



U.S. Department of Energy
Energy Efficiency and Renewable Energy

Sandia National Laboratories' Tribal Energy Program

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Tribal Greenbuilding 101:
How Tribes Can Build Homes
with Sustainability in Mind

Tribal Energy Program Review
Denver, CO

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company,
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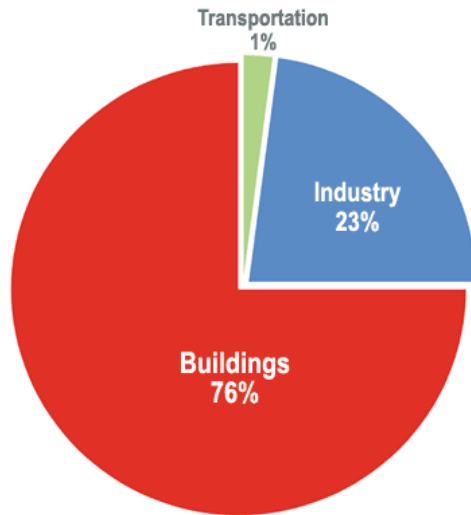
Overview

- Background
 - Current Practices
 - Our Impact
 - Tribal Housing
 - Housing
- Sustainability
 - What does it mean?
 - For tribes?
- Green Building
 - Elements
 - Benefits
- Case Study

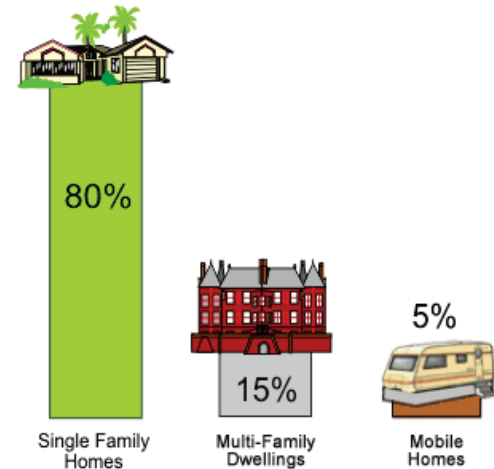




Energy Use by Sector



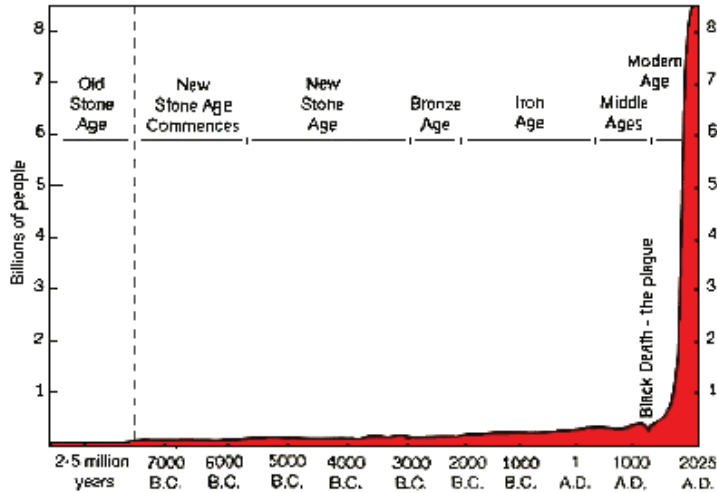
Energy Use by Building type





Linking Trends

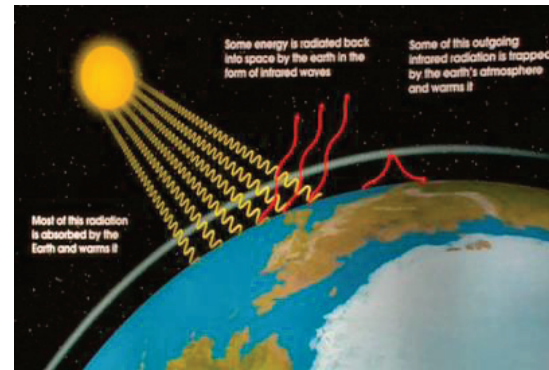
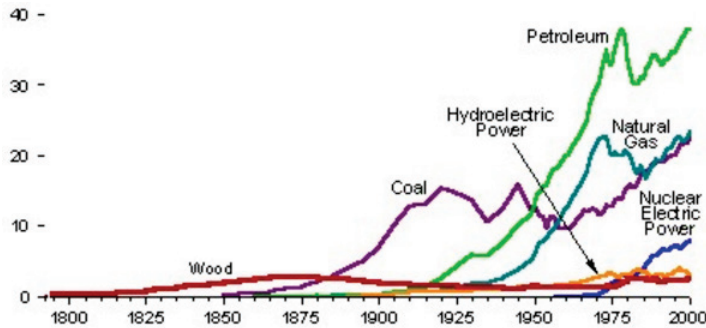
World Population Growth Through History



Climate Change



Energy Consumption by Source in Quadrillion BTU



Our Impact



- **SUBSTANDARD CONDITIONS:**

Native Americans suffer from some of the worst housing conditions in the nation. Some 14 percent of all reservation homes have no electricity, and on some reservations, as many as 20 individuals are forced to live in a single-family home.

- **GREAT DEMAND:**

The US commission on Civil Rights calculates that 90,000 Native families in America are homeless or under-housed.

- **TRIBES CAN DO SOMETHING:**

The goals of the act (NAHASDA) are simple: to put Indian tribes in the driver's seat when it comes to decisions on designing and building Indian homes and related infrastructure; and to encourage the use of creative and private sector financing in Indian housing.



The study stated, “the basic standard of living of Native Americans remains well below that of the rest of the nation,” adding that these conditions are “unacceptable in 21st century America.”

- 2003 US Civil Rights Commission Study

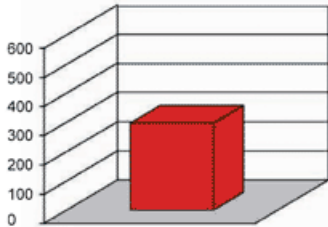




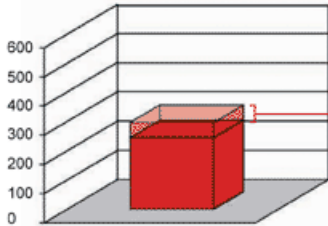
Housing

Billion Square Feet (sf)

Source: Energy Information Administration

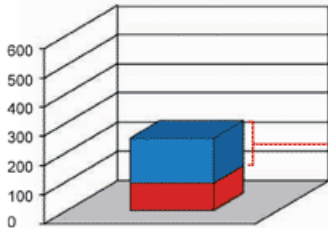


Currently the US building stock is approx. 300 billion sf.

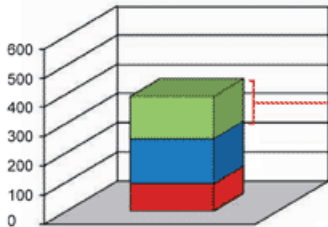


Over the next 30 years:

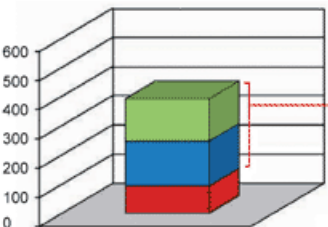
52 billion sf will be demolished



150 billion sf will be remodeled



150 billion sf will be new construction



Therefore, by the year 2035, three-quarters of the building stock will be new or renovated





“Social and environmental practices that protect and enhance the human and natural resources needed by future generations to enjoy a quality of life equal to or greater than our own.”

- Environmental Protection Agency

Sustainability



Traditionally, all tribes lived within the rhythms and cycles of the natural world, ingeniously discovering how to prosper using what nature provided. As contemporary Tribes work to achieve healthy and prosperous communities, they are presented with the challenge of reconciling their current needs with more traditional practices, particularly those that show respect for nature.

- The Center for Indian Community Development



“Green, or sustainable, building is the practice of creating and using healthier and more resource-efficient models of construction, renovation, operation, maintenance and demolition.”

- Environmental Protection Agency





Green Building Elements

- Energy efficiency
- Sustainable development
- Environmentally preferable building materials
- Renewable energy
- Indoor environment
- Water stewardship
- Waste reduction
- Toxic reduction



Nageezi House – ASU

5 Sustainable Design Strategies:

- Site
- Water
- Energy
- Materials
- Indoor Environment



Green Building Benefits



Environmental



Economic



Social



Environmental Benefits



- Enhancement & protection:
 - Biodiversity
 - Ecosystems
 - Air & water quality
- Conservation & restoration:
 - Natural resources
 - ↓ energy consumption
 - ↓ climate impacts
 - ↓ waste





Economic Benefits



- Consumer
 - Energy costs
 - Optimized life cycle performance
- Builder
 - O&M costs
 - Financial incentives





Social Benefits



- ↑ Community values
- ↑ Aesthetic qualities
- ↑ Occupant comfort & health
- ↓ Strain on local infrastructure
- Improved Quality of Life





Case Study



I-Sah'-Din'-Dii Housing Development
Mescalero Apache Reservation



Tribal Energy Program

Background

- 463,000 acres
- 4,000+ tribal members
- Unemployment: 8.6% (other tribes <80%)
- Service jobs
- Government: 63% & 34% private workers
- Median household income: \$23,902 (\$41,994 US)
- % Below Poverty: 35% (12.4% US)
- 400 families still on list

“Every home that is built is a blessing for our people, we still have work to do to accommodate all the people who have a need. I wish and pray we get more houses in here very soon.”

- Carleton Naiche-Palmer, Tribal President





Community-oriented Design

- 30 single family homes
- Community center
 - Kitchenette
 - Office/computers
 - Playground/bball
 - Social room
- Social Services
 - On-site health
 - Childcare
 - Employment
 - Homeowner educ.
- Access to school
 - Trails/Sidewalks
 - Transportation





NM MFA Guidelines:

- ↓ Impact on natural landscape
- Responsive to natural landscape
- Passive solar & energy efficient techniques
- Non-toxic materials for good indoor air quality

“We want to replicate this around the state and around the country. It’s one of the most progressive projects I’ve seen anywhere.”

- James Czar, NMMFA Exec. Direct.





Reduced Impact on Natural Landscape

- Erosion & Stormwater Plan
 - No clear cutting
 - Permeable paving
 - No building on slopes >10%
- Construction Waste Management Plan
- Local materials & workers
 - Local firewood use
 - 30% Native

“...this housing development has been designed to have as minimal an impact as possible on Mother Earth. .”

- Tim Horan, Exec. Direct.





Responsive to Natural Landscape

- Roads follow natural contours & ridgelines
- Undisturbed & reused natural features
 - Trees
 - Boulders

“Our people are about preserving our land here... Our ancestors lived off the land, the plants, the mescal, so this is a good plan for our people.”

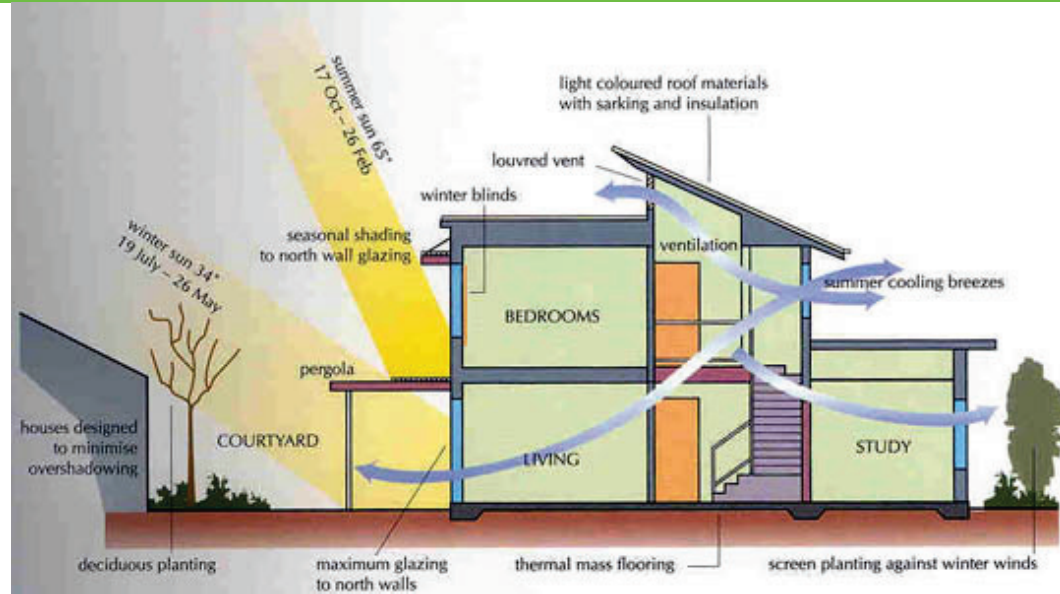
- Kathryn Zuazua, Tribal member





Passive Solar Heating & Lighting

- Orientation:
 - Southern Exposure
 - Dining
 - Living
 - Kitchen
- Large Windows & Overhangs
- Daylighting
- Thermal Massing



“This project is a wonderful example of how truly sustainable housing can be built on New Mexico’s tribal lands.”

- Diane Denish, NM Lt. Governor



Energy Efficiency

- Energy Star Appliances
- EE light fixtures & furnaces
- Low flow plumbing fixtures
- High performance doors & windows

“A lot of our people really struggle with the costs of food and housing. So what we intend to do is build green, healthy homes that are very energy efficient in order to reduce the cost of energy use.”

- Tim Horan, MAHA Exec. Direct.





Indoor Air Quality

- High windows:
 - Natural & cross ventilation
 - Warm air exhaust
- Materials:
 - Low VOC
 - Non-toxic
 - Formaldehyde-free
- Stained concrete floors

“Breathing or ingesting such chemicals is not only dangerous to respiratory systems humans and animals, but the natural environment and ozone.”

- IC Today Article, Aug. 27, 2008





Water

- Catch & Reuse
- Roof:
 - Metal
 - Pitched
- Water catchment system:
 - Two 55 gallon drums
 - Livestock
 - Garden
- Xeriscaping

“Respecting the environment is key to the values of the Mescalero people.”

- Tim Horan, MAHA Exec. Direct.





5 Sustainable Design Strategies:

- ✓ Site
- ✓ Water
- ✓ Energy
- ✓ Materials
- ✓ Indoor Environment

“Building green is a major part of the Tribe’s commitment to provide quality, sustainable, affordable homes for Mescalero Apache families.”

- Carleton Naiche-Palmer, Tribal President





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Ahéhee'!

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Questions?