Building Description

01 Overview
Architects: EHDD Architecture
Location: Stanford, California
Building Program: Offices + Lab
Gross Square Footage: 10,890 sq ft.
Cost: $4 Million
Completed: March 2004
Not LEED Certified

02 Program
Lobby
Offices (Private and Open)
Conference Areas
Administrative Area
Server Room
Dry Laboratory
Wet Laboratory
Laboratory Support Space
Storage
Green Houses
Freezer Warehouse

03 Owner + Occupancy
Owned by the Carnegie Institution
Department of Global Ecology.
Typically occupied by 45 researchers and staff, 40 hours a week.
Site Location

01 Location
Stanford, California

02 Carnegie Institution for Science
Located on the western edge of the Stanford University campus.

03 Global Ecology Center
The 10,890 sq ft. building sits on a 7.4-acre site leased from Stanford University. An additional 6,000 sq ft. is used for storage and greenhouses separated from the main building.

Site was previously paved over and used as a utility area.

Site Map

1 pedestrian entry
2 new courtyard
3 research building
4 greenhouses
5 warehouse
6 existing buildings
7 thermal storage tank
8 native oak woodland
9 irrigated turf removed
10 perennial grasses
11 chaparral
12 bioswale
13 agriculture research zone
14 new parking

North
Salvaged materials were used to reduce the waste stream leading to landfills. Water fixtures were installed as-is and bought used and new from off-spec orders. Solid wood doors were fabricated into desks and tables for offices and the lobby. Local fallen trees were milled into the conference table and lobby furniture. Lumber used as vats from a nearby winery were used for exterior cladding on the second floor.

Radiant heating and cooling tubes were installed to increase thermal comfort. The systems help limit the amount of outside air from entering lab spaces. Water is sprayed over the roof during summer nights where heat energy is released. The water is then recollected using a roof water catchment system and then stored in an insulated 12,000 gal cistern. The water is later pumped through the building during the day.

The cooling tower is located in the lobby and helps cool the space, even when the two bi-folding walls are opened to the outdoors. A special top was designed to collect all breezes above the roof line. A spray system helps cool the air in the tower and increases the humidity.

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The second floor, consisting of offices and open work space, is completely naturally ventilated. Proper building orientation, narrow size, and window sizing help to adequately daylight indoor spaces. Lighting sensors react to occupancy and daylight levels to determine if electrical light is needed.

High performance, low-E windows installed to allow in daylight while keeping solar heat gain down.

High-Volume Fly Ash Concrete
Half of the concrete used contained fly ash to eliminate the need to cement, lowering the carbon emissions by half.
Materials

01 Redwood Siding
Old-growth redwood used for wine vats at a nearby winery is re-purposed for cladding on the second story and cooling tower. Old growth does not need any sealants and preserves old-growth forests.

02 Minimal Finishes
Acoustical paneling and floor finishes are at a minimum in order to reduce the amount of waste going to the landfill. All systems in the building, from structure to architectural were thought holistically.

03 Salvaged Urban Logs
Lumber and whole circular cuts used from fallen trees in neighborhoods and parks were milled for conference tables and the coffee table in the lobby.

04 Natural Pavement
Terrapave, a natural type of pavement, was used in place of asphalt and concrete on outdoor walkways and the courtyard. Natural pavement uses tree resin with petroleum-free based additives.

05 Recycled Aggregate
A quarter of the aggregate used in the concrete on site was recycled to reduce mining for new aggregate.

06 High-Volume Fly Ash
Concrete
Almost all concrete on site had 50% high volume fly ash in order to reduce carbon emissions.

Energy

01 Design for Daylighting and Shade
The design of this narrow building, oriented east to west, allows in ample daylighting while incorporating shading devices to block direct solar heat gain.

02 Programming + Planning
Placing freezers in a separate warehouse allows for less energy for cooling the building from the heat generated from the freezers.

Offices are naturally ventilated while temperature sensitive lab equipment is placed in separately controlled rooms off of the main lab space.

03 Cool Tower
The cooling tower is located in the lobby and helps cool the space, even when the two bi-folding walls are opened to the outdoors. A special top was designed to collect all breezes above the roof line. A spray system helps cool the air in the tower and increases the humidity.

04 Cooling
Water is sprayed over the roof during summer nights where the water looses heat. The water is then recollected using a roof water catchment system and then stored in an insulated 12,000 gal. cistern. The water is later pumped through the building during the day.

05 Heating
Heating is supplied through a single high efficient condensing gas boiler.

06 Thermal Comfort
Unlike normal air-conditioned offices where thermal comfort is between 70-72 degree, radiant cooling affects the building surface temperatures allowing for a greater range of air temperature for comfort.

Water is 100 times better at storing heat and cold energy than air.
## Regeneration Based Checklist Results

<table>
<thead>
<tr>
<th>Project</th>
<th>Regeneration</th>
<th>Sustainable Sites</th>
<th>Energy and Atmosphere</th>
<th>Materials and Resources</th>
<th>Indoor Environmental Quality</th>
<th>Innovation in Design</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No energy generated on site</td>
<td>No food production on site</td>
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<td></td>
<td>Trees located on site</td>
<td>Cross ventilation and radiant cooling</td>
<td>Recycled wood, water fixtures, and concrete aggregate</td>
<td>Reuse already recycled content</td>
<td>Cistern filters water before reuse</td>
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<td></td>
<td>No energy generated on site</td>
<td>Xeriscaped areas provide habitat for small animals</td>
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<td>Not located directly next to parking lots</td>
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### LEED Checklist

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<td>Reused a parking lot instead of having to use land currently occupied by mature oak trees.</td>
<td>Xeriscaping to lower domestic water use.</td>
<td>Materials reused, has recycled content, and evidence of construction waste management.</td>
<td>Use low carbon-emitting materials including, adhesives, paints, flooring systems, and composite wood products.</td>
<td>Not LEED accredited by professional</td>
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<td>02</td>
<td>Looks into some, but not all, alternative transportation solutions.</td>
<td>Low flow water fixtures</td>
<td>Includes regional materials and certified wood.</td>
<td>Incorporates control systems for lighting and thermal comfort.</td>
<td>Innovative in design</td>
</tr>
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<td>03</td>
<td>Integrated xeriscaping to provide habitat and domestic water use.</td>
<td>No wastewater technologies currently in place.</td>
<td>08/10</td>
<td>Takes advantage of natural ventilation and daylighting.</td>
<td>Not a regional priority</td>
</tr>
<tr>
<td>04</td>
<td>Metal roof prevents collected water from becoming polluted.</td>
<td>No on-site renewable energy generated.</td>
<td>10/14</td>
<td>13/15</td>
<td>05/06</td>
</tr>
<tr>
<td>05</td>
<td>Optimized energy performance, not a zero-net energy building.</td>
<td>07/26</td>
<td>12/35</td>
<td>13/15</td>
<td>00/04</td>
</tr>
<tr>
<td>06</td>
<td>LEED Silver</td>
<td>55</td>
<td>05/06</td>
<td>00/04</td>
<td>07 Regional Priority</td>
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</table>
Redesign

01 Overview
The Global Ecology Center, with its integrated design, is predicted to use 57% of energy compared to a conventional building of this size and program.

However, the design scored low on site design and generating energy. These issues can be resolved through incorporating the following:

02 PV Panel + Rainwater Treatment Parking Lot
PV panels will provide energy for the Global Ecology Center. A canopy system over the parking lot will collect rain to be used for gardening and will provide shade for vehicles.

03 Wind Turbines
Wind turbines will help generate additional energy to be stored and used at a later time.

04 Community Gardens
Community gardens will help clean air, clean water, produce food, create rich soils, and consume waste through compost collected from Stanford University.

05 Constructed Wetlands
Constructed wetlands provide wildlife habitat, cleans water, and are economically feasible.

Redesign: PV Panel + Rainwater Treatment Parking Lot

01 Overview
A shading system to keep cars protected from direct sunlight. This parking lot in Spring Preserve, Las Vegas, combines electrical, shading and storm water runoff needs by combining pv panels and a canopy system.

02 Environment
PV panels allow for renewable energy to be generated/used on site. Sunshine in the Stanford, California, area averages at 78% daylight hours.

Treating storm water runoff on site lowers flooding and reusing the collected water is beneficial.

03 Economy
PV panels would be highly economical because of California's high electricity and utility rates, allowing PV panels to pay for themselves rather quickly. Tax credits are also rewarded in the state.

Collecting storm water for gardening saves money and potable water.
Redesign: Wind Energy

01 Overview
Additional energy might need to be generated for the Global Ecology Center and nearby buildings. The open land on the western edge of the site would allow the use of small vertical axis wind turbines.

02 Environment
The Stanford area is exposed to winds ranging between 7 to 14 mph.
Wind turbines are environmentally beneficial as they are nonpolluting, have zero carbon emissions, preserve habitat, and had nominal water use.

03 Economy
Wind power technology is one of the fastest growing industries today, making the price and recuperation period lower than in the previous decade.
Wind turbines, like pv panels, can be used to gain tax credits.

Redesign: Community Gardens

01 Overview
The Global Ecology has 1 acre of open land, located west of the building, designated as an agriculture research zone. That land can be used for composting and community gardens for the biology and ecology department. Part of this acre can be used as a constructed wetland.

02 Environment
Gardens filter rainwater, stop soil erosion, restores oxygen in air, and reduces the “heat island” effect.

03 Economy
Gardens are cost-effective as much of the cost in food production is labor-related.
A community garden is able to generate 3-5 times more produce than a large scale traditional farm of the same size.

04 Exercise
Gardens promote exercise and a healthy diet. Eating local foods lowers asthma rates because local pollen helps to develop healthy, strong immunities.

05 Education
Community gardens can serve as a model for learning healthy eating habits, along with strengthening math, communication and responsibility skills.
**Redesign: Constructed Wetlands**

**01 Overview**
The Global Ecology has 1 acre of open land, located west of the building, designated as an agriculture research zone. Part of that 1 acre can be used for a constructed wetland to treat waste water on site rather than exporting the waste for treatment.

**02 Environment**
This project will allow the Global Ecology Center to treat waste water on site instead of being connected to the grid.

Constructed wetlands provide wildlife habitat by providing nutrients and shelter.

**03 Economy**
Constructed wetlands are cost-effective, being less expensive than a waste water treatment plant.

These wetlands also need little to no maintenance and operation.

**04 Education**
The constructed wetlands can be used as a model for waste water treatment or a hands on project for the department of biology and ecology at Stanford and the Carnegie Institute of Science.

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**Redesign: Site Map**

**01 PV Panel + Rainwater Treatment Parking Lot**
Covers the entire 95 parking space lot providing protection from the sun and allowing solar axis for pv panels.

**02 Constructed Wetlands**
Four 30’x80’ constructed wetland beds placed at the bottom of the sloped open area. Two beds are needed for the Global Ecology Center’s needs.

**03 Wind Turbines**
Placed to take advantage of north east and south west winds without being blocked by dense vegetation or buildings.

**04 Community Gardens**
Placed on the highest point of the slope so any water runoff will travel into the constructed wetlands for further treatment.
**Redesign: Regeneration Based Checklist Results**

**Redesign: LEED Checklist**

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<td>82 LEED Platinum</td>
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<th>Energy and Atmosphere</th>
<th>Innovate in Design</th>
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<td>Fully optimized energy performance, zeronet energy building. Integrated pv panels and wind turbines on site producing renewable energy. Able to export excess energy.</td>
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* Green text indicates changes or additions due to redesign
Conclusion

Overall, the Global Ecology Center is a well-designed building, but the site design and generating renewable energy can be seen as an afterthought or was not fully investigated. We proposed an investment in community gardens, constructed wetlands, and generating energy on site through solar and wind resources to enhance the overall design and experience to give back to the community and environment.

As a result of our intervention the project gained 850 points on the regeneration based checklist and excelled to LEED platinum from LEED silver.

Thank You

Works Cited


