up to four times as many jobs as the fossil fuel industry per dollar invested.[111]

A "green job" is any job that restores the environment and contributes to de-carbonizing the economy by minimizing waste and pollution. Green jobs are most often associated with energy efficiency and/or clean energy production. If new renewable infrastructure like solar panels and wind turbines are the skeleton of the new energy economy, green jobs are the muscles that keep everything moving. People are needed to design, manufacture, install and maintain solar panels and wind turbines. Improving building efficiency requires hours of caulking windows, adding insulation and installing more efficient appliances. Green jobs are also created in the process of re-localizing



Art by Votan Ik'ahn, www.insurgentes.net

food systems and creating essential infrastructure for an economy that is resilient.

Renewable energy creates more jobs than fossil fuel energy per megawatt installed, per unit of energy produced and per dollar of investment.[112] There are 2.77 jobs in wind power for every megawatt installed, 7.26 jobs/megawatt in solar photovoltaics and 5.93 jobs/megawatt in solar thermal.[113] In 2006, the American Solar Energy Society estimated that renewable energy and energy efficiency were responsible for $970 billion in industry revenues and 8.5 million jobs.[114]

One example of this job potential in the upper Midwest can be seen by comparing economic figures for the proposed 580 megawatt Big Stone II coal-fired power plant and renewable energy alternatives. In 2007, Marshall Goldberg of MRS Consulting testified before the Minnesota Public Utilities Commission that displacing the proposed Big Stone II plant with wind would offer the following: 4,000 jobs in construction, $100 million in wage and salary income, and $345 million in economic output within the state of South Dakota (in 2005 dollars). When the wind farms were up and running, they would create 172 annual on-site jobs and $7.96 million in wage and salary income in South Dakota. Total statewide impacts for ongoing operations would be 483 jobs, $15.6 million in wage and salary earnings and $34.98 million in economic output annually.[115]

In comparison, Randall Stuefen, testifying for Otter Tail Power, a lead proponent of the Big Stone II coal plant, proposed a meager one-fifth of the jobs on-site and a total of 64 jobs in long-term operation of the plant with an annual contribution to the state economy of $6.8 million.[116] Big Stone II proponents and investors eventually dropped the project due to mounting financial uncertainties, a major victory for clean energy advocates.

Green jobs provide pathways out of poverty. With tribal unemployment rates soaring to 50% and beyond, Indian country cannot afford to miss out on these green job opportunities.

TRAINING THE NEXT GENERATION OF LEADERS

Growing the intellectual and technical capacity of our tribal members, and especially our youth, is critical to building the economy of the future. Developing green jobs training programs in our tribal colleges is critical to creating local capacity for managing green industries and projects.

Iowa Lakes Community College and Minnesota West Community and Technical College are two schools that already have green jobs training programs in place, and a number of community colleges nationally are looking to develop renewable energy certification and degree programs. Iowa Lakes offers degree programs in

Honor the Earth Intern Yana Garcia working at a solar installation. Photo by Tom Reed.

biorenewable fuels technology, wind energy and turbine technology, and sustainable energy resources management.[118] Minnesota West offers degree programs in biofuels technology, wind energy technology, wind energy mechanics, and windsmithing, including an online windsmithing certification program.[119] Fond du Lac Tribal and Community College near Duluth, Minnesota is offering a Clean Energy Certificate Program to provide future technicians with skills to work in electric-based renewable energy and high efficiency systems. Tribal colleges nationally can utilize these programs as a model to develop their own programs for training a green workforce.

Given our renewable resources and our land base, our tribal communities will either have a seat at the table or be on the menu in the future green economy. Decisions will either be made for us or we will make our own decisions about how to proceed in developing green economic opportunities and our future. By making our own decisions and taking action to establish and implement sustainable economic development, our tribal communities will exercise sovereignty and forge a green path for our coming generations.

NAVAJO GREEN JOBS SUCCESS!

In the summer of 2009, the Navajo Nation made history by passing the first green jobs legislation in Indian Country. The bill establishes a Navajo Green Economy Commission to oversee the growth of small-scale green projects on the reservation. It also creates a Navajo Green Economy Fund to receive federal, state, local, and private money to make these green projects possible.

The legislation was a result of a concerted grassroots effort spearheaded by the Navajo Green Jobs Coalition, an alliance of Navajo and environmental groups. According to the Coalition, Navajo green jobs funding will support:

- Community renewable energy projects;
- Green manufacturing, such as wool mills;
- Energy efficiency projects, such as weatherizing homes and sustainable water projects;
- Local business ventures, such as weavers' co-ops and green construction firms;
- Traditional agriculture, such as farmers markets and community gardens;
- Green job training programs, such as workforce development, green contractors and public service projects.

Approximately 70% of the money generated on the Navajo Reservation is currently spent off-reservation and in border towns,[117] and unemployment hovers around 45%. This bill takes an important step in closing the loop on lost revenue and toward the creation of local jobs rooted in Navajo culture. The Navajo Nation has historically relied on revenues from coal, oil, and gas royalties; the green jobs bill can begin to shift the Navajo economy away from a dependence on polluting industries toward safe and sustainable development. The bill's passage is an important model for other Indigenous communities hoping to move forward in building energy and food sovereignty.

"This is just the beginning for Indian Country. We hope our efforts pave the way for other tribal nations to bring local sustainable green jobs to their communities," said Wahleah Johns, Co-Director of the Black Mesa Water Coalition and one of the leaders of the Navajo Green Jobs Coalition.

For more information: www.navajogreenjobs.com

Part Four:

SOLUTIONS FOR BUILDING SUSTAINABLE TRIBAL ECONOMIES

This section is designed to offer information to assist in beginning clean energy and local food projects and lead you to additional resources that fit your project's specific needs.

Any efficiency or renewable energy project has unique circumstances that need to be taken into account before starting work. Be sure to plan thoroughly and consult a set of experienced professionals to ensure that the project you're undertaking will be a financial and environmental benefit to your community.

Solution One:

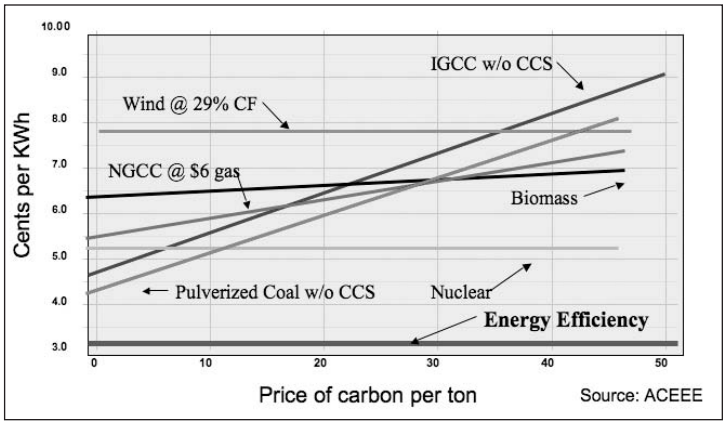
ENERGY EFFICIENCY AND CONSERVATION

The first step in developing a clean energy economy is to use less energy. It's much cheaper to use less power than to produce new power, so begin any clean energy plan by reducing energy use.

A good place to start an efficiency project is with an energy audit. An audit will evaluate where heat and energy are being lost or wasted in a building. Thorough audits often use equipment, such as blower doors and infrared cameras, to measure the extent of heat loss in the building.

Contact your utility to see if they offer free or discounted energy audits to customers. Energysavers.gov also has instructions for a do-it-yourself energy audit and offers help finding a professional to do a more comprehensive analysis. State energy offices are good sources of information as well.

The cost of efficiency improvements is much lower than the cost of increasing electrical generation. From a presentation by Joel Rogers, JR at Dream Reborn, 4/2008



EFFICIENCY BEFORE RENEWABLES

Before installing any renewable energy capacity, it's important to consider upgrading appliances to reduce overall electricity loads. For example, on a solar panel project Honor the Earth hosted on the Skull Valley Goshute Reservation in Utah, the decision was made to purchase a more efficient refrigerator before installing solar panels. Older appliances, especially refrigerators, can use up to twice the energy of more efficient models. In Skull Valley, the money spent on the new refrigerator allowed the solar panels to provide a much higher percentage of the site's power because the load was so significantly reduced. A similar investment in increasing the size of the solar panels would have made little difference.

Check here to help find efficient appliances and to calculate how much can be saved by replacing your old model with a more efficient one: www.energyguide.com

CONSERVATION: USE LESS, POLLUTE LESS, PAY LESS

No matter how efficient your furnace, if it's turned up to 95 degrees all winter long, you'll use a lot of energy. In addition to common sense ways of using less energy, like not leaving the water on more than you need it and turning down your furnace, there are some products that help conserve and pay for themselves quickly. Examples include low flow showerheads, which use less water than standard showerheads, and compact fluorescent light bulbs, which use up to 75% less energy than standard incandescent bulbs and last up to ten times longer.

TRANSPORTATION: A LOOK AT INCREASING EFFICIENCY

Conservation and efficiency improvements in transportation are also important tactics to stop revenue leakages from our tribal economies. Two strategies offer possibilities in reducing the need to drive long distances and the amount of fuel we use:

1) The creation of tribal transportation programs, like bus systems, to move people in a more efficient manner. Hybrid bus fleets are increasingly being used in major urban areas, such as Los Angeles, Indianapolis and Minneapolis, and offer a lower-carbon transportation alternative.

2) The creation of more local shops, workplaces and recreation sites in our villages, along with walking and biking paths, to reduce the distance we need to travel.

ENERGY EFFICIENCY RESOURCES

US Department of Energy's Energy Savers Site • www.energysavers.gov
Database of State Incentives for Renewables & Efficiency • www.dsireusa.org
American Council for an Energy-Efficient Economy • www.aceee.org
Department of Energy, Energy Efficiency and Renewable Energy
www.eere.energy.gov • tribaleecbg@go.doe.gov • (720) 356 1360
Search online for your state's energy office
For more information about your appliances' electrical usage, visit:
ABS Alaskan's Power Consumption Table
www.absak.com/library/power-consumption-table

WHITE EARTH LAND RECOVERY PROJECT: LOCAL ENERGY EFFICIENCY STRATEGY

White Earth Reservation, MN
A 2006 White Earth Land Recovery Project study of energy consumption helped create a plan for the energy future of the White Earth Reservation. At the center of this strategy is efficiency. The plan focuses on weatherization for tribal housing, using resources largely from a local utility, Otter Tail Power Company, to install more energy efficient appliances and conduct weatherization in tribal homes, including weather-stripping, putting plastic on windows and distributing energy efficient light bulbs.

The project will be continued in Otter Tail Power areas and expanded in other service areas as well (the reservation is served by four separate utilities and/or rural electric cooperatives). This strategy will benefit not only the White Earth tribe, but can also be easily replicated by other tribal nations across the country.

Along with traveling more efficiently and decreasing our transportation fuel use, we can consider producing and using sustainable alternative fuels, such as local biodiesel, described under the Renewable Energy section of this booklet.

Before installing renewable power, make sure your building is as energy efficient as possible and that conservation measures are in place so that the smallest and least expensive new energy system will meet your need!

Solution Two:
RENEWABLE ENERGY

Below is general information that applies to all renewable energy production and following that, types of renewable energy most applicable for tribal use are discussed individually. It's important to note that this booklet is not comprehensive and does not cover all renewable energy types, such as geothermal and tidal. Instead, we've profiled replicable models and technologies that are currently in use in tribal communities.

RENEWABLE ENERGY DEFINED

Renewable energy is energy that replenishes itself naturally. Oil, coal, gas and uranium are all finite resources, whereas the wind and sun are sources of power that will never be depleted. In contrast to finite fuels, renewable power production does not require massive resource extraction and does not emit toxic gases and pollution. Even with the development of renewable power, however, siting and construction considerations are essential to ensure respect for land and cultural continuity.

INITIAL CONSIDERATIONS FOR ALL RENEWABLE ENERGY TYPES

The resource: Whether it's wind, sun, or plants, it's important to determine the strength of your resource and its potential to produce energy. Your resource is affected by many factors including your geographic location, seasons, local weather patterns and the geophysical aspects of the specific installation site.

The demand or load: An analysis of your current energy use is important as it will provide a basis for determining which renewable system or combination of systems will best meet your demand. A simple way to conduct this analysis is to collect your utility bills for a year and add up your kilowatt-hour usage and expense.

Remember that the power in the wind and sun does not have to be converted to electricity to perform work over time. Wind mills have pumped water for irrigation or livestock and passive solar thermal collectors have heated homes and provided hot water for hundreds of years without ever generating a kilowatt of electricity. A thorough analysis of the actual work to be done or services needed should be conducted to determine the kinds of technology that will most effectively fit your needs.

Your budget: Often financing the planning stages and financing the hardware and installation are different processes with distinct budgets. Along with determining how much funding you need, it is important to evaluate how much time, energy and money you can invest long-term in maintaining an energy system.

Your partner(s): Who will you work with? What resources do they need to bring (expertise, financial, equipment, etc.)? Who owns the system? Who pays for the system? Who benefits from the system? Who makes decisions about installation and maintenance of the system? Will the system be interconnected to the local utility? Who fixes and pays for fixing the system? It's very important to have these details worked out in advance and to work only with people and companies that you thoroughly research and evaluate.

A BASIC OVERVIEW OF THE PROCESS

Whether installing solar panels, a wind turbine or building a biomass plant, there are similar general steps toward completing a renewable installation:

1. *Planning Begins:* Develop a planning budget, acquire initial research and development funding;

2. *Measure Resource:* Determine how much sun, wind, water, biomass, etc. you have available to use by consulting with experts and using measuring equipment;

3. *Choose Site and System:* Decide what specific system(s) and equipment fits your needs, your resource and your budget and where your installation will be placed;

4. *Development:* Acquire remaining needed funding for construction, training and maintenance; issue a Request for Proposals (RFP). Review bids and determine a partnering renewable energy and/or engineering firm;

5. *Secure Appropriate Permits and Agreements:* Research the need for BIA, NEPA and/or FAA permits, and requirements for an interconnect agreement and net metering, if appropriate. Acquire any necessary permits; develop and finalize power purchase and an interconnect agreement with the utility if needed. The interconnection with a utility will be a time and money consuming process, make sure you know the studies and the costs of these studies that will be required by the utility and grid system operator;

6. *Installation:* Acquire the system and install it; ensure the installer commissions the system as fully operational and conducts a performance check;

7. *Maintenance:* Regularly check and service your system as needed. Make sure someone physically near the site knows how to maintain the device. Too many projects have failed because no one took responsibility for the day-to-day work to keep a project operational.

We recommend doing extensive research and planning, and consulting with one or more reputable professionals, to ensure your project's safety and success.

SMALL-SCALE VERSUS LARGE-SCALE SYSTEMS

Conventional wisdom would have you believe that large-scale power production is the way to go. However, small-scale distributed energy production has distinct advantages in many situations. We need to re-scale our energy production, and as tribal communities, we are in perhaps the best situation of any community in the country to make localized energy production work.

The renewable industry often divides small-scale systems into two categories: residential and community scale. Residential systems refer to renewable installations that provide power to a single home, while community systems refer to those that can help power institutions, such as schools, radio stations or tribal offices.

The benefits of localized, small-scale renewable energy include increased efficiency (we don't lose as much energy as in large-scale transmission), getting power where there is none now and energy self-sufficiency.

Residential and community scale projects allow tribes to avoid many of the pitfalls associated with large-scale development. Energy transmission is often difficult in remote tribal locations, and utility-scale development can expose tribes to potential exploitation in the negotiation of transmission contracts. Furthermore, with smaller projects, tribes can often obtain necessary funding through grants, rather than relying on outside investors. We can own our energy projects rather than leasing our resources and rights to developers. Managing our own power is an important social and political affirmation of our peoples' sovereignty.

Large, commercial-scale renewable installations tend to cost less per unit of energy produced than residential or community systems, but they are initially more capital intensive. Large-scale renewable development has a much greater potential to employ more people and generate more power to sell.

Beginning with a mix of residential and community systems for individual homes, clusters of homes or tribal buildings, and moving to larger scale installations to generate tribal revenue can all be considered as elements of long-term plans for a renewable future.

OFF-GRID VERSUS GRID-TIED SYSTEMS

In discussing any renewable energy installation you will often hear talk of whether a project is 'grid-tied' or 'off the grid.' This refers to whether a system is integrated into the regional electrical system or whether it is completely self-contained and free standing.

If you're currently not connected to the electrical grid, it may be best to remain off-grid. Good portions of the solar and wind installations on the Navajo and Hopi Reservations are not grid-tied. In some cases, installing a new power line to remote households is cost prohibitive and in other cases, it's simply the preference of the people to remain energy independent. When estimating costs and other logistics, it's important to note that many off-grid systems require battery and back up generation systems to increase reliability and ensure a consistent power supply.

If you are in an area connected to the regional electrical system, you may want to choose a grid-tied installation. A grid-tied system ensures a back-up power supply and, if your renewable system produces more power than you use, it allows that excess power to be sold back to the utility.

Any renewable energy system, whether solar, wind or micro hydro, can be free standing, grid-integrated or hybrid. Hybrid installations either pair or combine a variety of renewable energy systems to provide increased output and reliability in delivering power.

RENEWABLE ENERGY RESOURCES

US Department of Energy's Tribal Energy Program
apps1.eere.energy.gov/tribalenergy • tribal@go.doe.gov • (303) 275-4727
National Renewable Energy Laboratory • www.nrel.gov
Midwest Renewable Energy Association • www.the-mrea.org
Home Power Magazine • www.homepower.com
Search online for your state's energy office

TRIBES LEVERAGING POLITICAL WEIGHT ON RENEWABLE POLICY

The politics of renewable energy is a critical issue to consider in planning a tribal renewable energy project. Below is one example of an effort to level the playing field so tribes can be equal partners in renewable energy projects on tribal lands.

FAIR CREDIT ACT

The Fair Allocation of Internal Revenue Credit for Renewable Electricity Distribution by Indian Tribes Act or FAIR CREDIT Act is a bill before Congress that will make a simple yet essential change to the tax code so that tribes can become equal partners with private companies in renewable projects on their reservations.

A press release from Congressman Raul Grijalva (D-NM), the chief sponsor of the bill, explains why legislation to ensure equity in renewable energy development is urgently needed in Indian Country. "Under current federal law, tribes are tax-exempt and are prevented from taking advantage of the production tax credit. Further, private entities that seek to partner with tribes for renewable energy projects on Indian lands will only obtain 50% of the credit, rather than 100% if they invest in such projects on private lands. This puts tribes at a huge disadvantage in the renewable energy generation arena. The new legislation would make a simple but significant change in the Internal Revenue Code of 1986 [allowing] tribes to transfer their share of the production tax credit (PTC) to private entities providing financing for joint venture renewable energy projects on tribal lands. Tribes will be able to offer 100% of the tax credit to their partners."[120]

The need is great and the opportunities are abundant, but without such legislation, tribes are not given a fair chance for equitable ownership of large-scale clean energy development projects on tribal lands.

RENEWABLE ENERGY CREDITS OR GREEN TAGS: WHAT THEY ARE AND WHAT THEY DO

Renewable Energy Credits (RECs), also called green tags, are the quantifiable commodity of renewable energy that can be bought and sold. If a utility company needs to comply with state renewable energy regulations, they may be allowed to purchase RECs from an eligible provider who guarantees to produce that amount of renewable energy.

Green tags are also used as a way for individuals and companies to theoretically cancel out or "offset" their carbon footprint. For example, an individual may buy sufficient green tags to offset their airline travel for a year, or event producers may buy green tags to make an event theoretically carbon neutral by purchasing green tags equal to the event's projected carbon emissions.

*Native*Energy is a majority tribally-owned company that buys and sells RECs to help provide capital for tribal renewable projects. NativeEnergy will often agree to purchase a tribal project's green tags for their projected value before the system is built, offering a mechanism to generate much needed upfront capital. There are a number of these REC-financed projects underway, including wind projects in the Native villages of Toksook Bay and Kasigluk, Alaska.[122]

It is important to understand the dilemma surrounding a system that allows utilities and corporations to buy their way out of reducing their carbon emissions instead of changing their behaviors. Because the energy produced by the REC provider is usually nowhere near the purchaser's site there can still be pollution hot spots, which often disproportionally affect the poor. Plus, monitoring reduced carbon emission accounting is difficult at best, making it easy for companies to take advantage of the program. RECs may be an option to help finance renewable projects, but it's important to carefully consider the reality that companies or utilities might be using the power you provide to continue destructive patterns.

Solar Energy

Harnessing the sun's energy is one of the cleanest and most reliable sources of power. In addition to electricity, the sun's energy can be used to heat air and/or water directly. And solar power isn't only viable in southern regions. Even when it's cold out, the sun can power solar projects in northern climates that are sunny in the winter.

SOLAR BASICS

A solar installation captures energy from the sun, and puts that energy to use as either direct heat or electricity.

Site placement is exceptionally important for maximizing solar technology's effectiveness. Solar installations in the northern hemisphere always face the south to maximize exposure to the sun. Significant shade from trees or other buildings can also interfere with and negate the benefits of a solar installation.

A simple piece of equipment called a "solar pathfinder" can be used to measure and evaluate your site's solar resource. An accurate determination of the strength of your solar resource is critical to a successful solar project.

SOLAR ELECTRIC: PHOTOVOLTAIC (PV) PANELS

Photovoltaic solar systems produce electricity directly from sunlight. PV modules generate direct current electricity, which is usually converted into alternating current electricity that can power most home appliances. PV systems produce clean, reliable energy and can be used in a wide variety of applications, from small, residential installations to large-scale commercial power generation. Residential and community installations can be pole-mounted near a building, or mounted on a roof top; recent innovative advances incorporate PV technology into standard building materials, such as roof shingles.

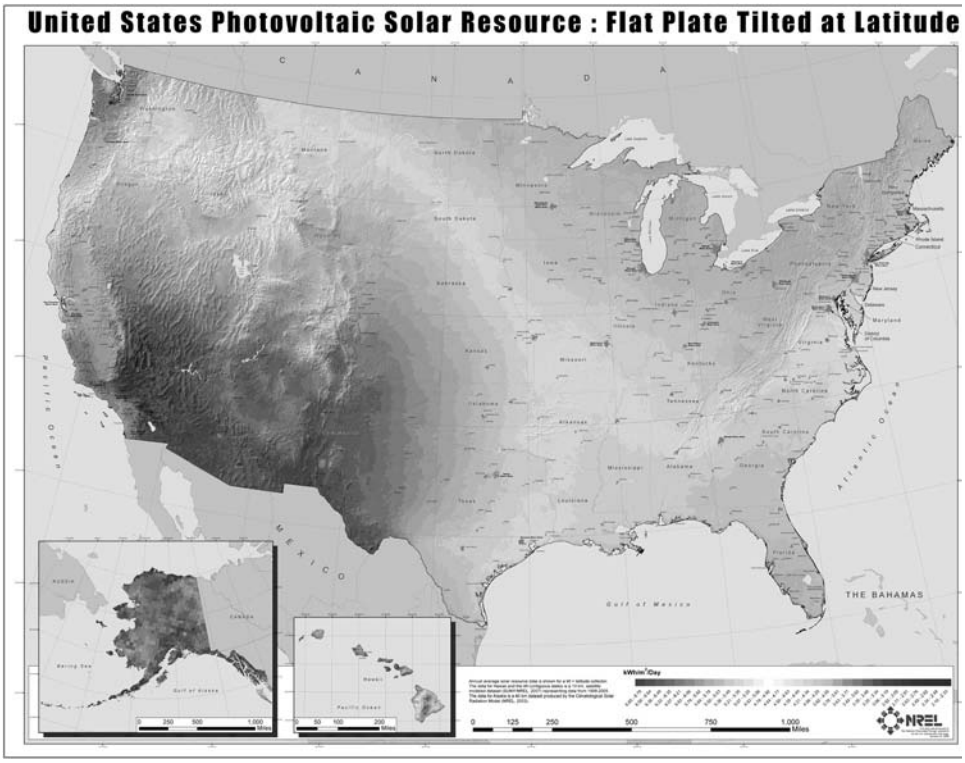
According to Solar Energy International, over 200,000 homes in the United States use some type of photovoltaic technology. Solar modules contribute power to 175,000 villages in over 140 countries worldwide, producing thousands of jobs and creating sustainable economic opportunities. In the US, 26 states now also offer a solar rebate program.[123]

Large-scale solar electric projects are comprised of a set of panel arrays. These systems require a substantial initial investment, but can provide energy sovereignty for our communities, powering tribal facilities and homes.

SOLAR ELECTRIC: CONCENTRATED SOLAR POWER

Concentrated Solar Power (CSP) systems differ from PV systems because they use the sun's heat to produce steam that drives a generator to produce electricity. "CSP technologies first concentrate the sun's energy using reflective devices such as troughs or mirror panels. The resulting concentrated heat energy is used to power a conventional turbine and produce electricity."[124]

While CSP works well on a utility-scale, it is also an option on a smaller scale, providing tribes with another



This is an example of a solar resource map. For more information visit www.nrel.gov

An example of a large solar array

option to become energy independent. Small CSP systems can produce 5 to 15 kilowatts of power for a single home and can be integrated with thermal storage systems, allowing excess energy to be saved during particularly sunny days to be used during cloudy days or at night[125].

SOLAR THERMAL: HEATING AIR AND WATER

While photovoltaic and concentrating solar power technology convert sunlight to electricity, solar thermal systems use the sun's heat directly. There are two ways to harness the sun's heat: passive and active solar systems.

In a passive solar heating system there are no moving parts. Energy efficient "superwindows" are strategically placed on a building in order to gather solar energy from the sun and insulation prevents the collected solar energy from escaping.[126] Passive solar systems also often include 'thermal mass,' which stores and releases heat on cloudy days or at night when the sun is not shining. Passive solar systems rely on good planning and energy efficient building design to make good use of the sun's energy during the winter.

In an active solar heating system, which can be used to heat both air and water, solar energy panels, often mounted on the roof, collect solar energy while a fan or pump moves the heated water or air where it is needed.[127]

Because of the moving parts involved, active solar systems usually cost more than passive solar systems and always require maintenance. However, if you are dealing with an existing building, active solar heating systems are often much easier to install than passive solar systems. Consideration must also be given to the winter operation of any solar heating system using water to prevent freezing and damage to the system.

HOW A SOLAR AIR HEATER WORKS

A solar air heating system often looks like a large black door (varying in size but often 4'x8'). This system should be mounted on a sunny south-facing exterior wall, as this is the side of the house that gets the most sunlight in colder seasons. The panel acts as a heat-collecting source – the sun heats the panel, which heats the air released into the home. The heated air is blown or circulated in the home through an internal vent or fan. Solar heaters are straightforward systems and can typically be installed after a small amount of training or by the manufacturer.

For new construction, the placement of windows and orientation of the building will have an impact on how the sun heats the building. Even without specially designed heating panels, a well-designed building with southern exposure can take advantage of the sun's heat and keep heating bills lower.

SOLAR HOT WATER

Water heating can constitute up to 25% or more of a home's energy expenditures; installing a solar hot water system can reduce a building's energy bills. Solar hot water heaters are often the most cost effective renewable energy system.

Solar hot water panels are most often roof-mounted. The basic design of a solar hot water system includes a solar thermal collector, which consists of a simple metal box with a glass or plastic cover, and an absorber plate. The absorber plate is painted black to attract as much sunlight as possible. Cold water is heated as it passes through the thermal collector. A water storage tank can be pre-heated for household use. Hot water is then piped to showers and sinks for use. Several simple do-it-yourself designs for batch type solar heaters are available. This type of solar water heater works where and when the outside temperature is above freezing.

Solar Hot Water Heater

SOLAR HOT AIR

A solar heating panel uses the sun's energy to heat the air inside a building, like a furnace. A solar air heating system often looks like a large black door (varying in size but often 4'x8'). The system should be mounted on a sunny south-facing exterior wall, as this is the side of the house that gets the most sunlight. The sun heats the panel, which heats the air in the panel which is then circulated into the home by a fan. Solar heaters are straightforward systems and can typically be installed after a small amount of training or by the manufacturer.

When considering embarking on new construction, the placement of windows, overhangs and orientation of the building will have an impact on how the sun heats the building and how the airflow cools it. Even without specially designed heating panels, a well-designed building with southern exposure can take advantage of the sun's heat and airflow keeping both heating and cooling bills lower. Building energy efficient homes powered by local fuel sources is an important element of building essential self-reliance.

SOLAR ENERGY ADVANTAGES AND CONSIDERATIONS

Advantages

- Solar systems require little maintenance;
- Solar systems produce power for decades at a very low operating cost. The life cycle cost of operating a house with a passive solar system installed is 30-40% lower than it would be without solar energy;[128]
- Solar hot air and hot water can be inexpensive to install and pay for themselves in a short time frame. A passive solar system typically adds 5-10% onto the construction cost of a home but, with cost saving associated with maintaining the home, will typically pay for itself within 3-7 years.

Considerations

- Solar electric systems (PV) can be expensive, costing between $7 and $12 a watt installed. This cost has steadily been decreasing and with advances in the technology along with increased mandates for clean energy, solar electric will become more cost competitive in the future;
- With passive solar, it may be necessary to have a backup heating system. It is also very important to design your system properly so the house is not in danger of overheating.

SOLAR ENERGY RESOURCES

Solar Energy International • www.solarenergy.org

Solar Energy Resources • www.findsolar.com/Content/SolarResources.aspx

Henry Red Cloud, Lakota Solar Enterprises. Photo credit: Kandi Mossett

Debby Tewa , formerly of NativeSUN

NAPV Installs Panels on the The Seba Dalkai School on the Navajo Nation. Photo credit: NAPV

TRIBAL SOLAR ENERGY: PROJECT PROFILES

The profiles below showcase a variety of examples of solar energy being put to use in tribal communities.

Lakota Solar Enterprises: Local Production, Local Benefits

Henry Red Cloud works primarily in the Great Plains region, installing Lakota-built solar heating panels on tribal houses and buildings. His company, Lakota Solar Enterprises (LSE), is 100% Native American owned and operated and produces all of their own panels, creating local employment on the Pine Ridge Reservation. In partnership with Trees, Water & People, Henry and LSE are also developing the reservation-based Red Cloud Renewable Energy Center which will house manufacturing and training facilities for solar heating panels along with a greenhouse, organic garden and model wind and solar electric systems. LSE has installed more than 200 solar heating panels on 10 reservations. From Utah to Montana, Minnesota to Oklahoma, tribal homes are harnessing the sun's energy to provide heat during bitter cold Great Plains winters.

NativeSUN: Self-Sufficiency Off The Grid

The phrase Hopi potskwaniat means "Hopi pathway to the future" and it can be aptly applied to the work of NativeSUN on the Hopi Reservation in northeastern Arizona. NativeSUN has brought over 800 household-size solar units to Native peoples in the region.

Many Hopi have resisted electrification by major utilities, and one-third of the villages have never allowed electric power lines in their communities. Doran Dalton, one of the owners of NativeSUN explains that, "The Hopi had no objection to electricity itself. It was the power lines." Former NativeSUN electrician Debby Tewa said that the Hopi traditionals "don't allow power lines into the villages, because the utilities will have right of way. [Village leaders] think that if we don't pay the bills, they will take even more land." There are also profound spiritual considerations. As the Hopi Foundation states, "The force field of electricity emanating from the power lines is considered to be disruptive to the atmosphere, ambience and balance of the plaza and ceremonial areas, at the same time blocking the aesthetics of the sky and the panoramic vistas of the mesas."

Solar power has allowed remote communities access to electricity without power lines and also maintain Hopi self-sufficiency. "When you get your own system," says Tewa, "It's yours. There's no power line, no right of way into the villages." Clients can choose from a variety of systems: two panels, four panels, eight panels, stationary or rotating. Most of these options are already operational on the reservation or on display at their head office.

NativeSUN started with the support of a set of foundation grants and a revolving loan program to help the community buy the solar panels. Today, a local bank has absorbed the loan program and NativeSUN is now run as a small business.

Native American Photovoltaics: Teaching The Way

Native American Photovoltaics (NAPV) is also implementing a solar strategy in Indian Country. Founded

in 1998, NAPV has constructed 44 solar systems for off-grid homes on the Navajo Reservation near Winslow and Dilkon in Arizona. NAPV's mission is to bring electricity to those currently without it. Their staff installs PV panels and offers monthly maintenance service and also teaches conservation and efficiency. Dave Silversmith, from NAPV explains, "I teach people how to use the electricity from solar panels efficiently, what kinds of appliances they can run, how to conserve electricity, things like that." Silversmith also plays an important role as an educator, translating solar terminology into Navajo and explaining cultural concepts that are still new to many people.

NAPV also assists with financing solar panels. While a Department of Energy grant supported the initial project and capital costs in the early years of NAPV, the project is now designing additional business plans that will help finance future projects. Initially, families paid $50 per month for ten years toward the purchase of the PV units (this fee also includes repair and maintenance service), but the project foresees additional grants and small monthly payments for projects that support 20 or 30 systems.

Natchez Elementary School: Bringing Solar Benefits To The Classroom

The Natchez Elementary School on the Pyramid Lake Reservation in Nevada has a grid-tied, medium-sized solar project. The project, a collaboration with Black Rock Solar, will put money directly back into the school to benefit the students by saving more than $13,000 a year in electricity costs.[129]

Honor the Earth and Solar Energy International solar installation in Skull Valley

Black Rock Solar focuses on the "social, rather than the financial bottomline."[130] Tom Price of Black Rock Solar states that the company's goal "is to help stop climate change by building renewable energy for people who can't afford it."

The Natchez Elementary School installation consists of 240 panels, and cost $360,000. The utility and the state provided nearly $300,000 in rebates and the school district was able to make up the difference. "This is about being a free and independent power and a future which is about self determination," Price explains.[131]

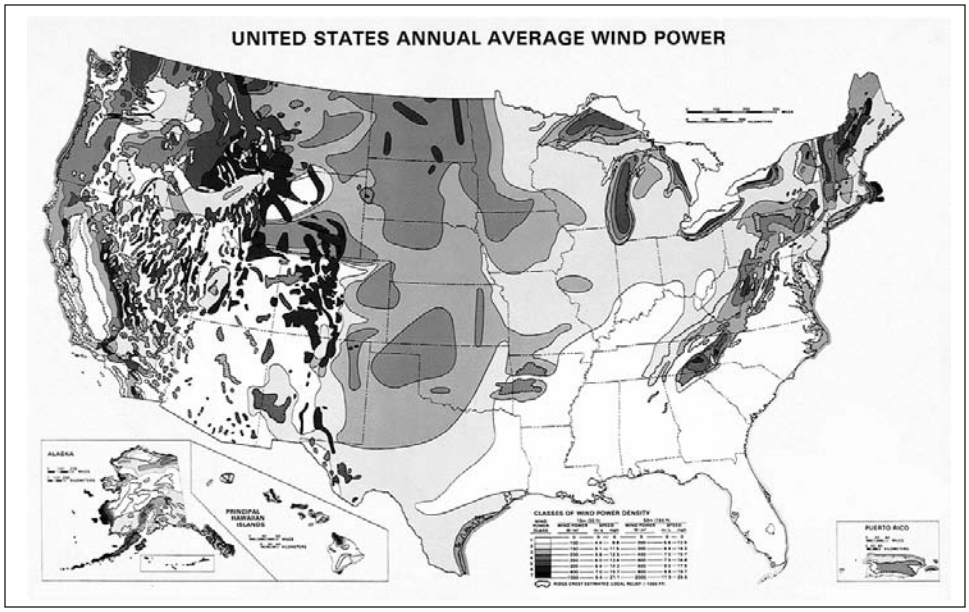
Skull Valley Goshutes: Small-Scale Solar Success

This project was a partnership between Honor the Earth and Solar Energy International in 2007 and included a solar PV array installation and a community training on the Skull Valley Goshute Reservation in Utah. The installation took place at tribal member Margene Bullcreek's home, which is also the office for the local, grassroots group Ohngo Gaudadeh Devia (OGD). OGD led a successful grassroots campaign against a nuclear waste dump for more than a decade, and their office now hosts a solid example of a safe alternative to nuclear energy. The "take-apart" 1.8 kW solar system can be used for future trainings. It involves an array of 10 panels, 180 watts each, and is tied to the electrical grid. When the panels produce more power than the house is using, the power goes back into the grid, the meter spins backwards and Margene's electricity bill goes down.

WIND ENERGY

"We believe the wind is wakan, or sacred, and bringing the power of the wind to our communities and our future is key to our survival and a part of honoring our instructions."

— Pat Spears, President, Intertribal Council On Utility Policy.[132]



Wind power presents an immense opportunity for localizing tribal energy economies and even for creating a source of revenue from exporting power. It turns out that some of our poorest reservations have the richest wind resources in the world. Wind can produce inexpensive clean energy on many different scales, making it an energy source well suited to tribes' varying needs.

WIND ENERGY BASICS

Wind power uses the movement of air to spin blades, which turn a generator that produces electricity. Wind generators come in a variety of sizes, from small turbines that power part of one home to huge turbines that produce several megawatts of power, enough for hundreds of homes.

Measuring your resource in order to determine whether wind power is a viable option for your area is an essential first step. A meteorological station, which includes an anemometer, is a device used to measure wind speed, direction and duration over the period of one year or more. Data collected from the station is analyzed and compared with long-term data from local sources to provide an estimate of the long-term wind resource. This information is then used to determine the financial feasibility of different wind turbines at the site.

The Department of Energy (DOE) offers tribes excellent resources to determine wind feasibility. The DOE's Wind Powering America Program loans tribes and tribal organizations anemometers and assists in analyzing and evaluating wind data, and the DOE's Tribal Energy Program offers grants to assess the feasibility of tribal wind projects of various sizes.

SMALL-SCALE WIND ENERGY

Generally wind turbines rated less than 100 kW are considered 'small wind.' The benefits of small-scale wind include their lower height, smaller footprint and lower cost. Smaller systems can be more easily tied into the local electrical distribution system for residential and community applications uses. Many tribes have small wind turbines already installed, serving homes, offices, schools and light industry. Small wind can be used in remote locations off-grid, or in systems that are grid-tied.

LARGE-SCALE WIND ENERGY

Large-scale wind installations are nearly always grid-connected and usually require interconnection and capacity on the regional transmission system, which is more complicated and costly than connecting to the local distribution system. The energy is usually sold directly to electric utilities as opposed to being consumed by local loads. Wind installations that have multiple turbines are called 'wind farms' and are often referred to in terms of their total generating capacity. For example, a wind farm that has twenty 2 MW turbines is a 40 MW wind farm. Large wind farms exist around the country already, and more are planned.

WIND ENERGY OPTIONS: NEW VERSUS USED

Your budget is probably the most limiting factor in determining your wind development options. Clearly, the larger the installation is, the higher the cost– but there are other factors to consider in relation to your budget. A used turbine may be less expensive than a similarly sized new model, and allow for a larger project, but used turbines cost money to refurbish and experience higher maintenance and repair costs over the life span of the unit.

If buying used, it's very important to carefully analyze the specific equipment and its history, including where it was used and stored. Different wind turbine companies have different records. Be sure you're getting equipment that has a good reputation for long-term reliability and that whomever you buy it from documents the work conducted to refurbish the machine and warranties its parts. Ensure a certified installer commissions and provides a performance check on the unit. This extra diligence will pay off by offering the best chance that your turbine will operate reliably to produce clean energy far into the future.

WIND ENERGY ADVANTAGES AND CONSIDERATIONS

Advantages

- Wind energy is less expensive in terms of power output compared to other renewable energy like solar photovoltaic.
- After construction, wind turbines can exist alongside livestock and agricultural operations with a minimal footprint.
- A variety of sizes and designs offer ways to match wind projects with specific tribal needs.

Considerations

- Wind turbines require regular electrical and mechanical maintenance from trained professionals. Because they involve moving parts, wind turbines require much more maintenance than solar installations.
- On average, wind turbines experience more mechanical down time than solar.
- The life span of some ultra-small turbines (under 10 kW) is five to seven years, which is much shorter than a similarly sized solar installation.

WIND POWER RESOURCES

Windustry • www.windustry.org/wind-basics

Wind Powering America • www.windpoweringamerica.gov/nativeamericans/index.asp

American Wind Energy Association • www.awea.org

Erecting the Fort Peck turbine. Courtesy: Fort Peck Tribes

TRIBAL WIND ENERGY: PROJECT PROFILES

Below are examples of the variety of wind power installations in Native communities.

Fort Peck: Fueling Tribal Headquarters

The Assiniboine and Sioux tribes of Fort Peck in Montana installed two Entegrity 50 kW wind turbines near the tribal headquarters building in 2006. The project was funded by the Department of Energy. The turbines reduce the amount of electricity that the tribe must purchase from outside sources and represent phase one of the tribe's wind development plans.[133]

Spirit Lake Wind: Wind Powered Casino

The Spirit Lake Dakota in North Dakota put up a 100 kW Micon brand wind turbine in 1996. The turbine provides about ¼ of Spirit Lake Casino's power, displacing power that would have been purchased from the local electric utility. The tribe and the

Raising the nacelle at Spirit Lake. Courtesy: Spirit Lake Community School District

The turbines at Toksook Bay. Courtesy: AVEC

The turbines at St. Paul Island. Courtesy: AK Energy Authority

Department of Energy jointly funded the turbine, and casino employees maintain it.[134]

Toksook Bay: Keeping the Power Clean

Three Northwind 100 kW turbines have been operating in the Native village of Toksook Bay, Alaska, since July 2006. Owned and operated by the nonprofit Alaska Village Electric Cooperative, these turbines produce over 600,000 kilowatt-hours per year. Every kilowatt-hour they produce means one fewer kilowatt-hour is generated by the diesel generators that would otherwise provide power for this remote village. Critical financing for the turbines was made available through NativeEnergy's sale of renewable energy credits.

St. Paul Aleut: An Innovative Hybrid System

The St. Paul Island Aleut (Alaskan Native) community has taken advantage of wind in combination with diesel, building a first of its kind hybrid wind and diesel power plant. This facility supplies affordable energy to the community as well as providing a profit for the tribal corporation, Tanadgusix (TDX) Corporation.

The successes of TDX continue as they proudly announce, "We have installed a total of three of the largest wind turbines in Alaska and have plans for two more for a total of five wind turbines to have the potential to meet the needs of the whole community."[135]

The project supplies electricity and space heat to an industrial/airport facility. The TDX power plant is a commercial project that did not utilize any grants in the funding process. The corporation has been recognized by the Department of Energy, which is now funding the Aleutian Pribilof Islands Association (APIA) to conduct an economic and technical wind and diesel plant feasibility study for five communities based on the St. Paul success.[136]

White Earth: Powering the North

A recently funded wind project on the White Earth Reservation in northwestern Minnesota will bring more power to tribal lands in the upper Midwest. A 75 kW refurbished Loland brand turbine will power White Earth Land Recovery Project's office building and any excess power will be sold back to the utility on the grid.

KILI Radio: Small Wind Lessons Learned

Over the course of several years, Honor the Earth, Intertribal Council On Utility Policy and a host of local allies have worked to bring a remanufactured turbine to the Pine Ridge Reservation's KILI radio station as a flagship wind project. KILI is the largest Indian radio station in the country and requires a significant amount of energy. By powering this station with a turbine, the Plains winds will satisfy the largest consumer of electricity on the Pine Ridge Reservation. Unfortunately there have been many ob-

Setting up the White Earth wind tower. Photo credit: Nellis Kennedy

Turtle Mountain Turbine

Kumeyaay Large Scale Wind Farm

stacles to overcome, teaching several important lessons the hard way. In 2008, a used 65 kW Nordtank turbine was installed but due to technical problems was never fully operational. In the summer of 2009, mechanical failure in strong winds caused the turbine to detach and it was rendered inoperable. Since that time, KILI allies have been working to assess what went wrong, and the best way to proceed to ensure a successful turbine is installed.

The most important lesson learned on the long road to get KILI a working turbine is that in wind power, like in any business, there are reputable, exceptional companies and companies that do sub-par work and are more interested in profit than progress. It is very important to look into a company's history and references before deciding who to work with and what equipment to purchase, particularly in the used and refurbished market. It is our hope that our learning experience can help others avoid the problems we have encountered. On a positive note, the Department of the Interior's Office of Indian Energy and Economic Development is providing funding and technical guidance to replace the KILI wind turbine, and the project's goal of acting as a concrete model of community wind will be realized.

Turtle Mountain: A Wind-Powered Tribal College

The Turtle Mountain Band of Chippewa Indians has taken advantage of clean energy by installing a 660 kW turbine at Turtle Mountain Community College in North Dakota. This turbine is expected to cover 90% of the college's annual electrical costs. The college plans to seek out other clean energy sources (possibly solar photovoltaic) for the remaining 10%, making the college powered by 100% clean energy.[137]

Kumeyaay Wind Project: Commercial-Scale Wind Farm

The Kumeyaay project, a 50 MW wind farm on lands held by the Campo and Viejas bands of Kumeyaay people in Southern California, is the only reservation-based commercial wind farm in the country. Undertaken with a developer, Superior Energy LLC, the tribe receives revenues from the lease of the land and the developer receives the revenues from the sale of the energy. The project uses twenty-five 2 MW Gamesa wind turbines.[138] Plans are underway to expand the installation to a total of 160 MW, serving some 104,000 homes during peak production.[139]

Mille Lacs Band of Ojibwe: Wind Investment

The Mille Lacs Band of Ojibwe has become a major investor in Mariah Power.[140] Mariah is a manufacturer that builds ultra-quiet vertical-axis wind turbines called Windspires for residential and commercial use. This tribal investment has the potential to create 15 new jobs and a reservation-based manufacturing facility to house operations.

THOUGHTS ON WIND PROJECT OWNERSHIP AND FINANCING

by Chase Iron Eyes (Standing Rock Lakota),
Executive Director, Wind Energy Tribes United (WETU)

If an entity has capital, developing its wind resource is easier. For those without capital, a reliance on some other source such as federal dollars is most promising.

With respect to commercial wind, the developer driven model is also an option. Tribes are faced with the negotiation task of ensuring optimum equity positions without putting up or risking any of the investment capital. Tribes almost always need a partner to facilitate wind resource measurement via anemometers and to negotiate the equity and revenue positions of each party. The more capital a party puts at risk in developing a wind asset, the stronger it can expect its equity and revenue positions to be. There are many sources of capital for tribes including tax-exempt bonds, Clean Renewable Energy Bonds, grants, low interest loans, federally backed loans and New Markets Tax Credits.

A general investment figure to develop 100 megawatts (MW) is around $2 million. Typically, a developer could then sell the right to develop the asset (100 megawatts) to a project company for roughly $100,000 per megawatt. The project company, assuming it is successful with respect to power purchase agreements, interconnections and other related processes, could then sell the power generated for a significant profit - depending on power prices.

In commercial and community wind development, tribes benefit from seeking funding from federal sources. However, community wind is almost impossible for tribes without an effective fund raising campaign, including grant applications.

WETU is working to actualize Indigenous-led renewable resource development. We are all responsible for directing our world toward a state of balance.

(Chase Iron Eyes is an attorney with the Climate and Law Policy Center, working to address climate change through tribal renewable energy and energy efficiency.)

Micro Hydropower

Small-scale, sustainable hydro development can be an exceptionally dependable and cost-effective source of clean, renewable energy to consider if you live in a location with falling water from a river or stream on or near your property.

MICRO HYDRO BASICS

Micro hydro is often considered to be the ideal small-scale renewable energy system because while solar and wind rely on less predictable, intermittent weather phenomena, energy can be derived from micro hydro systems 24 hours a day year-round if you have a consistent flow of water.

Micro hydro systems convert the energy from falling water into usable electricity. The technology is relatively simple. All that is required to set up a micro-hydro system is falling water, piping, a turbine generator system, and wiring to connect the power to your home.

Building a small-scale hydropower system can cost from $1,000 - $20,000, depending on site electricity requirements and location. Maintenance fees are relatively small in comparison to other technologies. Energy output is dependent on two major factors: the stream flow, or the volume of water that runs through the system, and the drop (or head), which is the vertical distance the water will fall through the water turbine.

Micro hydro systems are commonly known as 'run-of-river' systems because water runs straight through the generator and back into the stream. Since there is no loss of water in the generation process, micro-hydro has a minimal environmental impact on local ecosystems. The possibility of low-level environmental effects from diverting part of a stream's flow must be considered prior to construction. Careful planning to ensure there is no impact on local fish stocks may result in designing a smaller system with a lower energy output.

MICRO HYDRO ADVANTAGES AND CONSIDERATIONS

Advantages

- Only a small amount of water flow (as little as two gallons per minute) or a drop as low as two feet is needed to generate electricity.
- Micro hydro produces a continuous supply of electrical energy in comparison to other small-scale renewable technologies.
- Maintenance fees are relatively small in comparison to other technologies.

Considerations

- Stream size, including the speed and rate of water flow and the length of the vertical drop, determines electrical potential. The size and flow of small streams may restrict energy generation capacity and future expansion.
- Stream size fluctuates seasonally in many locations. During the summer, there will likely be less flow and therefore less power output.

Micro hydro installaton. Photos courtesy Sustainable Nations

MICRO HYDRO RESOURCES

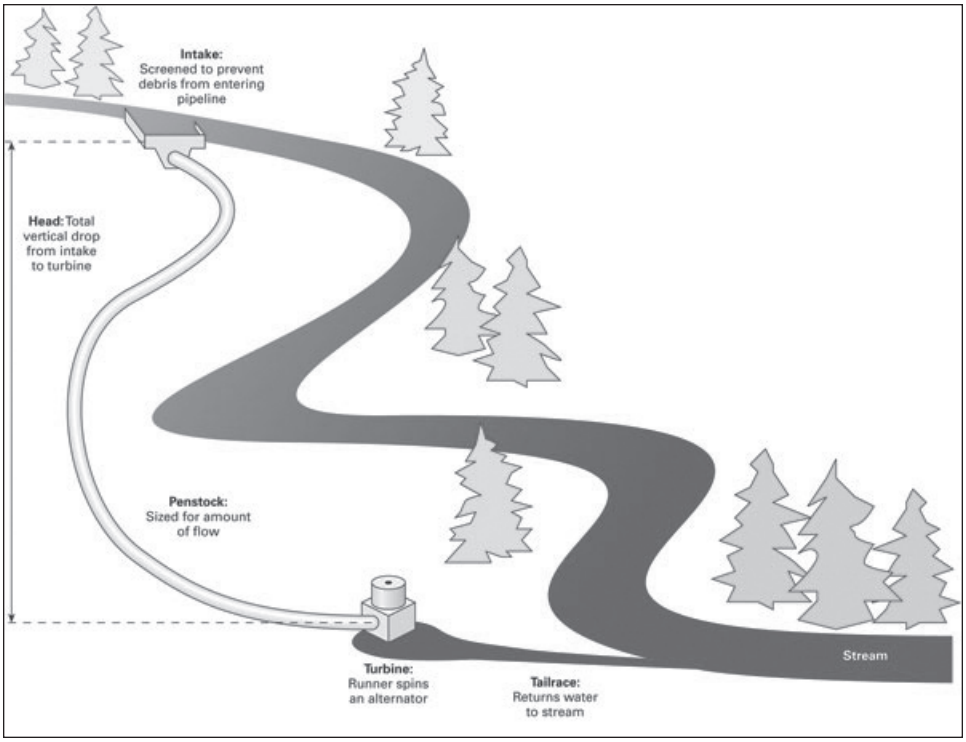
Sustainable Nations • www.sustainablenations.org/resources/howtos

US Department of Energy's Hydropower Basics
www1.eere.energy.gov/windandhydro

PennElys GoodShield from Sustainable Nations, a grassroots organization promoting Indigenous sovereignty writes about a recent micro hydro installation for a tribal family:

Sustainable Nations recently co-hosted a workshop in Weitchpec, on the Yurok Reservation, with a local family and Don Harris, from Harris Hydropower. The Yurok Reservation is rich in fast-moving creeks, tumbling down steep mountains, the ideal location to efficiently produce micro-hydroelectric power. These systems are also affordable to install. Most parts for homemade systems can be purchased cheaply from a hardware store, and pre-manufactured systems are relatively inexpensive, as well. A local elder had been making these systems for years out of car alternators. It's important to know that homemade systems do take more maintenance than pre-manufactured turbines. Our system was a pre-manufactured turbine that was installed by the participants and the hosting family, costing a total of $5,000. This system will produce enough electricity for the small family, with room to expand their need!

We hosted a two-weekend series, and had great attendance. The Yurok community has a high percentage of homes without electricity, and many community members were excited to learn about the system, how much it cost to install, and the installation process. Participants included representatives from Yurok Tribal departments, surrounding community members, a local tribal journalist, and students from the nearby university, Humboldt State. It was wonderful to see community members offering to help one another obtain the materials, labor, and resources to install more systems in the future, and good connections and friends were made. Sustainable Nations is working on creating a 'how-to' documentary film about the training and installation. This film will also feature statements from participants about the need for alternative energy systems on a reservation that is fighting to remove a large-scale and very destructive hydroelectric dam complex on the Klamath River.



Micro hydro diagram courtesy Home Power Magazine

Sustainable Biomass and Biofuels: Fuel, Heat and Electricity

Biomass and biofuels are controversial because, as discussed in the False Solutions section of this booklet, unsustainable production methods, particularly those that utilize industrial agriculture, actually cause more environmental and climate damage than they help to reduce. This section focuses on sustainably produced biomass and biofuels for tribal use.

BIOMASS BASICS

Biomass refers to organic matter, such as plants, animal fats and even waste that can be converted into energy. Native plants with high energy yields, fast growing trees in tree farms and waste wood, crop residues, manure and food wastes are all forms of biomass that can be produced sustainably at a local level.

INDIGENOUS PERENNIAL PLANTS FOR ENERGY

Restoring Indigenous plants for local energy and fuel can also restore our land by driving the conversion of marginal cropland back to ancient perennial grassland cover. Wild perennials such as switchgrass, bluestem, reed canarygrass and wheat grass are excellent energy crops because they grow quickly, produce high energy yields and can be harvested annually for several years before replanting. Indigenous perennials re-establish soil quality, enhance the structure of the soil, increase its organic content, serve as filters to protect waterways from chemical runoff and restore diverse habitats for birds, pollinators, and other species.

In appropriate ecosystems, local tree farms of fast-growing trees may be considered for biomass energy as well, since they grow back repeatedly after being cut close to the ground. Poplar, willow, sycamore and sweetgum are examples of short-rotation wood crops that can grow up to 40 feet in less than eight years and can be harvested for 10 to 20 years before replanting.

BURNING BIOMASS FOR ENERGY

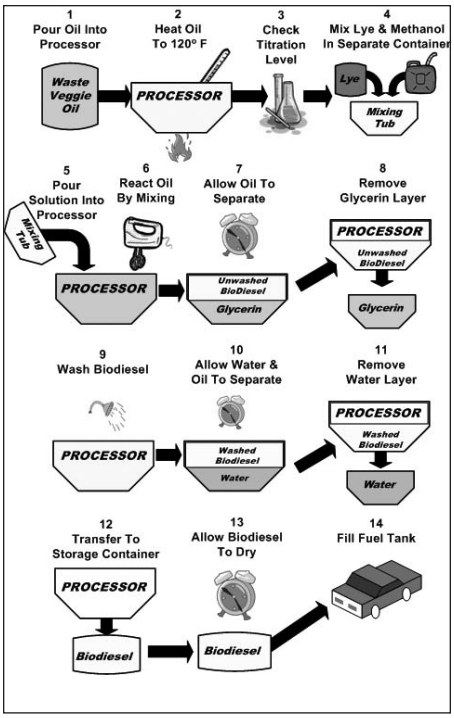
Most biomass is converted to energy the same way it has been for millennia—by burning it. The heat can be used directly for heating buildings, or it can also be used to produce steam and generate electricity.

The Shakopee Mdewakanton Sioux Community in Minnesota, in partnership with Rahr Malting Company, has completed a 22 MW biomass-fired plant that produces electricity and heat by primarily burning byproducts from cereal manufacturing, such as discarded oat hulls. Gathering waste from local businesses such as General Mills, Wood Chip of Princeton, and Rahr Malting to use as the biomass to fuel the plant, Shakopee produces more than enough electricity to run its tribal operations, which include operating an expansive casino, as well as Rahr Malting, which produces and distributes malt and industry-related brewing supplies. The tribe sells the excess energy it produces to Xcel Energy, the regional energy provider.[141]

On a residential scale, new efficient biomass fuel-based appliances, like

THE BIOFUEL BEGINNINGS OF THE DIESEL ENGINE

The diesel engine is named for its inventor, Rudolf Diesel. He designed the diesel engine to run on peanut oil. His first diesel engine was unveiled in Paris in 1900. Rudolf Diesel died mysteriously before his vision of plant oil powered engines became a reality. The petroleum industry co-opted Diesel's name, and plant oil as a fuel supply was forgotten.



The Biodiesel Process, courtesy Reich Chemistry

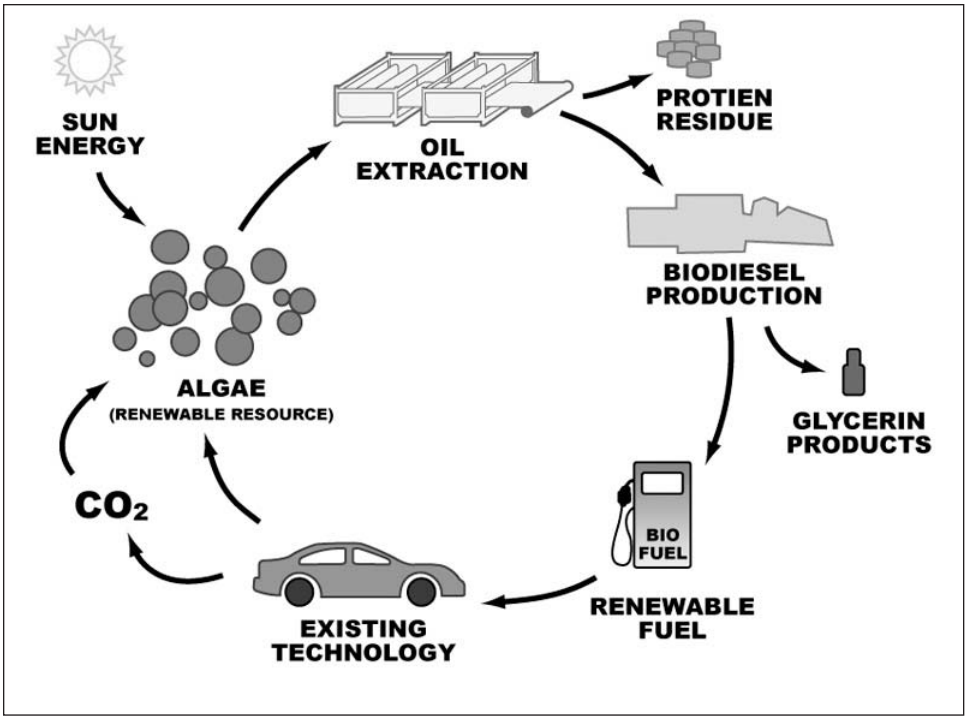
wood pellet stoves and heaters, can provide cost effective heating with less indoor air pollution and increased efficiency over standard wood stoves. Pellets are made from compacted sawdust, wood chips, bark, agricultural crop waste, waste paper, and other organic materials, which otherwise would end up in a landfill.

CONVERTING BIOMASS TO GAS: BIODIGESTERS

In addition to being burned directly, biomass can be converted into a gas by heating it under pressure without oxygen in a biodigester. A biodigester is simply a large insulated tank, sealed to keep all air away from the biomass.

Biodigesters can convert organic wastes, such as manure from livestock or horses, into biogas. Their use is widespread in remote village areas of India, Nepal, China and Vietnam. As organic wastes break down, they release methane, a potent greenhouse gas but a biodigester traps the methane as it is produced, making it available for heating, cooking or small-scale electricity generation. By utilizing the methane's energy rather than letting it vent freely into the atmosphere, these systems can help reduce emissions that contribute to climate change.

Biogas is a sustainable substitute for the propane and kerosene that many rural families use for their domestic energy needs. A biodigester can save hundreds of dollars every year on fuel. Biodigesters also have the added benefit of producing a nutrient rich fertilizer for gardens and community farms.



Algae-based Biodiesel Cycle, www.safeenvironment.files.wordpress.com

BIODIESEL: DIESEL FUEL FROM PLANTS

Plant based oils and/or animal fats can also be converted into a liquid form for diesel tanks. Biodiesel is a refined diesel fuel alternative that can be made from virgin agricultural oils coming direct from an oilseed crusher, from animal fats like tallow and poultry fats, or it can be made from recycled and re-used oils that come from restaurants and other kitchen facilities. Many Indigenous foods and plants, such as hazelnuts, peanuts and hemp, are excellent raw materials for biodiesel. Making biodiesel from used cooking oil has the added benefit of reducing waste — restaurants usually pay to have their used oil hauled away and dumped — but with biodiesel, that waste oil is recycled into fuel.

Biodiesel can be produced on an extremely small scale as well as on a large commercial scale. An entire subculture of "homebrew" biodiesel enthusiasts has grown in North America over the past decade. Small biodiesel operations are a great way for tribal communities to recapture the energy used in cooking oil at casinos, community centers and tribal schools and cut down on their reliance on imported petroleum.

The Sustainable Biodiesel Alliance (SBA), a non-profit organization whose members include Farm Aid and Institute for Agriculture and Trade Policy, provides tools to support community-based biodiesel and is developing a sustainability certification program. The SBA offers a host of free resources at: www.fuelresponsibly.org and www.sustainablebiodieselalliance.com

ADVANTAGES AND CONSIDERATIONS

Advantages of biomass for heat and electricity

- Biomass can be sourced and manufactured locally, contributing to security of supply and support for local economies.
- Local production and usage networks reduce the financial and environmental costs of manufacturing and transporting fuel.
- Biomass made from recycled and waste materials keeps them out of landfills and reduces carbon emissions by burning alternate fuels.

Advantages of biodiesel fuel

- Biodiesel has the highest net energy ratio of any plant-based transportation fuel. It burns significantly cleaner than petroleum-derived diesel, with substantial reductions in greenhouse gas emissions and other harmful pollution.[142]
- Biodiesel production does not require the heavy use of process heat and water that is the hallmark of ethanol production, nor does it produce significant odor, and manufacturing plants may be located in light industrial facilities in proximity to towns and larger settlements without affecting quality of life.

Considerations

- Producing energy from biomass is carbon neutral only if the resources used to produce the energy are replaced more quickly than they are harvested. The combustion of biomass returns the CO_2 to the atmosphere that was absorbed by the plant over the previous few months or years. Provided the land continues to support growing plant material, a sustainable balance can be maintained between carbon emitted and absorbed.
- Collecting or growing biomass fuel in sufficient quantities can be difficult.
- Some biomass materials, whether plants or waste materials, are not available year round.

TRIBAL BIOFUELS: PROJECT PROFILES

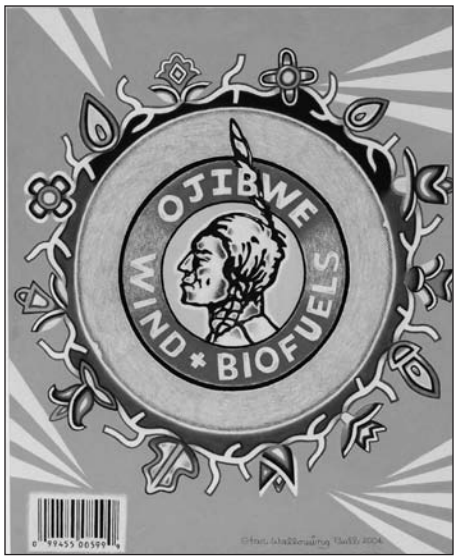
As the examples below show, tribes are already putting biofuels to use in energy systems.

Southern Ute Biodiesel: Reduce Emissions, Create Cleaner Fuel

The Southern Ute Tribe has invested in a facility that makes biodiesel out of algae grown next to a natural gas processing facility. CO_2 emissions from the natural gas plant are piped to the pools where CO_2-gathering algae plants grow and feed on the CO_2. The algae are harvested and their oil is used to produce biodiesel. In reference to the project's dual benefits of being a good investment and environmentally conscious, Tribal Chairman Matthew J. Box stated, "It's a marriage of an older way of thinking into a modern time."[143]

White Earth Biodiesel: Local Waste Into Local Fuels

Selling fuel on the White Earth Reservation is Green Range Biofuels, located in Ironton, MN. Using waste grease collected from local restaurants, the facility produces about a half a million gallons of fuel a year. In order to secure the used grease (which is usually hauled by waste management and other vendors), Green Range



Art by Star Wallowing Bull

Biodiesel provided restaurants with grease hoppers and collects the hoppers every two weeks. Green Range pays for the grease— a mixture of canola, olive, soybean and other vegetable oils. By cleaning and using of waste oil, the process is less resource intensive and more efficient than extracting virgin oil from plants.[144]

Taos Pueblo GARN: Biomass Heating System At Work

Also capable of lowering carbon emissions while heating homes is the GARN system. The GARN is a wood-fired hydronic heater. It is an extremely efficient biomass-burning central heating system, which has been used widely in European communities and is now being applied in innovative ways in some tribal communities.

The purpose of the GARN is to heat a home using a system that can burn wood (harvested in a sustainable manner) in a clean and carbon-reduced manner by making optimum use of fuel and emitting very little smoke. Carbon emissions are reduced

through the GARN by eliminating the short cycling of burners. In other words, the GARN does not allow any idle combustion to occur, thus making the most of the fuel being used.[145]

Searching for a way to prevent forest fires, [146] the Taos War Chief's Office in the Taos Pueblo in Northern New Mexico took the initiative to connect its Red Willow Education Center with a GARN representative based out of Minnesota. The project received a three-year Forest Health Collaborative Grant that funded the collection of a substantial amount of forest thinnings to be used as fuel for the system.[147] Further funding for the project came as a joint initiative from the Taos Renewable Energy Office and Education and Training Division, where it received $60,000 from the New Mexico Energy, Minerals and Natural Resources Department. These monies have been used for the purchase and installation of the GARN, as well as the training of five tribal staff in maintenance and operation of the systems. This training will result in the creation of two full-time jobs.

The product of this effort is a successfully installed biomass district heating system that now heats three greenhouses. The Taos system functions by heating a large metal water tank in a firebox that channels the water into a radiant floor heating system. As a result, the Pueblo will no longer need worry about the rising costs of fossil fuels like propane to heat the three buildings.

The GARN system has great potential to be replicated in Native communities and can heat a cluster of houses in a tribal community, as well as a single facility.

The GARN system has good potential to be replicated in Native communities and can heat a cluster of houses in a tribal community, as well as a single facility.

Photo credit: Marty Curry

SUSTAINABLE TRIBAL ECONOMIC DEVELOPMENT EXAMPLES

A diverse set of clean energy projects can work together to meet a tribe's needs. Below are examples of two tribal communities utilizing a mix of renewable power sources to build sustainable economies.

A Tribal Alternative Energy Mix: Mohegan Sun

Mohegan Sun, the Mohegan Tribe's casino in Connecticut, uses a variety of alternative energy sources to run its operations. The complex has over 10,000 employees and over 50,000 patrons a day— and aside from being highly profitable, their sustainability efforts are extensive. First, the tribe purchased two PC25TM fuel cell systems. Each cell produces 200 kilowatts of electricity and 900,000 BTUs, which will be used for space heating and hot water. While traditional generating systems create as much as 25 pounds of pollutants to generate 1,000 kilowatt-hours of power, the same production by fuel cells results in less than one ounce of pollutants. Further, the waste grease produced on the complex is sent to a local pig farm, alternative energy is used in the casino's transportation system, and the tribe even uses some hybrid cars in the casino fleet.

A Model Diversified Tribal Energy Economy: Shakopee Mdewakanton Sioux Community

The Shakopee Mdewakanton Sioux Community (SMSC) in Minnesota is a leader in utilizing the sun, wind and plants to restore a sustainable way of life. The tribe produces enough biodiesel from waste oil to meet 100% of their needs in summer months and part of their needs during winter months when weather condition require a blend with conventional diesel so it won't congeal. In addition, the tribe utilizes solar water heaters, waste heat, and a geothermal system for efficient heating and cooling. The tribe is also a partner in Koda Energy, which produces heat and power at a biomass plant utilizing recycled cereal hulls. In addition, SMSC also installed a 1.5 MW wind turbine that will meet most of the community's residential electricity demand. The Shakopee community has shown vision in implementing a set of innovative sustainable technologies that increase self-sufficiency, reduce costs and honor Unci Maka (Grandmother Earth).[148]

Learn more about the SMSC projects at www.shakopeedakota.org

Solution Three:
RESTORING TRADITIONAL FOODS

Nationally and internationally, there is a great deal of work underway to support the restoration of locally produced food as integral to the restoration of biologically diverse, resilient ecosystems and the development of sustainable economies. In a time of peak oil and climate change, compounded by the epidemic of diet-related illness in our Indigenous communities, the restoration of our traditional foods is an essential strategy for tribal survival.

THE BENEFITS OF RESTORING LOCAL FOOD ECONOMIES: TRADITIONAL FOODS HEAL OUR PEOPLES AND OUR LANDS

Traditional food restoration through organic farming is not only a tool to adapt to climate change, as discussed earlier in this booklet, but it can also help mitigate climate change by limiting and even capturing carbon emissions. The Rodale Institute found that organic farming can sequester carbon by using composting, cover crops and crop rotation, pulling carbon dioxide from the air and storing it as carbon in the soil.[152] Simply stated, if the world's 3.5 billion tillable acres used biological, regenerative practices, this would sequester up to 40% of current carbon dioxide emissions.[153]

Traditional farming practices can also offer improved yields over Americanized monoculture or row farming. The Six Nations Iroquois Confederacy, the Haudenosone, traditionally grew diverse strains of corn along with squash and beans. Planted together, corn, squash and beans – the three sisters – naturally repel insects and weeds. Today, community farms in Haudenosone and other Indigenous territories are replicating traditional

INDIGENOUS AGRICULTURE

Indigenous peoples developed highly sophisticated agricultural systems based on the unique qualities of our ecosystems and tens of thousands of years of cultivating diverse varieties. As a result, more than 60% of the plant foods sustaining the world today derive from crops originally cultivated by peoples indigenous to the Americas.[149]

Some of the crops our peoples developed and harvested over millennia include numerous varieties of:

Acorns
Arrowroot
Artichokes
Avocados
Beans
Black mustard
Black walnuts
Blueberries
Cherries
Chili peppers
Chokecherry
Corn
Crab apples
Cranberries
Elderberry
Hazelnuts
Hickory nuts
Maple syrup
Mint
Mushrooms
Peanuts
Pecans
Pinon nuts
Potatoes
Pumpkins
Squash
Stag sumac
Strawberries
Tomatoes
Turnips
Vanilla
Watercress
Wintergreen
Yellow and red bell peppers[150] [151]

polyculture, or "inter-cropping," with amazing results.

Along with these benefits, restoring our foods and returning to a traditional diet can rapidly undo much of the illness and harm western foods have caused in our communities. Our foods are just healthier for us. Hominy corn, high in carbohydrates and protein, also yields 47% of the recommended daily value for fiber and 33% of the recommended daily value for B vitamin Thiamine; it also has only half the calories of market corn.[154] Arikara squash contains 13% of the recommended daily value of fiber, 64% of the recommended daily value of vitamin A, and half the calories and double the calcium and magnesium of the market equivalent.[155] Potawatomi lima beans are low in fat, and high in carbohydrates, protein, and B vitamins; they also provide 24 grams of fiber per serving, and 21 times the antioxidants found in market beans.[156] Ancient foods simply contain superior nutrition for the specific needs of our communities over market varieties.

Moving away from industrial meat will also go a long way to restoring our environment and our health. While switching to local, free range meat is a critical strategy for stemming climate change, even better for our peoples is the restoration of the indigenous species we relied on for millennia. Compared to domesticated meat, wild meat like elk, deer and buffalo have significantly higher amounts of omega 3 heart-healthy fats.[157] Wild game also contains more than five times the amount of polyunsaturated fat per gram than is found in livestock.[158] Polyunsaturated fat can help lower bad cholesterol.[159] Buffalo meat has less fat and cholesterol than skinless chicken, and is listed as one of the top five heart healthy foods for women because of its high iron content and its richness in good fats.[160] Buffalo and elk are also loaded with vitamins and minerals such as niacin, vitamin B6, phosphorus, vitamin B12 and zinc.[161]

In addition to restoring our physical health, restoring the species unique to our ecosystems heals our lands. For example, buffalo cultivate the soil, stimulating the return of diverse indigenous plant species. Prairie restoration, buffalo restoration and cultural restoration are intertwined, and all are connected to a promise of a healthier future for the coming generations.

HOW TO START A GARDEN

Every garden is unique to the ecosystem and community in which it is grown. Here are general steps you can use or adapt to start a garden:

Site Selection

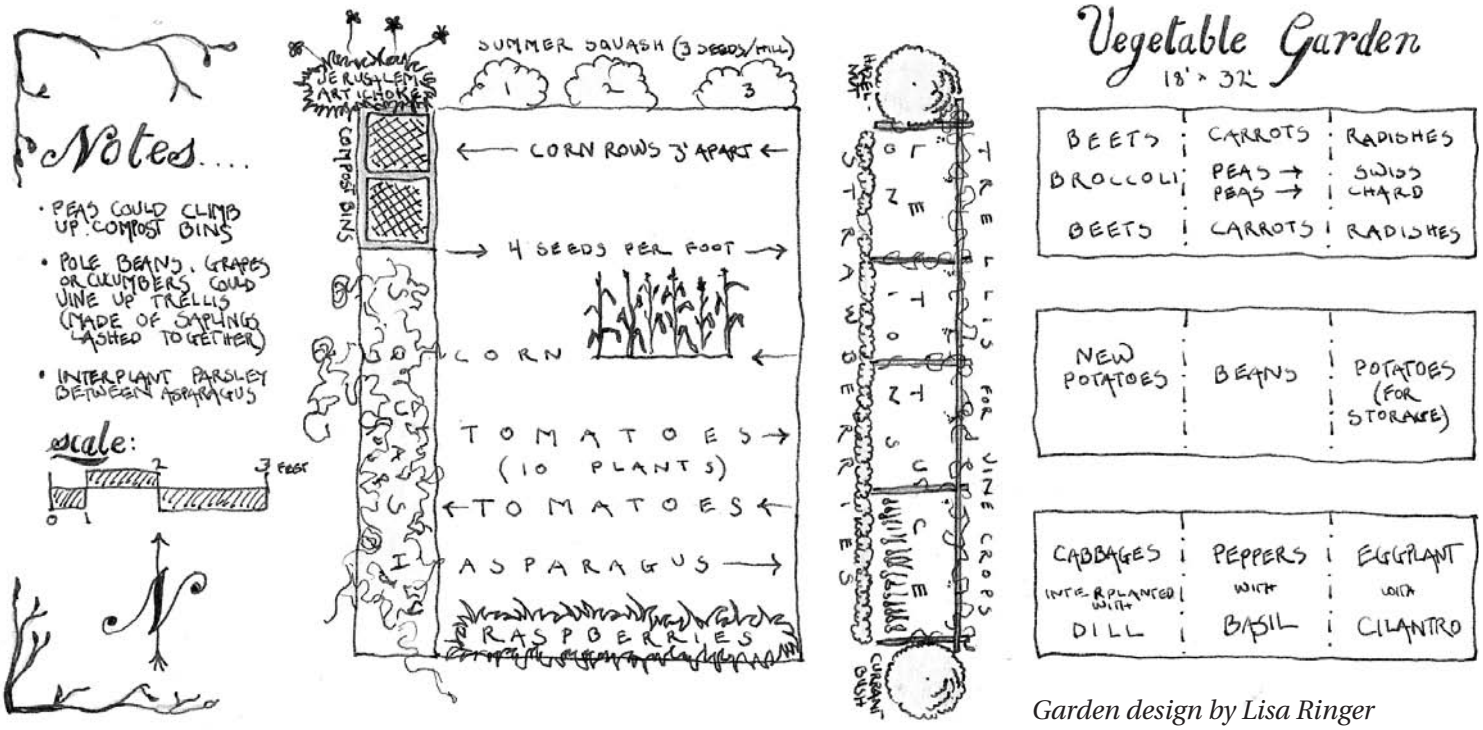
- Watch the sunlight and shadows. Your garden site will need at least six hours of full sun a day.
- A gentle south-facing slope that drains well is best.
- Dig a hole and look at the soil. Is it very sandy? If so, you will have to add compost and other water-retaining amendments. If it is heavy, like clay, you may have to add compost and sand to lighten it up.
- Locate the site away from the competition of tree roots, shrubs and poison ivy and oak.
- It is very important that the site have easy access to water.

Layout/Design

- Measure the dimensions of your garden plot.
- Look at seed catalogues and garden books to help determine what you would like to grow.
- Check the US Department of Agriculture's website at www.usna.usda.gov/Hardzone/ushzmap.html to understand what will grow in your area and climate zone. For example, Minnesota is hardiness zone 3-4.
- Determine the space, zone hardiness and days to maturity requirements for individual crops by looking at seed catalogues.
- Draw and lay out your garden on paper. Using graph paper is helpful for designing your garden beds.
- Order seeds and find a source for starter plants.
- Protect from predators (deer, rabbits, groundhogs, moles etc) with a fence or wall.

Soil and Bed Preparation

- Create the boundaries of your garden with string, chalk, or marking paint.
- Dig an edge around the garden with a sharpened square spade.
- Remove existing grass, prairie, bramble or weeds by digging them out, roots and all, with a spade or sod stripper.
- Spread rotted manure, leaf or kitchen scrap compost to a depth of 3 inches on top of the garden. All compost should be well broken down.
- Add natural fertilizers before digging. Natural fertilizers like alfalfa meal, granite dust, bone meal, etc. can be found in some good organic, commercial fertilizer mixes.



Garden design by Lisa Ringer

- Turn the soil to a spade's depth (8 inches – 1 foot) and for best results, loosen subsoil with a digging fork to another spade's depth (16-24 inches total).
- Rake out and break up clods in beds with a garden rake until the soil is fine enough to plant garden seeds. You may want to rent or purchase a tiller if you are preparing a large garden plot.
- Create planting beds and paths according to your plan using stakes and string.

Planting the Garden

- Read seed packets carefully and plant accordingly.
- Tomatoes, peppers, eggplants, many woody herbs and perennial plants are best started in a greenhouse, purchased as seedlings at a nursery, or divided from other plants.
- Seeds are usually planted to a depth of 3 times their width. Water them very gently at first so they don't wash away.
- The temperature of the soil is important to the timing of the sowing of different seeds and planting of starts.
- Transplants need to be watered immediately and regularly.
- Once the seeds sprout, they need to be kept evenly watered.
- Some plants like peas and beans may want to climb and will need a trellis. It is useful to learn about the growth habit of each crop.

Weeding

- Once established, cultivate carefully around plants and seedlings using a hoe to disturb weed seeds and roots with out harming crop root space.
- Perennial weeds such as burdock, quackgrass, crabgrass, and dandelions must be dug out or they will immediately come back.
- Weed barriers, such as cardboard or newspaper covered with hay, help discourage weeds in the paths.
- Once the soil temperature has warmed up sufficiently, mulch the garden with marsh hay, composted manure, or other composts to discourage weeds and conserve water.

Watering

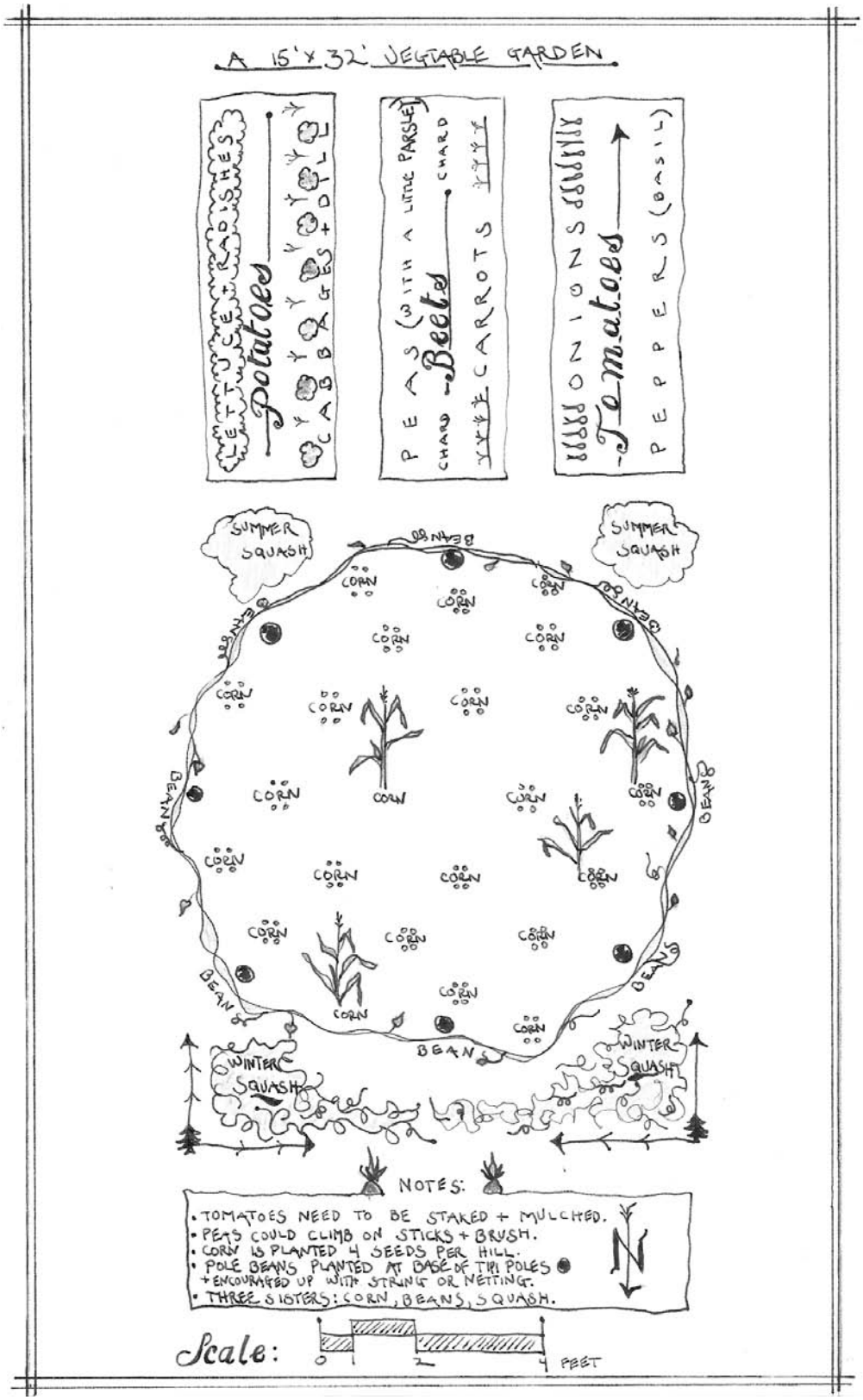
- The conservation of water in the root zone of plants is best achieved with ample organic matter in garden soil, the application of mulches, and consistent watering.
- One can water a garden via overhead sprinkler, soaker hose or hauling with buckets and using a watering can.
- It is important not to water the leaves during the heat of the day when the sun is high. This can burn the leaves, like a magnifying glass,

during evaporation. Morning or late afternoon watering is best.

- Plants thrive when deeply watered. Light watering causes roots to stay on the surface, thereby making them vulnerable when the soil surface dries out.
- Cabbage family and leafy greens require even moisture. Other crops such as corn, beans and squash (The Three Sisters), survive with regular watering but like to dry out a bit so their roots grow deeper. It is helpful to understand the water requirements of your crops.

Making Compost

- Compost is made by layering carbon rich, organic matter, such as fallen leaves, hay, or wood chips with nitrogen rich materials, such as food scraps, manures, and grass clippings.
- The carbon/nitrogen ratio to make compost is roughly 3/1.
- Kitchen scraps (non-meat) are gold for making soil-improving compost.
- Compost can be made in piles or bins and can be turned every 3-6 months.
- Because of the continual stream of kitchen scraps and organic matter, it is a good idea to have more than one pile or bin.
- Compost layers need to be watered during the layering process.
- Apply compost when it is close to feeling and smelling like soil.
- Compost can also further be broken down with Red Wriggler Worms (Eisenia fetida). See www.lavermesworms.com for more information on this technique.



Garden design by Lisa Ringer

LEARN MORE ABOUT SEEDS AND SEED SAVING

Our seeds hold our past and our future. Each crop grows its own seeds for planting in the years to come. The following organizations offer resources on indigenous seeds and seed preservation.

Native Seeds/SEARCH
526 N. 4th Ave.
Tucson, AZ 85705
(520) 622-5561
www.nativeseeds.org
Native Seeds/SEARCH (Southwestern Endangered Aridlands Resource Clearing House) conserves, distributes, and documents the adapted and diverse varieties of agricultural seeds, their wild relatives and the role these seeds play in cultures of the American Southwest and Northwest Mexico.

Seed Savers Exchange
3076 North Winn Road
Decorah, IA 52101
(563) 382-5990
www.seedsavers.org
The members of Seed Savers Exchange plant and preserve more than 5,000 varieties of heirloom seed stocks.

Eastern Native Seed Conservancy
P.O. Box 51
Great Barrington, MA 01230
(413) 229-8316
This organization preserves and distributes heirloom varieties with an emphasis on the seeds of eastern and northern plants.

Saving Our Seeds
P.O. Box 1304
Charlottesville, VA 22902
www.savingourseeds.org
The mission of Saving Our Seeds is to promote sustainable, ecological, organic vegetable seed production in the Mid-Atlantic and South. Saving Our Seeds provides information, resources, and publications for gardeners, farmers, seed savers, and seed growers.

USDA Seed Bank
National Center for Genetic Resources Preservation
1111 South Mason
Fort Collins, CO 80521-4500
(970) 495-3200
The mission of the National Center for Genetic Resources Preservation (NCGRP) is to acquire, evaluate, preserve, and provide a national collection of genetic resources to secure the biological diversity that underpins a sustainable US agricultural economy through diligent stewardship, research and communication.



Photos of traditional foods by Martin Curry

TRIBAL FOOD RESTORATION: PROJECT PROFILES

We invite you to take a look at some of the amazing work being done in our communities to restore traditional food systems. Below are examples of re-localized tribal food economies and a brief analysis of their impact.

Oneida Community Integrated Food Systems (OCIFS) and Tsyunhehkwa Farm

The work of the Oneida Tribe of Indians in Wisconsin is exemplary in the realm of developing healthy, local food and food education. The organically certified Tsyunhehkwa Farm, (meaning "it provides life for us"), spreads the tribe's agricultural traditions, engaging community members and people living outside the reservation with the agricultural fields, a cannery and a retail store.

The Three Sisters Mounds encompass the most important traditional crops on the Farm. The corn serves as the trellis for the beans, while the squash becomes living mulch. Throughout the year, people come to Tsyunhehkwa to learn about a nutritionally rich Native variety of white corn. Students from the surrounding school districts and students from the University of Wisconsin at Green Bay are part of the entire process from raising the seed to hand-harvesting the corn. The community participates in the annual corn harvest and comes together to cook traditional foods like corn soups, breads and mush.

The Tsyunhehkwa Farm contributes greatly to Oneida cultural preservation. As an offshoot of its harvest, Tsyunhehkwa provides significant foods to the Longhouse ceremonies. By placing placards around the farm in both English and Oneida and speaking key agricultural words in Oneida, the culture of the tribe lives on.

The Farm processes 250 free range chickens a year, sells produce from a half-acre plot on the farm at a farmers' market, maintains a pick-your-own raspberries patch and sells beef and eggs. This local food production system demonstrates a forgotten tradition on the reservation, which is having a direct connection with the land.

As a result of the tribe's agricultural restoration efforts, tribal members have been learning to garden on their own land, and many operate farm stands informally, selling produce from their own front yards. The tribe also offers a number of programs and ways for youth to be involved in agricultural life. Oneida youth can no longer think that food only comes from a grocery store after spending time at Tsyunhehkwa.

For more information contact:
Ted Skenandore
tskenan2@oneidanation.org
(920) 869-2718
www.oneidanation.org
www.tsyunhehkwa.org

Mvskoke Food Sovereignty Initiative (MFSI)

Mvskoke food traditions go back in time long before the Trail of Tears forced them from their southeastern homelands to Oklahoma. For centuries, the Mvskoke maintained a successful agricultural culture that sustained large populations living in towns along the rivers and creeks (European settlers called them "Creek In-

Children in the garden at Pine Point School on the White Earth Reservation. Photos courtesy WELRP

dians"). These were the mound builders who developed a sophisticated civilization, taking care of the food as well as the spiritual and political needs of their people.

Today, these cultures still exist as the Muscogee, Seminole, Chickasaw, Choctaw, Cherokee and Yuchi tribes. The respective languages are still spoken by many and the ceremonial dances, songs and practices are still carried on. Traditional foods still play an important role in cultural activities. The Mvskoke Food Sovereignty Initiative (MFSI) seeks to preserve the food heritage and traditions of their peoples through hands-on classes, educational programs, intergenerational sharing and sustainable agriculture practices.

MFSI's Community Tradition, Foods and Future Project works to improve public nutrition programs, reconnect tribal members with traditional foods and promote community-based agriculture. Another project, entitled the Community Outreach for Producer's Empowerment Project, is funded by the USDA Cooperative State Research Education and Extension Service. A 37 foot mobile unit is driven into communities within Okmulgee County to provide financial and technical assistance to farmers, ranchers, and those interested in pursuing loans, grants, cost shares and incentive programs available through federal, state and regional sources. These projects are just a few of the ways MFSI is working to revitalize the Mvskoke peoples' heritage as an agrarian society.

For more information about MFSI, contact:
Vicky Karhu
Mvskokefood@gmail.com
(918) 756-5915
www.mvskokefood.org

White Earth Land Recovery Project (WELRP)

For the past twenty years, the White Earth Land Recovery Project (WELRP) has been fulfilling its mission to facilitate recovery of the original land base of the White Earth Indian Reservation, while preserving and restoring traditional practices of sound land stewardship, language fluency, community development, and strengthening Anishinaabe spiritual and cultural heritage. Providing future generations of Anishinaabeg with a sustainable, secure future has meant protecting and preserving sacred foods and traditional seeds on White Earth in addition to expanding local food production capacity, creating a market for local foods and passing on food cultures and traditions to youth.

In the spring, food production efforts move to the woods, where dozens of Anishinaabe workers and teams of Percheron horses collect sap from sugar maple stands to produce maple syrup. Beyond managing its own operations, WELRP has assisted other small-scale producers to procure equipment and infrastructure to begin their own rice mills and sugar bushes. When the snow finally melts in northern Minnesota, planting season begins. WELRP tills upwards of 200 gardens each year for individuals and organizations in each community on the 36 x 36 mile reservation and has erected greenhouses in six communities thus far. The organization also distributes plants and trees at a

In the gardens at Tohono O'odham Community Action.

subsidized rate to anyone on the reservation wishing to begin a garden.

The Gitigaaning ('Garden') Farm, owned and operated by WELRP, produces organically certified raspberries, strawberries, potatoes, and vegetables along with ceremonial tobacco and sage. A separate plot is dedicated to traditional Three Sisters Gardens featuring corn, beans and squash. At harvest times, seeds are carefully selected and saved. WELRP has also worked with local farmers on a native corn restoration project, seeking to grow varieties of corn particularly suited to Minnesota's harsh 85-day growing season. Food produced by these year-round efforts is put to good use. Locals and tourists alike enjoy locally-sourced meals at the Minwanjige ('Eat Well') Café, a WELRP project that also serves as a point of sale for Native Harvest products and an educational event center. The Mino-Miijim ('Good Food') Program delivers fresh seasonal produce along with wild rice, hominy, buffalo, honey, and tea each month directly to the homes of 180 tribal elders with diabetes.

The Pine Point Farm to School Program began in 2007 to revamp the Pine Point School's breakfast and lunch menu. Breakfast and lunch are served daily to 120 students, 98% of whom qualify for free and reduced price meals. Working with more than fifty local farmers, gardeners and businesses, program and kitchen staff have replaced pre-packaged, processed foods with fresh, local, sustainably grown ingredients. Traditional foods like wild rice, blueberries, hominy, venison and maple syrup were reintroduced and tasty, kid-friendly foods such as corn on the cob, organic all-beef hot dogs and buffalo burgers were substituted for out-of-the-can or off-the-truck versions. The shift in the school cafeteria has been accompanied by the creation of a corresponding cultural curriculum.

For more information, contact:
Winona LaDuke
info@welrp.org or
www.nativeharvest.com
(218) 375-2600

Tohono O'odham Community Action (TOCA)

TOCA is an organization that works to restore and strengthen the local agricultural traditions of the Tohono O'odham community. Located in Southern Arizona, the Tohono O'odham Reservation is roughly the size of Connecticut, and has only one major grocery store.

TOCA is working to establish school garden and lunch programs. Currently, three schools have gardens: the Santa Rosa Boarding School and the Santa Rosa Ranch Day School, both run by the Bureau of Indian Education, and the Indian Oasis Primary School, run by Pima County. The school gardens produce enough food for special occasions, and when the food is harvested teachers integrate traditional Tohono O'odham recipes into their classrooms. TOCA has been working to empower the surrounding community to ensure that school curriculum and food services incorporate traditional meals and knowledge on a regular basis.

TOCA also runs a non-certified organic farm on the reservation that cultivates traditional plants such as yellow meat watermelon, sixty-day corn, brown and white tepary beans, and O'odham squash. The TOCA farm has been working to establish a local food economy by packaging and selling their harvest in the supermarket and in the small markets at gas stations across the reservation. Students also visit the farm and TOCA teaches the children how to start a water line, separate beans from pods, pick squash, and remove and store seeds for next year.

Tohono O'odham culture comes alive through songs, dances, and language at the TOCA farm. TOCA staff members frequently go into local schools at the teacher's request to teach nutrition and cooking education. They use a variety of activities and presentations to get the students engaged, including videos, cooking demos and taste tests of local food.

The community uses TOCA as a resource for information, classes, seeds, starting gardens, and restarting farms. Now, traditional foods appear at special events across the community, indicating that there is growing community support for eating local, indigenous foods. TOCA's small staff of eight carries on the enormous task of operating the farm and programs that educate the community about a local food system. TOCA believes that if people speak up; institutions such as the schools will listen, and begin to change.

For more information, contact:
Karen Blaine
kblaine@tocaonline.org
(520) 383-4966
www.tocaonline.org

InterTribal Bison Cooperative (ITBC)

ITBC takes an alternative approach to solving the food insecurity issues on Native reservations. The InterTribal Bison Cooperative currently works with 57 tribes from 18 different states to develop self-sufficient, tribally run bison herds.

ITBC advocates for tribes to raise their bison to be organic and free range, but they do not certify their meat due to the costs involved with organic certification. ITBC is currently focused on getting bison meat into each tribe's schools, the Oneida Tribe of Indians of Wisconsin and the Southern Ute Tribe in Colorado being exemplary leaders in these efforts. Learning from each tribe's struggles in getting local bison meat in their schools, ITBC hopes to compile a resource detailing all the discouraging setbacks tribal members have had to cope with in their area and how they can overcome them. By learning from others' experiences, these setbacks will not seem insurmountable, but merely part of the course towards getting healthy foods into their schools and communities.

For more information, contact:
Jim Stone
jstone@itbcbison.com
(605) 394-9730
www.itbcbison.com

Glossary:

TERMS AND ABBREVIATIONS USED IN THIS BOOK

British Thermal Unit (BTU): The amount of heat required to raise the temperature of one pound of water one degree Fahrenheit.

Carbon: A chemical element that is in carbon dioxide (CO_2) which is the most prolific greenhouse gas. When talking about global warming, "carbon" is often used to refer to carbon dioxide and other greenhouse gases.

Clean Renewable Energy Bonds (CREBs): A CREB is a special type of bond that can be used to create loans for energy projects that are effectively interest-free.[162]

Fossil Fuel: Any combustible organic material, such as oil, coal, or natural gas, derived from the remains of former life.

Genetically Modified Organism (GMO): An organism whose genetic makeup has been altered by the techniques of genetic engineering so that its DNA contains one or more genes not normally found there. Also known as a Genetically Engineered Organism (GEO). Sometimes shortened to GM or GE.

Greenhouse Gases (GHG): Gases in the atmosphere that absorb and emit heat within the atmosphere, trapping the heat and not letting it escape into space.

Grid-tied: Electrical generation that is connected to the electric grid (power lines etc.) as opposed to electrical generation which only powers an independent electric system.

Gross Domestic Product (GDP): The total market value of all the goods and services produced within the borders of a nation during a specific time period.

Interconnection Agreement: A legally binding document that defines the technical and contractual terms under which an electricity generator can connect and deliver energy to a transmission system.[163]

Kilowatt (kW): A unit of power, equal to 1,000 watts. (See below for definition of watt)

Kilowatt Hours (kWh): A unit of energy, equivalent to the energy transferred or expended in one hour by one kilowatt of power.

Megawatt (MW): A unit of power, equal to one million watts.

Monoculture: The agricultural practice of producing or growing one single crop over a wide area. Creates a single, homogeneous food culture without diversity.

Off-grid/remote: Electricity that is produced and not hooked into the broader electric grid.

Organic Farming: The form of agriculture that relies on crop rotation, green manure, compost, biological pest control, and mechanical cultivation (uprooting or burying weeds) to maintain soil productivity and control weeds and problem insects, excluding or strictly limiting the use of synthetic fertilizers and synthetic pesticides, plant growth regulators, livestock feed additives, and genetically modified organisms.

Parts Per Million (PPM): A way of expressing very dilute concentrations of substances. Just as per cent means out of a hundred, parts per million means out of a million. PPM is often used to describe atmospheric concentrations of greenhouse gases.

Peak Oil: The point in time when the maximum rate of global petroleum production is reached, after which the rate of production enters terminal decline.

Photovoltaic (PV): A type of solar panel which produces electricity when exposed to radiant energy, especially light.

Power Purchase Agreement (PPA): A legal contract between an electricity generator and a power purchaser. The power purchaser purchases energy, and sometimes also capacity and/or ancillary services, from the electricity generator. Such agreements play a key role in the financing of independently owned (i.e. not owned by a utility) electricity generating assets.

Production Tax Credit (PTC): Provides the investor or owner of qualifying property with an annual tax credit based on the amount of electricity generated by that facility.[164]

Renewable Energy: Any naturally occurring, theoretically inexhaustible source of energy, such as biomass, solar, wind, tidal, wave, and hydroelectric power, and is not derived from fossil or nuclear fuel.

Renewable Energy Certificate (REC): Tradable, non-tangible energy commodity in the United States that represent proof that a specified amount of electricity was generated from an eligible renewable energy resource.

Sustainable: Sustainability means meeting the needs of the present without compromising the ability of future generations to meet their own needs.[165]

Tribal Energy Program (TEP): A Department of Energy program that provides financial and technical assistance to tribes for the evaluation and development of renewable energy resources. The program also provides education and training to help build the knowledge and skills essential for sustainable energy projects.[166]

Watt: A basic unit of power which is used to measure electricity. One watt is a small amount of power so kilowatts and megawatts are frequently referred to in energy discussions. 'Kilowatt hours' is a term used to refer to watts used over time (see above definitions).

Definitions are from or modified from dictionary.com and wikipedia.org (verified with original sources) unless otherwise noted.

Notes:

Sources

1 "Happiness Doesn't Cost the Earth," *BBC News* (July 12, 2006) available at: http://news.bbc.co.uk/2/hi/science/nature/5169448.stm

2 Ajl, Max, "Life Expectancy, Carbon Footprints and a Happy Planet," *SolveClimate.com* (July 19, 2009), available at: http://solveclimate.com/blog/20090719/life-expectancy-carbon-footprints-and-happy-planet

3 "Calculating the HPI," *The Unhappy Planet Index 2.0*, available at: http://www.happyplanetindex.org/learn/

4 "Happiness Doesn't Cost the Earth," *BBC News* (July 12, 2006) available at: http://news.bbc.co.uk/2/hi/5169448.stm

5 LaDuke, Winona; Shimek, John; Thomsen, Carly & Triplett, Mike, *White Earth Anishinaabe Nation Energy Plan* (2006).

6 Sontag, Viki, "Why Local Linkages Matter: Findings from the Local Food Economy Study," *Sustainable Seattle* (April 2008) available at: http://www.sustainableseattle.org/Programs/localfoodeconomy

7 Intergovernmental Panel on Climate Change, "Climate Change 2007: Synthesis Report," (IPCC Report) available at: http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf

8 "Climate change,"*Dictionary.com,* available at: http://dictionary.reference.com/browse/climate%20change

9 Intergovernmental Panel on Climate Change," Climate Change 2007: Synthesis Report," (IPCC Report) available at: http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdfIPCC Report.

10 *Ibid.*

11 U.S. Global Change Research Program, Global Climate Change Impacts in the United States (USGS Report)"Executive Summary," (2009) available at: http://downloads.globalchange.gov/usimpacts/pdfs/executive-summary.pdf

12 US Energy Information Administration, "Emissions of Greenhouse Gases in the United States 2008," Report #: DOE/EIA-0573 (2008) Release Date: December 3, 2009.

13 US Department of Energy, Office of Fossil Energy, "Fossil Energy Homepage," available at: http://fossil.energy.gov/

14 "Climate Change- Greenhouse Gas Emissions," Environmental Protection Agency, available at: http://www.epa.gov/climatechange/emissions/index.html

15 *Ibid.*

16 NASA, "Recent Warming of Arctic May Affect Worldwide Climate,"(Oct. 23, 2003) available at: http://www.nasa.gov/centers/goddard/news/topstory/2003/1023esuice.html

17 Greenfacts, "Figure 6.1. Linkages and Feedback Loops among Desertification, Global Climate Change, and Biodiversity Loss," available at: http://www.greenfacts.org/en/desertification/figtableboxes/figure-6-1.htm

18 TerraNature, "Melting Permafrost Methane Emissions: Another Threat to Climate Change," available at: http://www.terranature.org/methaneSiberia.htm

19 USGS Report.

20 IPCC Report.

21 National Resources Defense Counsel (NRDC), "Global Warming Puts the Arctic on Thin Ice" available at:
http://www.nrdc.org/globalwarming/qthinice.asp

22 GAO Report to Congressional Committees, Alaska Native Villages, "Most Are Affected by Flooding and Erosion, but Few Qualify for Federal Assistance," p. 2 (Dec. 2003).

23 *Ibid.* at 53.

24 *Ibid.*

25 *Ibid.*

26 Brooks, Walter, "Mirant Canal Electric Plant Owners Sued For Causing Global Warming," *Cape Cod Today* (Feb. 28, 2008) available at: http://www.capecodtoday.com/blogs/index.php/2008/02/28/mirant_canal_plant_owners_sued_for_causi?blog=53

27 Keteltas, Gil, "Kivalina global warming litigation dismissed on political question grounds," *Global Climate Law Blog* (Oct. 16, 2009) available at: http://www.globalclimatelaw.com/2009/10/articles/climate-change-litigation/kivalina-global-warming-litigation-dismissed-on-political-question-grounds/

28 The Center for International Environmental Law, "The Inuit Case," available at: http://www.ciel.org/Climate/Climate_Inuit.html

29 Butler, Rhett A., "Arctic Inuit Sue U.S. Government Over Global Warming Pollution," *Mongabay.com* (Dec. 8, 2005) available at: http://news.mongabay.com/2005/1208-icc.html

30 The Center for International Environmental Law, "The Inuit Case," available at: http://www.ciel.org/Climate/Climate_Inuit.html

31 United Nations Framework Convention On Climate Change (March 25, 2009) available at: http://unfccc.int/resource/docs/2009/awg7/eng/misc01a01.pdf

32 Castaldi, Andrew, Swiss Reinsurance America Corp. testimony before Senate Committee on H.S. and Governmental Affairs (April 19, 2007) available at http://www.swissre.com/resources/334d8400455c5e82aa73ba80a45d76a0-Senate_testimony_Andrew_Castaldi_19_April_2007_final.pdf

33 U.S. Government Accountability Office, "Climate Change: Financial Risks to Federal and Private Insurers in Coming Decades are Potentially Significant," (May 3, 2007) available at: http://www.gao.gov/products/GAO-07-820T

34 Hirsch, Robert, "The Inevitable Peaking of World Oil Production," *The Atlantic Council of the United States Bulletin* (Oct. 2005) available at: http://www.acus.org/docs/051007-Hirsch_World_Oil_Production.pdf

35 "Gas Prices Rise for 48th Day, but Oil Sells Off," *USA Today* (June 16, 2009) available at: http://www.usatoday.com/money/industries/energy/2009-06-15-gas-prices_N.htm,

36 Floegel, Mark, "Half a Tank: The Impending Arrival of Peak Oil," *Multinational Monitor* (Jan./Feb. 2007) available at: http://www.multinationalmonitor.org/mm2007/012007/floegel.html

37 Belasco, Amy, "The Cost of Iraq, Afghanistan, and Other Global War on Terror Operations Since 9/11," Congressional Research Service (May 15, 2009) available at: www.fas.org/sgp/crs/natsec/RL33110.pdf

38 U.S. Geological Survey, "90 Billion Barrels of Oil and 1,670 Trillion Cubic Feet of Natural Gas Assessed in the Arctic" (July 23, 2008) available at: http://www.usgs.gov/newsroom/article.asp?ID=1980&from=rss_home

39 Rowell, Andy, "Oil Frontiers: The Future of Oil," *Multinational Monitor,* (Jan./Feb. 2007) available at: http://www.multinationalmonitor.org/mm2007/012007/rowell.html

40 Indigenous Environmental Network, "IEN and REDOIL Environmental Justice Win in Alaska," available at: http://www.ienearth.org/news/WIN_IN_ALASKA!.html

41 *Ibid*.

42 Sierra Club, "Keystone XL Pipeline: Tribes Have Filed Lawsuit" (Aug. 4, 2009) available at: http://southdakota.sierraclub.org/LivingRiver/KeystonePipeline.htm

43 "Environment Statistics: CO_2 Emissions (most recent) by Country," *NationMaster.com,* available at: http://www.nationmaster.com/graph/env_co_2_emi-environment-co_2-emissions

44 Western Canada Wilderness Committee, "Canada's Tar Sands: What the Government Doesn't Want You to Know," available at: http://wc-zope.emergence.com:8080/WildernessCommittee_Org/campaigns/wildlands/boreal/alberta/reports/Vol27No04/article3

45 Holt, John, "Nigeria of the North: Oil Sands Frenzy Threatens Alberta Environment," *E- The Environmental Magazine,* available at: http://www.emagazine.com/view/?3007

46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57 Native Agriculture & Food Systems Initiative, "Time for the Harvest: Renewing Native Food Systems," available at: *www.firstnations.org/publications/NAFSIFinalPR92903.pdf*

58 *Ibid*.

59 *Ibid*.

60 The FAO Price Indices, "Food Outlook: Global Market Analysis" (June 2009) available at: http://www.fao.org/docrep/011/ai482e/ai482e15.htm

61 Johns Hopkins Center for a Livable Future, "The Agriculture and Public Health Gateway,"available at: http://aphg.jhsph.edu/?event=browse.subject&subjectID=18

62 Tomczak, Jay, "Implications of Fossil Fuel Dependence for the Food System," *EnergyBulletin* (Dec. 11, 2005) available at: http://www.energybulletin.net/node/17036

63 Pirog, R.; Van Pelt, T., Enshayan, K. and Cook, E. "Food, Fuel, and Freeways: An Iowa perspective on how far food travels, fuel usage, and greenhouse gas emissions," Leopold Center for Sustainable Agriculture, p. 1. (June 2001), available at: http://www.leopold.iastate.edu/pubs/staff/ppp/index.htm

64 Cox and Atkins, qtd. in Wes Jackson, "Natural Systems Agriculture: A Radical Alternative," *The Land Institute Journal* (April 17, 2001).

65 Weil, Andrew, Guide to Healthy Eating, p. 25 (2009).

66 Klein, Ezra, "The Meat of the Problem," *The Washington Post* (July 29, 2009) available at: http://www.washingtonpost.com/wp-dyn/content/article/2009/07/28/AR2009072800390.html

67 Fanelli, Daniele, "Meat is Murder on the Environment," *New Scientist* (July 18, 2007) (discussing study by Akifumi Ogino of the National Institute of Livestock and Grassland Science in Japan) available at: http://www.newscientist.com/article/mg19526134.500

68 Ogino, Akifumi; Orito, Hideki; Shimada, Kazuhiro & Hirooka, Hiroyuki, "Evaluating Environmental Impacts of the Japanese Beef Cow–Calf System by the Life Cycle Assessment Method,"*Animal Science Journal* (July 9, 2007) available at: http://www3.interscience.wiley.com/journal/117979629/abstract?CRETRY=1&SRETRY=0

69 Goodwin-Nguyen, Sarah, "Vegetarianism is Good for the Environment: How Reducing Meat, Fish, and Poultry Consumption Helps the Planet," *Suite101.com* (July 26, 2009) available at: http://ecosystem-preservation.suite101.com/article.cfm/why_vegetarianism_is_good_for_the_environment#ixzz0WUUCgWRx
70 *Ibid.*
71 *Ibid.*
72 *Ibid.*
73 "USDA Recalls 143 Million Pounds of Beef," *MSNBC*, (March 3, 2008) available at: http://www.msnbc.msn.com/id/23212514/
74 "Chemicals: Messing Around in Nature's Lab," *EcoHealth*, available at: http://ecohealth101.org/whats_left/eat5.html
75 Morley, H.V., "Methods to Assess Adverse Effects of Pesticides on Non-Target Organisms," London Research Center, available at: http://www.icsu-scope.org/downloadpubs/scope49/chapter06.html
76 Duhigg, Charles, "Health Ills Abound as Farm Runoff Fouls Wells," (Sept. 17, 2009) available at: http://www.nytimes.com/2009/09/18/us/18dairy.html?_r=1&scp=1&sq=wisconsin%20farms&st=cse
77 U.S. Geological Survey, "The Quality of Our Nation's Waters: Nutrients and Pesticides," p. 6, National Water Quality Assessment Program (1999).
78 *Ibid.*
79 *Ibid.*
80 Glover, Jerry, "Characteristics of Annual vs. Perennial Systems," The Land Institute (Feb. 20, 2003) available at: http://www.landinstitute.org/vnews/display.v/ART/2003/02/20/3e78b3f2d0336
81 *Ibid.*
82 "150 'Dead Zones' Counted in Oceans: U.N. Report Warns of Nitrogen Runoff Killing Fisheries," msnbc, (March 29, 2004) available at: http://www.msnbc.msn.com/id/4624359/
83 Larsen, Janet, "Dead Zones Increasing in the World's Coastal Waters," Earth Policy Institute, (June 16, 2004) available at: http://www.earth-policy.org/index.php?/plan_b_updates/2004/update41
84 GAO Audits of the Commodity Food Area, T-RCED-90-15 (Nov. 15, 1989).
85 Wolfe WS, Sanjur D., "Contemporary diet and body weight of Navajo women receiving food assistance: an ethnographic and nutritional investigation," *Journal of American Dietetic Association*, 822-27 (1988).
86 Mihesuah, at 16 (citing research from the Native American Diabetes Initiative).
87 *Ibid.*
88 *Ibid.* at 51.
89 *Ibid.*
90 Rainforest Action Network, "Rainforest Agribusiness," available at: http://ran.org/what_we_do/rainforest_agribusiness/about_the_campaign/
91 Fogarty, David, "Indonesia Applies for World Bank forest CO_2 Scheme," *Reuters* (March 4, 2009) available at: http://www.reuters.com/article/latestCrisis/idUSSP394051
92 Pierce, Lizana K., "DOE's Tribal Energy Program," U.S. Department of Energy Office of Energy Efficiency and Renewable Energy, available at: http://www.harvestcleanenergy.org/conference/HCE9/Post-conference/PPT/LizanaPierce.pdf
93 *Ibid.*
94 Honor the Earth staff interview with Bob Gough, Secretary of Intertribal Council On Utility Policy (2009).
95 "Renewable & Alternative Energy Portfolio Standards," Pew Center on Global Climate Change, available at: http://www.pewclimate.org/what_s_being_done/in_the_states/rps.cfm
96 Wiser, Ryan, "Renewables Portfolio Standards: A Factual Introduction to Experience from the United States," Ernest Orlando Lawrence Berkeley National Laboratory, available at: *eetd.lbl.gov/ea/EMS/reports/62569.pdf*
97 Alliant Energy, "Wind Power The Fastest-Growing Energy Source Anywhere,"*Alberta Lea Tribune* (May 30, 2009) available at: http://www.albertleatribune.com/news/2009/may/30/wind-power-fastest-growing-energy-source-anywhere/
98 "Wind: AWEA Trumpets Success, CanWEA Laments 'Failure,'" *Clean Break* (Jan. 28, 2009) available at: http://www.cleanbreak.ca/2009/01/28/wind-awea-trumpets-success-canwea-laments-failure/
99 *Ibid.*
100 "Growth in Wind Power Will Create 'Green Collar' Jobs, According to Duke Study," Duke University Website (describing study by Duke University's Center for Globalization, Governance & Competitiveness (CGGC) entitled "Wind Power: Generating Electricity and Employment,") available at: http://news.duke.edu/2009/09/windpower.html

101 Devlin, Katy, "Solar market suffers in the face of lost incentives and the recession," *Glass* (Oct. 27, 2009) available at: http://www.glass-magazine.com/news-item/commercial/solar-market-suffers-face-lost-incentives-and-recession
102 Galbraith, Kate, "Solar Industry Posts Strong Growth in 2008," *The New York Times* (March 19, 2009) available at: http://greeninc.blogs.nytimes.com/2009/03/19/solar-industry-posts-strong-growth-in-2008/
103 Rascoe, Ayesha, "Recession Cools Solar Energy Growth," *Reuters* (March 18, 2009) available at: http://www.reuters.com/article/idUSTRE52H4PC20090318
104 Osborne, Mark, "U.S. solar market to top 440MW in '09, says GTM Research: 50% annual growth through 2012," *PV-Tech.org* (Dec. 8, 2009) available at: http://www.pv-tech.org/news/_a/u.s._solar_market_to_top_440mw_in_09_says_gtm_research_50_annual_growth_thr/
105 Organic Consumers Association, "Organic Food: Growth Will Continue" (Jan. 26, 2009), available at: http://www.organicconsumers.org/articles/article_16656.cfm
106 Nield, Jeff, "Organic Food Sales Still Growing Despite Economic Woes" (Feb. 1, 2009) available at: http://www.treehugger.com/files/2009/02/organic-food-sales-still-growing.php
107 *Ibid.*
108 "Despite Recession, the Market for 'Ethical' Consumer Products Remains Healthy," *Earth Times* (Oct. 5, 2009) available at: http://www.earthtimes.org/articles/show/despite-recession-the-market-for-ethical-consumer-products-remains-healthy,985725.shtml
109 *Ibid.*
110 *Ibid.*
111 Zabarenko, Deborah, "$100 billion Could Yield 2 million 'Green' Jobs," *Reuters* (Sept. 9, 2008) available at: http://www.reuters.com/article/environmentNews/idUSN0930092120080909
112 "Putting Renewables to Work: How Many Jobs can the Clean Energy Industry Generate," *Renewable and Appropriate Energy Laboratories,* (April 2004) available at: http://rael.berkeley.edu/files/2004/Kammen-Renewable-Jobs-2004.pdf
113 Reiss, Jeremy "High Performance Buildings: Promoting Economic Development and a Healthy City," Urban Agenda, (Sept. 27, 2004) available at: http://www.urbanagenda.org/publications/jeremy_intro324_testimony.htm
114 Bezdek, Roger, "Renewable Energy and Energy Efficiency: Drivers for the 2lst Century," American Solar Energy Society, (2007) available at: http://www.greenforall.org/resources/renewable-energy-and-energy-efficiency-economic
115 Testimony of Marshall R. Goldberg, *In the Matter of Otter Tail Power Company,* Case No. EL05-022 (May 19, 2006) available at: http://www.ucsusa.org/assets/documents/clean_energy/testimony_goldberg.pdf
116 *Ibid.*
117 "Navajo Council OKs Effort to Create Green Jobs," *CNBC* (July 23, 2009) available at: http://www.cnbc.com/id/32102138
118 Iowa Lakes Community College, "Programs of Study," available at: http://www.iowalakes.edu/programs_study/index.htm
119 Minnesota West Community & Technical College, "Alphabetical Listing of Programs," available at: http://www.mnwest.edu/programs/alphabetical/#4845
120 "Grijalva Introduces Bill to Facilitate Renewable Energy Projects on Tribal Lands," *Yuma News Now* (June 19, 2009) available at: http://yumanewsnow.com/index2.php?option=com_content&do_pdf=1&id=1583
121 *Ibid.*
122 *Native*Energy, "NativeEnergy Supports An Evolving Portfolio of Carbon Reducing Projects," available at: http://www.nativeenergy.com/pages/our_carbon_projects/413.php
123 Solar Energy International, "Technology Primers: Solar Energy" available at: http://www.solarenergy.org/technology-primers
124 US Department of Energy, "Solar FAQs—Concentrating Solar Power, The Basics," available at: http://apps1.eere.energy.gov/solar/cfm/faqs/third_level.cfm/name=Concentrating%20Solar%20Power/cat=The%20Basics
125 Ibid.
126 Miller, Tyler G., Living in the Environment, p. 409 (2000).
127 *Ibid.* at 410.
128 *Ibid.* at 410.
129 Kostelecky, Kendra "Natchez Elementary Unveils Solar Power Project," *Go Green,* (Jan. 27, 2009) available at: http://www.kolotv.com/green/headlines/19416849.html
130 "Black Rock Solar: About," available at http://www.blackrocksolar.org/?page_id=8
131 Interview with Tom Price by Winona LaDuke (June 30, 2008). For more information please email Tom Price at tom@blackrocksolar.org.
132 Honor the Earth staff interview with Pat Spears, President of the Intertribal Council On Utility Policy.

133 "Tribal Renewable Energy - Final Report for the Fort Peck Reservation Wind Project," DOE Tribal Energy Program (Aug.15, 2007) available at: http://apps1.eere.energy.gov/tribalenergy/pdfs/fortpeck03final.pdf
134 "Spirit Lake Sioux Wind Energy Project," Department of Energy, available at: http://www.windpoweringamerica.gov/nativeamericans/sioux.asp
135 "Message From the Chairman & CEO, Ron Philemonoff," *Kachix: Special Edition* (Nov. 11, 2008) available at: http://www.tanadgusix.com/kachix-wind-se.pdf
136 Wright, Bruce & Fredeberg, Connie, "Wind Energy Development in the Aleutian Pribilof Islands: The Birthplace of the Wind," Tribal Energy Program Review (Nov. 18, 2008) available at: http://apps1.eere.energy.gov/tribalenergy/pdfs/0811review_19wright.pdf
137 Falcon, James C., "Wind Turbine is Going Up," *Turtle Mountain Star* (March 10, 2008) available at: http://www.turtle-mountain.cc.nd.us/news/turbnews.asp
138 For additional information see "Kumeyaay Wind Energy Project: San Diego County's First Commercial Wind Project." Available by typing "Kumeyaay Wind Energy" in Google's search engine.
139 Soto, Onell R., "Wind-Farm Project Set for Campo Reservation," *The San Diego Union Tribune* (June 2009) available at: http://www3.signonsandiego.com/stories/2009/jun/11/wind-farm-project-set-campo-reservation/
140 Hellman, Jennifer, "Mille Lacs Band of Ojibwe: Press Release," available at: http://www.millelacsojibwe.org/page_PressReleaseContent.aspx?prid=228
141 Geiger, Bob, "With New Biomass Plant, Xcel Energy Becomes Electricity Customer" (June 26, 2009) available at: http://www.finance-commerce.com/article.cfm/2009/06/27/With-new-biomass-plant-Xcel-Energy-becomes-electricity-customer
142 "Biodiesel Q&A," Idaho Office of Energy Resources, available at: http://www.energy.idaho.gov/renewableenergy/biodiesel_qa.shtml
143 Johnson, Kirk, "A New Test for Business and Biofuel," *The New York Times* Aug. 16, 2009) available at: http://www.nytimes.com/2009/08/17/business/energy-environment/17algae.html?_r=2&hp
144 Staff Interview with Green Energy.
145 "Why Thermal Storage?," GARN Website, available at: http://garn.com/content/storage.aspx
146 Romancito, Rick, "Taos Pueblo Fires Up County's First Biomass Heating System," *The Taos News* (March 14, 2008) available at: http://taosnews.com/articles/2008/03/14/news/doc47d8169db7af9849932953.txt
147 *Ibid.*
148 "Energy Solutions," Shakopee Mdewakanton Sioux Community Website, available at: http://www.shakopeedakota.org/3energy.html
149 Weatherford, Jack, Indian Givers, p. 71 (1988).
150 Mihesuah, Devon Abbott, Recovering Our Ancestors' Gardens, p. 23 (2005).
151 *Ibid.* at 24.
152 LaSalle, Tim J. & Hepperly, Paul, Rodale Institute, "Regenerative Organic Farming: A Solution to Global Warming"(2008) available at: *www.rodaleinstitute.org/files/Rodale_Research_Paper-07_30_08.pdf.*
153 *Ibid.*
154 Hassel, Craig, "Good Nutrition at Harvest Time," *Harvest Newsletter of the Dream of Wild Health Network* (Oct. 2003).
155 *Ibid.*
156 *Ibid.*
157 Hunting for Tomorrow, "From the Field to the Table: The Benefits of Eating Wild Game" available at: www.huntingfortomorrow.com/HFTF.../FS%2015%20Oct%2008.pdf
158 *Ibid.*
159 *Ibid.*
160 *Ibid.*
161 *Ibid.*
162 Modified from document entitled "Clean Renewable Energy Bonds," prepared by the National Rural Electric Cooperative Association, available at: http://www.nreca.org/documents/publicpolicy/cleanrenewableenergybonds.pdf
163 Modified from Windustry, "Interconnection Agreement," available at: http://www.windustry.org/interconnection-agreement
164 Clean West Capital, "Glossary," available at: http://www.cleancapitalwest.com/glossary.html
165 Modified from Brundtland Commission, *Our Common Future* (1987).
166 Modified from US Department of Energy description of the Tribal Energy Program, available at: http://apps1.eere.energy.gov/tribalenergy/

Notes:

Notes:

A PUBLICATION OF HONOR THE EARTH

Honor the Earth
2104 Stevens Avenue South
Minneapolis, MN 55404
(612) 879-7529
info@honorearth.org
www.honorearth.org

Honor the Earth is a project of the Tides Center, a non-profit 501(c)(3) organization. All contributions to Honor the Earth are tax-deductible. Please consider making a gift to support our work.

Find Honor the Earth on:

PRINTED ON 100% POST CONSUMER WASTE RECYCLED PAPER