Clemson University

PRME - Principles for Responsible Management Education
Sharing Information on Progress¹
Report on Progress, September 2012

1. Renewal of Commitment

Clemson University’s commitment to sustainability is fundamental. It is not something new. It is long-standing, deep, and broad. It goes all the way back to our founder and our founding mission.

Sustainable agriculture and a sustainable economy – these were Thomas Green Clemson’s goals in advocating for a college that focused on scientific education and research in the 19th century. These issues are woven into the history of our institution and into the fabric of our academic enterprise across campus and across disciplines.

Because of this history and the state of current global environmental affairs, Clemson University remains constant in its commitment to the principles of PRME. We continue to support research and educational activities promoting the principles of sustainability.

James F. Barker, Ph. D.
President
Clemson University

2. Major Achievements

Sustainable Environment was one of the University’s emphasis areas spelled out in a 10-year plan developed in 2000. We re-committed to that emphasis in the new Clemson 2020 Road Map. Clemson University’s concern for the environment and a sustainable future is reflected in the classroom, in the laboratory and in the field – arenas in which we carry out our missions of teaching, research, and service.

As an institution, Clemson adopted a Sustainable Building Policy in 2004 and a Sustainable Energy Policy in 2008. Clemson had the first LEED-certified public building in South Carolina and has now completed nine LEED-certified projects, with four others in the works. We pledged to reduce overall energy consumption 20% by the year 2020, and to increase energy sourcing from

¹ A sizable portion of the material in this report is taken from the webpages of the Clemson University President’s Commission on Sustainability: www.clemson.edu/administration/commissions/sustainability
renewable resources by 10% by 2025. Energy use and carbon emissions on campus peaked in 2007, and have since declined even though we’ve added to the total square footage.

President James F. Barker was a charter signatory to the Presidents’ Climate Commitment, and Clemson is a member of the Association for the Advancement of Sustainability in Higher Education. In 2009, we established the President’s Commission on Sustainability with broad representation from every segment of the university community and responsibility to develop a comprehensive Sustainability Plan. The first draft of the plan was filed with the American College and University President’s Climate Commitment in December 2010. It envisions the University as a living/learning laboratory where students are the top priority and sustainability is valued and integrated into every department and every discipline. The goal to be carbon neutral – a Net Zero Campus – by 2030 is particularly ambitious and aggressive. It will touch every aspect of campus life. It will require a comprehensive approach, including significant cultural and behavioral changes. We also need to make major upgrades and investments in our aging campus infrastructure and eliminate the use of coal on campus.

2.1 Curriculum Change

Principle 1

Purpose: We will develop the capabilities of students to be future generators of sustainable value for business and society at large and to work for an inclusive and sustainable global economy.

Principle 2

Values: We will incorporate into our academic activities and curricula the values of global social responsibility as portrayed in international initiatives such as the United Nations Global Compact.

Clemson University is dedicated to providing sustainability educational opportunities to all students regardless of college or major. A sample of the class offerings in all disciplines is listed below and the set is increasing annually. This also includes co-curricular opportunities.

The following undergraduate courses are available:

Agricultural Biotechnology SSCS 335: Strategies for the best use of biotechnology and genetic resources to alleviate constraints in global hunger, environmental sustainability, and health. Includes genetic enhancement and chromosome engineering of plant, animal, and microbial systems; issues related to commercial implementation; the impact on developing countries, environmental impact, and governmental policies.

Beneficial Soil Organisms in Plant Growth CSENV 490: Aspects of biological nitrogen fixation, mycorrhizal fungi, microbial-pesticide interactions, bioremediation, nutrient cycles, and biological pest control related to plant growth, soil/environmental quality; and sustainable agriculture are covered.
Ecological Engineering BE 424: Focuses on engineering solutions to environmental and socioeconomic problems using ecological design principles. Explores ecosystem processes as they pertain to sustainable development, natural resource protection, food and energy production, waste management, and environmental restoration. Engineering fundamentals and ecological modeling are integral components of this course.

Experiences in Sustainable Development: Water GEOL 270: Integrates cross-disciplinary perspectives on sustainability through active student participation in real-world development projects. Focuses on identifying and overcoming environmental, technical, organizational, social, and economic barriers to the sustainability of water resources. Emphasizes small-scale international water resources development.

Design Implementation I LARCH 262: Basics of landscape architecture construction methods and construction documents, including site information gathering and analysis, basic site grading and drainage, cut and fill, principles of storm water management, and sustainable land management related to implementation. Includes explorations in hand and computer graphic techniques used in construction drawings.

Design Implementation II LARCH 362: Advanced landscape architecture construction methods and construction documents, including site information gathering, analysis, site grading and drainage, cut and fill, principles of storm water management, sustainable land management related to implementation, materials research and use, sustainable planting strategies, site demolition and construction management. Includes explorations in appropriate graphic communication techniques.

Macromarketing MKT 445: Examines the relationship between marketing and society, focusing on the social impact of marketing practices. Topics include technology, ethics, materialism, globalization, environmental sustainability, and the political and economic philosophy underlying marketing. Course is multidisciplinary and uses a variety of readings to cover each topic area.

Natural Resource Use, Technology, and Policy APEC 457: Focuses on economic analyses of actual, efficient, and sustainable uses of natural resources, impacts of technologies that affect these uses, and policies that affect development and use of such technologies. Resource-technology-policy combinations may vary, but an example is crude oil, hybrid automotive engines, and fuel economy standards.

Packaging Design Theory PKGSC 320: Study of human factors psychology as it relates to product and package development. Lecture topics center on advanced color theory, space, shape, texture, pattern, typography, branding, marketing, consumer studies, ergonomics, sustainability, and applied packaging. Laboratory focuses on developing retail packaging through applying course theory, group development and peer critique.
Organic Vegetable Production HORT 456: The objectives of the course are to introduce students to the concepts of sustainable agriculture and certified organic vegetable production through an experiential learning environment at the Clemson Student Organic Farm. The course will cover a wide range of topics related to organic vegetable production including fundamentals of sustainable and organic agriculture, site selection, preparation of the vegetable growing area, variety selection and planting, cultural practices to manage insects and diseases, and harvesting.

Pollution Prevention and Industrial Ecology EE&S 486: Topics include pollution prevention technology, the role of pollution prevention within a corporation, source reduction and recycling assessments, treatment to reduce disposal, life-cycle assessment, design for environment, and industrial ecology. Emphasizes case studies.

Sustainable Construction CE 436: Presents the why, what, and how for sustainable construction projects. Students gain a working understanding of how to minimize the negative impacts of buildings and other large construction projects.

Sustainable Landscape Garden Design HORT 308: Landscape planning of gardens using environmentally sensitive design, construction, and maintenance practices. Survey skills to obtain user perception and preference and environmental measurement skills are introduced. Offered fall semester only.

Sustainable Landscape Garden Design Laboratory HORT 309: Landscape garden design using sustainable environmentally sensitive concepts and practices. Techniques of sustainable landscape garden design including hand drawing, site assessment, client interview, user perception survey, plant selection, and professional presentation. Plant selection encourages establishing healthy ecosystems. Emphasis on interactions between design, installation, and maintenance phases.

Sustainability Leadership EE&S 490: Participants, representing Clemson's diverse student body, will learn how principles of economic, social, and environmental sustainability apply in contexts ranging from personal lifestyle choices, to the structure of the built environment, to the operation of public and private institutions. Participants will also develop and practice skills to act as agents of change in the University and the broader community. We will use our local, regional, national, and global communities as laboratories for studying sustainability, leadership and social advocacy.

Urban Design Studio LARCH 352: Landscape architectural design in the urban context. Students study urban issues and offer design and sustainable management solutions for urban areas. Includes readings and theory component as well as an opportunity to collaborate with architecture students.

Technology, Environment, and Sustainability PHIL 340: Philosophical examination of how technology contributes to significant environmental change. Considers role of science in
justifying claims about (for example) global climate change, role of technology in responding to these changes, how technology affects relations between humans and the extra-human world, and ethical implications of various kinds of technology.

The following graduate courses are available:

*Architecture & Health Studio: Selected Projects ARCH 895*: Studio for students in Architecture + Health Concentration offering selected projects engaging a variety of health-related topics from health community design, sustainable/green architecture, long-term care and community health-care projects associated with health and wellbeing. Projects executed are similar to professional practice, combining teamwork with individual design alternatives.

*Architectural History and Theory IV ARCH 864*: Investigation of emerging architectural trends and urban phenomena prepares students for advanced history/theory electives, independent research and architectural practice in the decades ahead through the study of such topics as globalization and non-western architecture, mega-cities, sprawl and urbanization, energy and infrastructure, landscape and urban design, science and sustainability.

*Beneficial Soil Organisms in Plant Growth CSENV 690*: Aspects of biological nitrogen fixation, mycorrhizal fungi, microbial-pesticide interactions, bioremediation, nutrient cycles, and biological pest control related to plant growth, soil/environmental quality; and sustainable agriculture are covered.

*Building Design and Construction Principles ARCH 820*: Essential principles for quality design and construction. Emphasis is on design, programming, and sustainability issues for different project types. Nature and characteristics of construction materials, equipment, and systems used in modern buildings are presented as well as how they affect function and feasibility.

*Building Processes: Technical Resolution ARCH 874*: Develops the designer’s ability to assess, select and conceptually integrate structural systems, building envelope systems, environmental systems, life-safety systems and building service systems in a sustainable building design.

*Environmental Sedimentology GEOL 814*: Environmental-based applications of sedimentology to developing an understanding of heterogeneity and scale, fluid flow and saturation, sediment-fluid interactions, and modeling approaches; field and laboratory methods; case studies; implications to environmental sustainability.

*Environmental Systems Analysis EE&S 820*: Analysis of a systems view of environmental problems, with particular emphasis on conflicting objectives such as economic and environmental concerns. Example problems span traditional environmental engineering processes, natural resources, proactive environmental management and sustainability.

*Natural Resource Use, Technology, and Policy APEC 657*: Focuses on economic analyses of actual, efficient, and sustainable uses of natural resources, impacts of technologies that affect
these uses, and policies that affect development and use of such technologies. Resource-technology-policy combinations may vary, but an example is crude oil, hybrid automotive engines, and fuel economy standards.

*Pollution Prevention and Industrial Ecology EE&S 686*: Topics include pollution prevention technology, the role of pollution prevention within a corporation, source reduction and recycling assessments, treatment to reduce disposal, life-cycle assessment, design for environment, and industrial ecology. Emphasizes case studies.

*Rural Sustainable Development: Evolution of Public Policy POST 851*: Formulation of current national and local public policies that impact rural community development; the constraints and opportunities they provide; interaction among government institutions, decision makers and interest groups; associated influence on rural sustainability.

*Seminar in Sustainable Development POST (CRP) 870*: Concept of sustainable development traced from its historical roots through the popularization of the term in the international development literature; scientific base and the application of sustainability through economic sectors and building practice. Students conduct individual/group research projects.

*Site Planning and Infrastructure CRP 802*: Covers the principles and practice of site planning, including site analysis, site design, infrastructure planning; exploration of site planning options for residential, commercial, office, industrial and mixed-use projects; street network, civic space, and open space planning; emphasis on walkable, mixed-use, transit-oriented, sustainable development.

*Sustainable Business Practices MBA 876*: Examination of emerging field of sustainable business practices and its role in strategy development and implementation. Specific emphasis is on history, science and politics of sustainability, including its effects on production, consumption and environmental impact.

*Sustainable Construction CE 636*: Presents the why, what and how for sustainable construction projects. Students gain a working understanding of how to minimize the negative impacts of buildings and other large construction projects.

*Sustainable Event Management PRTM 849*: Examines the impacts events have on the environment. Practices related to reduction of social and environmental impacts events have are discussed. Topics include green positioning, carbon reductions, water use and conservation, ethics, and waste management.

*Sustainable Infrastructure Systems CE 839*: Covers sustainable infrastructure systems with emphasis on science-based tools to design and analyze these systems. Examines theoretical background and specific cases for topics including life-cycle assessment, systems analysis and economic valuation for sustainability.
Sustainable Tourism: Myth or Reality? PRTM 850: Provides students with exposure to issues related to developing sustainable tourism, both in developing and developed countries. Emphasis is on understanding global and local politics, policies, environments, and social and cultural impacts stemming from developing sustainable tourism.

2.2 Method

Principle 3

Method: We will create educational frameworks, materials, processes, and environments that enable effective learning experiences for responsible leadership.

As one of this nation's top public universities with particular emphasis on engineering, the sciences, and economic development, Clemson University has both the capability and the obligation to help develop a sustainable world through the following:

1. The education of its students (our future decision makers and citizens)
2. Cutting edge research
3. Developing a campus culture of conservation and green decisions
4. Outreach beyond the campus, and
5. Establishing world leadership in a green economy

Sustainability has widespread support among Clemson students, and over 86% of our students think Clemson should be a leader in sustainability. As stated in a recent Clemson white paper on Clean Energy: "It is not only appropriate for Clemson to be involved in the development of the green economy, it is mandatory."

We recognize that this process will not be easy or quick. For too many years, energy has been too cheap, lifestyles too carefree, and the environment too neglected. However, one of the best organizations to initiate change is a university. It is HERE that young people learn the way in which the world works, and where they establish their adult lifestyle. It is here that bright minds produce new ideas and it is here that educators can seek to interlace with the world beyond the campus.

Clemson is already a leader in many areas of sustainability. In the areas of engineering, science and economic development a number of institutes, initiatives, and student organizations support and measure our success:

- International Center for Automotive Research (CU-ICAR)
- Clemson University International Center for Wind Energy Systems
- Clemson University Restoration Institute (CURI)
- Recognition as a Center of Excellence for Watershed Management (by EPA)
- Advanced Materials Center
- Arthur Spiro Institute for Entrepreneurial Leadership
- Small Business Development Center
In the area of student development:

- Creative inquiry programs where undergraduates solve open ended problems
- Courses and degrees related to sustainability
- Service opportunities for undergraduate students
- Research and internship programs for undergraduate and graduate students alike

In campus culture through peer and campus organizations:

- Solid Green
- Clemson Student Chapter of the Wildlife Society
- Tigers for Tigers
- Beyond Carbon
- USGB Youth Student Chapter
- Entomology Club
- Students for Environmental Action
- Creative Inquiry Teams
- Dirt to Food
- Clemson Student Chapter of the Society of American Foresters
- C.A.T. Citizen Action Team

2.3 Research

Principle 4

Research: We will engage in conceptual and empirical research that advances our understanding about the role, dynamics, and impact of corporations in the creation of sustainable social, environmental and economic value.

There have been numerous Clemson publications in recent years exploring sustainability and the world around us. For example, Dr. Leidy Klotz, Associate Professor of the Civil Engineering department, and current member of the President's Commission for Sustainability, has headed and conducted a number of initiatives, courses and studies that relate to sustainability and mark him as a pioneer in the sustainable research area. He has also written and contributed to a number of recent publications covering areas such as sustainable construction, design process evaluation for sustainable buildings, cognitive biases surrounding commercial building processes, the promotion of intra-campus collaboration, and numerous other concentrations that are invaluable contributions to Clemson's research exploring ways to live sustainably.

Areas of additional research include the following:

- Environmental Toxicology: Department of Biological Sciences - Gia-Ming Hung
- Thermal Inactivation during Composting: Department of Biological Sciences - Rhandir Singh
- Diversity, habitat use and Conservation of Herpetofauna: Department of Biological Sciences - Thilina Surasinghe
• Plant Ecology: Department of Biological Sciences - Isaac Park
• Water’s Demand on Energy at Clemson: Department of Environmental Engineering - David Ladner
• Materialism and Sustainability: Department of Marketing - William Kilbourne
• Lean Production Systems: Department of Management - Larry Fredendall
• Sustainable Supply Chains: Department of Management - Aleda Roth
• Sociology of Sustainability: Department of Sociology and Anthropology- Catherine Mobley

2.4 Partnership and Dialogue

Principle 5

Partnership: We will interact with managers of business corporations to extend our knowledge of their challenges in meeting social and environmental responsibilities and to explore jointly effective approaches to meeting these challenges.

Principle 6

Dialogue: We will facilitate and support dialogue and debate among educators, business, government, consumers, media, civil society organizations, and other interested groups and stakeholders on critical issues related to global social responsibility and sustainability. We understand that our own organizational practices should serve as an example of the values and attitudes we convey to our students.

The research Clemson University is conducting in sustainability is broad and continuing to grow. The Sustainable Environment is one of the University’s eight emphasis areas. Our expertise in alternative energy technologies, water resources, sustainable agriculture, the built environment and the natural environment come together to address the challenges of today and tomorrow.

Clemson faculty, staff and students form collaborative partnerships through the Baruch Institute of Coastal Ecology and Forest Science, the Clemson Institute for Environmental Toxicology, the Clemson Environmental Institute, the South Carolina Institute for Energy Studies, the Restoration Institute, the Center for Nuclear Environmental Engineering Sciences and Radioactive Waste Management and the Warren E. Lasch Conservation Center.

3. Key objectives for the next 18 month period

Purpose and Values: Because education is the core of Clemson’s purpose, we will continue to develop courses on sustainability at both the undergraduate and graduate levels.

Method: We will continue to expand creative inquiries on sustainability and to develop a culture of conservation on campus.
Research: We will continue to encourage and support research on issues both directly and indirectly related to sustainability.

Partnership and Dialogue: We will encourage and support collaborations between Clemson University and both business and other academic institutions such as the relationship recently established with the University of Aarhus in Denmark.

4. Desired Support

In addition to sharing reports of other universities, a forum for discussing current initiatives and approaching them, information on collaborations between universities, and a syllabus repository for sustainability classes would be very valuable to all participants.

5. Sustainability on Campus

Sustainability is an integral part of the Clemson experience. Currently, many courses in various areas of sustainability are offered, and students can choose to major in 17 different areas and minor in 12.

Clemson University is committed to carbon neutrality, or a "net zero” carbon footprint.” This means achieving net zero carbon emissions by balancing carbon dioxide released with an equivalent amount of renewable energy, or with offsetting emissions through planting trees that, in turn, could help prevent future greenhouse gas emissions.

Net-Zero Strategy Challenge:

As of 2007, Clemson University signed joining more than 750 colleges and universities towards working for a sustainable future. Of those, Clemson University is one of 93 other institutions with a goal to be a carbon neutral campus; within one generation -- by 2030.

Energy to support activities at the University is a major percentage of the direct and indirect carbon emissions attributable to Clemson’s carbon footprint. The NetZero Strategy seeks to develop and implement collaborative campus energy programs that will significantly reduce our carbon emissions related to Clemson’s energy consumption and provide sufficient renewable energy offsets towards the University’s goal to achieve carbon neutrality.