

THE NEXT REVOLUTION

An Introduction to Sustainable Development



**Business Council for Sustainable Development--
Gulf of Mexico**



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OBJECTIVES

Our World - Facts, Figures, & Trends

Sustainable Development Defined

Sustainable Development in Practice



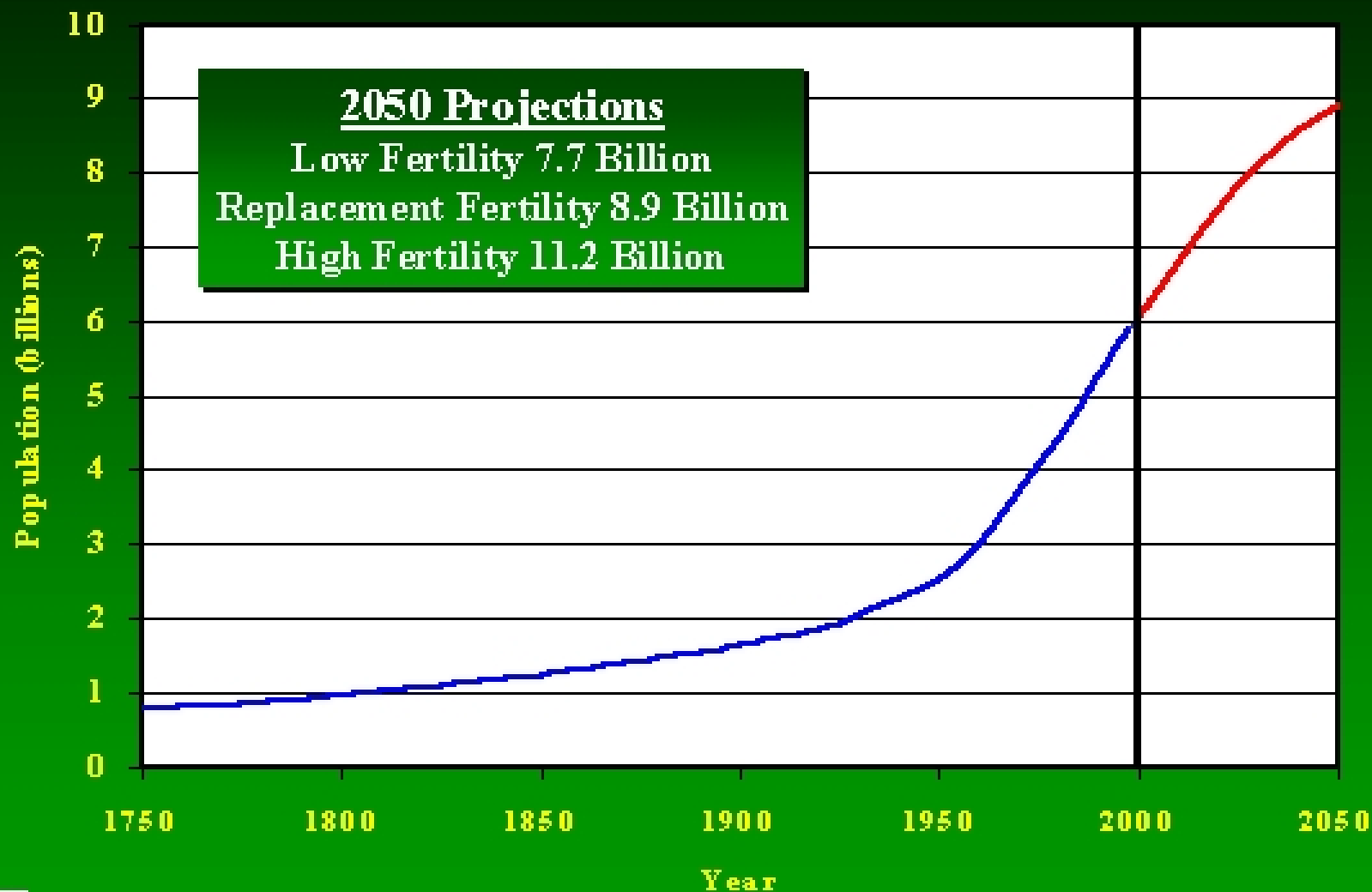


POPULATION

Facts, Figures, and Trends



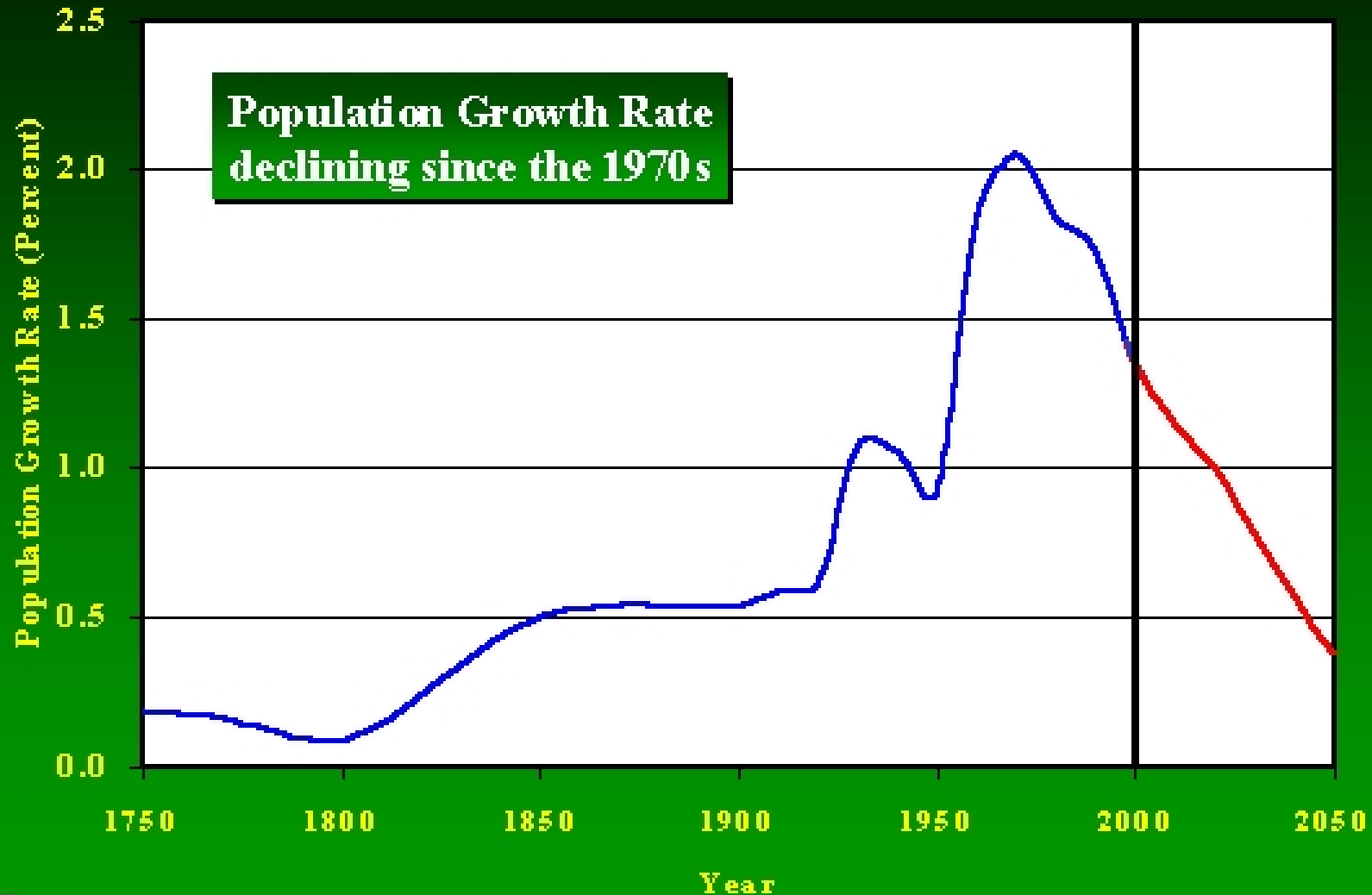
World Population 1750 - 2050



(Source: United Nations World Population Estimate, 1998 Revision)



World Population Growth Rate 1750 - 2050



(Source: United Nations World Population Estimate, 1998 Revision)



ECONOMY

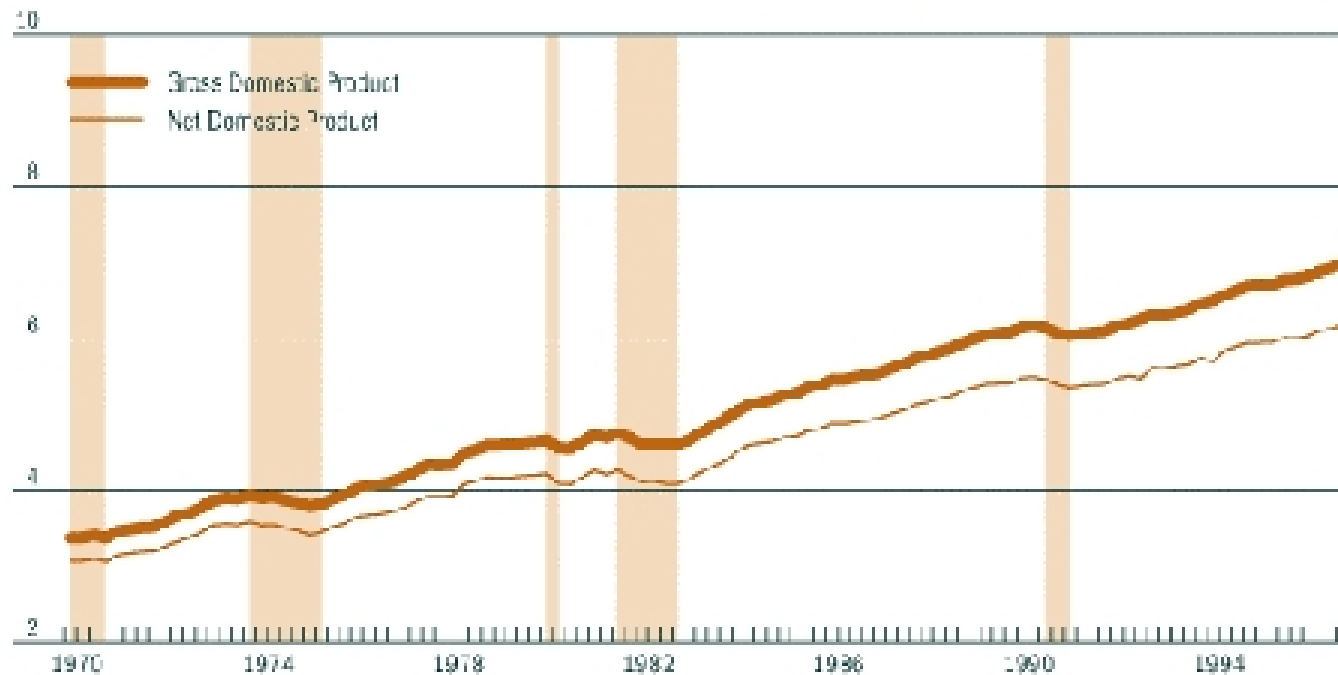
Facts, Figures, and Trends



United States GDP 1970 - 1998

United States GDP 1970 - 1998

Trillions of chained 1992 dollars



Shaded areas = Recessions

Source: Bureau of Economic Analysis, Economics and Statistics Administration, U.S. Department of Commerce



Take - Make - Waste

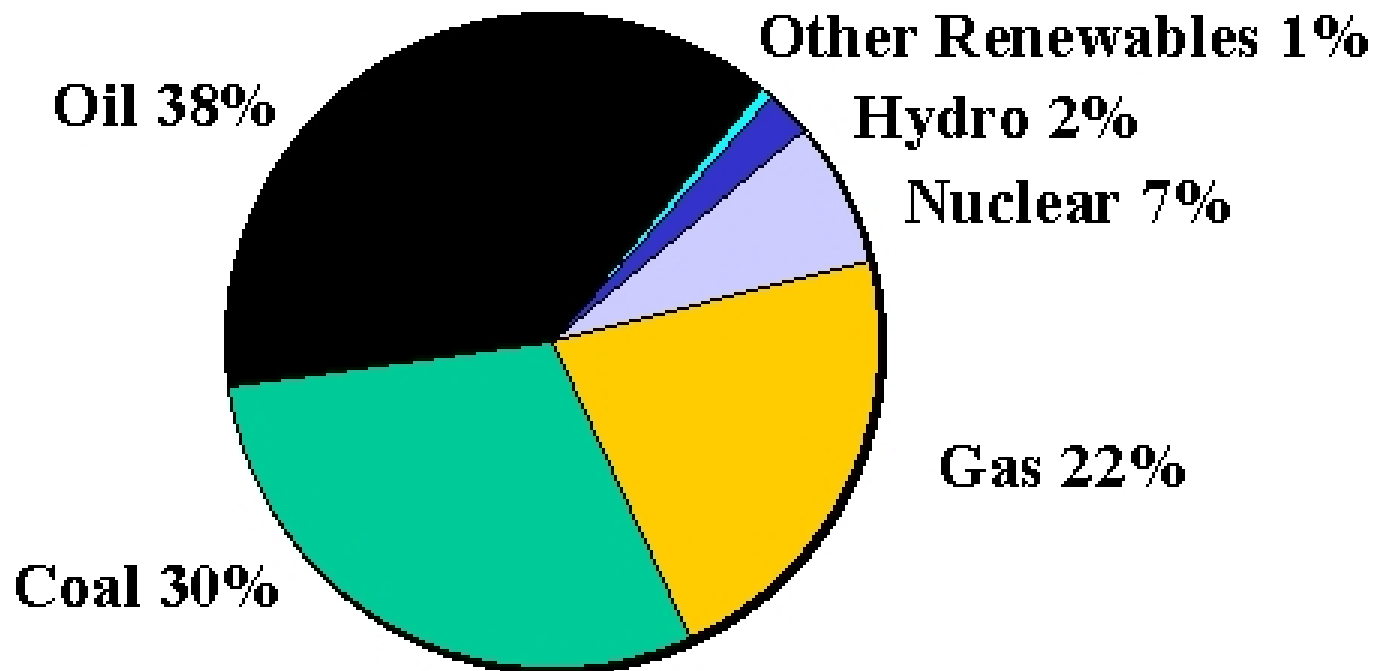


- *Every week* more than 500,000 trees are used to produce the *two-thirds* of newspapers that are never recycled.
- American consumers and industry throw away enough aluminum to rebuild our entire commercial air fleet *every three months*.
- Americans go through 2.5 million plastic bottles *every hour*, only a small percentage of which are now recycled.

**Everyday the US Generates about 200 million tons of trash.
Less than 25% is recycled**



Current World Energy Supply by Fuel Type



Wind Power has been the World's fastest growing energy source since 1994.

North Dakota, South Dakota, and Texas have enough combined wind resource to meet US electricity demand.

ALTERNATIVES



NATURAL CAPITALISM

- Amory and Hunter Lovins, Paul Hawken
- Recognition and valuation of a part of the capital which the business world has treated as a free good – our natural resources like water and air
- Well, they ain't free!
- Modify the relationship between human systems and natural systems
- Green book keeping

TRENDS

LIMITS



TRENDS ARE NOT DESTINY



Sustainable Development in Practice

Global



Community

Business

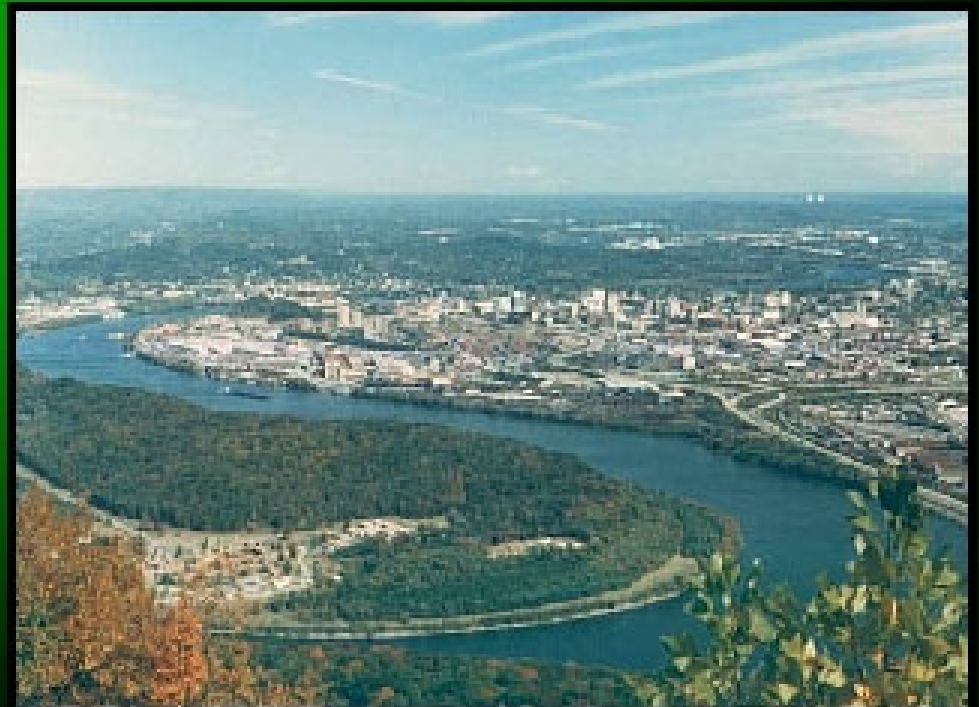




SUSTAINABLE COMMUNITIES

**“Sustainability takes
everyone and it
takes forever.”**

David Crockett,
Chattanooga City Councilman



Walnut Street Bridge



Chattanooga Sustainable Initiatives



Orange Grove
Recycling Center



City Greenways



Electric Shuttle Buses



SUSTAINABLE COMMUNITY INITIATIVES AROUND THE COUNTRY

Austin Sustainable Community Initiative

Campaign for a Sustainable Milwaukee

Sustainable Calgary

Eco-City Cleveland

Sustainable Seattle

Santa Monica Sustainable City Program

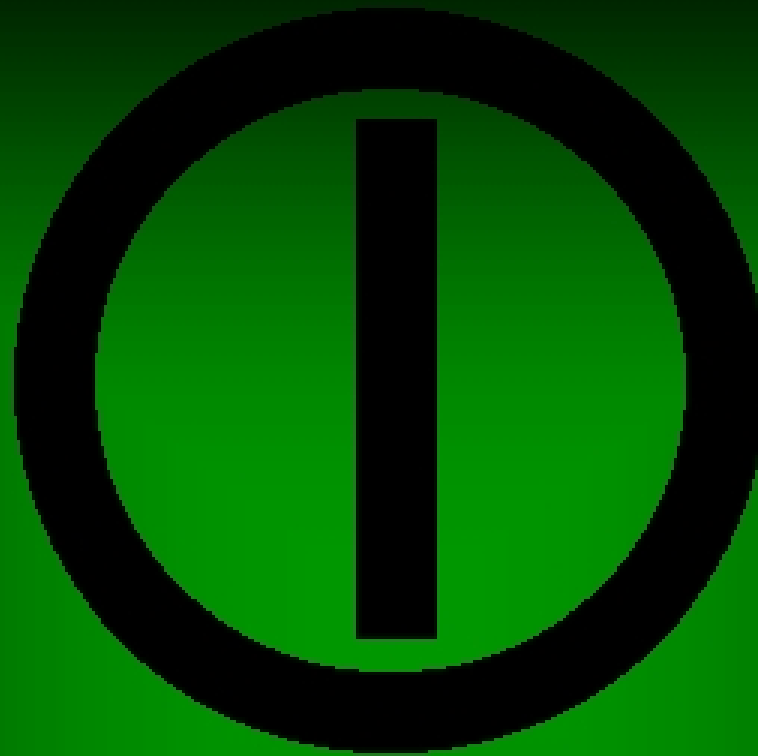
Olympia Sustainable Community Initiative

Vision for a Greater New Haven

Sustainable Cobscook

Maryland Alliance for Sustainable Communities





INTERFACE

“In the future, people like me will go to jail.”

Ray Anderson, CEO Interface Inc.



Interface Path to Sustainability

1. Zero Waste
2. Benign Emissions
3. Renewable Energy
4. Closing the Loop
5. Transportation
6. Sensitivity Hookup
7. Redesign of Commerce

Solenium

Durable

Recyclable

Sustainable Production



**Body Shop, BP-Amoco, CSW International, Ford,
Hatch, Royal Dutch Shell, Toyota, Monsanto, Dell,
Vinsin & Elkins, TXU, IKEA, Nortel,
Thompson & Knight, SC Johnson Wax,
Volkswagen, McDonalds, Dupont, Gap, Unilever,
Ben and Jerry's, Conoco, Patagonia, OK Petroleum
Intel, Deutsche Bank, Novartis, AT&T, Pfziser,
Texas Instruments, Indigenous Designs, United
Airlines, General Motors, TXI, IBM, Sprint, UPS,
Temple Inland Forest Products, Calvert,
URS Radian, Georgia Pacific, McMillan-Bloedel,
Westvaco, Enron, Triangle Pacific,
Mitsubishi, Aurthur D. Little, Weyerhaeuser,
DaimlerChrysler, Citizens Funds, Burger King**



ADAM JOSEPH LEWIS CENTER FOR ENVIRONMENTAL STUDIES

- **Oberlin College – Oberlin, Ohio**
- **Building:** 13,600 square feet (two stories)
- **Project coordinator:** David Orr, director of the environmental studies program



- **Architect:** William McDonough + Partners

ADAM JOSEPH LEWIS CENTER FOR ENVIRONMENTAL STUDIES

The Roof

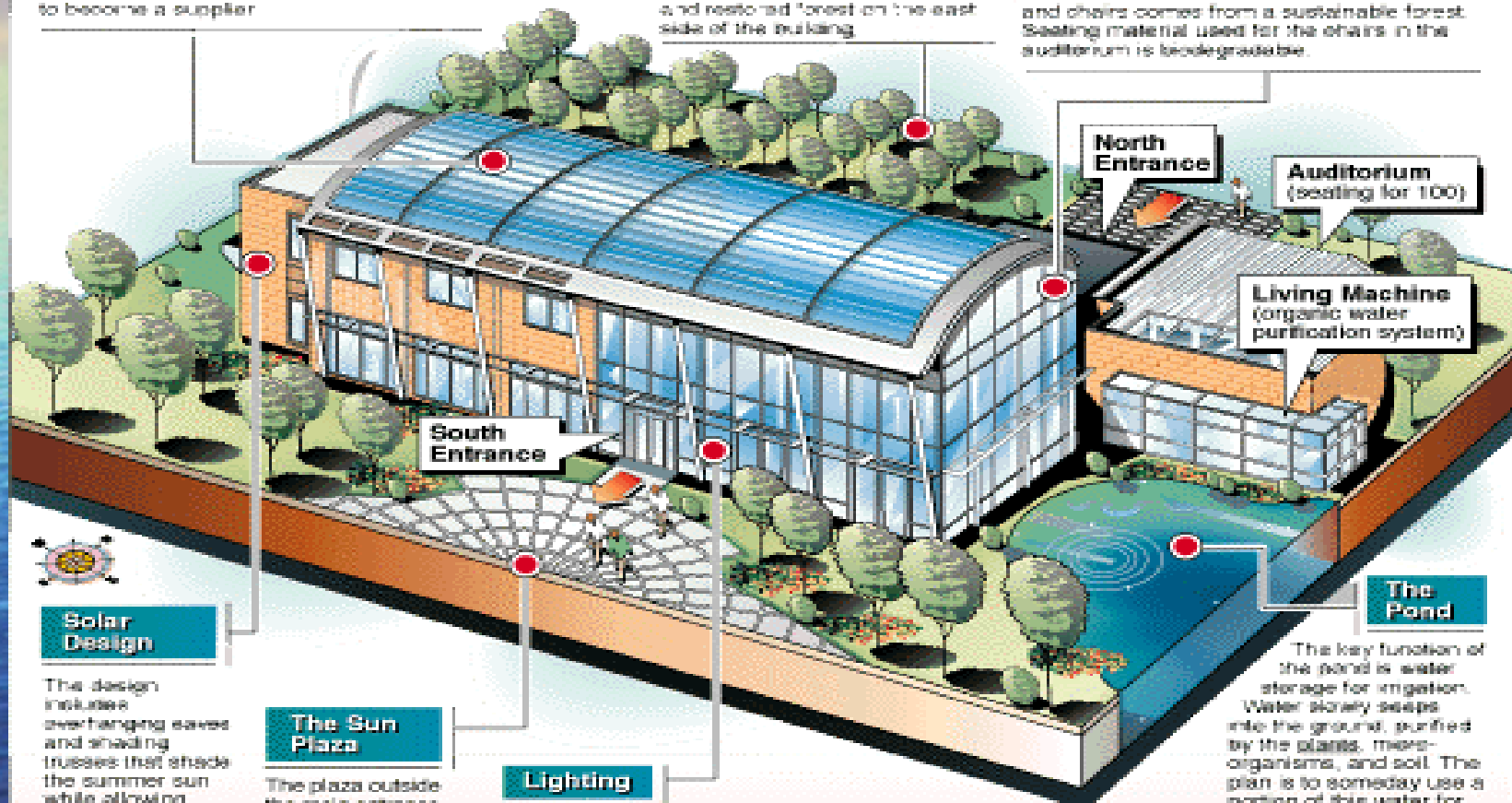
The roof's first solar cells will be replaced within a few years when new solar cells offering more electrical generating power become available. The plan is for the building to generate more electrical power than it needs and, in fact, to become a supplier.

The Landscape

North side of the building is protected by an earthen berm and tree grove. No pesticides will be used for the gardens, orchards, and restored forest on the east side of the building.

The Interior

The interior is designed to change and adapt over time. Carpeting is leased from the manufacturer, which will recycle the carpeting for reuse. The wood used to make the desks and chairs comes from a sustainable forest. Seating material used for the chairs in the auditorium is biodegradable.



Solar Design

The design includes overhanging eaves and shading trusses that shade the summer sun while allowing winter heat gain.

The Sun Plaza

The plaza outside the main entrance features a sundial noting the summer and winter solstice.

Lighting

To take advantage of daylight and heat gain, major public rooms such as classrooms will face south and west. The glass panes are specially treated to vary the amount of UV light that can both enter and leave the building, helping to maintain an even temperature inside.

North Entrance

Auditorium (seating for 100)

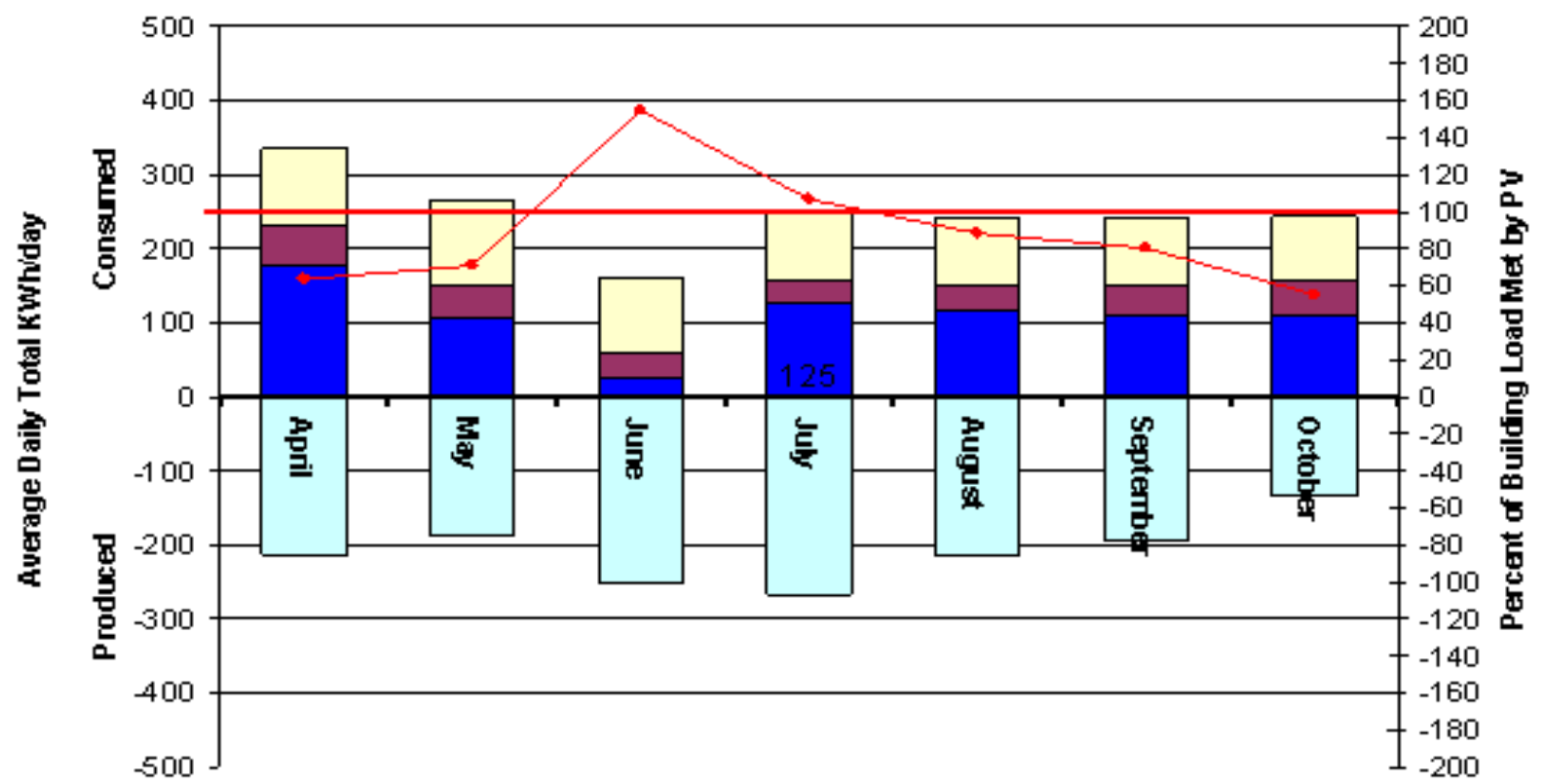
Living Machine (organic water purification system)

The Pond

The key function of the pond is water storage for irrigation. Water slowly seeps into the ground, purified by the plants, micro-organisms, and soil. The plan is to someday use a portion of this water for recycling.

Monthly Normalized Average Daily Total Electricity Use

■ Total HVAC
 ■ Total Lights
 ■ Equipment
 ■ PV Production
 —●— %load met by PV



SOLAR DESIGN

- **3,700 square foot of photovoltaic (PV) panels** on the main south-facing curved roof
- **Building Orientation** is elongated along the east-west axis to optimize passive solar performance.
- **Daylighting**
- **Thermal Mass** in concrete floors and exposed interior masonry walls retains and re-radiates heat to temper the space.



ENERGY EFFICIENCY

- **R-30 to R-40 roof assemblies.**
- **Energy efficient wall design** R-21 masonry cavity-walls
- **Integrated building controls** included advanced, central building controls for mechanical, security, fire, and Living Machine systems.
- **Electrical lighting** uses only 0.9 watts per square foot of building space.
- Hall and stairwell lights are connected to sensors for both movement and daylight while classroom and office lights are motion-sensored.

MATERIAL SELECTION

- **Durable, low-maintenance materials** are used throughout, including brick exterior walls, interior walls composed of stained concrete masonry units, and steel structure.
- **Recycled products** include the steel framing, aluminum for the roof, windows and curtainwall frames, ceramic tiles in the restrooms, and toilet partitions.
- **All wood** are **Certified Forest Products**
- **Products of Service:** The raised floor and carpeting are leased to the College by **Interface**.

LIVING MACHINE

- This engineered wastewater treatment system is modeled on natural wetland ecosystems and serves as research and teaching tool.
- The Living Machine replicates and accelerates the natural purification processes of ponds and marshes. Diverse communities of bacteria, algae, microorganisms, plants, trees, snails, and fish interact in tanks and act as living bio-filters.
- The end-goal of the Living Machine is to recycle the treated "gray water" through the building's toilets, thus helping to conserve water.



BUILDING COST

- Total Project Cost: \$7,110,000
- Construction Cost: \$4,854,600 (\$357/square foot)
- Total Design Fees: \$1,175,000
 - Further breakdown by building systems----
 - Photovoltaic array: \$402,500
 - Living Machine: \$400,000
 - Landscape: \$84,000

MONITORING

- **Researchers from the National Renewable Energy Lab have worked with the people in charge of operating the building to develop a system to monitor the building's energy use and key environmental variables throughout the building and landscape.**
- **Results may vary from initial modelling**

