A Sustainable Solutions Framework for Planning and Urban Design

Sustainable Urban Design Symposium - MIT
Greg Havens – Sasaki Associates

6 May 2013
operating society environment economy
Sasaki’s Sustainable Solutions Framework
At Sasaki, we know our work will contribute to the resilience of the world’s built environment, natural environment, society, and economy. The decisions we make in our projects today will affect the ability of future generations to meet their needs.

Across the breadth of our practice and through the depth of our work, Sasaki provides Sustainable Solutions at multiple scales—the region, the city, the neighborhood, the campus, the building. Across these scales, we integrate multiple professions, including planning and urban design, landscape architecture, architecture, civil engineering, strategic planning, and interior design.

We believe the most creative and enduring solutions across the full spectrum of design challenges will emerge from a strong foundation in sustainability—the “triple bottom line” of the social, environmental, and economic conditions unique to each project.
ENERGY
Sustainable environments utilize energy efficiently and limit the need for fossil fuels. Our goal is to plan and design high performance environments that promote the use of renewable energy.

Integrated systems and BIM result in 74% energy savings.

A comprehensive approach to building orientation, shade, ventilation, and water management.

Wind turbines along the waterfront produce electricity.

Operable clerestory windows provide daylight and promote natural ventilation.

34% electricity reduction achieved through lighting retrofits.

Geothermal heat pump system reduces energy use by 30%.

.54W/sf, 46% better than energy code, at no additional cost.

Photovoltaic energy and shading strategy.
CLIMATE
Sustainable environments are responsive to climate. Our goal is to create buildings, landscapes, and plans that are appropriate to their location, and that mitigate/adapt to climate change.

Canopy structures
filter sunlight and circulate air
creating a cooler microclimate

Pocket parks
provide respite from the urban environment

Canopy structures
filter sunlight and circulate air
creating a cooler microclimate

Pocket parks
provide respite from the urban environment

Street and building orientation
minimize the urban heat island effect and provide shade

Enhanced microclimates
create shaded outdoor spaces

Facade studies assist in reducing heating and cooling loads

Louvered shading
reduces heat gain and cooling loads

Optimal solar and wind orientation
minimizes heat gain and blocks northern winds

Windbreaks
mitigate strong winds

West Texas A&M University, Master Plan, Canyon, Texas

Greensacre Park, New York, New York

Samsung Brno, Corporate Campus, Brno, Czech Republic

University of California Santa Barbara, Student Resource Building, Santa Barbara, California

St. Edwards University, Landscape Master Plan, Austin, Texas

Lulu Neighborhood 3, Abu Dhabi, United Arab Emirates
ECOLOGY

Sustainable environments are respectful of the flora and fauna indigenous to the place. Our goal is to preserve and enhance biologically diverse habitats.

Preservation of ecological systems in the Tamarisk Eco Reserve

Five acre wildflower meadow reduces mowing costs and saves $32,400 annually

Minimizing human impact, establishing habitat corridors, and creating riparian buffers restores degraded coastal wetlands

Ecological corridors provide for wildlife habitat and movement, increase rainwater infiltration, and promote outdoor recreation

Willows-Barros River Commons Willows-Barros, Panamby area

Interpretive signage and wayfinding educates visitors

Removing invasive plant species and reducing erosion preserves salt marshes

Native sea grass roof garden minimizes stormwater runoff and reduces heat island effect

Restoring ecological function improves habitat conditions and creates a valuable amenity

Bedsalee New District Master Plan, Shenzhen, China

Jeans North District Green Design Zone, China

601 Congress Street, Landscape Architectural Services, Boston, Massachusetts
WATER

Sustainable environments respect the hydrological cycle and watersheds. Our goal is to provide creative and innovative strategies for preserving watersheds, enhancing water quality, and decreasing the demand for potable water use.

A green roof, cistern, and water feature collect and treat 28,500 gallons of rainwater for irrigation.

A network of natural stormwater treatment facilities mitigates peak loads and filters stormwater.

Rainwater provides 30% of domestic water supply.

Interpreting the H₂O footprint

Water-receiving landscapes mitigate existing flooding problems.

A renovated reflecting pool that treats river water and reclaimed sump water saves 1.35 million gallons of potable water annually.

Raingardens integrate with the building and landscape.

The design protects three natural systems:
mountainous wads, alluvial wads and rivers, and an existing Tamarisk grove.

Dead Sea Development Zone, Amman, Jordan

Lakeview Southworks, Master Development Plan, Chicago, Illinois

University of North Carolina at Pembroke, Campus Master Plan, Pembroke, North Carolina

Cathedral of Wisdom and Mercy, School of Education, Warrenton, Virginia
MOBILITY
Sustainable environments address mobility in all of its forms: Our goal is to plan for a comprehensive system of pedestrian, bicycle, transit, and vehicular movement—a system that coordinates with the land use patterns and the transportation policies of a campus, community, or region.

Environmental education trails
link regional systems and neighborhoods to the riverfront.

The Charlotte LRT corridor bridges
town and downtown districts.

29% reduction in single-occupant commuting through alternative transportation plans.

Investments in pedestrian networks encourage walking.

Circulation improvements connect urban districts.

2 million transit trips decrease carbon emissions by 8,816 metric tons.

A comprehensive bicycle network provides mobility options.

Pandall Corridor serves over 10,000 bike riders each day.
MATERIALS

Sustainable design demands non-toxic, low carbon materials. Our goal is to specify sustainable materials procured in close proximity to the site and that do not contribute to environmental degradation during extraction, manufacture, or delivery.

Integrated design strategies encourage recycling

Adaptive reuse of buildings makes use of embodied energy

A new park incorporates existing ore wall

95% of the building

Recycling and salvaging materials diverted

95% of construction waste from landfills

Salvaged wood from an old Thomas Edison manufacturing facility became the ceiling of a new dining hall

Bowling alleys transform into conference tables

Crushed stonedust, preserved pier piles, local brick, marine wood, and recycled granite are utilized in the waterfront park

Continuum, West Newton, Massachusetts

National Grid New England Plaza

Boston, Massachusetts

Pig Iron Wall

Campus Commons, University of Illinois at Chicago, Chicago, Illinois

Charles River Waterfront Park

Charleston, South Carolina
COMMUNITY

Sustainable environments foster a sense of community. Our goal is to create environments that encourage community engagement and interaction.

Climate responsive design
creates spaces for community engagement

A park serves as a natural buffer between port operations and adjacent residences

Multipurpose spaces foster a sense of community

An integrated communication process builds community support

Open space connects the downtown to the natural resources of the river corridor

A landmark plaza becomes the heart of an emerging urban core of mixed-use development

Shaded pedestrian routes bring people together

Thoughtful urban design provides places for people
Mission

**PEOPLE**
Meet growth targets for 5,000 additional students, 160 additional tenured faculty, and related personnel growth.

**MISSION**
Develop strategies for supporting the mission to “Go Big” and teach, research, and serve.

**ATHLETICS**
Support the athletic mission of the Nebraska Huskers and role in the Big 10 conference

**PLACE**
Establish a sense of place that is reflective of a Big Ten Institution while preserving the character and image of UNL.

**COMMUNITY**
Foster collaboration among UNL and the surrounding community.

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**A Strategic Plan for UNL: Setting Our Compass**
General Strategies for Success
1. Resource-Maximizing Strategies
2. Resource-Investment Strategies
3. Operational Strategies

---

**Enrollment**
- Undergraduate: 19,345
- Graduate: 3,248

**Graduation, Tenure Faculty, Research $$**
- Faculty Today
- Research: $732 million

**Teams**
- **MEN**
  - Baseball
  - Basketball
  - Cross Country
  - Football
  - Golf
  - Gymnastics
  - Tennis
  - Track and Field
  - Wrestling

- **WOMEN**
  - Basketball
  - Bowling
  - Cross Country
  - Golf
  - Gymnastics
  - Rifle
  - Soccer
  - Softball
  - Swimming and Diving
  - Tennis
  - Track and Field
  - Volleyball

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**On-campus Housing**
- 12
- Apartment style

**Campus Art**
- Strategy

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**2012**
- Undergraduate: 19,345
- Graduate: 3,248
- Faculty: 5,248
- Research: $732 million

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**2020**
- Undergraduate: 23,345
- Graduate: 4,000
- Faculty: 5,548
- Research: $300 million
Environment

LAND
- Reserve the land for the land grant mission

HYDROLOGY
- Incorporate green strategies for stormwater management

LANDSCAPE
- Create a “working landscape,” utilize native plants, minimize potable water, herbicide and pesticide use

SPACE
- Provide the facilities needed to support the mission

INFRASTRUCTURE
- Review the capacity, condition and location of existing infrastructure

MOBILITY
- Reduce emissions by decreasing solo-occupant vehicle use

Land Use
- 2011: 7,000 trees, 46,000 kg of CO₂ annually
- 2022: 15,000 trees, 60,000 kg of CO₂ annually

Impervious Area (Acres)
- 2011: 77 acres, 77 acres, 73 acres

CO₂ Sequestration
- 2011: 7,000 trees
- 2022: 15,000 trees

Campus-wide Space Inventory
- 2011: 7.6 million GSF to be demolished
- 2022: 7.3 million GSF

Infrastructure Utilization Rates
- 2011: 100% for each category
- 2022: 100% for each category

Energy Split
- 2011: 30% solar, 59% natural gas
- 2022: 45% natural gas, 35% natural gas
Resources

**WATER**
Reduce potable water consumption per square foot

**ENERGY**
Aim for greater energy efficiency than required by building codes. Establish EUI targets for new construction and renovation

**EMISSIONS**
Aim to become climate neutral by 2050. 10% reduction in purchased electricity, heating, commuting, travel and fleet emissions by 2015

**MATERIALS**
Increase the percentage of materials purchased that meet environmentally preferable purchasing guidelines

**WASTE**
Lower landfill impact by reducing solid waste. Encourage recycling

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**Annual Water Consumption (2006)**
- 20 million gallons
- 15 million gallons
- 10 million gallons
- 5 million gallons
- 1 million gallons
- 5 million gallons
- 1 million gallons
- 5 million gallons
- 10 million gallons
- 15 million gallons
- 20 million gallons

**Annual Electricity and Energy Consumption**
- 171 million kilowatt hours of electricity
- 541 million cubic feet of natural gas

**Annual Greenhouse Gas Emissions (MTCO2e)**
- Scope 1: 212,259 total
- Scope 2: 118,645
- Scope 3: 64,458

**Local Procurement**
- Local content: 70%
- Sourced from distance: 30%

**Solid Waste Management**
- Annual per capita waste generation (lbs)
- Waste recycling
- Diversion rate

---

**2012**
- Academic: 20,000
- Athletics: 15,000
- Services: 10,000
- Other: 5,000
- Total: 50,000

**2022**
- Academic: 20,000
- Athletics: 15,000
- Services: 10,000
- Other: 5,000
- Total: 50,000
Finances

**COST**
Coordinate emerging capital projects with projected operational costs

**RESEARCH**
Respond to the research mission and potential funding

**ENDOWMENT**
Coordinate with fundraising efforts of the university. Support the capital campaign.

**PARTNERSHIPS**
Respond to partnership objectives and opportunities

Operational Cost per Square Foot

Research Funding

Endowment

Partnerships with Private Sector

2012

2022
social

people

mission

place

community
Population Impact

2011

Residents: 10
           Commuters: 15

2022

Residents: 12
           Commuters: 18
Population Impact

**Population**

- Spring 09: 16548
- Fall 08: 17824

**Electricity Consumption**

**Gas Consumption**

**Water Consumption**
UT contributes many civic and cultural attractions to the city of Austin.
environmental

NATURAL SYSTEMS

climate
land
hydrology
climate
Orientation + Wind Analysis
Building Spacing

Shadow on March 21
12:00 pm

Shadow on June 21
12:00 pm

Shadow on December 21
12:00 pm

Cooler Micro-climate created between buildings

Average Annual Shadow Range (9 am- 4 pm)
Urban Heat Island Analysis
Sustainable Cooling Strategies
Climate Responsive Design
Solar Gain: summer south facing

Summer

3,900 Wh/m²
Solar Gain: winter south facing

Winter

9,100 Wh/m²
Summer Conditioning Strategy

Shading reduces solar gain from 1,295,000 to 453,000 BTU per day
Building Energy Strategies

- orientation
- high performance envelope design
- cool roofs (Energy Star, shaded or green roofs)
- reduce electrical load (lower Energy Use Intensity – EUI)
- design for day lighting
- shading devices and new glazing technology
- ensure sub-metering is in place for each building
- design for solar adaptation
- low occupancy space – south side; high occup. - north side

Winter Conditioning Strategy
hydrology
Water retention capacity based on soil condition

Irrigated surfaces

Rainwater Central Campus = ~8,584,525 gallons/yr

Drill Field area: 248,350 s.f

Available rain water falling on the 4400 acres campus

Annual Rainfall - inches

Annual Rainfall - gallons
Topography + Streams
Open Space Structure
Flood Zones & Soil Conditions
environmental

BUILT ENVIRONMENT

land use  landscape  space  infrastructure  mobility
Develop a “working landscape”
Landscape Typology + Maintenance

Surfaces

Buildings = 28%

Streets = 8%

Landscape = 65%

- Civic Space
- Waller Creek
- Streetscape
- Courtyards and Quads
- Connective Space
- Parking and Service
- Open Lawns
- Water
The abundance of canopy coverage and fine grain building fabric on West campus creates a more comfortable and desirable experience.

37% 72 Acres
30% 54 Acres
19% 10 Acres
Heat Islands + Human Comfort Zones

Temperature Variability

°F

+ 10
Hardscape No Shade

+5
Landscape No Shade

-5
Hardscape with Shade

-10
Landscape with Shade

SURFACE TEMPS

<table>
<thead>
<tr>
<th>Surface Type</th>
<th>Surface Temp</th>
<th>Air Temp 1</th>
<th>Air Temp 2</th>
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<tbody>
<tr>
<td>Asphalt</td>
<td>119.4</td>
<td>97.8</td>
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<td>104.1</td>
<td>96.6</td>
<td>93.7</td>
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<td>102.0</td>
<td>93.1</td>
<td>96.9</td>
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<tr>
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<td>n/a</td>
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24% 196 Acres

29% 182 Acres

38% 52 Acres
shade strategy
Sept
High: 86°
Low: 62°
Sept
High: 86°
Low: 62°
Sept
High: 86°
Low: 62°
Sept
High: 86°
Low: 62°
Shade Strategy
Windbreaks

Existing windbreaks provide minimal protection from north/northwest winter winds.
Windbreaks

- Virtual Wind Analysis programs are utilized to determine the effectiveness of a wind break
Windbreaks: computational analysis

Wind Speed

0 mph  50 mph
Windbreaks: computational analysis
Integrated Landscape Solutions
- Windbreaks and shelterbelts have been utilized to protect land from wind erosion and conserve soil moisture by reducing evaporation.
- Windbreaks can assist in reducing wind speed, heating and cooling loads, and contribute to the visual quality of the environment.
Windbreaks and Building Placement

Windbreak (Pine or Spruce)

Labs

Offices

Classroom

Social Space

9,100 Wh/m²/day Dec

Calm Air

9

1

2

3

4

Sheltered area: 4 x height of windbreak

Deciduous Trees (block 50-80% of sunlight)

Calm Air

North

Dec. 21 2:00 pm
water management
Water receiving landscape
Existing Median
Pedestrian Walkway
Integrated Landscape Solutions

- Water receiving landscape
- Existing Median
- New stormwater line
A modified catch basin diverts storm water to lateral drains that feed into the planting areas via perforated underdrains. As run-off seeps into the soil, excess water not absorbed by tree’s root systems is stored in drainage stone below the planting beds. The water quality volume then infiltrates into the soil. During large storm events, run-off flows into the city drainage system by passing over the over-flow weir.
energy production
Energy + Landscape

Geothermal Field

DIRECT SOLAR RADIATION ON A VERTICAL PLANE (ANNUAL)

- 6000+ Wh/m²
- < 1000 Wh/m²

Building Orientation (longer axis)

19% energy reduction for space cooling
10% energy reduction for space heating

Annual Energy Use in MBTU

Space Cooling
Space heating

0
50
100
150
200
250

N-S E-W

W E W E
carbon sequestration
830 acres of forest

\[ \text{CO}_2 \text{ stored} \quad 868.16 \text{ MTeCO}_2 \]

\[ \text{CO}_2 \text{ annually sequestered} \quad 10.78 \text{ MTeCO}_2 \]
## Carbon Sequestration

<table>
<thead>
<tr>
<th>CAMPUS EMISSIONS</th>
<th>SEQUESTRATION THROUGH TREES ANNUALLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{CO}_2$ emitted</td>
<td>$\text{CO}_2$ sequestered (annually)</td>
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<tr>
<td>68,515 MTeCO2</td>
<td>1,017 tonnes</td>
</tr>
</tbody>
</table>

Tree cover sequestration: 1.5% of CO2 emissions

Total emissions

68,515 MTeCO2
space
Space and Energy

Space → Energy → Emissions

People → Energy → Cost
EUI, or energy use intensity, is a unit of measurement that describes a building’s energy use. EUI represents the energy consumed by a building relative to its size. EUI is calculated by taking the total energy consumed in one year and dividing by the total floor space of the building.
Space and Energy Use Intensity

<table>
<thead>
<tr>
<th>Space Type</th>
<th>Avg EUI</th>
<th>Target</th>
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</thead>
<tbody>
<tr>
<td>LABS</td>
<td>300 kBTU/sf/yr</td>
<td>250 kBTU/sf/yr</td>
</tr>
<tr>
<td>ACADEMIC</td>
<td>100 kBTU/sf/yr</td>
<td>75 kBTU/sf/yr</td>
</tr>
<tr>
<td>OFFICE</td>
<td>100 kBTU/sf/yr</td>
<td>75 kBTU/sf/yr</td>
</tr>
<tr>
<td>HOUSING</td>
<td>125 kBTU/sf/yr</td>
<td>80 kBTU/sf/yr</td>
</tr>
<tr>
<td>CAMPUS LIFE</td>
<td>200 kBTU/sf/yr</td>
<td>200 kBTU/sf/yr</td>
</tr>
<tr>
<td>LIBRARY</td>
<td>200 kBTU/sf/yr</td>
<td>150 kBTU/sf/yr</td>
</tr>
</tbody>
</table>
Creek buffers occur along Waller Creek, but there are several sites still prone to flooding.
Mobility Strategy – bicycle network
Creek buffers occur along Waller Creek, but there are several sites still prone to flooding.

UT Shuttle/CapMetro Routes

Mobility Strategy – transit network
Mobility Space
Mobility Space + Complete Streets
Modal Split Targets

2010

Walking  Bicycle  Transit  Single Occupancy Vehicle

2020

Walking  Bicycle  Transit  Single Occupancy Vehicle
2,000,000 additional transit trips

994,000 fewer gallons of gasoline used for car trips

Reduction of 8,816 metric tons of carbon emissions in the first 2 years

54% increase in ridership in the first 2 years
resources

RESOURCE FLOWS

potable water
energy
emissions
materials /waste
potable water
Water Resource Flows

Rainfall on Site
393,183,058 Gallons/year

COLORADO RIVER BASIN
LAKE BUCHANAN & LAKE TRAVIS
(in times of drought)

Potable Water Supply
FROM CITY OF AUSTIN
7,000,000 Gallons/year

Reclaimed Water Line
PROPOSED BY CITY OF AUSTIN

Waller Creek
DRAINS TO COLORADO RIVER AT TOWN LAKE

Water use in Buildings
124,647,872 Gallons/yr

Cooling Towers Water Use
400,000,000 Gallons/yr

Direct Reuse of Free Water
To cooling towers

Xeriscaping
Drought resistant plants

4500 Campus Trees on
Drip Irrigation

Rain Sensors + Sprinkler Timers

Ground Water recharge
MINIMAL

Water Carried to City’s Wastewater Treatment Plant

Waste Water

778,000,000 Gallons/yr
Total Campus Water Use

60,000,000 Gallons/yr
Predicted Campus Water Savings

SASAKI
Average Daily Water Consumption: 1,000,000 gallons

Approximately 2 Olympic Pools per Day
Potable Water Consumption

2010

Average Daily Water Consumption: 1,000,000 gallons

Summer 2010 Average Daily Consumption: 1,750,000 gallons

Goal: 20% reduction in water use

2020

Targeted Daily Water Consumption: 800,000 gallons

20% reduction
Energy Flows

SOLAR ENERGY INPUT
3,495,784,853 kWh/yr

CHILLED WATER
110,000,000 kWh/yr

BUILDINGS ELECTRICITY USE
91,407,000 kWh/yr

500 kW PV Array

CHP

CAMPUS ELECTRICITY
0.96 lbsCO₂/kWh

CAMPUS STEAM
0.134 lbsCO₂/lb Steam

COAL 31%
NATURAL GAS 31%
NUCLEAR 27%
REFRIGERANT 1%

29,328 MT CO₂e/yr
233,839 MT CO₂e/yr
19,602 MT CO₂e/yr

20% Waste Energy

NATURAL GAS

FLEET FUEL
9,798 MT CO₂e/yr

STUDENT/FACULTY/STAFF COMMUTE
29,000 MT CO₂e/yr

AIR TRAVEL
24,000 MT CO₂e/yr

SOLID WASTE
2,937 MT CO₂e/yr

475,671 MT CO₂e/yr
Total Campus Emissions
Energy Consumption

Annual Electricity Consumption (2009): 224,000 MBTU (65,684,000 kWh)

Annual Natural Gas Consumption (2009): 142,470 MBTU (1,424,708 Therms)

TOTAL MBTU: 366,587
Energy Consumption

2010

Annual Electricity Consumption (2009): 224,000 MBTU (65,684,000 kWh)

Annual Natural Gas Consumption (2009): 142,470 MBTU (1,424,708 Therms)

TOTAL MBTU: 366,587

2020

Targeted Electricity Consumption: 180,000 MBTU

Targeted Natural Gas Consumption: 128,000 MBTU

Renewable ??

30% reduction
emissions
Emissions Scopes

SCOPE 2 INDIRECT
- Purchased Electricity

SCOPE 1 DIRECT
- Fuel Combustion
- University-Owned Fleets
- Heating & Cooling

SCOPE 3 INDIRECT
- Outsourced Activities
- Waste Airplane Travel
### Emissions

<table>
<thead>
<tr>
<th>% of Net Emissions</th>
<th>Emissions Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>54.7%</td>
<td>Purchased Electricity</td>
</tr>
<tr>
<td>13.7%</td>
<td>Stationary Combustion</td>
</tr>
<tr>
<td>11.7%</td>
<td>Financed Ground Transportation</td>
</tr>
<tr>
<td>9.1%</td>
<td>Commuting</td>
</tr>
<tr>
<td>5.4%</td>
<td>Transmission Losses</td>
</tr>
<tr>
<td>2.6%</td>
<td>Solid Waste</td>
</tr>
<tr>
<td>1.9%</td>
<td>Fugitive Emissions</td>
</tr>
<tr>
<td>0.6%</td>
<td>University-Owned Transportation</td>
</tr>
<tr>
<td>0.2%</td>
<td>Air Travel</td>
</tr>
</tbody>
</table>

Net Emissions: 160,986 MTCO2e
Emissions Comparisons

Land Grant University Northern US

26% Electricity
62% Natural Gas/Fuel Oil
12% Transportation

Land Grant University Southern US

64% Electricity
20% Natural Gas/Fuel Oil
16% Transportation

Commuter College Southern US

33% Electricity
9% Nat. Gas
58% Transportation
US Fleet Emissions

The US Fleet average: 240g CO₂ / km

<table>
<thead>
<tr>
<th>Fleet Average (2008)</th>
<th>Grams CO₂ / km</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>240 grams</td>
</tr>
<tr>
<td>Canada</td>
<td>215 grams</td>
</tr>
<tr>
<td>China</td>
<td>185 grams</td>
</tr>
<tr>
<td>European Union</td>
<td>152 grams</td>
</tr>
<tr>
<td>Japan (2007)</td>
<td>~145 grams</td>
</tr>
</tbody>
</table>

EU target for 2020: 95 grams / km
Emissions

2010

Scope 1 (2009): 19,343 MTeCO2 (Natural Gas Consumption)

Scope 2 (2009): 75,595 MTeCO2 (Purchased Electricity)

2020

5.5 MTeCO2

15.3 MTeCO2

1 FTE

1000 FT²

CO₂ = 10,000 MTCO2
Emissions Targets

2010

Scope 1 (2009): 19,343 MTeCO₂ (Natural Gas Consumption)

Scope 2 (2009): 75,595 MTeCO₂ (Purchased Electricity)

Scope 1 Target: 15,000 MTeCO₂ (Natural Gas Consumption)

Scope 2 Target: 60,000 MTeCO₂ (Purchased Electricity)

Per Capita

= 10,000 MTCO₂

2020

Scope 1 Target: 15,000 MTeCO₂ (Natural Gas Consumption)

Scope 2 Target: 60,000 MTeCO₂ (Purchased Electricity)
materials / waste
Material Procurement

500 mile radius
Waste Management Targets

2010

3,922,708 lbs of solid waste

124,000 lbs recycled

2020

30% reduction

= 500,000 lbs
economic

operation costs

economic development
operational costs
Energy Costs

Cost spent per capita:

- **electricity**: $18 per month to $132 per month
- **natural gas**: $14 per month to $71 per month
economic development
Economic Partnerships
University of Maine Master Plan
Case Study

AWARDS:
SCUP / AIA MERIT AWARD FOR EXCELLENCE IN PLANNING, 2009
BSA CAMPUS PLANNING MERIT AWARD, 2010
A VISION FOR THE FUTURE
A VISION FOR THE FUTURE
Sustainability Metrics

**Habitat**

- **Goals**
  - Increase connectivity
  - Preserve woods and farm land

- **Strategies**
  - Growth boundary
  - Reforestation
  - Riverfront restoration
  - Wetland restoration
  - Windbreaks

- **Outcomes**
  - Reforestation / Habitat Corridors
  - Wetland restoration
  - 800 acres of forest preserved
Sustainability Metrics

Water Resources:

• Goals
  - Comprehensive stormwater management plan
  - Reduce impervious area
  - Increase water retention time
  - Decrease potable water use

• Strategies
  - Re-establish wetlands
  - Restore riverfront floodplain
  - Create detention areas

• Outcomes
  - Decrease in impervious area
  - Decrease in run-off volume (cubic feet)
  - Decrease in run-off rates (cubic feet/second)
Sustainability Metrics

Access / Mobility :

• Goals
  - Improve the pedestrian experience
  - Plan for transportation options / reduce parking demand
  - Connectivity: interior/exterior circulation/community network

• Strategies
  - Establish pedestrian priority zone
  - Park once and walk policy
  - Relocate parking to the periphery
  - Create campus shuttle / transit service
  - Connectivity to community path

• Outcomes
  - Pedestrianized core
  - Improved transit access/modal split
  - Increase in resident population
Sustainability Metrics

Energy & Emissions:

• Goals
  - Presidents' Climate commitment (climate neutrality)
  - Reduce CO₂ emissions
  - Reduce energy costs

• Strategies
  - Cogeneration
  - Transition fuel sources
  - Creating working landscapes
  - Building performance guidelines
  - Solar adaptability
  - Emissions reduction targets

• Outcomes
  - 1.7 million additional SF
  - Potential eCO₂ increase – 25,800 MTeCO₂ (assuming current fuel mix/power sources)

Existing Emissions
- 70,000 MTeCO₂ annually
- 0.015 MTeCO₂ / sf (37 lbs/sf)
- 6.1 MTeCO₂ per capita
LAND USE

Demeritt Forest
830 acres

10 min. 5 min walk
LAND USE
THANK YOU

Greg Havens, AIA, AICP
Sasaki Associates, Inc.
64 Pleasant Street
Watertown, MA 02472

+1 617 926 3300
ghavens@sasaki.com