5. SUSTAINABILITY

INTRODUCTION

In the next fifty years, several factors will radically change the world we live in: the end of oil, global warming, environmental degradation, species extinctions, and increasing human population pressure on resources and the environment. These challenges impose on us an obligation to minimize their deleterious effects, and an incentive to take action to maintain our productivity and quality of life.

Efforts to meet these challenges are often subsumed under the concepts of "Sustainability" and "Sustainable Development." The term "sustainable development" was defined by the United Nations' Brundtland Commission in 1987 as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Chief economist for the World Bank Herman E. Daly suggested three operational rules to define the condition of sustainability:

1. Renewable resources such as fish, soil, and groundwater must be used no faster than the rate at which they regenerate.
2. Nonrenewable resources such as minerals and fossil fuels must be used no faster than renewable substitutes for them can be put into place.
3. Pollution and wastes must be emitted no faster than natural systems can absorb them, recycle them, or render them harmless.

These definitions can be seen as complementary—Brundtland's establishing the ethical goal of avoiding the depletion of natural capital and Daly's providing rules for action necessary to achieve that goal.

Note that both of these definitions have an anthropocentric orientation. They are biased toward human use: they view the natural world as a reservoir of materials and supplies, and as a mechanism to deal with our wastes. They do not directly address the concern that many feel for other species, nor do they convey the sense of responsibility for the world as a whole which many believe complements the goal of avoiding harm to and maximizing benefits to present and future human populations. However, given the urgency of the situation, and the difficulty of changing the paradigms under which decisions regarding natural systems are currently made, it is generally felt that these definitions are adequate for practical action.

Due to their missions to serve as loci of learning and research, their strengths in using knowledge and expertise to improve the human condition, and their relative freedom to make informed and intelligent decisions, colleges and universities are well positioned to serve as models of sustainability for government and business.

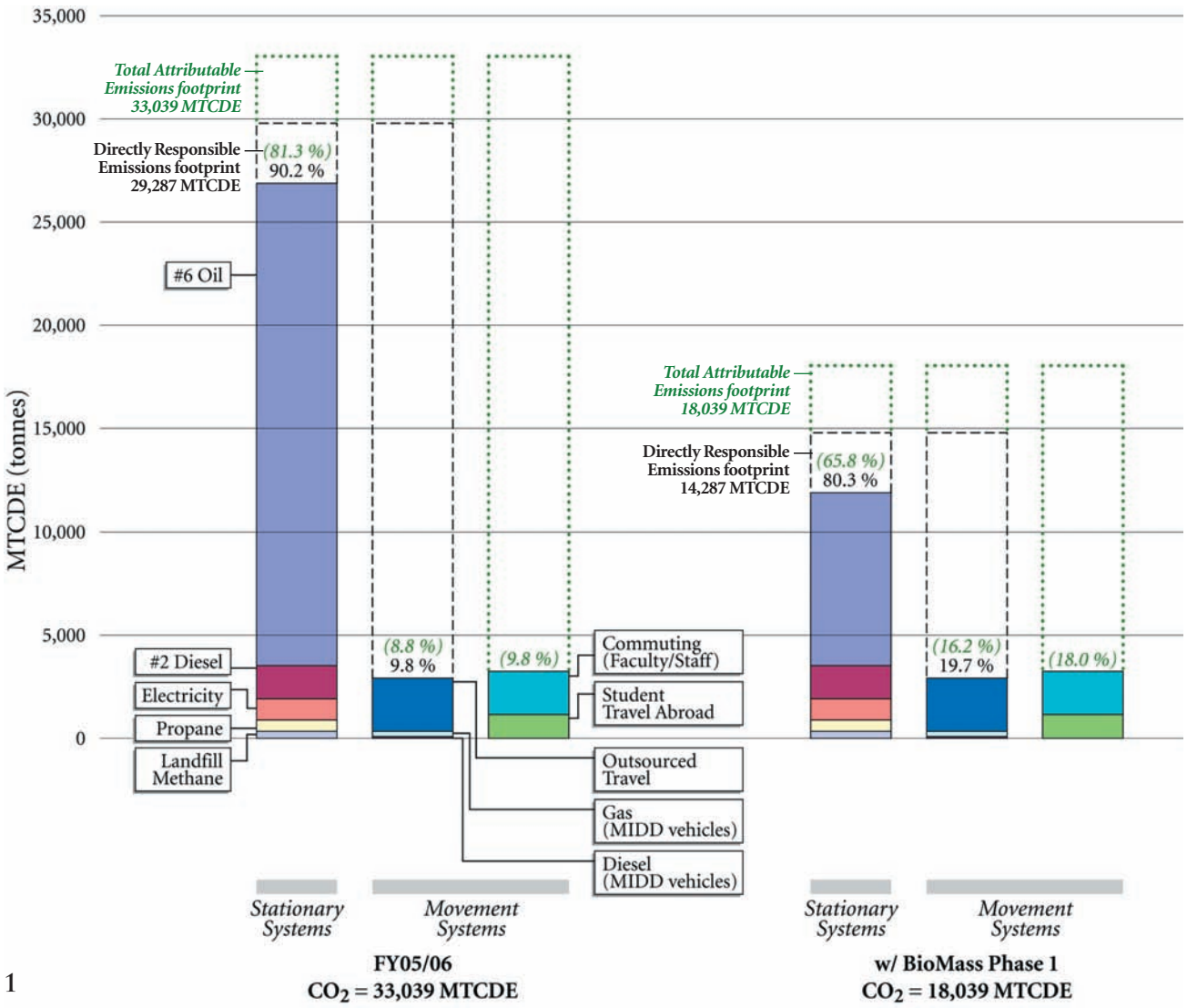
Middlebury College has long been a leader in the exploration and advancement of sustainability. The College's Environmental Studies Program was established forty-three years ago, and environmental responsibility permeates the curriculum and the ethos of the place. Students, faculty, and staff take it seriously, and many aspects—such as waste management, the purchase of local foods, sustainable design and construction, and commitment to carbon neutrality—are models for other institutions.

This Master Plan is an instrument of Middlebury College's engagement with sustainability. It offers the opportunity to take a comprehensive, holistic look at environmental issues—to take a snapshot assessment of where the College is—and to formulate a strategy for further action. It establishes a plan for growth and defines policies, principles, and guidelines that:

- Discourage sprawl—thereby minimizing the loss of open space and the amount of fuel wasted in moving people and goods
- Improve energy efficiency of existing and future buildings—envelope, systems, monitoring, and control
- Continue to advocate that construction maximizes the use of locally produced materials
- Consider options for campus and building utilities in terms of conservation, energy efficiency, and global warming
- Suggest changes to the campus's landscape design so as to enhance plant and animal habitat, emphasize local species, minimize the amount of fuel used in maintenance, reduce the use of fertilizer and pesticides, and address water quality and runoff issues
- Minimize the amount of student, faculty, and staff driving through the use of parking management, incentives, an expanded public transportation network, rideshare programs, improved bicycle facilities, and by increasing the College's provision of affordable faculty and staff housing close to campus
- Improve the pedestrian experience by strengthening

FIGURE 1

Middlebury's Greenhouse Gas Footprint, before and after Biomass implementation



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the spatial cohesion of the campus, the path system, and the vehicular street system

During the course of the Master Plan, there were five parallel but interrelated efforts regarding sustainability:

1. A comprehensive overview and assessment by Arup, Sustainability Consultant
2. A building energy audit by EarthTech, Energy Consultant
3. A transportation audit by Howard/Stein-Hudson, Transportation Consultant
4. A landscape and planning effort by the planning team
5. A student-initiated and produced Carbon Initiative Study. (This report resulted in the adoption of a commitment by the Trustees to carbon neutrality by 2016.)

These reports are summarized on the following pages, and are included in full in the Appendix.

ANALYSIS

Comprehensive Overview

The sustainability of the Middlebury campus as a whole was assessed, based on information from many sources, including the Master Planning Committee, faculty members, maintenance and operations personnel, student representatives, special program officers, College administrators, and trustee representatives. The principal findings were that Middlebury performs particularly well in materials and waste management, and that improvement could be made in several areas, particularly in transportation, energy in general, and in the documentation and monitoring of its sustainable efforts.

Additional analysis was done to evaluate the improvement that will result as Middlebury adopts the sustainability measures recommended by the Master Plan. These measures can be categorized into three themes: carbon neutrality, the recommendations of the Master Plan with regard to the

physical form of the campus, and reporting and guidelines. A sustainability plan was developed, based on these themes, outlining actions, targets, responsibilities, timing, and costs. This plan is supported by detailed guidelines given in the Sustainability section of the Appendix.

Middlebury's Greenhouse Gas Footprint

Middlebury students, faculty, and staff have produced several influential studies regarding the College's energy use and its greenhouse gas footprint. These include: *Carbon Neutrality at Middlebury College* (2003); and *Midd Shift: A Proposal for Carbon Neutrality at Middlebury College* (2007). The latter draws on Jason Kowalski's *Middlebury College Interim GHG Inventory* (2006).

An analysis of Middlebury's existing greenhouse gas emissions, based on these studies, is shown on the left in Figure 1. In this diagram, the College's emissions are viewed in two different ways, and accordingly are represented by two different numbers. The smaller number, 29,287 MTCDE, represents the College's *"directly responsible emissions footprint."* It includes the greenhouse gas emissions which the College tracks in its standard reporting: emissions caused by fuel and other emissions sources that the College directly purchases for its operations. The larger number, 33,039 MTCDE, is the College's *"total attributable emissions footprint."* This number attempts to represent the total emissions caused by the College's programs and operations: the total greenhouse gas load that the College places on the planet's atmosphere and oceans. It includes not only the emissions described above, but in addition, the emissions due to faculty and staff commutes between home and work, and those due to travel by students attending Middlebury's junior year abroad program. The "total attributable footprint" number is only a first attempt to represent this quantity. There are other indirect emissions caused by the College that should be quantified and incorporated in it, for instance the emissions caused by the production and shipping of materials and fuels that the College uses.

The two numbers have different purposes: the "directly responsible footprint" corresponds to the accounting systems used by the World Resources Institute. In this system, the person or entity who purchases carbon is responsible for it, thus facilitating the accounting necessary for carbon trading. The "total attributable footprint" number conveys the true magnitude of the College's impact on the global greenhouse gas balance, and allows a fuller understanding of the relative impacts of different aspects of the College's operations and programs.

In the diagram, the College's greenhouse gas footprint is divided into the portions due to stationary systems and movement systems, and these are subdivided according to energy source and use. The "total attributable" annual emissions equal 33,039 metric tons of carbon dioxide equivalent (MTCDE) per year. About 97% of this amount is in the form of carbon dioxide, and about 70% of the total results from the combustion of #6 oil, which is used for steam generation (and as a by-product, co-generated electricity, which constitutes 15% to 20% of the electricity the College consumes).

A biomass gasification boiler is currently in construction as part of a new Biomass Energy Plant to augment the College's existing oil boilers. Once operational, it is anticipated that it will reduce Middlebury's annual greenhouse gas emissions by 15,000 MTCDE. The right-hand portion of Figure 1 illustrates the condition after the first phase of the biomass boiler is put into operation: Middlebury's total attributable greenhouse gas footprint will be reduced to 18,038 MTCDE/year, and the relative contribution of the other components of the total attributable footprint, particularly transportation, will accordingly increase.

Middlebury's Carbon Reduction Initiative

The student, faculty, and staff emissions studies listed above document numerous additional ways that Middlebury's greenhouse gas footprint could be reduced, estimate how great that reduction would be if these suggestions were adopted, and estimate the potential cost savings and payback periods. This Master Plan draws upon these studies and incorporates them in its Appendix. The studies led to Trustee approval of Middlebury College's Carbon Neutrality Initiative in May of 2007, which recommended that the College achieve carbon neutrality relative to its "directly responsible footprint" of 29,287 MTCDE. In addition, the College is committed to assisting with reductions to emissions due to staff and faculty commutes and due to student travel for junior year abroad.

FIGURE 1

Building Energy Efficiency Evaluation

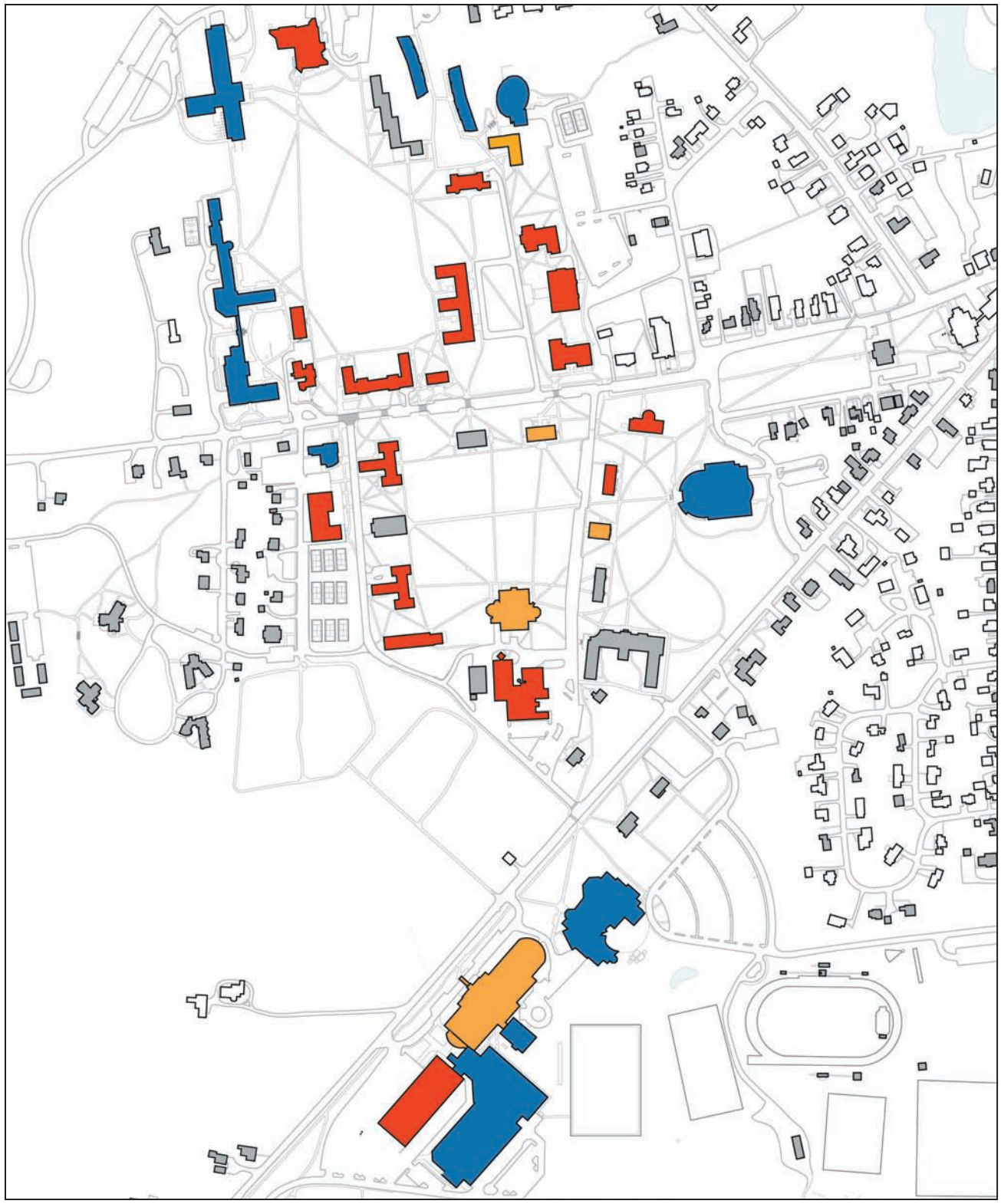
LEGEND

76%–100+% compliance with State Energy Code

51%–75% compliance with State Energy Code

Below 50% compliance with State Energy Code

Not included in Energy Audit



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Building Energy Audit

Middlebury College does not track energy use by building, but does track overall energy use by category. Source energy for heating campus buildings currently is, primarily, #6 oil. Typically in the United States, buildings account for approximately 40% of total energy consumption. At Middlebury College, the heating and cooling of buildings currently accounts for approximately 80% of the carbon footprint.

The exterior envelopes and energy systems of thirty-eight campus buildings were analyzed for their energy performance, and rated from good to poor. This represents nearly 80% of the approximately 2.2 million square feet on campus. Perhaps not surprisingly, most of the older campus buildings are in the poor category, with leaky, poorly insulated exterior walls and antiquated mechanical and electrical systems. In addition, the fact that the

campus consists of mostly small, widely spaced buildings distributed over a large geographic area contributes to energy inefficiency.

Of the thirty-eight buildings studied as part of the audit, 37% of the total square footage performs below 50% of the current building energy code standards, and 16% performs at 25%–50% below the energy code. The Appendix includes more detailed analyses of these buildings, as well as prioritized lists of recommended improvements.

There are many buildings that would benefit from non-invasive upgrades such as continuing to add weatherstripping to doors, replacing single glazing, and adding loading dock air control. These kinds of improvements will have a short payback period. On the other hand, the payback period for improving other aspects of building envelopes, such as the amount of wall insulation, is fairly long. The opportunity to make these changes most likely will come only when there is a need for a complete interior renovation of a building.

Transportation Audit

The transportation analysis included all non-stationary sources of energy consumption and carbon production, including faculty, staff, and student commuting; maintenance and service; all College travel, including junior year abroad and faculty, staff, and consultant travel; deliveries; and incoming visitors and events. Naturally, some of these had to be empirically estimated on an order-of-magnitude basis. All are summarized in the Appendix.

The urgency to improve transportation systems and their associated carbon footprint will increase when the Biomass Energy Plant is completed. Currently, transportation accounts for approximately 19% of the College's total attributable carbon footprint and 17% of its total attributable energy consumption; after Biomass is completed it will account for 34% of the College's emissions. (Typically in the United States, transportation accounts for about 32% of carbon emissions, 29% of energy consumption, and 75% of petroleum consumption.)

Because Middlebury is in a rural area without much public transportation, the daily faculty/staff commute requires particular attention. It accounts for an estimated 6% of the current total attributable carbon footprint. To put that figure in perspective, that is twice as much as the carbon footprint associated with the College's entire electrical consumption. This reliance on the personal automobile to get to and from work not only produces a large quantity of emissions, but it puts pressure on the College to maintain and create sufficient parking on campus. There are several strategies outlined addressing these issues in the Circulation and Parking sections of Chapter 6: Built Systems.

Landscape and Planning

The existing form and arrangement of the campus's outdoor spaces were reviewed for their spatial coherence, the efficiency of their layout relative to transportation and to utility systems, their programmatic uses, their soils and vegetation, the maintenance they receive, the energy costs and carbon footprint of that maintenance, and the wildlife habitat they provide.

The Middlebury campus is fairly spread out, and several of its most heavily used buildings are at the perimeter of the occupied area. Because of this, time and energy are wasted as people move between buildings, and in providing utilities and services to the buildings.

Excessive expense and effort are dedicated to maintaining the campus's extensive grass lawns, contributing to the campus's carbon footprint. The campus's soils are poor, and many areas are poorly drained. Because of this, lawns recover slowly after large programmed events. The variety and interconnectedness of wildlife habitat are limited by the extent of the campus's lawns and by the lack of arboreal connections between isolated groves of trees.

The proposed landscape plan strengthens the spatial configuration of the campus, and includes guidelines intended to reduce the financial and energy costs of landscape maintenance and to improve the landscape's role as wildlife habitat, and to integrate the region's ecological landscape.

The Master Plan indicates potential building sites and proposes buildings for them with the intent of strengthening the relationships between different parts of campus, improving the spatial coherence of the campus, reducing the travel distance between destinations, improving outdoor spaces, and preserving and enhancing views of the surrounding landscape.


Baseline SPeAR Assessment
Combined Implementation
Sectors and Indicators
Poor
Exemplary
Poor
Exemplary
Environmental
Air Quality: Emissions [Direct & Indirect]; Baseline Environment; Dust & Particulate Matter; Refrigeration / Ozone Depletants; Regulated Processes
Land Use: Site Location Planning Intent; Context; Diversity / Mixed Use; Flood Plain; Open Space; Contaminated Land
Water Discharge: Drainage Systems; Risk Management; Sewage Treatment
Natural & Cultural Heritage: Habitat Conservation; Protected Areas; Biodiversity; Cultural Heritage Resources; Archaeological Resources; Soil
Design & Operation: Assessment Methods; Appropriate Technology; Environmental Management System; In-use Management; Management Regime; Microclimate; Flexibility
Transport: Public Transport Infrastructure; Choice of Transport; Pedestrian / Bicycle Facilities; Green Transportation; Freight Traffic; Internal Transport & Material; Handling Equipment (MHE)
Natural Resources
Materials: Reduction of Materials Use; Renewable Resources; Materials Reuse; Local Materials; Material Specification & Supply
Water Use: Water Efficiency; Water Monitoring; Process / Construction Water Source; Auxiliary Water
Energy: Energy Efficiency; Energy Sources; Energy Monitoring; Daylighting
Waste Hierarchy: Waste Avoidance; Waste Reduction; Reuse; Recycling; Best Practical Environmental Option; Landfill; Hazardous / Special Waste Generation; End-of-Life; Refurbishment
Economic
Campus Longevity: Endowment Transparency; Trustee Commitment; Investment Practices; Operating Guidelines and Goals
Viability: Financial Viability & Risk; Expenditure on Improving Environmental & Social Performance; Innovation; Risk Management; Displacement; Products & Services; Service Contracts; Operations Management Tools & Techniques
Competition Effects: Ethical Competition; Vitality & Regeneration; Pricing; Diversification & Choice; Supply Chain
Employment / Skills: Job Numbers; Status of Employment; Investment in Skills; Equal Opportunities; Diversity of People; Diversity; Training Programs
Transport: Dependency; Public Transport; Freight Traffic; Rail & Water; Vehicle Use; Off-Campus Travel; Internal Materials & Handling
Social
Social Responsibility: Community & Citizenship; Stakeholder Relations; Donations to Voluntary & Community Organizations; Internal & External Reporting; Community Plans; Social Identity; Global Supply
Amenity: Landscape; Leisure Facilities; Green Space; Noise & Vibration; Amenity Conflict
Access: Public Transport; Key Facilities; Access for Physically Impaired People; Training; Education & Lifelong Learning; Housing Types; Telecommunications
Form & Space: Internal & External Security; Scale; Public & Private Realm; Communal / Circulation Areas; Severance; Rights of Light(s)
Stakeholder Satisfaction: User Controls; Indoor Air Quality; Occupant Satisfaction; Employee Satisfaction; Supplier Satisfaction; Other Stakeholders' Satisfaction
Health & Well-being: Health & Safety Management System; Occupational Safety; Provision of Support Facilities; Deliver Key Health Targets; Conditions of Work

EVALUATION AND PROGNOSIS

The overall sustainability of the Middlebury campus was analyzed through the use of the SPeAR methodology (Sustainable Project Appraisal Routine), an analytical tool developed by Arup that evaluates how well an institution performs with regard to sustainability in four broad sectors: economic, social, environment, and natural resources. Each of these sectors is divided into a series of focused topics ("indicators"). The institution's performance is ranked in each of these indicators relative to what would be best practices in a perfect world. The chart on the opposite page shows the results of this assessment. Areas of strength are indicated by bright green segments; areas of weakness are indicated by dark red segments.

Middlebury's current performance is represented in the "Baseline" column of the chart. Middlebury's best performance is with regard to use of materials and its waste hierarchy, reflecting the College's efforts to minimize construction waste and to salvage construction materials, and its successful recycling and composting programs. It is no surprise that Middlebury's poorest performance is with regard to transportation. Considerable improvement is also possible in the Natural Resource indicators of energy and water use; the Environmental indicators of design and operation, water discharge, land use, and air quality; the Social indicators of health and well-being, form and space, and access; and the Economic indicator of campus longevity.

Potential improvements are represented in the "Combined Implementation" column of the chart. This diagram reflects the improvements that will result when Middlebury's carbon footprint is reduced by the installation of the biomass gasification boiler (currently in progress), and if other recommended improvements are made: the use of other alternative energy sources, an increase in the efficiency of energy use on campus, improvements to the College's land use, landscape and open space, building design and operation, circulation system, transportation systems, utilities infrastructure, improvements to its interaction with the surrounding community, to its guidelines for the design and operation of buildings, and to its record-keeping and reporting systems. These recommendations are summarized below and elaborated in the Sustainability section of the Appendix.

GUIDELINES

The Master Plan provides guidelines directed toward increasing the sustainability of Middlebury's buildings. These guidelines, titled LEED-MC Plus, are based on the U.S. Green Building Council's LEED (Leadership in Energy and Environmental Design) system for evaluating sustainable design. The LEED system covers sustainable sites, water efficiency, energy & atmosphere, materials & resources, indoor environmental quality, and innovation & design process, awarding points for required and optional items within these categories, and providing a sustainability rating for the project based on the results. The LEED MC-Plus guidelines augment the basic LEED system: they establish higher standards for areas in which Middlebury already exceeds or desires to exceed LEED standards; they add key Middlebury College–specific categories for Process, Community, and Education; and they integrate Middlebury's own Carbon Neutrality Guidelines into the LEED Energy and Atmosphere category. Projects fulfilling the requirements of Middlebury's LEED-MC Plus guidelines will meet or exceed the requirements for a silver rating in the standard LEED system. The LEED-MC Plus guidelines are included in the Appendix.

RECOMMENDATIONS

General

1. ***Establish a process by which decisions affecting the sustainability of the campus are made, and to resolve conflicts involving sustainability***
2. ***Consider the impact of decisions about facilities and operations on Carbon Neutrality and other aspects of sustainability, and assess costs and benefits over the long term***

Buildings

1. ***Adopt the LEED MC-Plus guidelines system for all renovation and new construction projects***
2. ***Design new buildings to be as energy efficient as possible***
3. ***Improve the energy performance of existing campus buildings through improvements to their envelopes and building systems***
4. ***Assign priorities for improvements based on the energy audit of buildings on campus and on academic program and availability***

FIGURE 1

SPeAR assessment showing Middlebury College's current condition and the College's anticipated condition with the combined implementation of all Master Plan recommendations

5. ***Encourage behavioral changes for students, faculty, and staff, including adjustments to indoor temperatures and use of air-conditioning***
6. ***Meter all buildings for water, power, and steam***
7. ***Install "Building Dashboards" and "Campus Dashboards": displays that show building and campus energy use and production in real time, and the corresponding greenhouse gas emissions, along with water use, comparative historical data, environmental conditions, etc.***
8. ***Minimize the use of air-conditioning in campus buildings***
   - *Increase the air-conditioning set point*
   - *Minimize the need for air-conditioning by using shading, natural ventilation, and mechanically assisted ventilation*
   - *Strategically plant deciduous shade trees on south side of buildings to help reduce daytime solar heat gain during summer months*
9. ***Where appropriate, utilize energy efficient means of cooling, such as geothermal, shading, natural and mechanical ventilation, etc.***
10. ***Utilize refrigeration gases in air-conditioning and refrigeration systems that are as benign as possible, both in terms of their global warming potential and their ozone depletion potential***
11. ***Consider energy efficient alternative systems for specialized functions in individual buildings, such as***
    - *a purified water system for Kenyon Arena's ice sheet, which will reduce the energy required to create the ice*
    - *a solar hot water heating system for the Natatorium*
    - *heat exchangers for the recapture of waste heat, for example at the campus data center and if possible in food service areas*
12. ***Investigate the feasibility of solar heating for domestic hot water***
13. ***Develop a life-cycle assessment for construction materials, considering cost, longevity, environmental damage caused by production, embodied energy, potential for recycling, disposal, hazards, etc.***
14. ***Adaptive reuse of buildings should be considered before removal***
15. ***Building deconstruction***
    - *Building removal should minimize the quantity of materials entering the waste stream by employing deconstruction rather than demolition*
    - *Materials salvaged from deconstruction should be considered for future use in anticipated building projects*
    - *New construction projects should incorporate salvaged material*
16. ***Continue collaborating with Efficiency Vermont to obtain greatest efficiency for both new and renovated buildings***

Utilities

1. ***Improve the efficiency of utility systems by upgrading steam lines, etc. as necessary***
2. ***Introduce monitoring and metering devices so that leaks and losses can be readily identified and excessive usage can be curtailed***
3. ***Develop a reporting log for comparing end-use measurements over time and verifying that the systems are performing as designed***

Energy Sources

1. ***Conduct an alternative energy assessment of the campus to better understand what forms of alternate energy are feasible and how best to employ them***
2. ***Pursue the procurement of responsibly planted and harvested woodchips for the biomass gasification boiler by partnering with woodchip suppliers, the State of Vermont Department of Forests, Parks, and Recreation, professional logging and forestry associations, and others***
3. ***Pursue the feasibility of using local agricultural land for the purpose of growing biomass for the biomass gasification boiler coming on-line in 2008***
4. ***Develop a portion of Middlebury College's own agricultural land for the purpose of self-sufficient generation of biomass for the biomass gasification boiler***
5. ***Reforest a portion of Middlebury's agricultural land with Clayplain forest to sequester carbon***
6. ***Continue to participate in Central Vermont Public Service's "Cow Power" program, which uses methane produced by cow manure to generate electricity, and partner with local farms engaged with manure to methane projects***
7. ***Increase Middlebury's on-campus generation of electricity from alternative renewable sources: wind power, photovoltaic panels, exercise machines***

8. ***Participate in the development of a hydroelectric plant at Otter Creek. This could generate a significant portion of the electricity that Middlebury College uses***
9. ***Consider participating in the Landfill Gas to Energy program at the Moretown Landfill***
10. ***Collaborate with Central Vermont Public Service (CVPS) to install alternative energy generators under the Regional Global Gas Initiative***
11. ***Carbon offsets will be a part of the effort to achieve carbon neutrality. Middlebury will look for opportunities to purchase or establish bona fide offsets with a preference for those that are local and regional***

Vehicular Travel and Commuting

1. ***Secure offsets for 100% of outsourced travel***
2. ***Prioritize local meetings and conferences or utilize teleconferences to minimize air travel***
3. ***Begin shifting campus fleet vehicles where appropriate from gasoline or diesel fuels to electric power or hybrid fuel***
4. ***Institute transportation demand management strategies to reduce private vehicular use by faculty, staff, and students***
   - *Establish a target for a reduced level of carbon emissions due to regular commuting*
   - *Develop a hub system with ACTR to connect Campus shuttles with the County shuttles for scheduling purposes*
   - *Provide incentives for faculty and staff who would typically commute to campus via private car to instead utilize public transportation, walk, or bike*
   - *Provide incentives for using shuttle services such as passes or financial compensation*
   - *Provide financial incentives for car pooling*
   - *Provide vehicles for emergency use by faculty and staff who use public transit or car pooling for their daily commutes*
   - *Provide an "on-call" shuttle system for on-campus travel*
   - *Introduce parking fees for on-campus parking*
   - *Provide the majority of parking spaces in peripheral campus lots to reduce car use during the day*
   - *Eliminate parking in the Central Campus (with the exception of ADA requirements)*
   - *Relocate all student parking to the West Ridgeline lot to discourage students from using their cars for short trips during the school year*
5. ***Purchase offsets for the remaining carbon emissions due to regular commuting***
6. ***Subsidize the purchase of alternative fuel and/or hybrid vehicles by faculty and staff. See Appendix***
7. ***Encourage outside vendors to use alternative fuel or hybrid vehicles, for instance private bussing companies***
8. ***Develop a non-idling policy for campus deliveries, outside vendors, athletics buses, etc.***
9. ***Continue offering an hourly/daily car rental program to students, faculty, and staff***
10. ***Advocate the reestablishment of passenger train service to the town of Middlebury***
11. ***Encourage faculty and staff to live close to campus***
    - *Develop Middlebury College property in the Town to house as many faculty and staff as possible within walking distance*
    - *Subsidize the cost of purchasing housing in the Town of Middlebury by faculty and staff*
12. ***With few exceptions, continue to limit student housing to on-campus facilities***
13. ***Consider banning first year cars from campus***

Bicycle Transportation

1. ***Develop a comprehensive bicycle program for both the regular academic year and the summer that includes access, maintenance, information, safety, and a reinvigorated free campus bicycle program***
2. ***Make the campus more bicycle friendly***
   - *Provide sufficient parking for bicycles, with attention to number, location, and type of bike racks*
   - *Widen pathways to accommodate bicycle use along major corridors*
   - *Construct curb cuts at all locations where pathways intersect roads*
   - *Replace all storm sewer drain covers that are not bicycle friendly*
   - *Provide showers in more locations for bicycle commuters*
   - *Provide secure indoor storage locations for bicycle commuters*
3. ***Develop an incentive program to promote bicycle commuting by employees***

4. ***Integrate the college's bicycle transportation initiatives with efforts by the Town to promote bicycle transportation***
5. ***Provide or rent bicycles and helmets to members of the summer Language Program***

Landscape and Open Space

1. ***All new construction at Middlebury College should be planned within the existing developed area of the main campus***
2. ***New buildings and hardscape should not be built in green areas remote from the core campus***
3. ***Plant materials should be local species if possible***
4. ***Reduce the amount of lawn by converting it to greensward, meadow, trees with groundcover, and forest as appropriate in different areas of campus***
5. ***Increase the amount of habitat suitable for indigenous plants and animals***
6. ***Increase the interconnectedness of plant and animal habitat by linking currently isolated areas***
7. ***Continue to reduce the amount of herbicides and pesticides used***
8. ***Improve soils and drainage, particularly in heavily used areas of campus***
9. ***Conduct a land value survey for all of Middlebury College's land holdings in Addison County to assess existing conditions, environmental practices, environmental connectivity, economic possibilities, and social benefits***
10. ***Protect sensitive or critical areas by establishing a Green Reserve***
11. ***Provide summer shade for building facades with trees and shrubs***
12. ***Design the campus landscape to encourage social interactions and a variety of uses***
    - *Orient plazas and terraces outside of academic and residential buildings to maximize daylight and solar heat gain*
    - *Provide seating in protected areas and in locations best suited to capture the panorama of the Green Mountains*

Water Management

1. ***Implement a rainwater collection system for water from the athletic buildings, and use it to supply water for irrigation of fields***
2. ***Create additional raingardens and bioswales, appropriately located, to reduce stormwater runoff and to improve water quality***

On-Campus Operations Guidelines

1. ***Develop Sustainable Campus Operations Guidelines in conjunction with the Strategic Plan that consider:***
    - *Maintenance and operations schedules for campus grounds and buildings including building envelope upgrades*
    - *Dining services storage capacities, relative to the locations of dining operations and food delivery schedules*
    - *Reduced energy use by building equipment*
    - *Parking policies and transportation management*

Off-Campus Operations

1. ***Develop Sustainable Off-Campus Guidelines that address the abroad program, Bread Loaf, the Snow Bowl, and the management of the College's other property***
2. ***Chart travel emissions for these activities and include them in carbon reports***
3. ***Strive to reduce carbon emissions due to travel***

Supply Chain Management

1. ***Initiate a purchasing plan that prioritizes sustainable materials and supplies, and prioritizes purchases from companies invested in maintaining their own sustainability standards***
2. ***Strive to use suppliers located within 500 miles of the final point of delivery***
3. ***Encourage suppliers to use recyclable and returnable packaging as shipping materials***
4. ***Ensure that Middlebury College does not engage in unfair trade or limit growth opportunities in the region***
5. ***Support and serve as a catalyst for sustainable Vermont businesses***

Reporting, Record-Keeping, and Guidelines

1. ***Institute a formalized record-keeping and reporting system for issues of sustainability, such as that developed by the Global Reporting Initiative***
2. ***Develop formal guidelines, including performance benchmarks, for capital projects, maintenance, deconstruction, and operational activities***

3. *Utilize the reporting and record-keeping system to monitor successes, areas for improvement, costs and benefits, and to more accurately attribute costs and benefits to actions taken*
4. *Report performance against guidelines and principles through an annual report*
5. *Develop maintenance guidelines and schedules to meet the recommendations for improving energy efficiency and thermal comfort by upgrading the envelopes of existing buildings*
6. *Revise the energy accounting system to equitably allocate the greenhouse gasses associated with the production of steam and co-generated electricity*
7. *Work with suppliers and encourage them to conduct their own greenhouse gas inventory and life cycle assessments. Estimate the full greenhouse gas emissions associated with materials and energy purchased and produced, including the embodied energy of supplies and construction materials, and the energy consumed in the production, refinement, processing, shipping, and combustion of energy sources*

College Finances

1. *Make every effort to invest in environmentally friendly, socially responsible areas*

Carbon Neutrality

1. *Develop a carbon offset purchase and management program to compensate for irreducible greenhouse gas emissions*
2. *Purchase Carbon Offsets as a last resort to compensate for irreducible greenhouse gas emissions. Offset 100% of all remaining emissions by 2016*