Hot Science Cool Talks

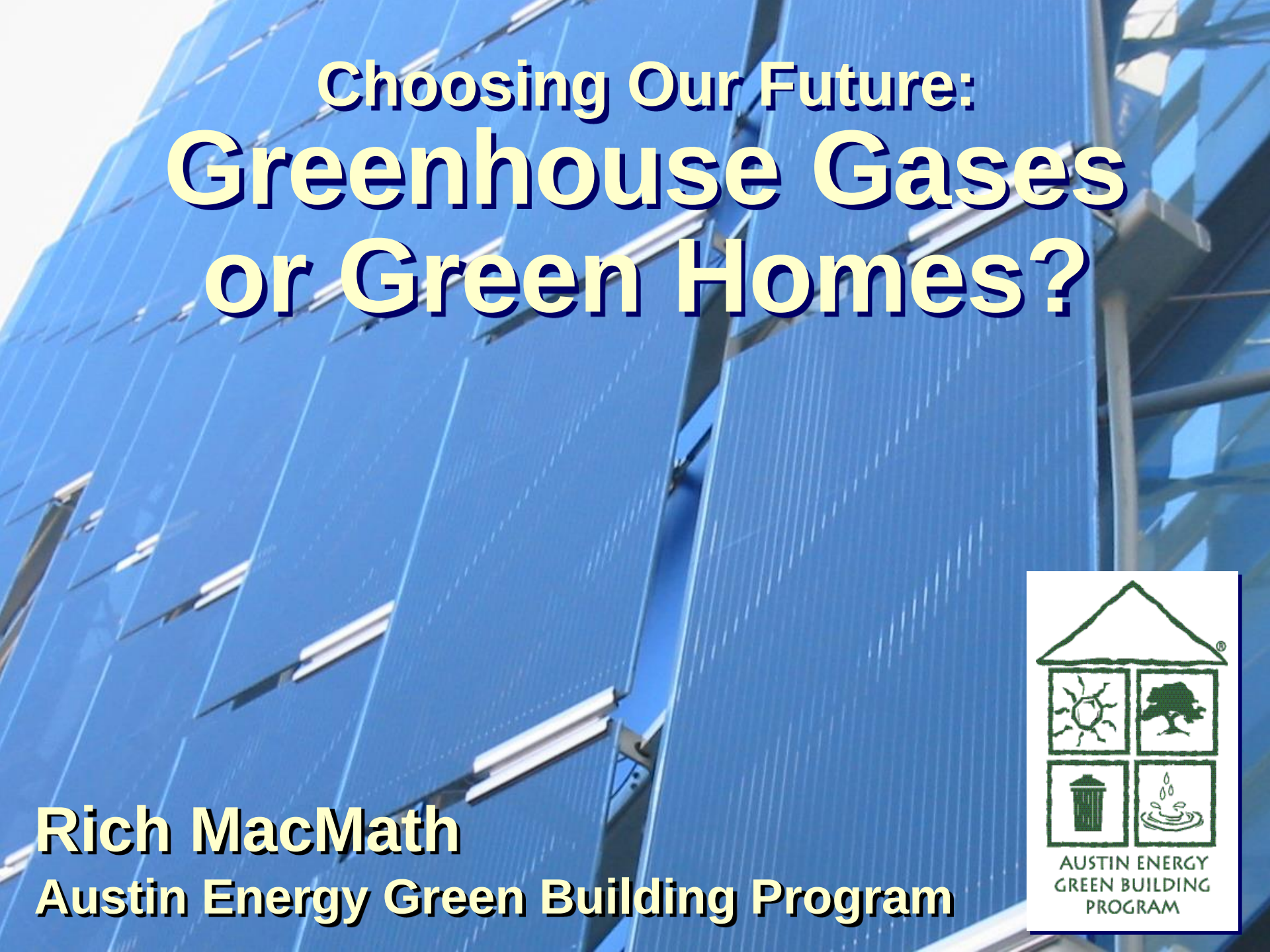
UT Environmental Science Institute

46

Choosing Our Future: Greenhouse Gases or Green Homes?

Dr. Rich MacMath

February 9, 2007



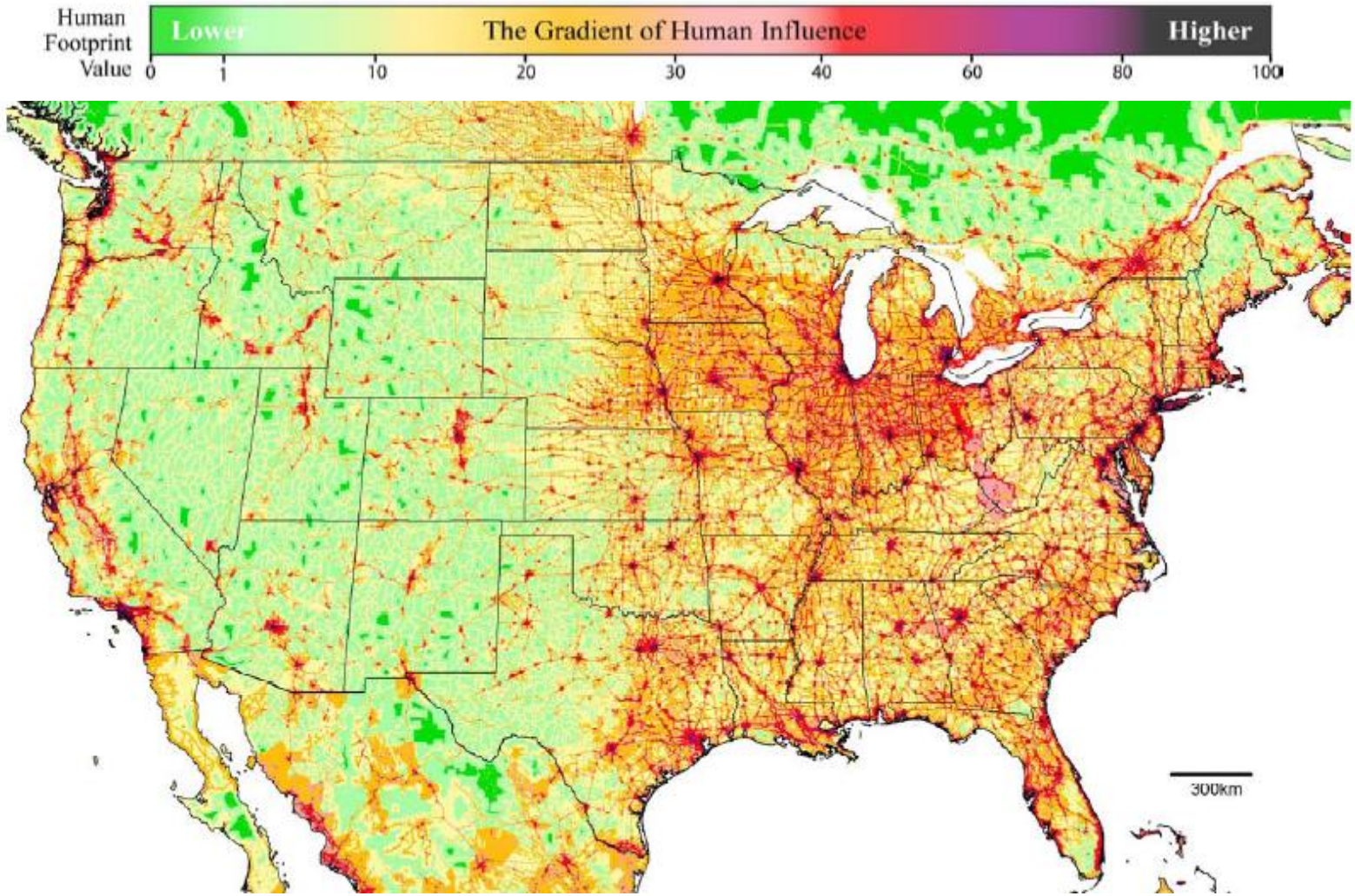
Choosing Our Future:

Greenhouse Gases or Green Homes?

Rich MacMath
Austin Energy Green Building Program

AUSTIN ENERGY
GREEN BUILDING
PROGRAM

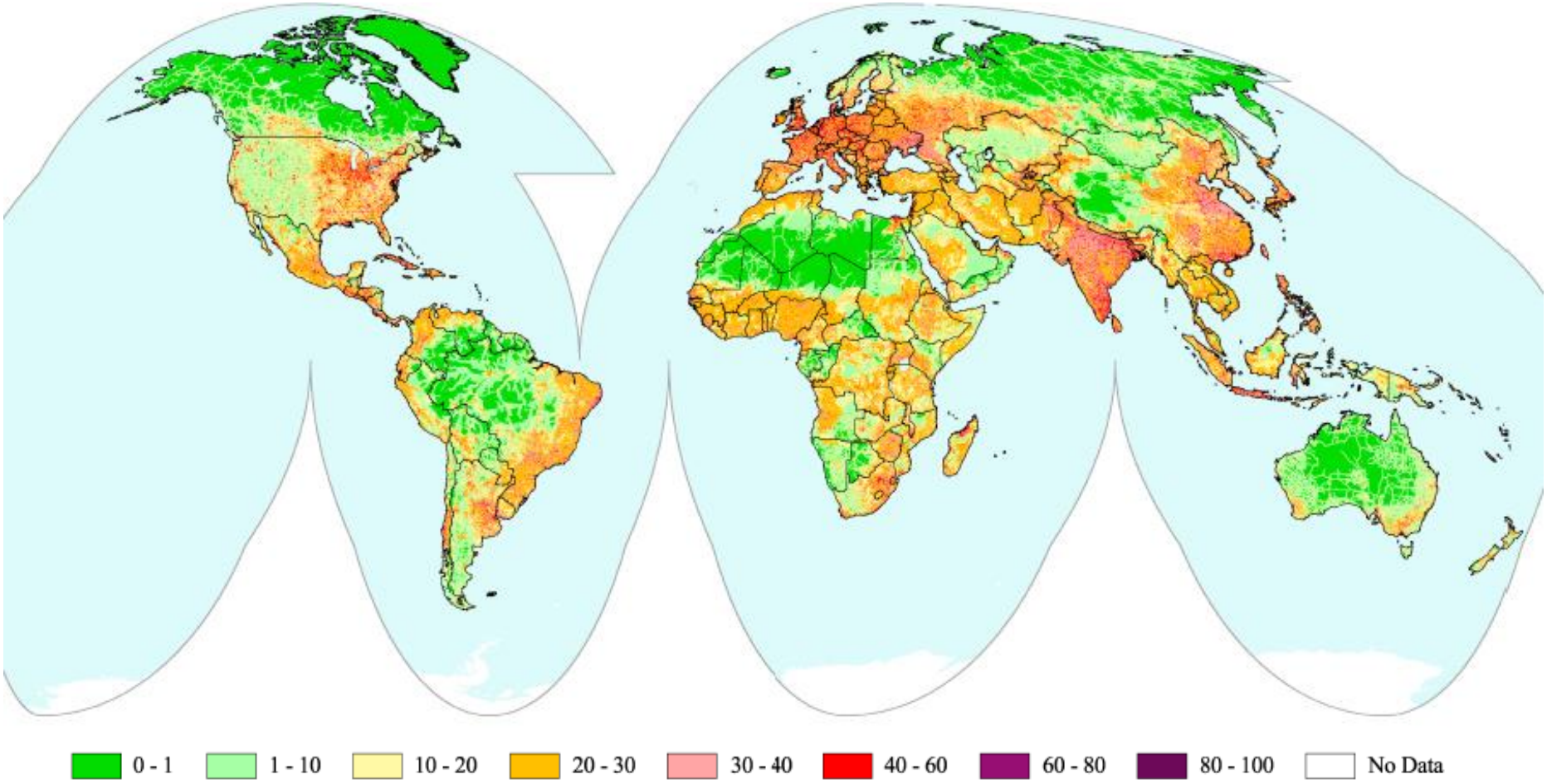
What is the Human Footprint?



A map of human influence on earth's land surface

www.wcs.org/sw-high_tech_tools/landscapeecology/humanfootprint

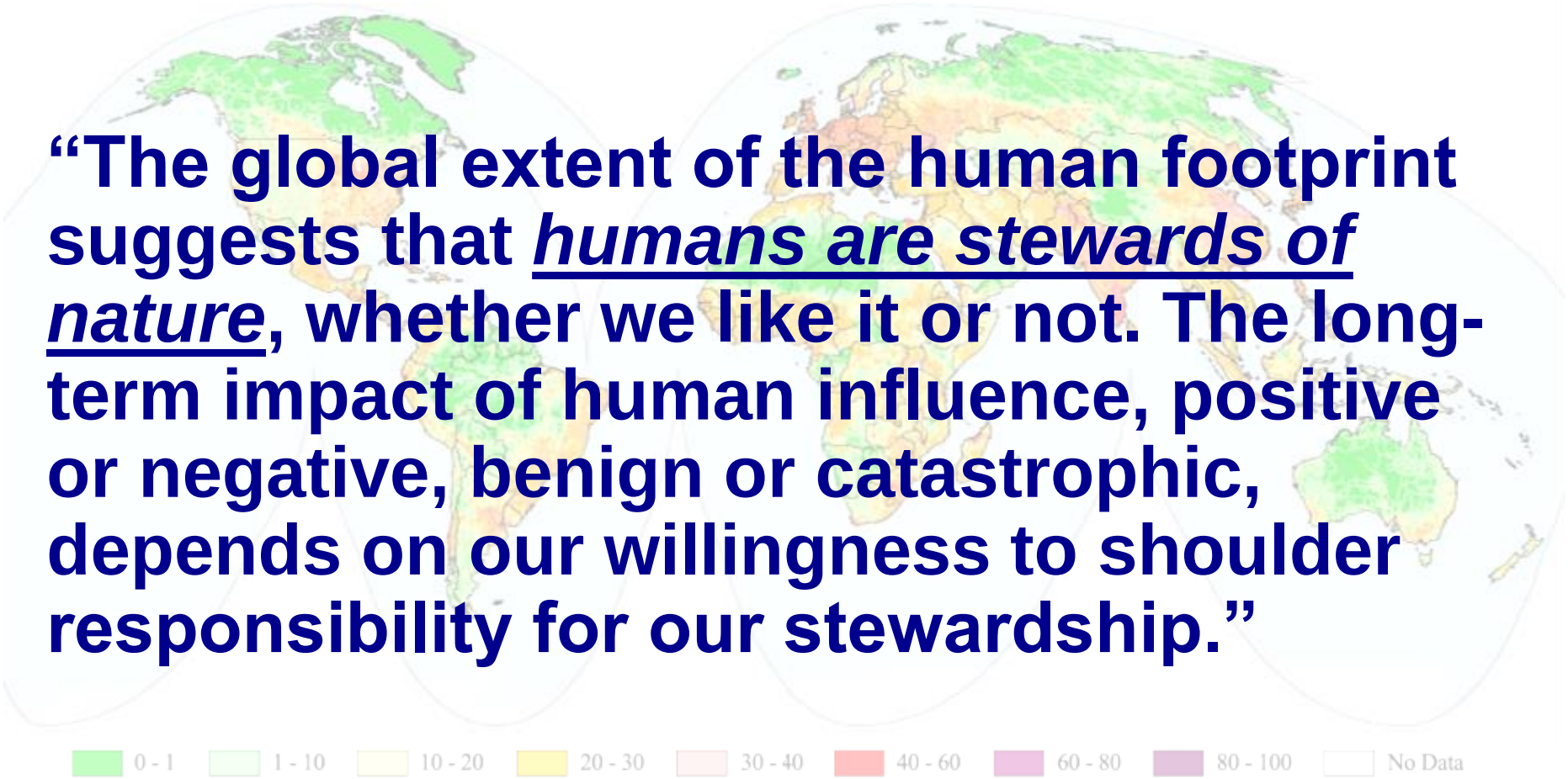
Atlas of the Human Footprint



83% of world's land surface under human influence

www.wcs.org/sw-high_tech_tools/landscapeecology/humanfootprint

The Human Footprint Report

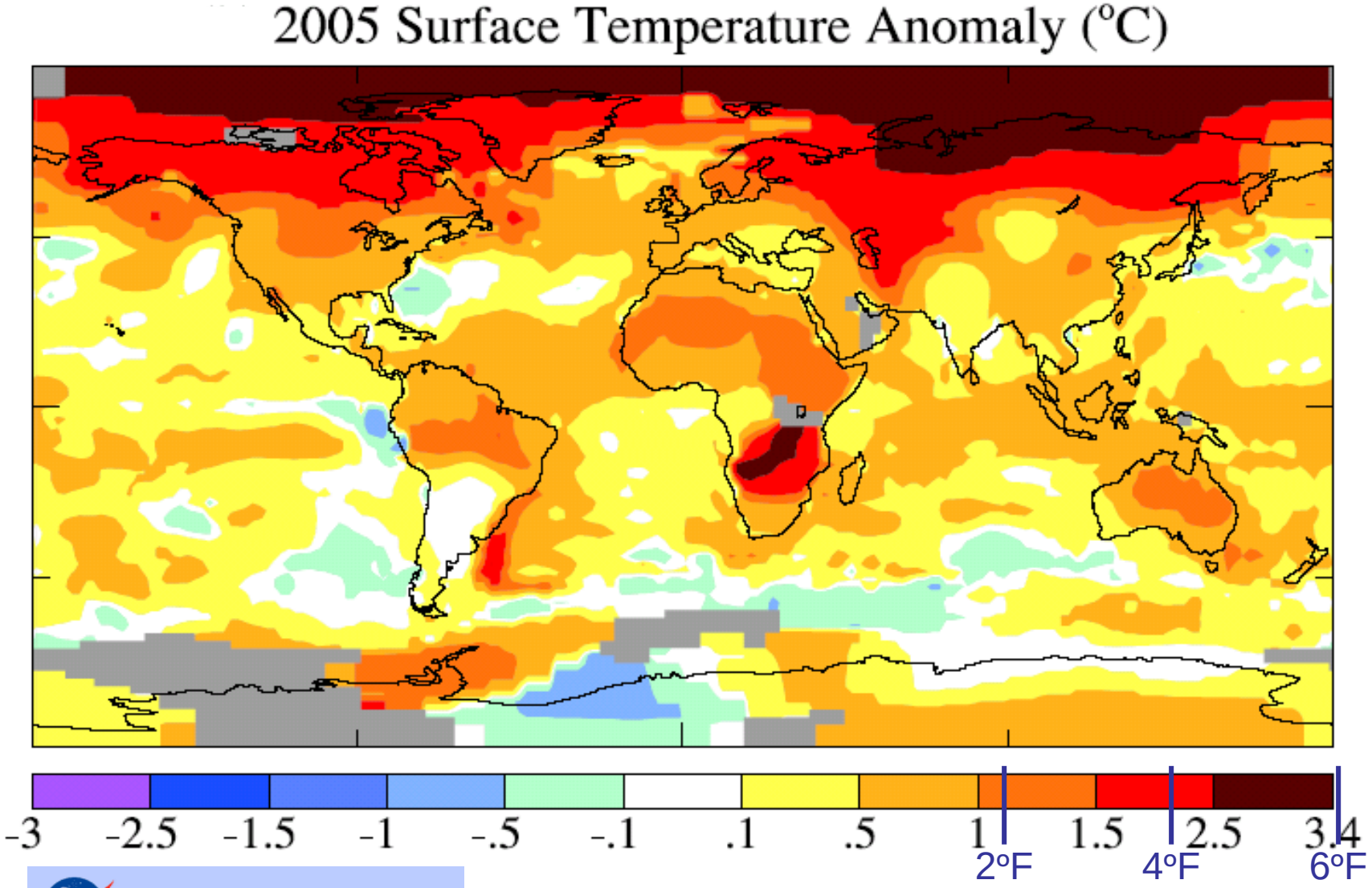


"The global extent of the human footprint suggests that *humans are stewards of nature*, whether we like it or not. The long-term impact of human influence, positive or negative, benign or catastrophic, depends on our willingness to shoulder responsibility for our stewardship."

83% of world's land surface under human influence

www.wcs.org/media/file/human_footprint2.pdf

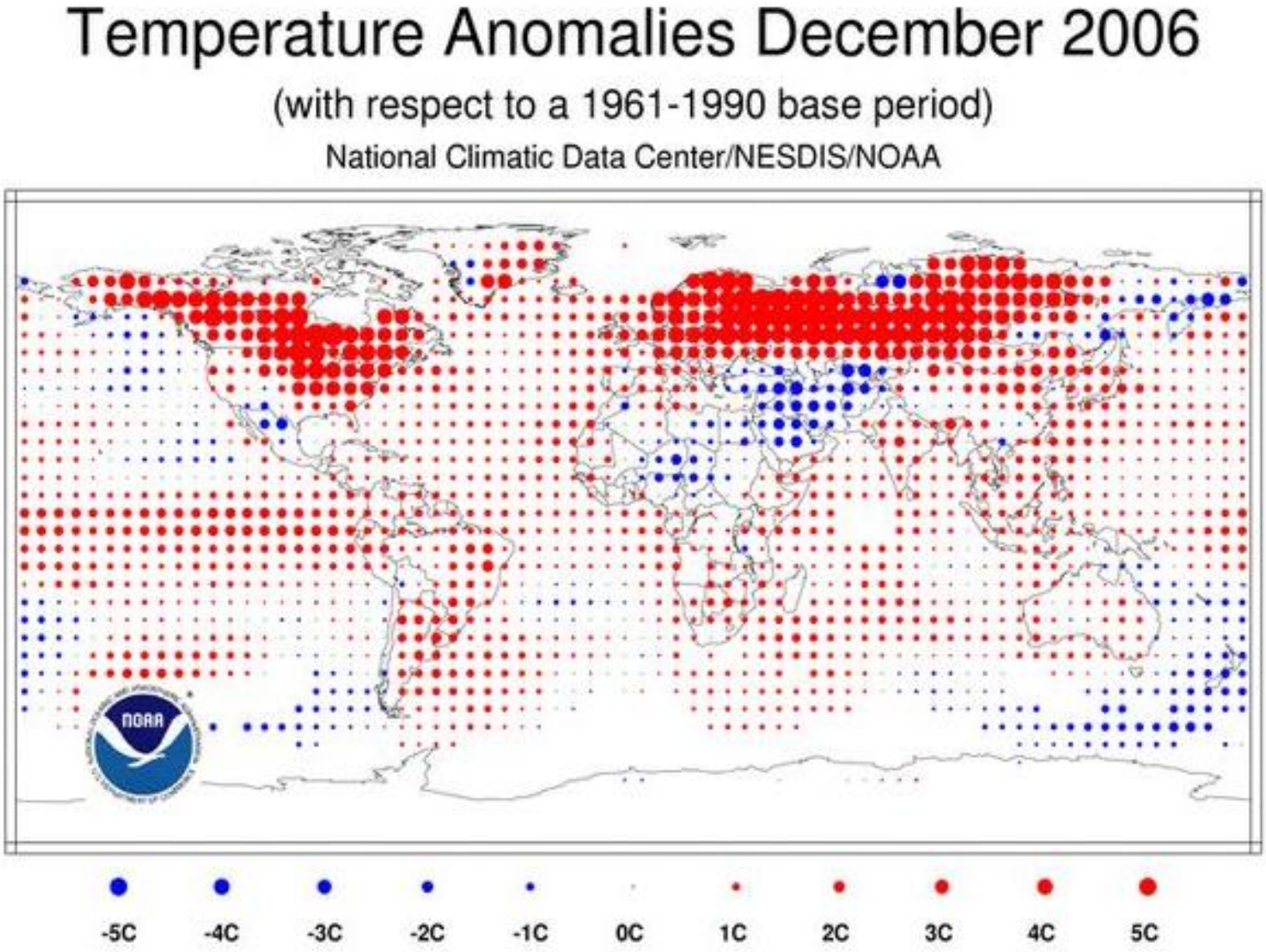
The Human Footprint / Atmosphere



Goddard Institute for Space Studies
New York, N.Y.

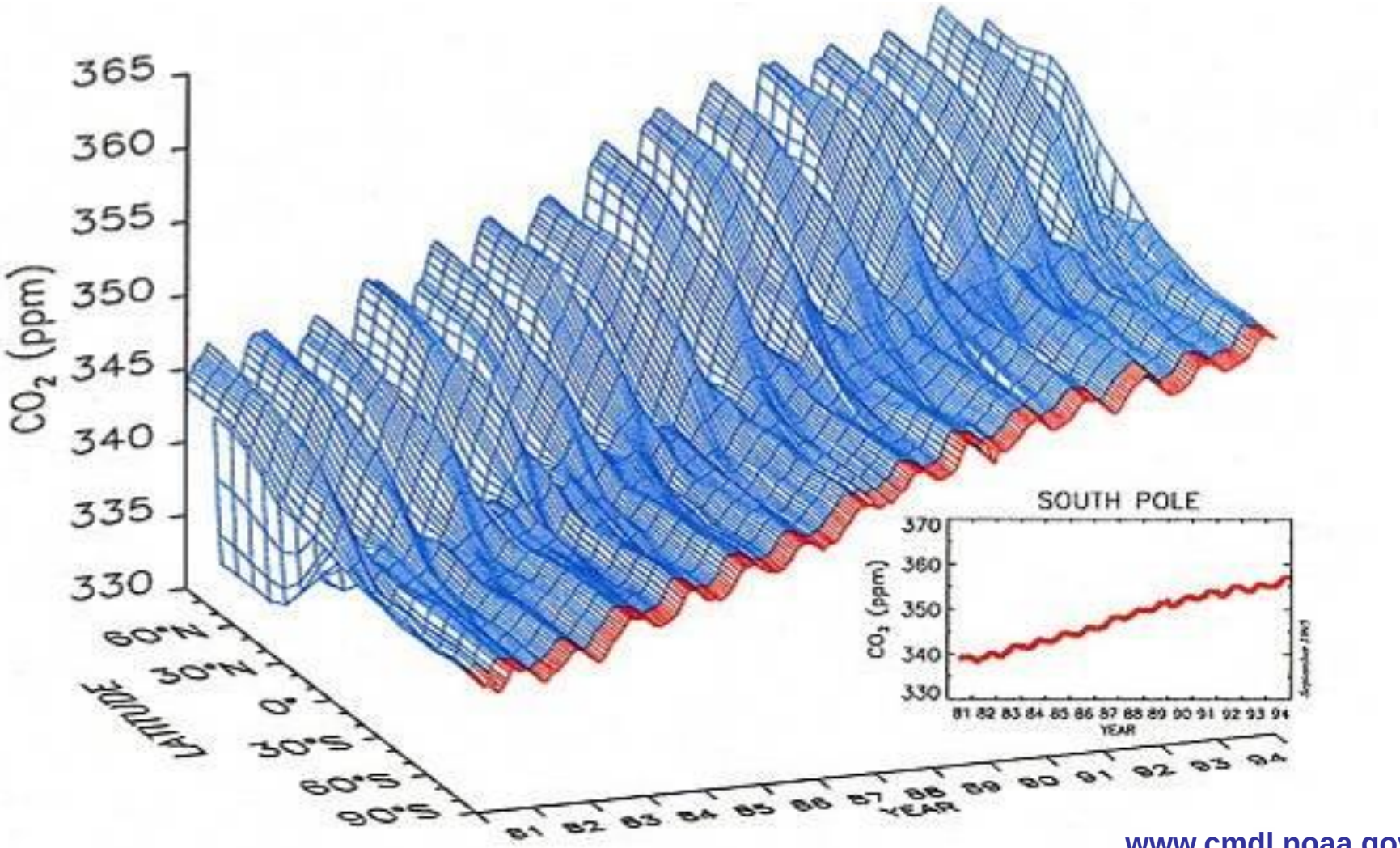
http://data.giss.nasa.gov/gistemp/2005

The Human Footprint / Atmosphere



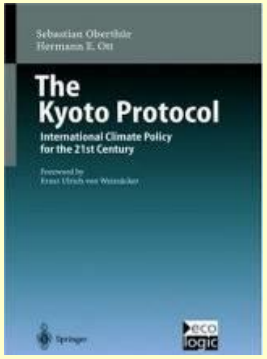
The Human Footprint / Atmosphere

Global Distribution of Atmospheric Carbon Dioxide



www.cmdl.noaa.gov

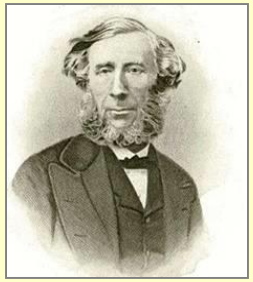
New Science?

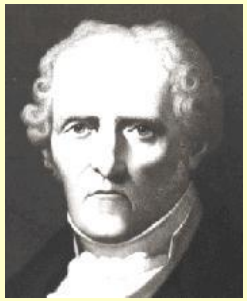


1990: First IPCC report concludes there is a causal relationship between human activities and global warming.

1988: James Hansen, a leading NASA scientist, told a U.S. Senate sub-committee he was "99% certain" that global warming was occurring and that it was linked to fossil fuel combustion.

1958: Charles Keeling began keeping CO^2 records on the peak of Mauna Loa in Hawaii (more on this in a moment).





New Science?

1938: Guy Callendar, meteorologist, first to claim evidence of global warming.

1896: Svante Arrhenius, Nobel chemist, makes first quantitative attempt to measure effect of atmospheric CO^2 on global temperatures.

1860: John Tyndall, scientist, measures absorption of light spectra by CO^2 and attributes ice ages to changes in atmospheric gas concentration.

1827: Charles Fourier, mathematician, coins the term "greenhouse effect."

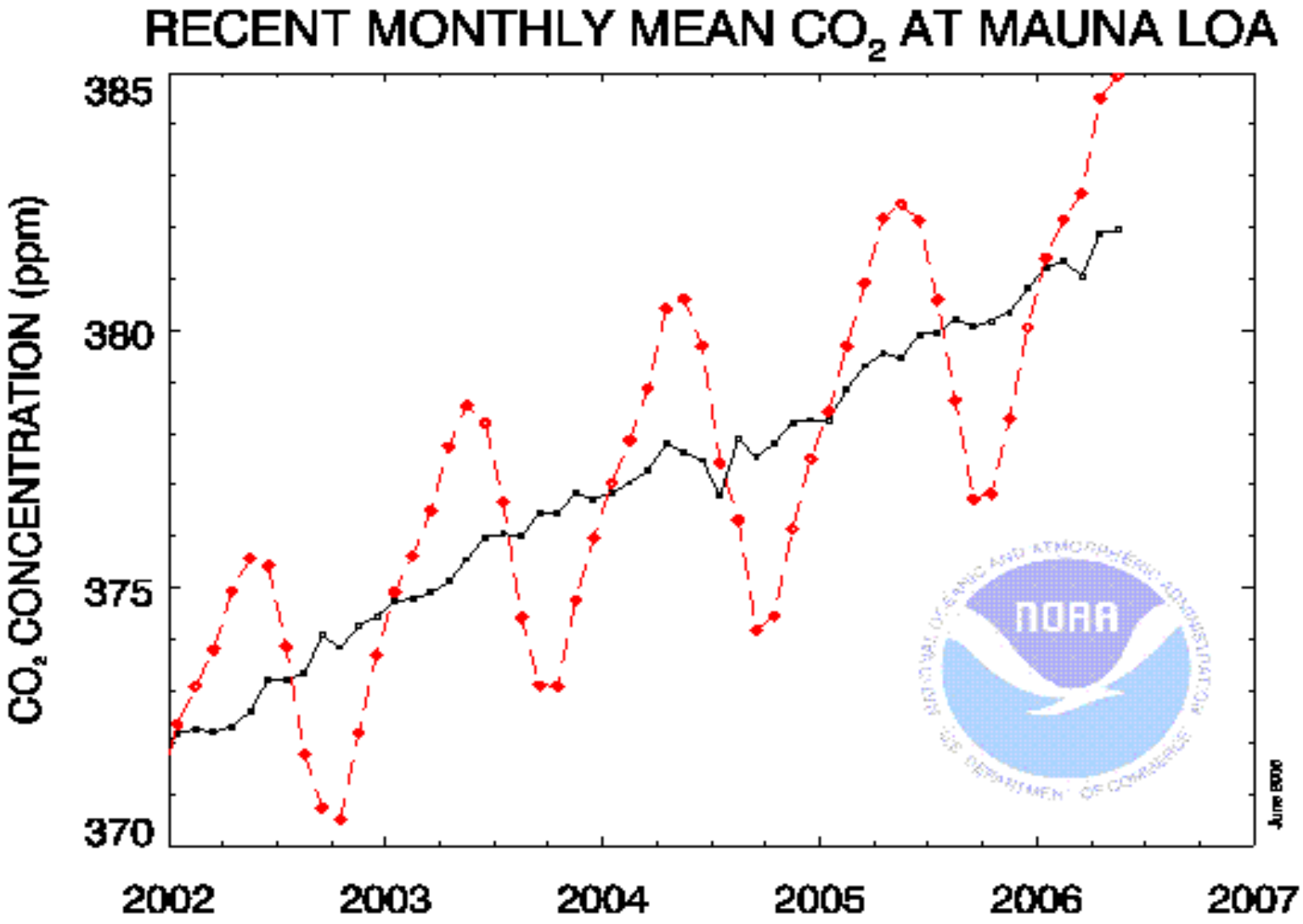
The Human Footprint / Atmosphere
Mauna Loa Hawaii

Not Enough Data?

Charles Keeling
1928 – 2005

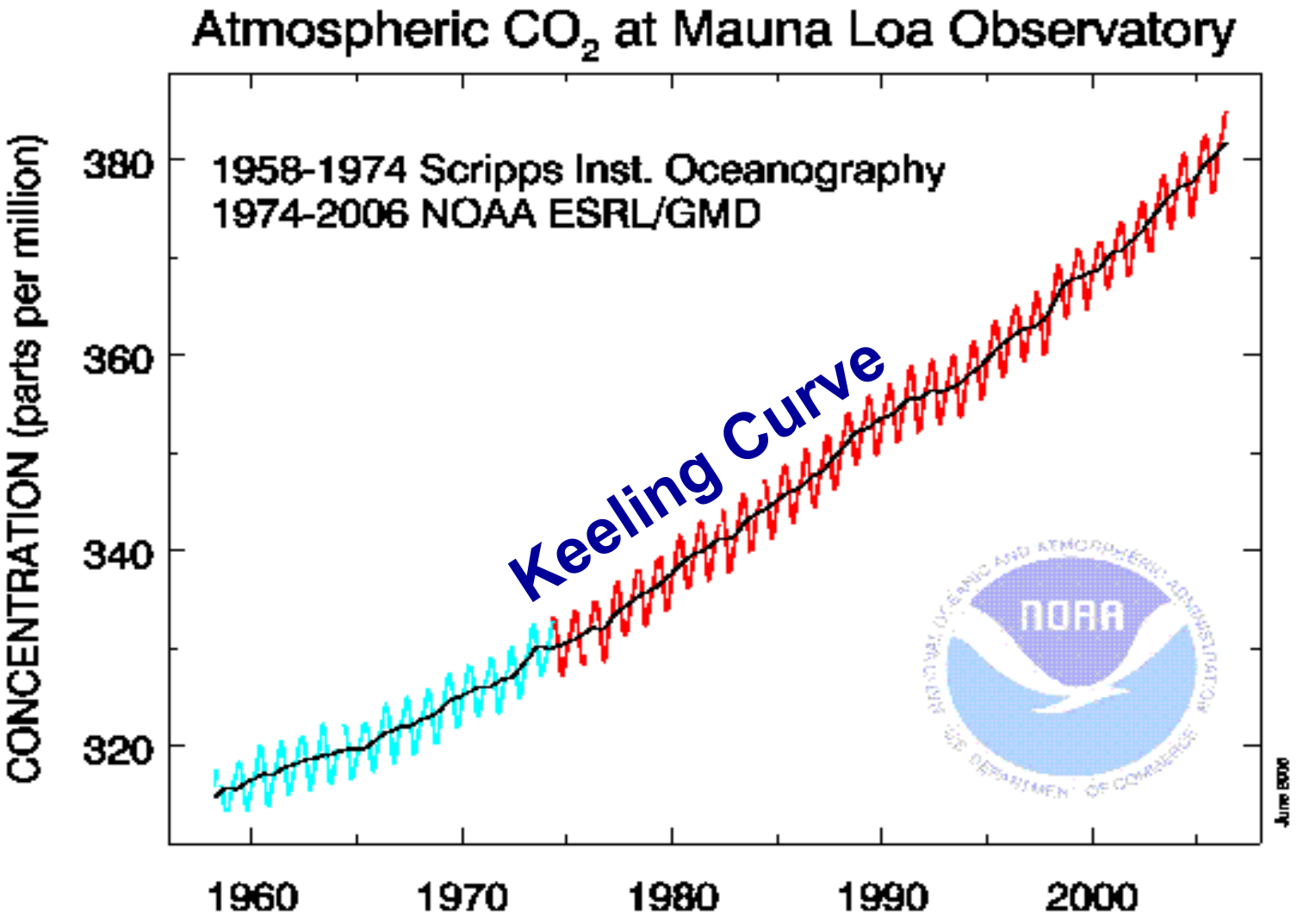
Charles David Keeling's measurements of the global accumulation of carbon dioxide in the atmosphere set the stage for today's profound concerns about climate change. They are the single most important environmental data set taken in the 20th century.

Not Enough Data?



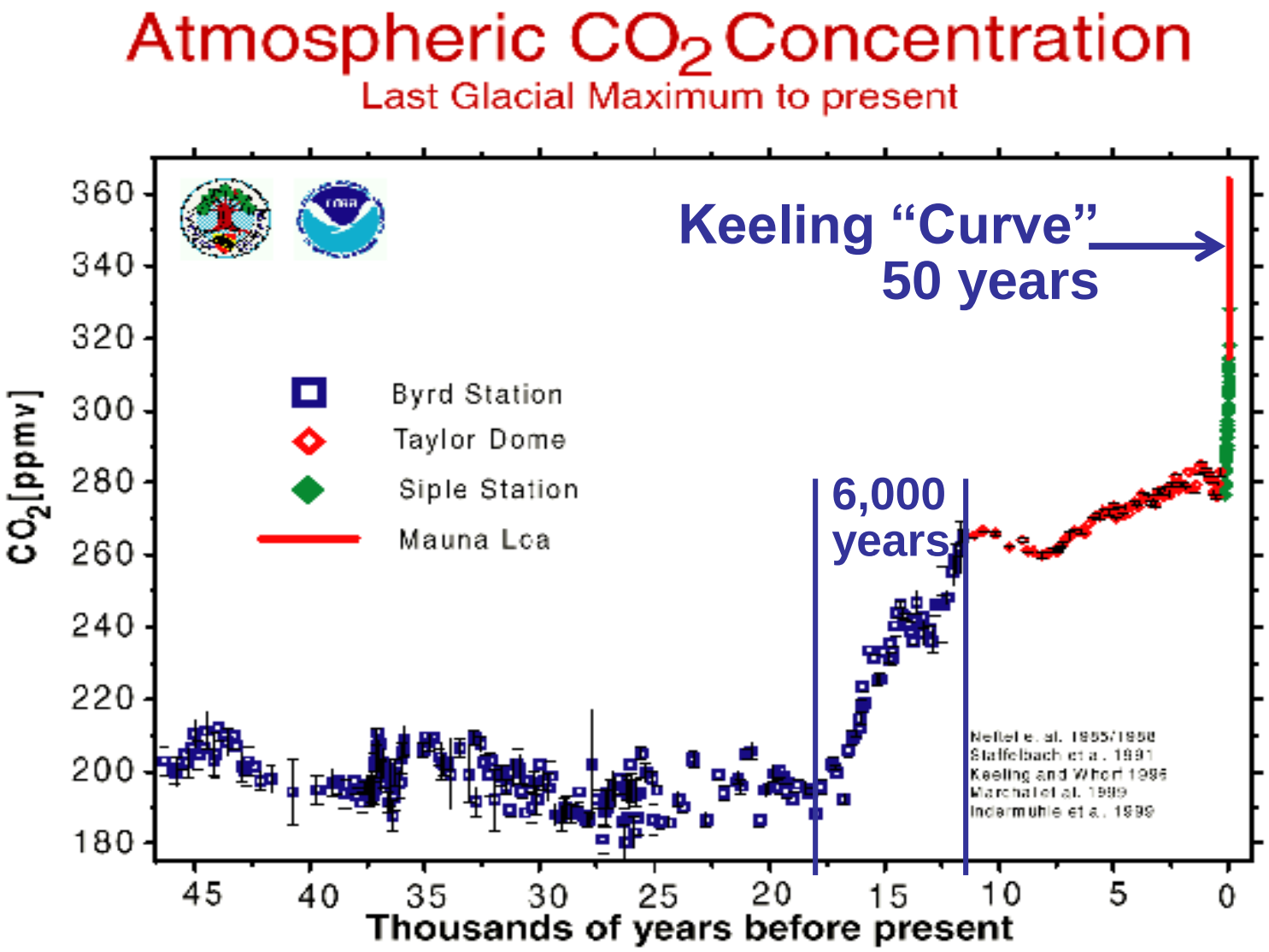
www.cmdl.noaa.gov/ccgg/trends/

Not Enough Data?



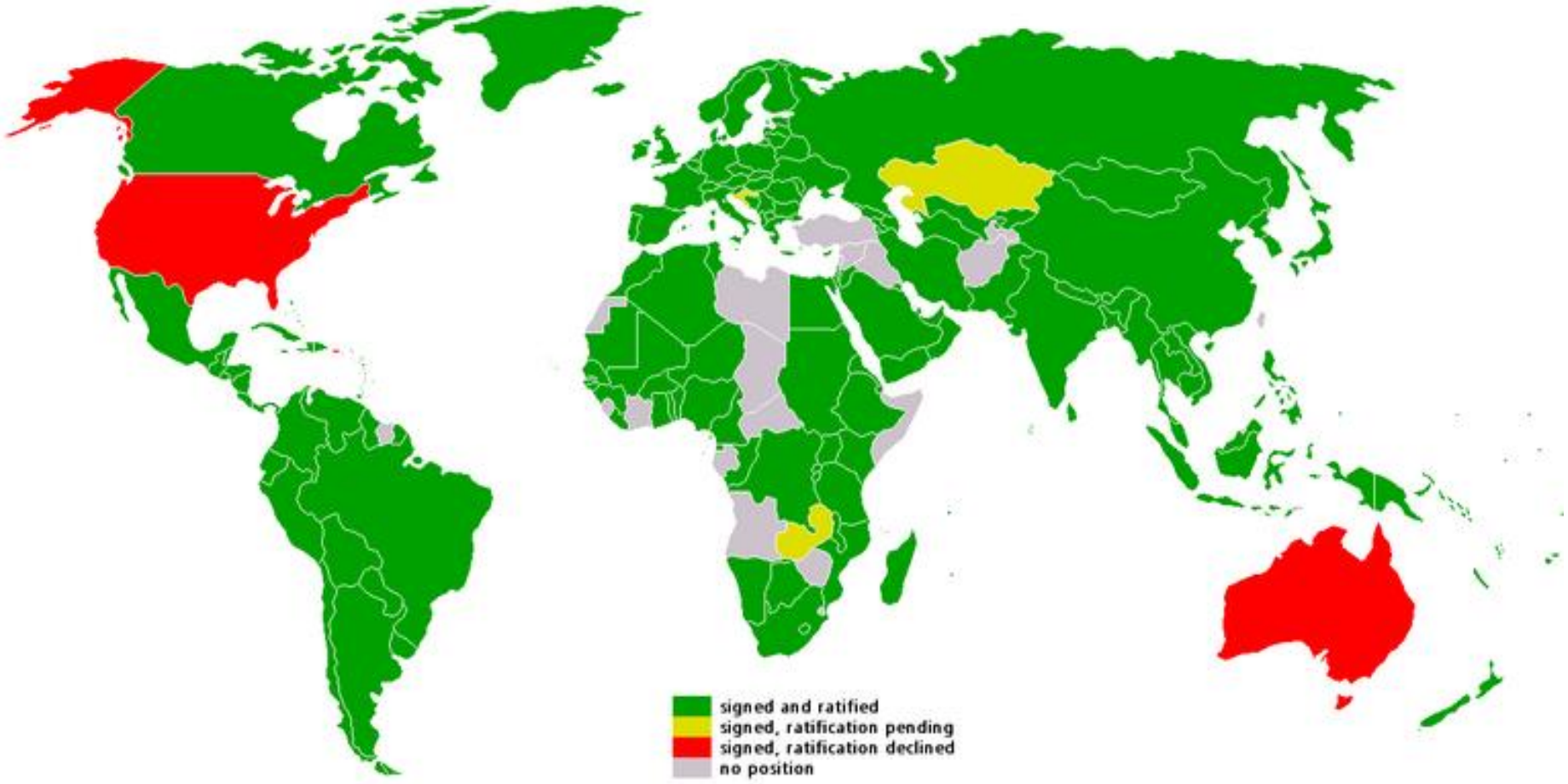
www.cmdl.noaa.gov/ccgg/trends/co2_data_mlo.php

Not Enough Data?



Adapted from: http://www.climate.unibe.ch/gallery_co2.html

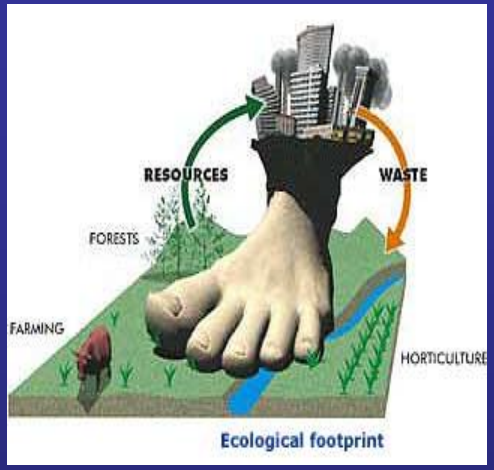
Kyoto Protocol Participation 2005



163 COUNTRIES SIGNED AND RATIFIED

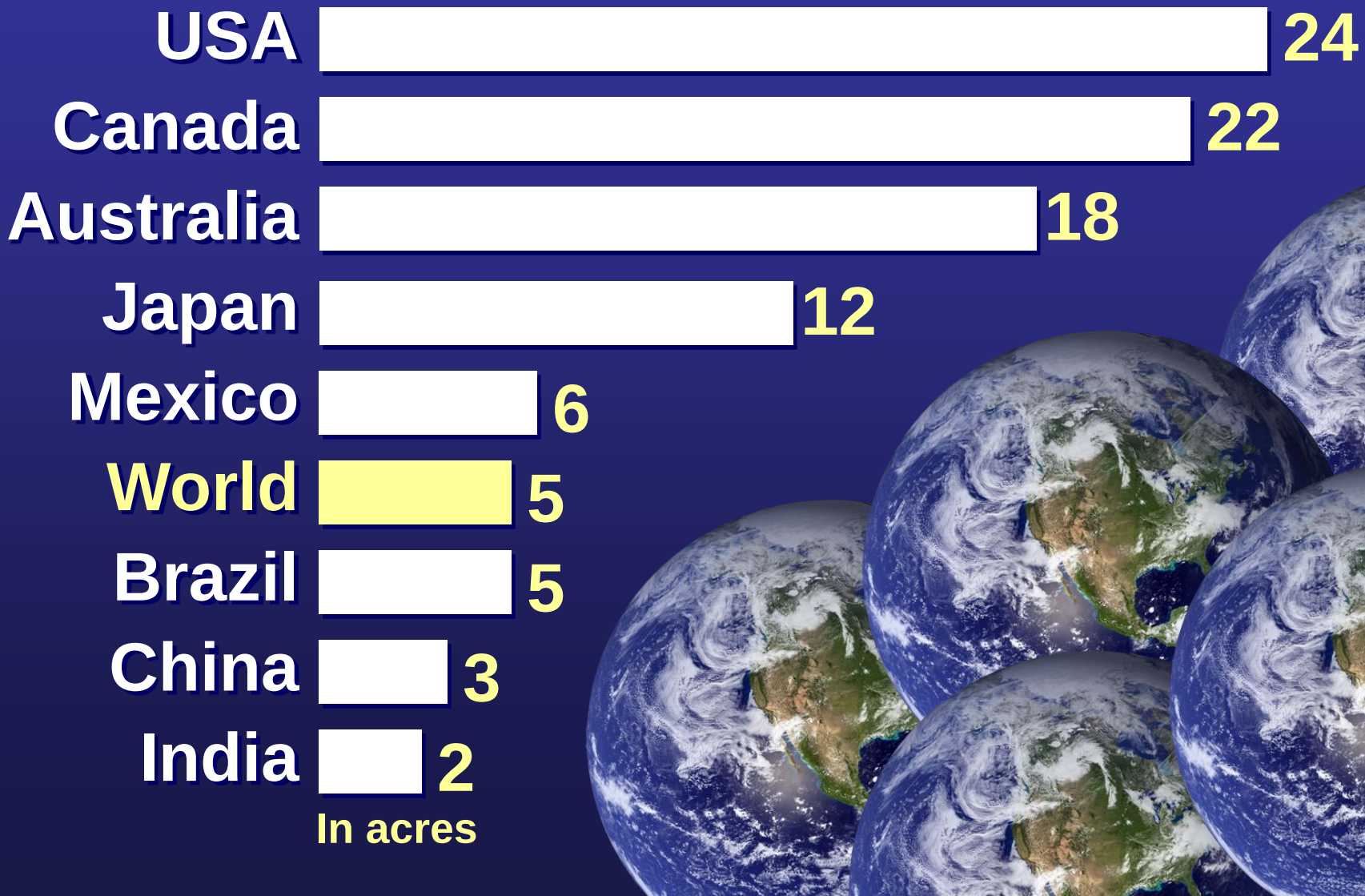
What is an Ecological Footprint?

- **The total area of productive land and sea**
- **required to provide the resources for,**
- **and assimilate wastes of,**
- **a defined population (e.g., a nation)**
- **at a particular level of consumption (lifestyle).**

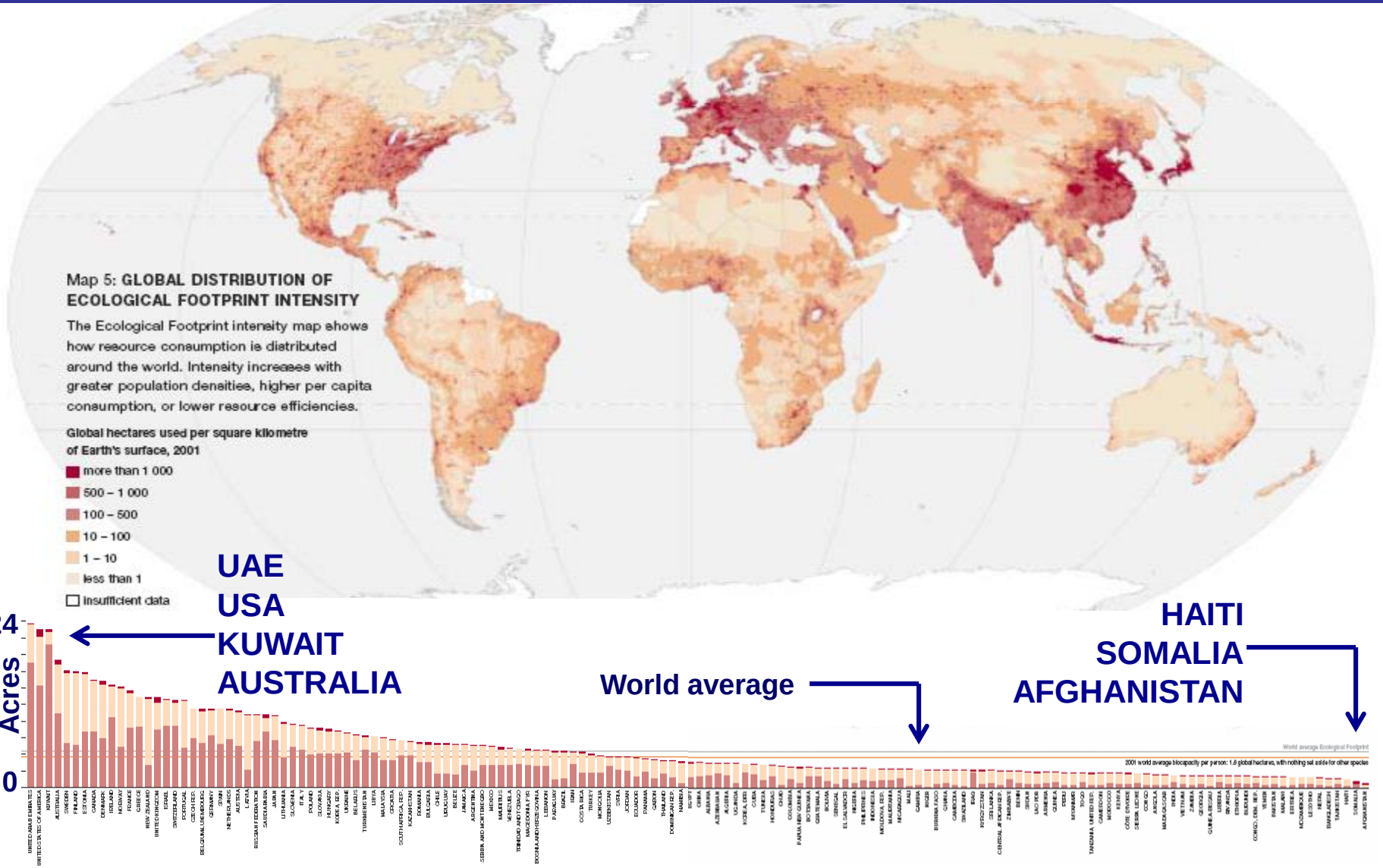


Global Footprint Network
www.footprintnetwork.org

Ecological Footprint of the average person in….



Per Capita Footprint by Country



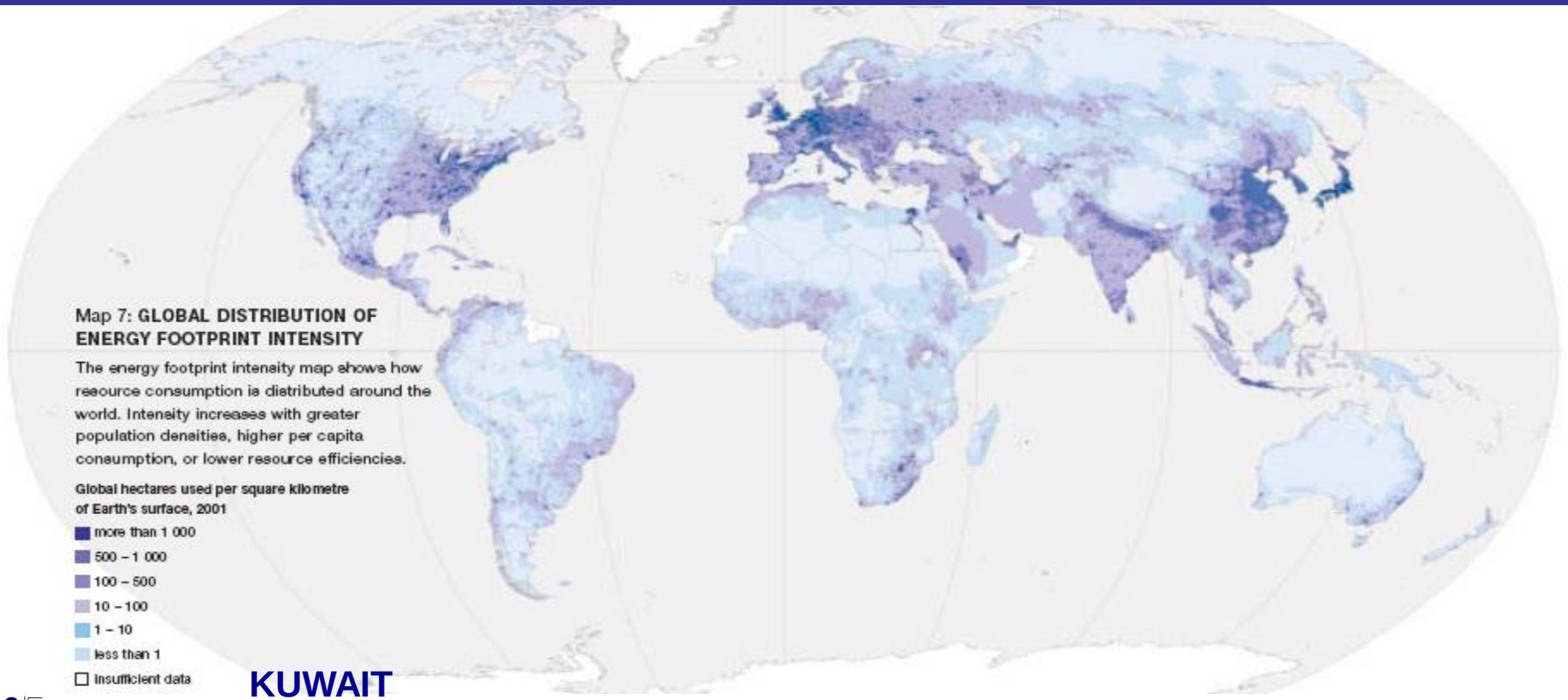
UAE
USA
KUWAIT
AUSTRALIA

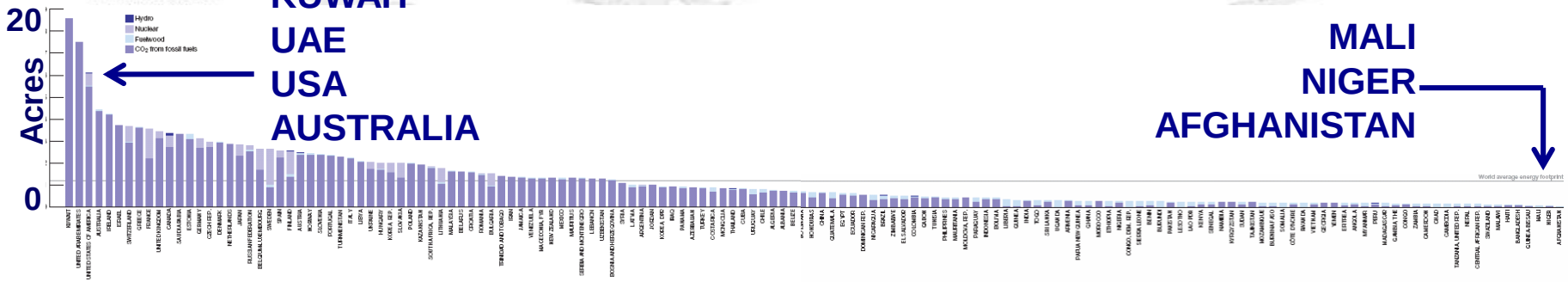
World average

HAITI
SOMALIA
AFGHANISTAN

www.panda.org/news_facts/publications/key_publications/living_planet_report/index.cfm

Per Capita Footprint by Country



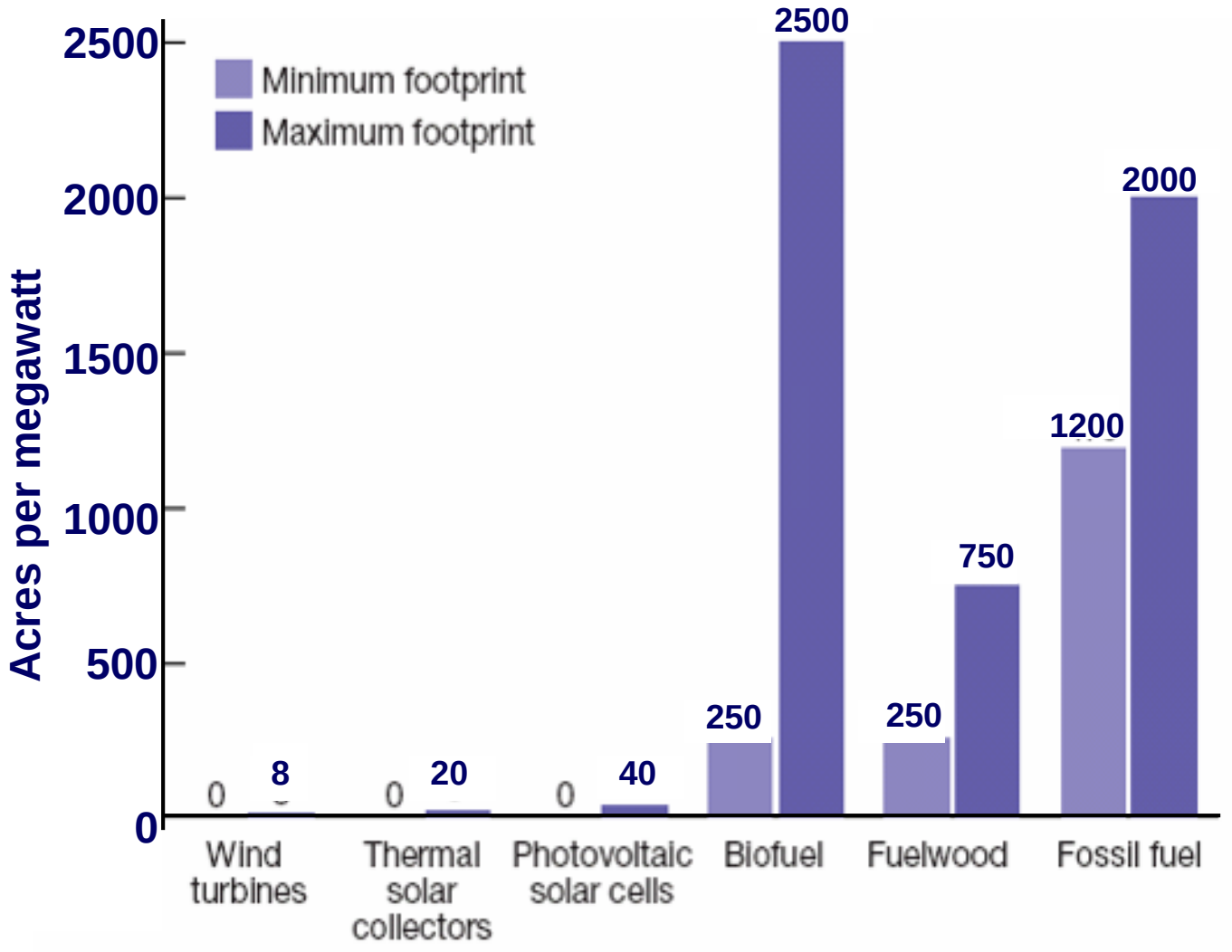


KUWAIT
UAE
USA
AUSTRALIA

MALI
NIGER
AFGHANISTAN

www.panda.org/news_facts/publications/key_publications/living_planet_report/index.cfm

Footprints of Energy Technologies



Different footprints to produce 1mW of electric power

Living Planet Report 2004
WWF

Ecological Footprint Simplified

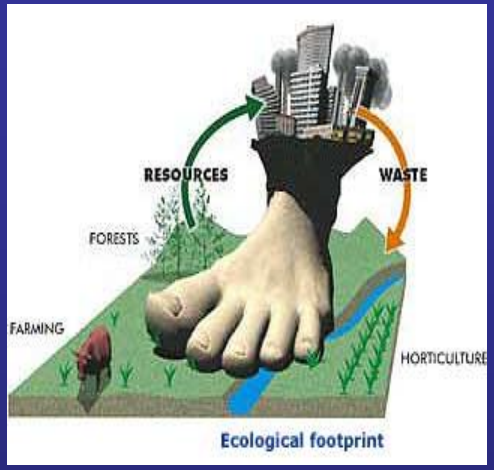
$$EF = P \times A \times T$$

Where

P = Population size

A = Affluence per capita

T = Type of technology



Paul Ehrlich
The Population Bomb 1968

Role of Green Building Program

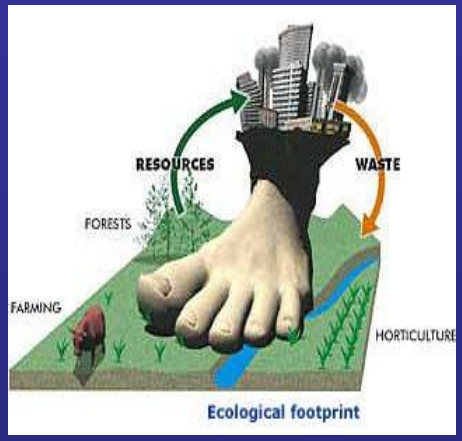
$$E F = P \times A \times T$$

Where

P = Population size

A = Affluence per capita

T = Type of technology

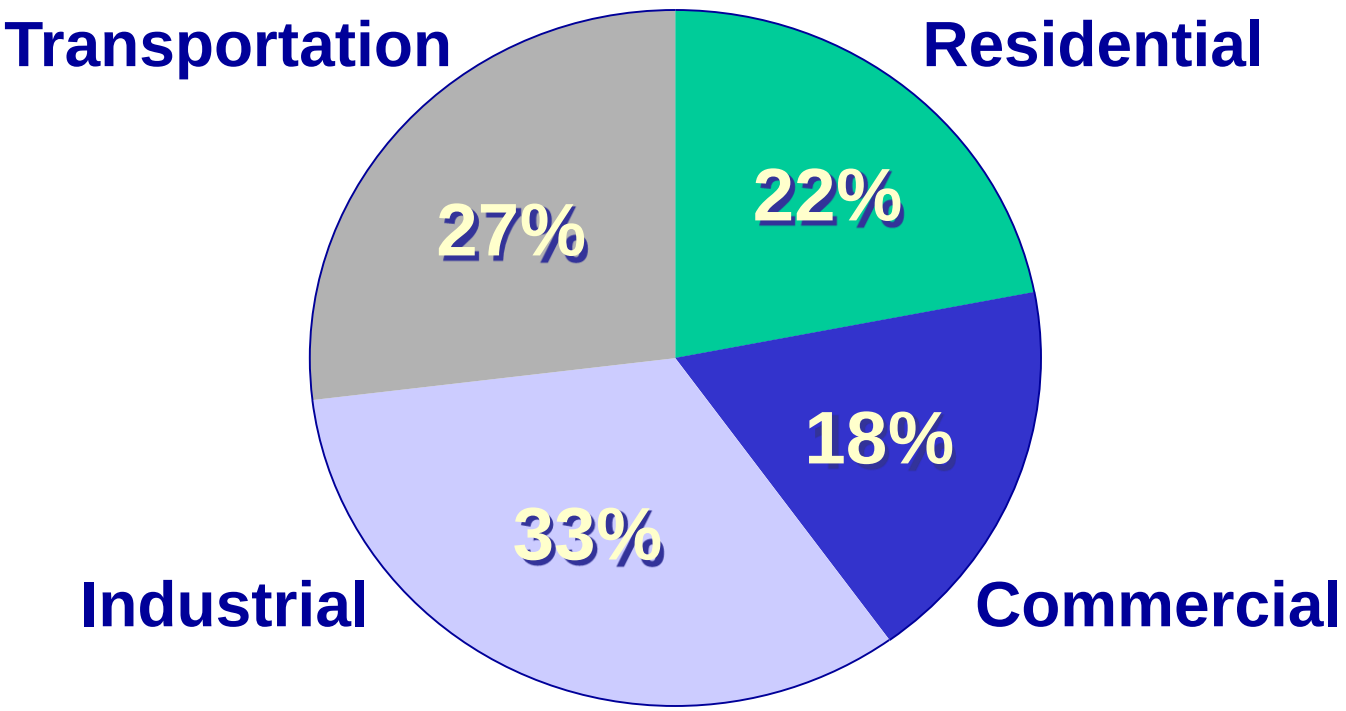


AUSTIN ENERGY
GREEN BUILDING
PROGRAM

Paul Ehrlich
The Population Bomb 1968

U. S. Energy Footprint by Sector

End Use Sector Shares
U. S. Total Energy Consumption
2003



Annual Energy Review 2003 (EIA)

Buildings account for about 70% of electricity use

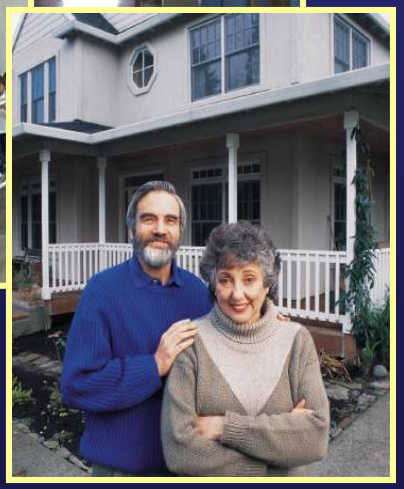
What is Austin Energy doing?

What can you do?

GREEN BUILDING PROGRAM
Public/Private/Consumer Partnership

AUSTIN ENERGY®

COMMUNITY-OWNED UTILITY



Building Professionals

Building Users and Owners

GREEN BUILDING PROGRAM
How It Works

Participation

Infrastructure

Training, Marketing

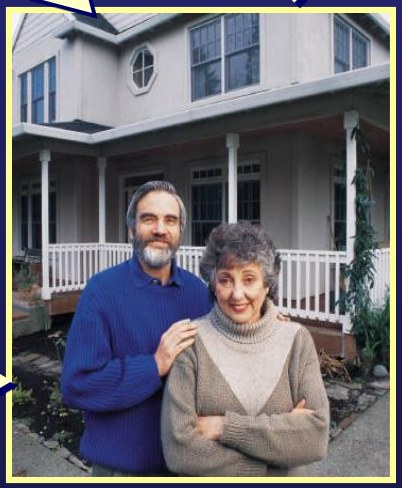
Education, Rebates

Electric Power

Efficiency, Peak Load Reduction

Supply of green professionals

Demand for green



GREEN BUILDING PROGRAM
How It Works

HARD INFRASTRUCTURE

- Transportation
- Electric Power
- Water/Wastewater
- Communications
- Solid Waste
- Parks

SOFT INFRASTRUCTURE

- Principles or Vision
- Plans or Policies
- Programs
- Land Use /Zoning
- Codes

Our Vision

To make Austin the most livable community in the country.

AUSTIN ENERGY STRATEGIC PLAN

Green Building Program

+

Energy Efficiency Programs

+

Green Choice Programs

= 35% of AE total power profile by 2020

AUSTIN ENERGY POLICIES

- Energy Efficiency (Demand Side Management)
- Diverse Sources of Energy (Distributed Energy Services)
- Renewable Energy Portfolio
- Clean Power Sources

AUSTIN ENERGY PROGRAMS

- Energy Efficiency
- Green Building
- Power Partner
- District Cooling
- Combined Heat & Power
- GreenChoice
- Solar Rebates
- Plug-In Hybrids
- Zero Energy Homes

RESULTS
6,500 + Homes Rated by the GBP

AFFORDABLE

Hatch Partnership

KRDB

CUSTOM

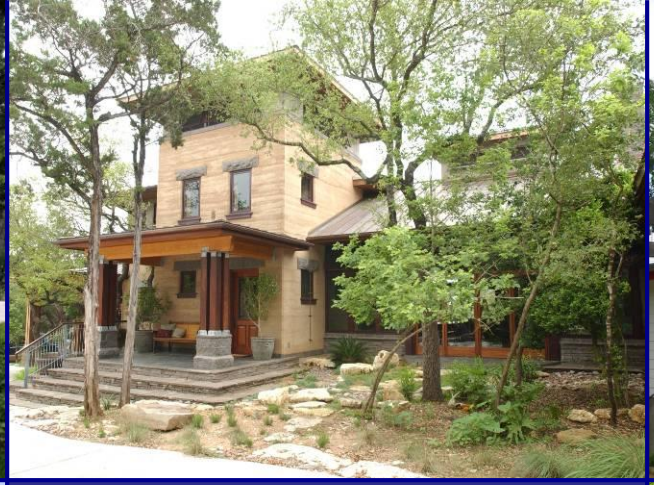
Pilgrim Building

Venture Four

PRODUCTION

Newmark Homes

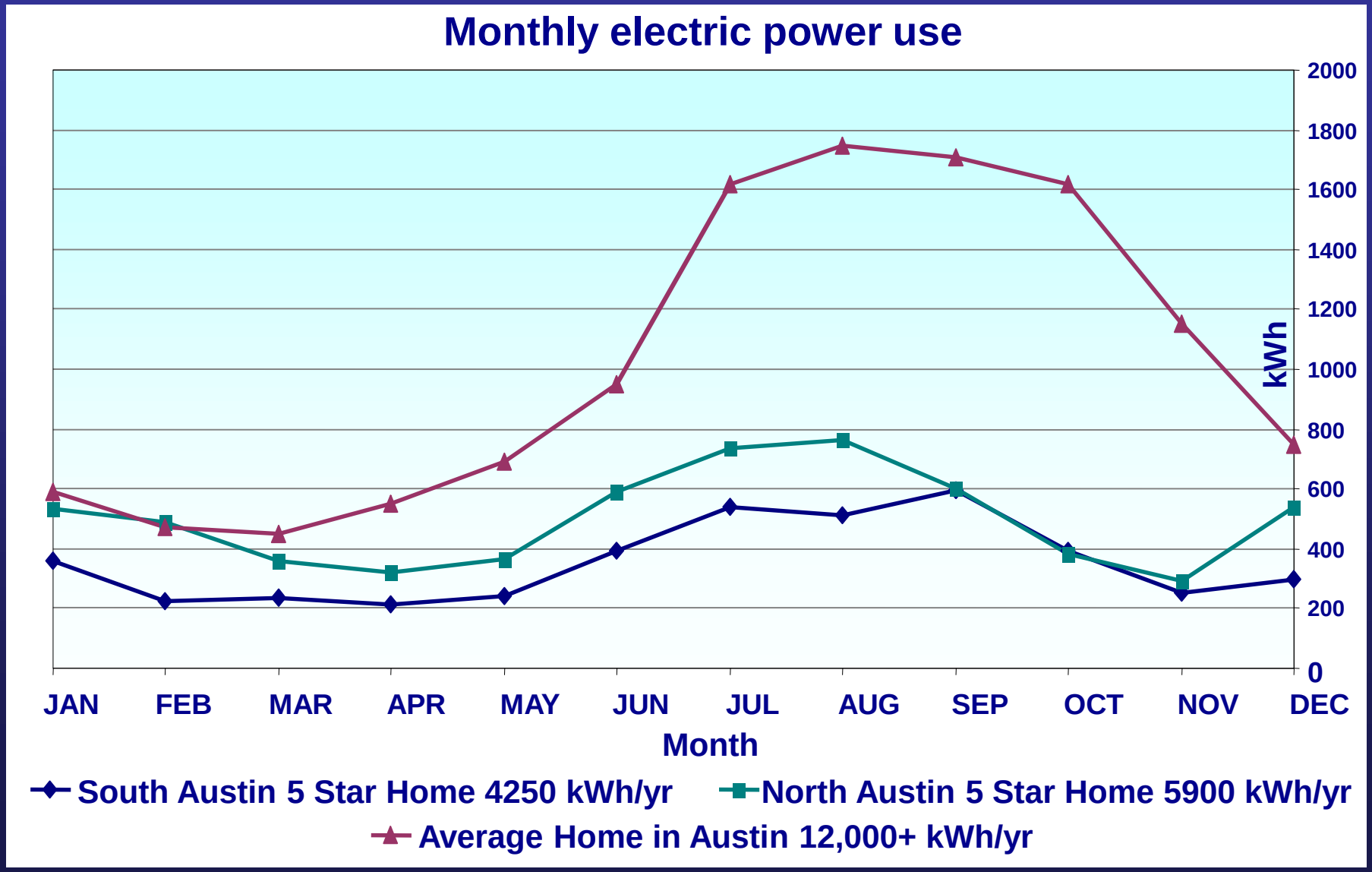
David Weekley Homes

Gallery of 5 Star Homes




5 Star Homes
Examples of Annual Electric Consumption



RESULTS

Hundreds of Green Building Professionals

Developer **Builder** **Landscape Architect**

GBP Rep **Mechanical Contractor** **Architect**

RESULTS
Civic Buildings

AUSTIN CITY HALL

Antoine Predock Architects
Cotera Reed Architects

USGBC LEED Gold

RESULTS
Civic Buildings

DANIEL RUIZ PUBLIC LIBRARY
Lars Stanley Architects
AEGBP 2 Star

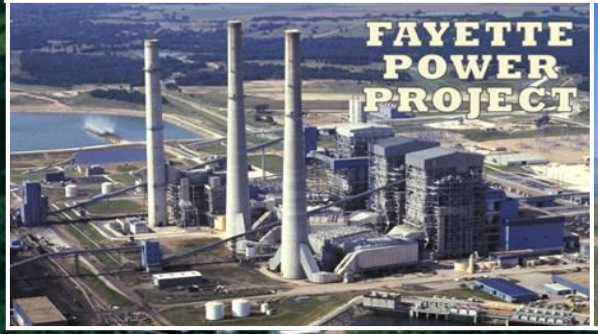
RESULTS
Commercial Buildings

VELOCITY CREDIT UNION

Clark Mente Architect

AEGBP 2 Star

RESULTS
Diverse Energy Sources



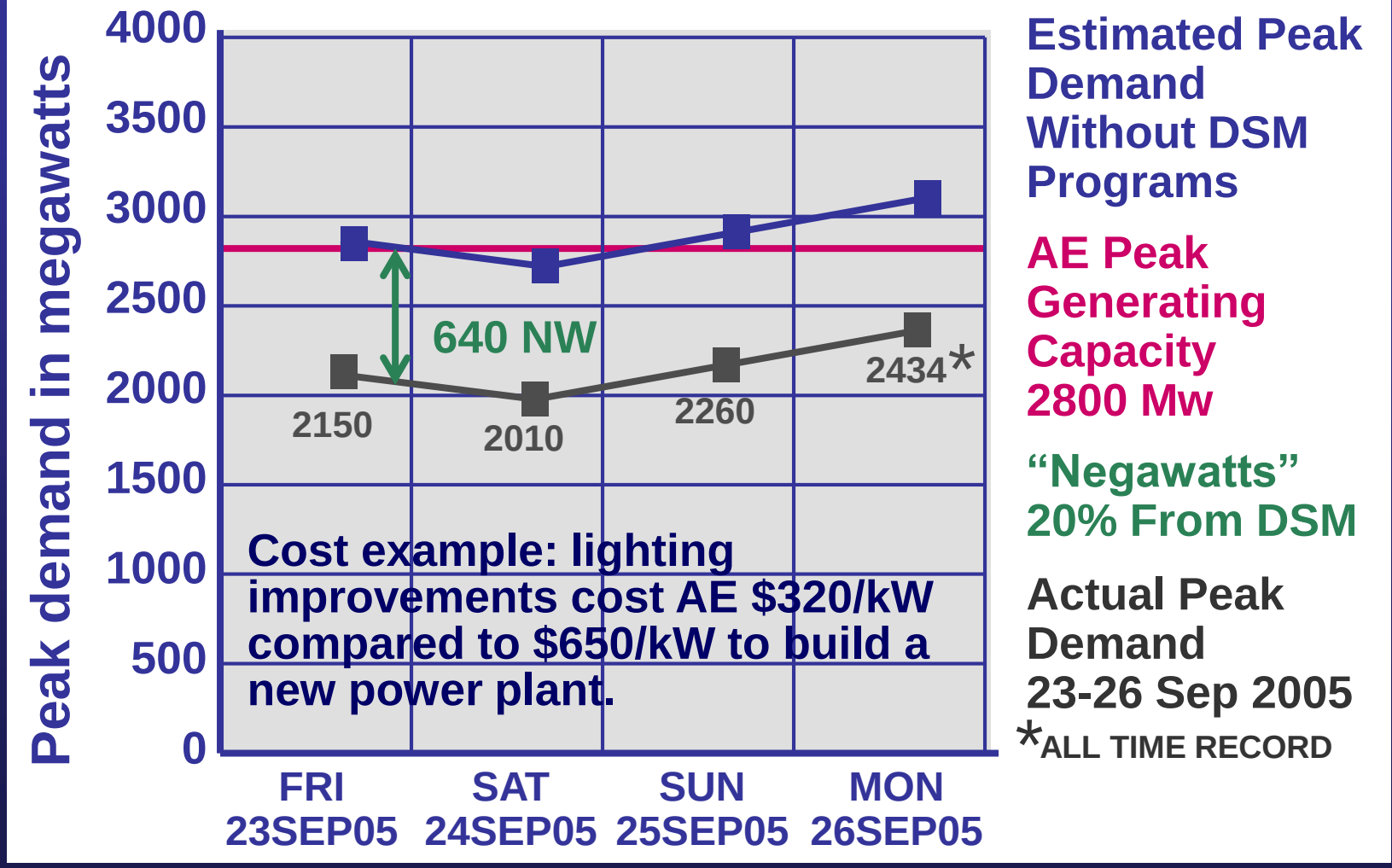
RESULTS
Renewable Energy Sources

GREENCHOICE®

Annual participation: 665,000,000 kWh (Equivalent to 55,000 homes)

Number 1 program in U.S. in sales of renewable energy

RESULTS
Avoided Infrastructure (Negawatts)



A record hot weekend in 2005

RESULTS
Future Developments

Mueller Airport Redevelopment

GREEN URBANISM

Mueller brings together two of today's most important and exciting trends—New Urbanism and Green Building. This new model promotes environmental responsibility at every level.

The compact, walkable mixed-use urban village means Mueller neighbors have choices that don't involve getting in the car and polluting the air. And it means thousands of people can live in high-quality, reasonably priced neighborhoods without moving out to the edge of town and adding to suburban sprawl.

AUSTIN ENERGY GREEN BUILDING PROGRAM

Mueller also combines Austin's homegrown Green Building Program—one of the best in the nation—with national LEED standards. Mueller's designs are resource-efficient, use non-toxic and recyclable regional materials, and help maintain and improve air and water quality. And the extensive greenspace system, along with Mueller's innovative utility systems, also help keep Mueller clean, green, and sustainable.

Mueller's unique approach is laid out in detail in the Mueller Green Resources Guide, a sourcebook for all who are working to help the community meet its sustainability goals.

RESULTS
Future Developments

Mueller Airport Redevelopment

Dell Children's Hospital

USGBC LEED Platinum

RESULTS
Future Building Codes

Zero Energy Homes Project

AUSTIN BUSINESS JOURNAL
WHERE CENTRAL TEXAS CAPITALIZES ON BUSINESS

Task force to study zero-energy homes

Austin Business Journal - 2:52 PM CDT Monday

Unsatisfied with being the official Capital of Texas and unofficial Live Music Capital of the World, the City of Austin now says it wants to be the "Clean Energy Capital" of the world.

To further that end, **Austin Energy** says the city council will create and appoint a task force Aug. 10 to study the possibility of adopting building code changes that require all new single-family homes in Austin to be "zero-energy capable" by 2015.

Zero-energy capable means a home is efficient enough to be able to power itself with on-site energy generation. This level of energy efficiency is approximately 60 percent more efficient than homes built to code today, the city-owned utility says.

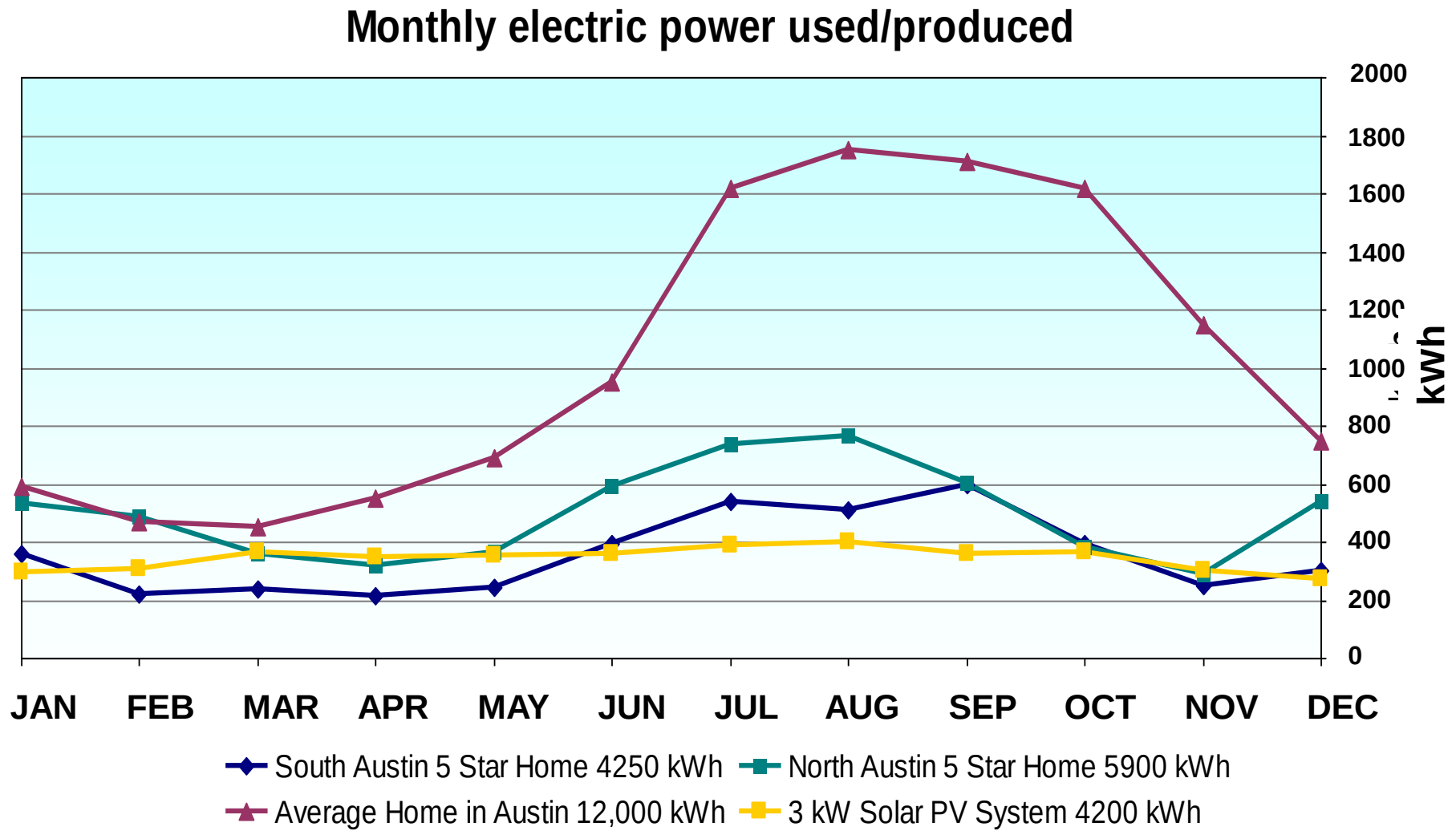
"The cleanest of all energy, of course, is the energy that doesn't need to be produced," Mayor Will Wynn said in a news release announcing the initiative. "This bold step will be another example of Austin's continuing leadership role in national energy policy."

To further that end, **Austin Energy** says the city council will create and appoint a task force Aug. 10 to study the possibility of adopting building code changes that require all new single-family homes in Austin to be "zero-energy capable" by 2015.

Monday, 31 July 2006

RESULTS
Future Building Codes

Zero Energy Homes Project



Here's what you can do.

Change a Light Bulb

Fluorescent bulbs:

- ***Last longer***
- ***Save energy***
- ***Save money***

10 year total electric cost:

- ***Incandescent $600***
- ***Fluorescent $150***

Change a Light Bulb

How much coal avoided over 10 years?

Incandescent

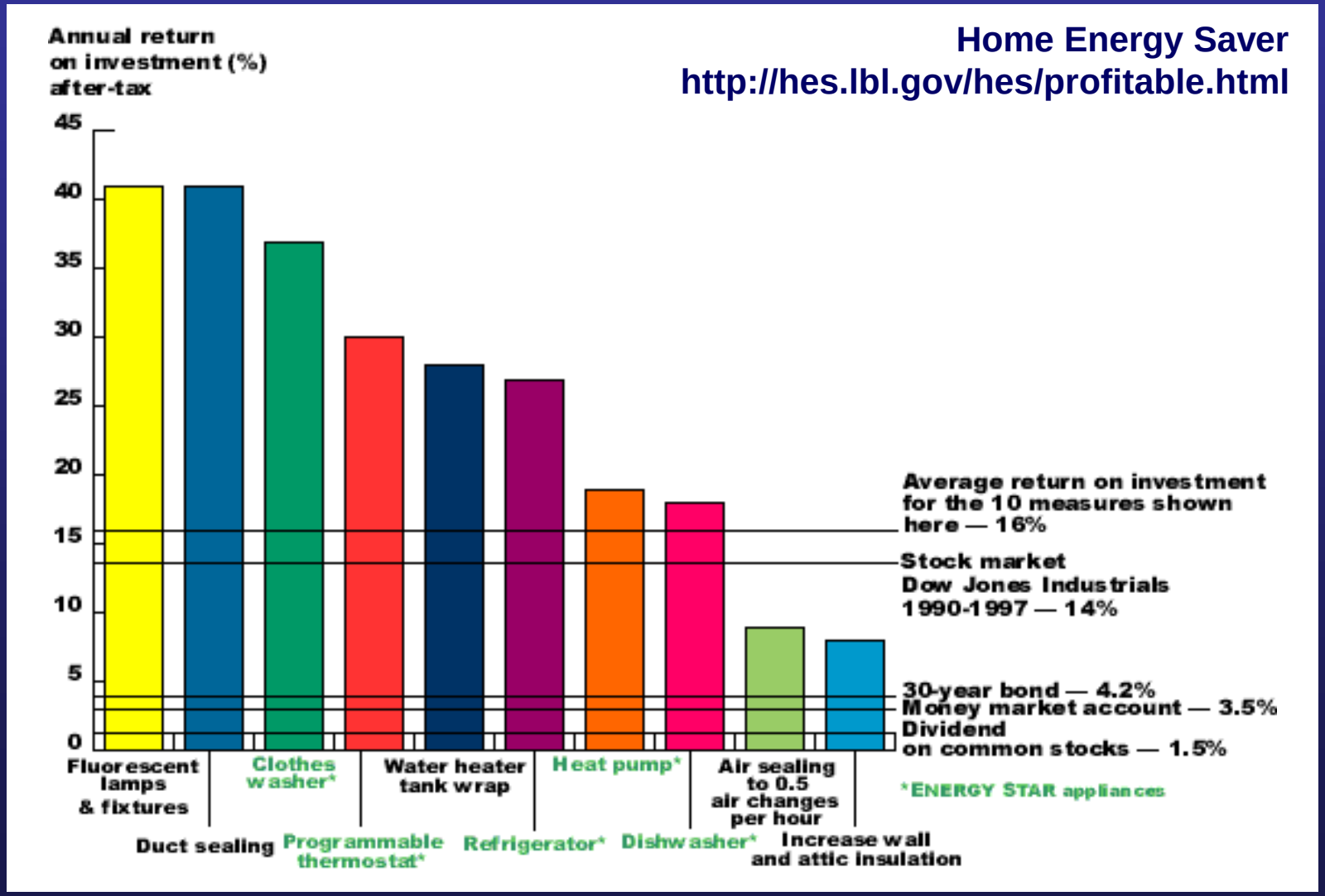
660 lbs.

Fluorescent

155 lbs.

Change a Light Bulb

Profitability of Energy Efficiency Upgrades



Upgrade Your Home and Business
through Austin Energy Programs

Power Partner

AUSTIN ENERGY®

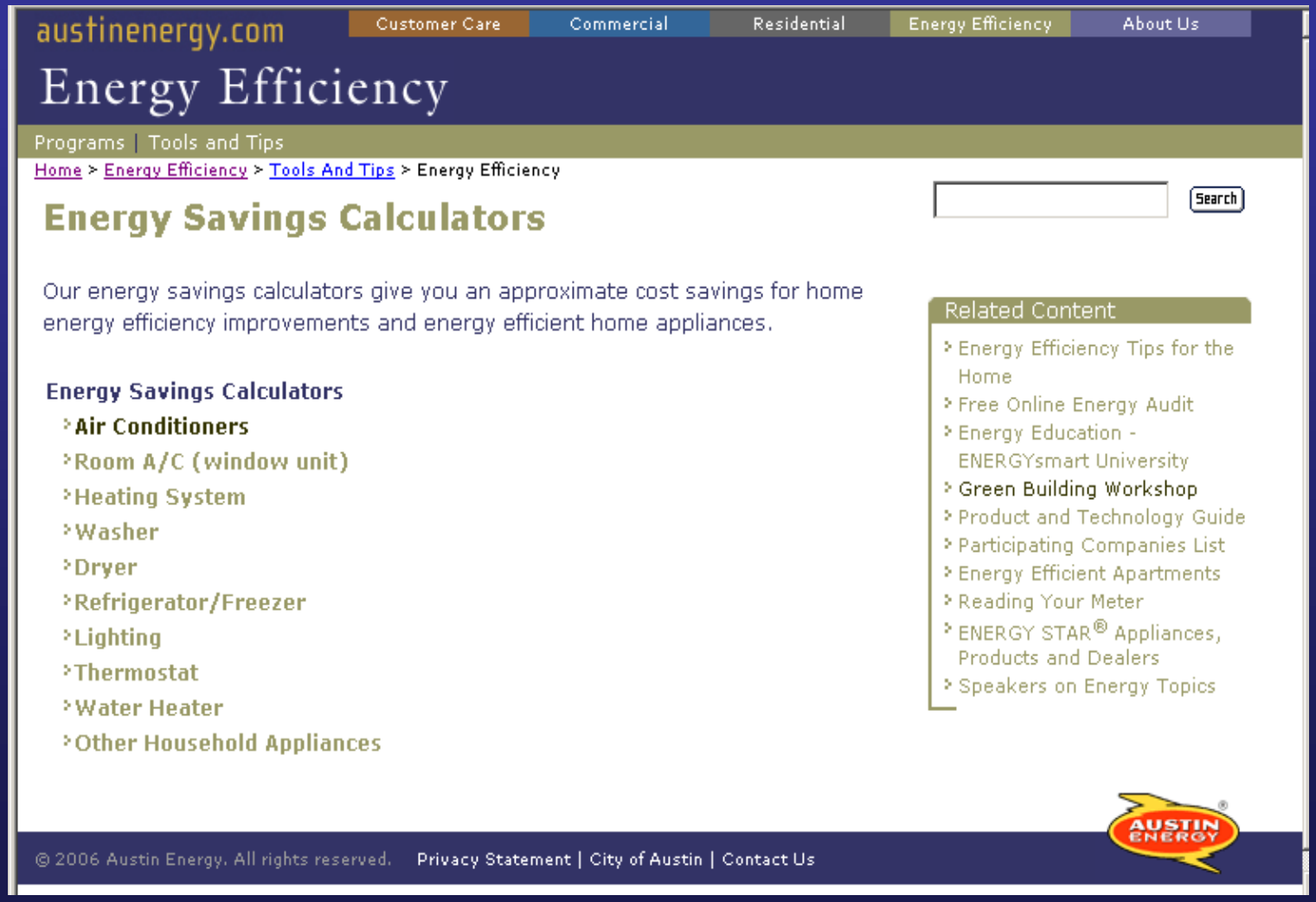
Lighting, Appliances

Duct Diagnostics

HVAC Equipment

Thermal Envelope

Upgrade Your Home and Business
through Austin Energy Programs



www.austinenergy.com/Energy%20Efficiency/Tools%20and%20Tips/calculators.htm

Buy Energy Star Appliances

- Refrigerators
- Dishwashers
- Clothes Washer
- Air Conditioners
- Lighting Fixtures
- Ceiling Fans

If just one in 10 homes used ENERGY STAR qualified appliances, the change would be like planting 1.7 million new acres of trees.

Install Solar Electric Panels and Water Heaters

Solar Rebate Program

One of the highest solar rebates in the U.S. at $4.50 per watt

Example: 3kW (3,000 watts) PV system in Austin

3000w x $6.35/watt:	*$20,000*
Austin Energy rebate:	*-$13,500*
Federal tax credit:	*-$ 2,000*
Net cost:	*$ 4,500*
(22.5% of gross cost)	

Support the Plug-in Hybrid Program

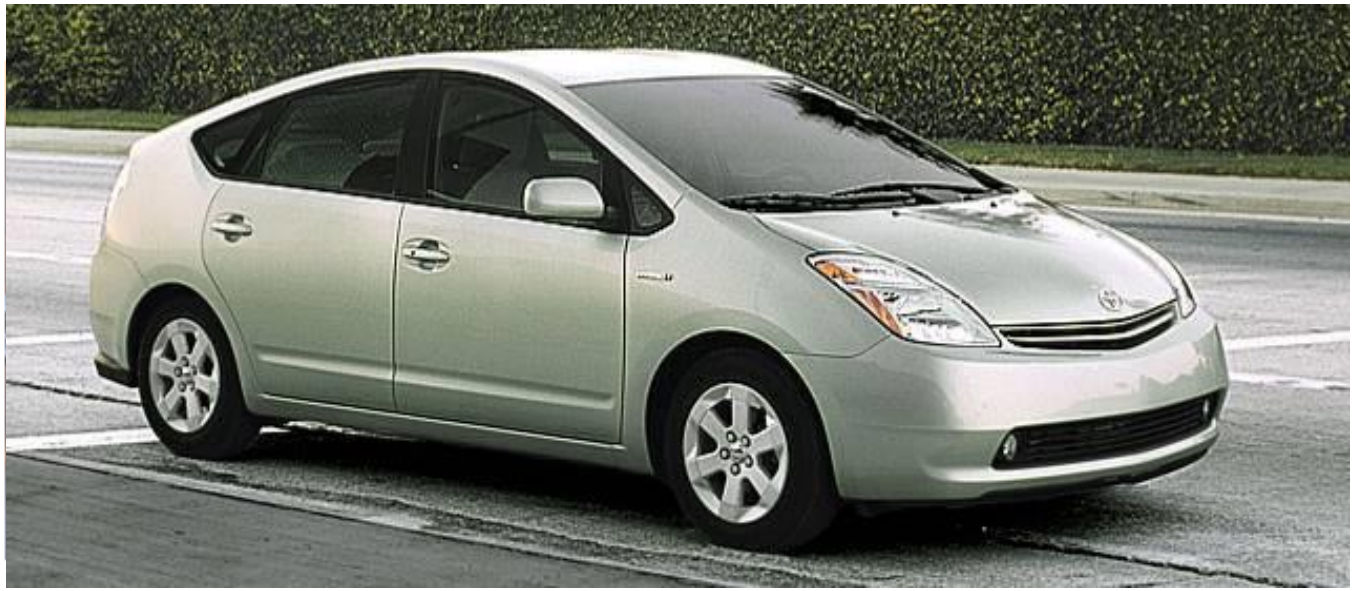
www.pluginpartners.org

PHEVs — Plug-in Hybrid Electric Vehicles

- Home
- About The Technology
- Benefits
- Politics/Policies
- Current Hybrid Options
- PHEV - Path to the Hydrogen Economy
- Related Publications

Welcome to the PHEV Homepage!

A Source Dedicated to the Evolution of the PHEV Technology and the Many Benefits PHEV Technology Brings.



Learn More…

Public educational & demonstration events of the Green Building Program

COOL HOUSE TOUR 2005

Sunday, May 15, noon to 6 p.m.

Photography: R. Greg Hursley

Designer: sun&stone
Builder: CG&S Design Build

Open houses range from affordable to high-end custom homes and showcase energy-efficient and environmentally friendly design, construction and landscaping.

Photography: Imagiz Photography

Architect: Barley + Pfeiffer Architects
Builder: Oliver Custom Homes

Producers

AUSTIN ENERGY GREEN BUILDING PROGRAM

TEXAS SOLAR ENERGY SOCIETY

Sponsors

Environmental Depot
Oliver Custom Homes

Purchase the Guidebook, which serves as your ticket, for **$10** at **Central Market** (either location) or online at **www.txses.org**.

For information visit www.txses.org or call 512-326-3391.

Austin American-Statesman 05/14/05

GREEN BUILDING
Market Forecast

"…Green building will reach its "tipping point" by 2007 using conservative estimates. This is profound. As any industry crosses from being "less involved" to "more involved" it means the rest of the industry will be forced to follow and the green homes of today will become the standard homes of tomorrow."

Residential Green Building Smart Market Report
McGraw-Hill Construction/NAHB
September 2006

Green Building is…

- …a set of principles, policies, and practices
- …implemented by AE, GBP members, builders and citizens everyday
- …at building, development, city, and regional scales
- …that better "balance" our ecological footprint
- …so that we may pass on…

GREEN BUILDING PROGRAM


…A sustainable future
The best way to predict the future is to invent it.
Alan Kay (Inventor of OS for Apple Computers)

Choosing Our Future:
Greenhouse Gases or Green Homes?

CONTACT INFORMATION

Austin Energy: www.austinenergy.com
Green Building Program: www.austinenergy.com/go/greenbuilding
Rich MacMath: rich.macmath@austinenergy.com

ESI: www.esi.utexas.edu

Rich MacMath

Rich MacMath, is a Registered Architect with a Masters degree from the University of Texas. He started his sustainable career in the 70's as the Co-founder of Sunstructures Architects in Ann Arbor, Michigan. Prior to joining Austin Energy's Green Building Program, Rich was working with the Center for Maximum Potential Building Systems as a sustainable architecture consultant for commercial, educational, and office building projects, including LEED ratings for commercial and office buildings. He has extensive experience with materials and products life-cycle analysis and database development. Rich is currently the lead Green Building Program staff member working with the City of Austin's Neighborhood Housing and Community Development Department to create an affordable, solar powered, green built subdivision in Austin.