Oregon State University Climate Plan

A Strategic Plan for Institutional Climate Neutrality

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1. Acknowledgements

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2. Definitions of Key Terms

1) **"Carbon dioxide"** (CO_2) means the chemical compound containing one atom of carbon and two atoms of oxygen.

2) **"Carbon dioxide equivalent"** (CO_2e) represents the quantity of a greenhouse gas multiplied by a Global Warming Potential (GWP) factor, relative to CO_2. This is the "standard unit" used to quantify various greenhouse gasses.

3) **"Global Warming Potential factor"** (GWP) means the radiative forcing impact of one mass-based unit of a given greenhouse gas relative to an equivalent unit of carbon dioxide over a given period of time. For instance, methane (CH_4) has a GWP of 23, meaning that every gram of methane will trap 23 times as much solar radiation as a gram of CO_2.

4) **"Greenhouse gas"** (GHG) is any gas that contributes to anthropogenic global warming including, but not limited to, carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

5) **"Metric ton", "tonne,"** or **"metric tonne" (t)** means one metric tonne (1000 kilograms) or 2204.62 pounds.

6) **"Total emissions"** or **"Gross emissions"** are the calculated sum of GHGs emitted due to OSU-related activities.

7) **"Net emissions"** is the calculated sum of GHGs emitted minus renewable energy certificates, composting activities and carbon offsets.

8) **"Emissions sources"** are distinct sources of greenhouse gases. Athletics air travel, student commute and fertilizer are examples of emissions sources.

9) **"Emissions categories"** are high-level groupings of related emissions sources. Air travel, ground transportation and agriculture are examples of emissions categories.

10) **"Mitigation strategies"** are distinct groups of actions that will reduce or mitigate net emissions. Three are used here: conservation and efficiency; renewable energy and fuels; and carbon offsets and renewable energy certificates (RECs).

11) **"Renewable energy source"** means any source of energy that is replenished rapidly by natural processes. Renewable sources include, but are not limited to, wind, solar, hydroelectric, biomass, geothermal, tidal or sea currents, etc.

12) **"Renewable Energy Certificate"** (REC) is a tradable certificate that represents a unit of energy produced by renewable energy sources. Owners of RECs can claim that they are using renewable energy equal to the amount of RECs they own.

13) **"Renewable energy fee"** or **"Green fee"** refers to the student-approved initiative that directs $8.50 per term per student towards the purchase of RECs. These RECs offset a large percentage of OSU's electrical consumption with additions of clean, renewable energy to the electrical grid.

14) **"Carbon offsets"** are reductions of greenhouse gases that can be used to counteract emissions from other activities, measured in metric tonnes of CO2e. While similar, carbon offsets are not the same as Renewable Energy Certificates (RECs).

15) **"World Business Council for Sustainable Development (WBCSD)"** is a global association of business representatives that deals exclusively with business and sustainable development.

16) **"Intergovernmental Panel on Climate Change (IPCC)"** is a scientific body established to provide policymakers with an objective source of information on climate change. The IPCC performs no research, nor does it monitor climate data; instead it offers analysis of research and climate data as an objective body representing a broad range of views and expertise as well as wide geographical coverage.

17) **"American College and University Presidents Climate Commitment"** (ACUPCC) is an effort to encourage commitments from institutions of higher learning to neutralize greenhouse gas emissions and prioritize the research and education efforts aimed at stabilizing earth's climate.

3. Executive Summary

By signing the American College and University Presidents Climate Commitment (ACUPCC), OSU has committed to achieving climate neutrality, defined by the ACUPCC as "having no net greenhouse gas (GHG) emissions." The OSU Climate Plan charts a timeline and outlines strategies for achieving climate neutrality by 2025. By setting aggressive yet attainable goals, OSU positions itself as a leader in addressing global climate destabilization.

Upholding OSU's Strategic Plan and mission of promoting "economic, social, cultural and environmental progress for people across Oregon, the nation and the world," the Climate Plan is divided into three parts:

- Infrastructure
- Education and Community Engagement
- Research

In this plan, OSU commits to the following goals:

- By 2010, arrest the growth of greenhouse gas emissions and begin to reduce emissions.
- By 2012, achieve net greenhouse gas emissions at least 10 percent below 1990 levels.
- By 2020, achieve net greenhouse gas emissions at least 75 percent below 1990 levels.
- **By 2025, achieve net climate neutrality**.

OSU's net emissions totaled 117,211 metric tonnes carbon dioxide-equivalent in Fiscal Year 08. With early action, OSU should be able to mitigate its emissions without paralyzing the institution with long-term costs by using a combination of three primary mitigation strategies:

1) conservation and efficiency projects
2) on-site renewable energy installations
3) carbon offsets, renewable energy certificate purchases, and other off-site measures.

Mirroring the emphasis of the ACUPCC, campus infrastructure is the focus of the Climate Plan. OSU's reportable emissions result from its buildings, equipment and other activities (solid waste, air travel, etc.). Education, community engagement and research are also central themes and are required by the ACUPCC to be addressed.

For education and community engagement, OSU shall

- Incorporate sustainability and climate change into the curriculum and ensure that graduating students are exposed to these topics through experiential learning and other mechanisms
- Make the OSU community aware of climate change resources, as well as create new and strengthen current connections beyond the campus boundaries.

With regard to research, OSU shall

- Increase visibility and coordination of existing climate research, as well as encourage the growth of 'top tier' climate research through various mechanisms.

4. Introduction

An increasingly strong scientific consensus has identified global climate destabilization as one of the pressing issues of our time. According to the Intergovernmental Panel on Climate Change 2007 Summary for Policymakers, "Unmitigated climate change would, in the long term, be likely to exceed the capacity of natural, managed and human systems to adapt."

As one of only two institutions in the United States with land, sea, space and sun grant designations, as well as being ranked by the Carnegie Foundation as having "very high research activity," Oregon State University (OSU) has significant potential to make major contributions to human understanding of and adaptation to global climate change, while demonstrating real ways to reduce human impact on the Earth's climate.

OSU is emerging as a national leader in sustainability and has been recognized by organizations like the US Environmental Protection Agency and the Sustainable Endowments Institute as a leader in campus sustainability, ranking in the top 25 colleges and universities in the nation. OSU has many highly ranked programs and a research focus on earth ecosystems that position us well to achieve sustainability goals[1].

OSU recognizes the potential of organizing these efforts into a comprehensive sustainability strategy. In signing the American College and University Presidents Climate Commitment (ACUPCC), OSU President Ed Ray prompted the university to undertake a strategic planning process for achieving climate neutrality. As stated in the ACUPCC, OSU has committed to:

> Within two years of signing this document, develop an institutional action plan for becoming climate neutral, which will include
>
> i. A target date for achieving climate neutrality as soon as possible.
>
> ii. Interim targets for goals and actions that will lead to climate neutrality.
>
> iii. Actions to make climate neutrality and sustainability a part of the curriculum and other educational experience for all students.
>
> iv. Actions to expand research or other efforts necessary to achieve climate neutrality.
>
> v. Mechanisms for tracking progress on goals and actions.

1 The journal Conservation Biology ranked OSU's conservation biology program No. 1 in North America.
OSU ranks 17th among all U.S. universities in R&D expenditures in Environmental Sciences.
Oregon Sea Grant at OSU is the nation's top-ranked Sea Grant program.
U.S. News and World Report in 2007 ranked the Oregon Master of Public Health Program (OMPH) in community health second in the nation.
OSU ranks sixth in the United States and eighth globally in coral reef research cited for its scientific significance.

As a sustainability leader, OSU would seem well positioned to move easily toward climate neutrality. However, the challenges faced by this institution to truly achieve a climate neutral state are as daunting as they are for most large public research institutions.

4.1 Climate Plan Organizational Framework

In the same way that the OSU Strategic Plan enables the university to represent its mission on a broad scale, a strategic effort is necessary to articulate OSU's institutional vision of moving toward climate neutrality. Indeed, this climate plan addresses the strong emphasis on sustainability in the Strategic Plan, which outlines the following Signature Areas of Distinction:

- Advancing the Science of Sustainable Earth Ecosystems
- Improving Human Health and Wellness
- Promoting Economic Growth and Social Progress

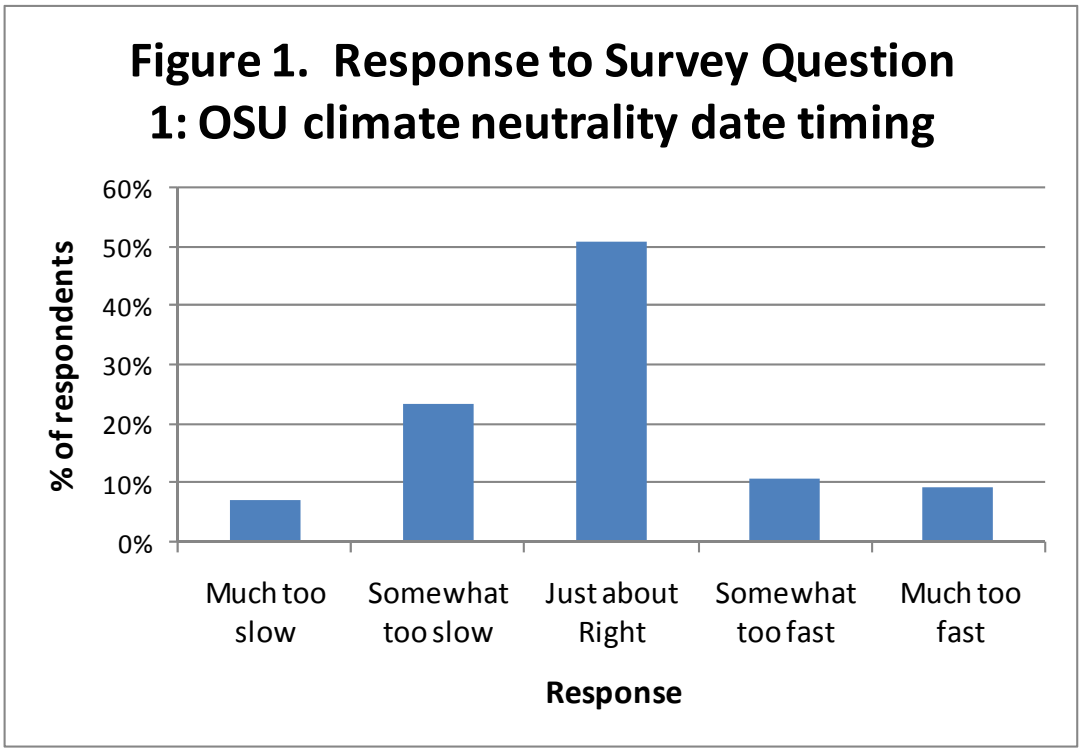
Building on the OSU Strategic Plan and other planning efforts, this document identifies a strategic framework for achieving climate neutrality at Oregon State University. Although a strategy is outlined in this plan, not every implementation tactic is specified. Because of the size and complexity of OSU, a separate living document will be developed which will introduce a more comprehensive set of tactics than can be detailed here. Since a full implementation plan will contain potentially hundreds of actions, this document contains a set of example actions associated with each goal and strategy. These example actions are included to give a clearer impression of the strategic direction outlined in this plan.

The process of developing these goals, actions and strategies involved small workgroups of volunteers who ranged from graduate students, to teaching faculty and university administrators. To minimize the amount of time contributors spent in meetings, the bulk of the development work fell to the staff of the OSU Sustainability Office. Refinement of ideas and documents also occurred electronically between and during meetings in a collaborative electronic workspace that was set up to facilitate brainstorming. Additional input was collected at campus events like Earth Week.

Announcements were distributed campus wide prior to a climate planning kickoff meeting which was attended by 14 people. This event built on work that had started in the summer of 2008 with a group of graduate students from the Global Environmental Change Organization (GECO), who reviewed other climate plans to find themes that would apply to OSU.

After the timeline and strategies were drafted, an electronic survey was distributed campus-wide to collect feedback on the timing of the 2025 climate neutrality target, and the appropriateness of the strategies to reach that target. With over 1,100 responses received as of September 15, 2009, the majority of survey respondents have indicated agreement with the

timeline and strategies. Surprisingly, the survey revealed that the campus community leans toward an earlier target than the 2025 climate neutrality goal (Fig. 1).



The survey did not use random sample methodology, nor was it scientific. However, it did demonstrate widespread interest in sustainability and climate-related issues within the OSU community. The OSU Climate Plan is not the only institutional effort to reduce OSU's carbon footprint, and this work is supported by other planning, tracking and implementation efforts. For example, when it is available, OSU will use the Sustainability Tracking, Assessment and Rating System (STARS) from the Association for the Advancement of Sustainability in Higher Education (AASHE). AASHE has indicated that STARS will be released in 2009.

It is assumed that the Climate Plan, its implementation documents, STARS, Oregon University System and State of Oregon goals, combined with existing campus efforts, will round out Oregon State University's efforts to manage common sustainability and climate change issues. By applying these methods, OSU can expect to remain among the top 25 institutions in the United States addressing sustainability and climate issues.

This Climate Plan is divided into three primary "chapters" meant to address the specific components of the ACUPCC (items i-v above):

- Infrastructure – focuses on the operational components of the university, including building operation, transportation, and other business practices. This chapter addresses items **i, ii** and **v** above.
- Education and Engagement – discusses campus community learning, including curriculum, experiential learning and employee and community engagement. This chapter addresses item **iii** above.
- Research – outlines institutional research strengths on which future actions can be built. This chapter addresses item **iv** above.

The three chapters each contain two primary sections, the purposes of which, respectively, are to

1. Highlight points from Phase II of the OSU Strategic Plan relevant to the ACUPCC and the Climate Plan.
2. Share additional information and campus community input gathered and formulated during the climate planning process.

Many Supporting Activities advance specific Strategic Plan Phase II elements.

As an educational enterprise and a land, sea, space and sun grant institution, Oregon State University has the potential to be tremendously effective in mitigating climate-changing activities worldwide. However, the vast majority of this positive impact will not occur within university-owned systems or properties. As a result, and given current measurement protocols, it is difficult to quantitatively acknowledge OSU's impact on global greenhouse gas reduction.

As discussed in more detail in the Research chapter, OSU is engaged in scholarship examining mitigation techniques as well as research activities studying – and in many cases reducing – greenhouse gas emissions and global climate change impacts.

Similarly, one of OSU's largest positive impacts is the education provided to its students. As explained in the Education and Engagement chapter, the university expects to emphasize curriculum that advances the OSU Strategic Plan's three Signature Areas of Distinction, which stress the importance of "improving the understanding of the earth ecosystems upon which all life depends, and promoting their sustainability."

Because OSU graduates are expected to have some exposure to climate, sustainability and natural resources issues, it is likely that they will reduce in some amount global greenhouse gas emissions as they enter the workforce, in whatever profession they choose. However, as with the impact of OSU research activities, it is difficult to measure and attribute the resulting emissions reductions. The strategies outlined in the Education and Engagement chapter aim to broaden students' exposure to these concepts during their academic careers at OSU.

4.2 Strategies and Imperative

4.2.1. College and Department Strategies

While strategic efforts undertaken by several individual OSU departments and colleges will be addressed in each of the three chapters, there are a number of cross disciplinary efforts worth noting here.

Specifically, several OSU colleges have identified sustainability and climate issues as core components of their college strategic plans, as summarized in the table below.

College of Agricultural Sciences (2004)

- The Oregon Agricultural Experiment Station plans and carries out its work in the agricultural, biological, social, and environmental sciences. Its director is also the dean of the College of Agricultural Sciences. Research is targeted to improve Oregon's economic, social, and environmental well-being and sustainability.
- As part of its Vision, the Oregon State University College of Agricultural Sciences is a responsive force for fostering economic growth and sustainability.

College of Business Strategic Plan (February 2007)

- Strategic Initiative – Entrepreneurship and Innovation. Provide expertise and knowledge in developing sustainable business practices and new products, processes and organizational forms.
- Desired Capabilities – Education Programs. Offer high quality business education integrating information technology, ethics, sustainability, the global economy, and the entrepreneurial process.
- Scholarship Objectives and Actions – Measures to assess progress in meeting required capabilities for "Scholarship". Faculty publication and productivity especially in family business, sustainability, and entrepreneurship and innovation.
- Infrastructure Objectives and Actions – Maintain the physical facilities and implement sustainable practices. Establish baseline to measure sustainable practices in the building and implement best practices.

College of Engineering FY06-07Business Plan (2006)

Within the Business Plan, COE identifies an Energy Systems research cluster, the goal of which is to develop innovative alternative energy systems capable of providing electric power or transportation fuels using centralized or distributed energy sources, while creating new industries and family-wage jobs in Oregon.

Launched in 2009, the Sustainable Energy & Infrastructure (SENERGI) initiative addresses issues of supply and environmental impact simultaneously, through

three objectives:

1. **Discover high-impact solutions**, exploring multiple pathways to energy independence.
2. **Commercialize breakthroughs,** and put sustainable energy solutions to work through industry partnerships, spinoff companies and technology licensing.
3. **Develop engineering leadership** by incorporating the latest clean and renewable energy concepts into the curriculum, involving both undergraduate and graduate students in research projects and providing hands-on experience through internships with industry partners.

College of Forestry Strategic Plan (Spring 2002)

- Three overarching themes that encompass our goals: …Broaden and diversify interests and scope of programs…Become the world leader in interdisciplinary approaches to achieving sustainability of forest resources.
- Seven major factors that will influence the College's future. The world and the workplace require professionals who possess and are comfortable with diverse ideas, perspectives, and cultures. The College aims to produce a diverse community of graduates who will enrich society, solve complex problems, and help achieve sustainability.
- Goals of the College of Forestry – Develop collaborative and interdisciplinary approaches to address complex issues through teaching, research, and extended education. Expand activities of the Sustainable Forestry Partnership.

College of Oceanic and Atmospheric Sciences Strategic Plan (Executive Summary, 2008)

The COAS scientific focus has long been on integrative Earth System Science with emphasis on the impacts of global scale processes on the Pacific Northwest. This focus directly supports the College's goal to ensure the long-term ecological and economic sustainability of our region through fundamental research, technology development, and the creation of meaningful partnerships within the University, with government agencies at all levels, and with the private sector.

Table 1. Highlighted "Sustainability" Statements in OSU College Strategic Plans
(Modified from "Sustainability at Oregon State University," *OSU Institute for Natural Resources)*

4.2.2. OSU Strategic Plan - Phase II

In 2008-2009, Oregon State University embarked on an effort to create Phase II of its 2004 *Strategic Plan for the 21st Century.* This effort included adopting a single overarching imperative and two instituting educational action commitments to guide the university from 2009-2013. Phase II also refined the 2004 Strategic Plan thematic areas into three new Signature Areas of Distinction:

- Advancing the Science of Sustainable Earth Ecosystems
- Improving Human Health and Wellness
- Promoting Economic Growth and Social Progress

Strategic Plan Imperative and Action Commitments

The Imperative identified in Phase II of the Strategic Plan is to *foster exceptional education research and outreach initiatives that sustain human well being and improve the quality of human life*. Acting on this imperative requires understanding diverse, complex interactions among populations, demographics, human health, climate, access to natural resources (including safe food, clean water and air, and wood products), sustainability, economic vitality, cultural diversity, and new technologies, among others. Well-being and quality of life are enhanced by the fine and performing arts and the humanities and social sciences, which promote understanding and improvement in human interactions within and across cultures.

Phase II includes two commitments, paraphrased here:

1. OSU will lead in developing a globally competitive workforce and an informed and capable citizenry. Students will acquire the understanding of major political, social and intellectual trends – and the functions of the natural world – necessary to address complex academic and research problems.
2. OSU will address multifaceted national and global challenges that resist simple technical or social solutions.

Strategic Plan Signature Areas of Distinction

While all three areas of distinction have traceable connections to principles within the sustainability movement and ties to human understanding of and influence on climate change, the Signature Area of *Advancing the Science of Sustainable Earth Ecosystems* outlines a strategic direction that most directly meets the tenets of the ACUPCC.

The *Ecosystems* Signature Area goes on to be defined as OSU's opportunity to create superior learning opportunities for students by

> Improving the understanding of the earth ecosystems upon which all life depends, and promoting their sustainability through high-impact public policy involvement with issues such as climate change, food security and safety, renewable energy production, and economically viable natural resource management.

The *Ecosystems* Signature Area developed out of OSU's understanding of historical environmental problems associated with the era since the Industrial Revolution. Complications

generated by population growth, economic activity and consumption of fossil fuels have prompted OSU leadership to identify consequences for oceans, forests, agricultural lands, fresh water and the atmosphere.

This signature area also identifies future challenges at both the local and global scales:

- linking the drivers of climate and ecosystem change to their impacts on natural and human systems
- assessing strategies to mitigate the human "footprint" (such as carbon sequestration, consumption moderation and resource conservation)
- formulating strategies that balance sustainable environmental, social, and economic systems.

OSU has several top-ranked programs that give it tremendous advantages in the study of earth ecosystems. Also, synergy has been attained as a result of the close proximity and interdisciplinary interaction of faculty and students from these programs. Capabilities in these areas represent an opportunity to establish distinctive interdisciplinary educational programs that teach students how to solve problems creatively in the interpenetration of natural and human systems.

5. Infrastructure

5.1 Introduction

In addition to addressing shared areas of concern in general terms, the *Education for Climate Neutrality and Sustainability: Academic Guidance for ACUPCC Institutions* requires that signatory institutions to the American College and University Presidents Climate Commitment (ACUPCC) include detailed sections on Campus Emissions and Mitigation Strategies:

- *Campus Emissions* – describes the institution's current emissions trajectory and sets a target date for climate neutrality. This section should include visual representations of the institution's emissions trajectory under business as usual and under the ACUPCC plan, as well as a graph illustrating the contribution to the institution's total emissions from each emission source.

- *Mitigation Strategies* – shows how the institution intends to achieve climate neutrality. This section should include sub-sections describing how the institution will neutralize emissions from each source.

Climate neutrality is defined by the ACUPCC as "having no net greenhouse gas (GHG) emissions, within a minimum scope of boundaries." This should be achieved by "minimizing emissions as much as possible, and using carbon offsets or other measures to mitigate the remaining emissions."

The "minimum scope of boundaries" is comprised of all Scope 1 and 2 emissions, as well as Scope 3 emissions from commuting and from air travel paid by the institution.

Scope 1 includes direct GHG emissions from sources owned or controlled by the institution such as combustion of natural gas, gasoline, propane and diesel, and other sources. Scope 2 includes indirect emissions from purchased electricity. For more details on OSU emissions within these scopes, please see OSU's greenhouse gas reports webpage.

This Infrastructure chapter contains four primary sections, the purposes of which are to

1. Explain the imperative for a Climate Plan, including references to the Phase II of the OSU Strategic Plan, the Facilities Services' Strategic plan, as well as other reasons to act;
2. Detail current campus emissions, display emissions trajectories, and outline state and institutional emissions goals;
3. Detail reduction goals for each emissions category and the mitigation scenarios and strategies that will enable OSU to meet either state or internal goals; and a financial analysis of scenarios;
4. Describe current and future policies and procedures related to infrastructure.

5.2 Imperative for Action

5.2.1 OSU and Facilities Services' Strategic Plans

In supporting OSU's mission-related activities of education, research and outreach, it is important to model the tenets of the mission in the operation and management of infrastructure. For many disciplines, there are a wide variety of on-campus experiential learning opportunities. Because the operation of this infrastructure is responsible for the real emissions of greenhouse gases (GHGs), infrastructure is a central focus of the ACUPCC and this climate plan. Additionally, as a state institution, OSU is committed to helping meet Oregon's GHG reduction goals articulated by the Governor and Oregon's participation in the Western Climate Initiative.

Strategic Plan Phase II includes "Substantially reducing OSU's carbon footprint" as a university-wide initiative. As such, this Climate Plan represents the first of many steps to implement that portion of the Strategic Plan Phase II.

Facilities Services, the department responsible for developing and maintaining campus infrastructure, has a Strategic Plan that recognizes the need for a "reliable utility infrastructure" and "well-maintained buildings that support our staff." A large portion of the climate plan will focus on buildings and making them more efficient. Efficient buildings are typically healthier for their inhabitants and more reliable with respect to utilities, factors that highlight additional benefits of efficient buildings.

Financial considerations cannot be ignored. Efficient buildings cost less to operate than their less-efficient counterparts. By using resources efficiently, emissions of GHGs are reduced and financial savings are realized. The economic benefit of building efficiency is as much a priority as the environmental benefit, and many emissions reduction actions will yield cost savings.

5.2.2 Other Reasons to Act

Beyond what is stated in the strategic plans, there are numerous reasons why OSU should act to reduce its emissions.

- Reduce energy expenses and buffer the effects of volatility in the energy markets
    - Energy conservation and efficiency projects have associated cost-savings, which will reduce OSU's operating costs and improve long-term financial health. A reduced level of energy consumption will reduce OSU's risk to the often-volatile energy markets.
- Reduce the exposure of the university to future regulation

    - Legislation is currently being proposed that could cap or tax carbon emissions. By acting now, OSU minimizes its exposure to the effects of this legislation and the resulting changes in the carbon market.
- Increase research and educational opportunities
    - The design, construction and implementation of new technologies and practices that reduce emissions will require significant investments in research and education. Institutions could achieve win-win-win scenarios, by attracting R&D dollars, offering experiential learning opportunities and reducing emissions.
- Appeal to the desire of students, faculty and staff, and the community
    - Stakeholders have demonstrated significant interest in OSU's environmental impacts. 70% of voting students voted 'Yes' to install the $8.50 per term 'Green Fee' which purchases renewable energy certificates (RECs).
- Be a leader in an area where OSU holds significant scientific clout
    - OSU is nationally recognized for its research. These fields are all closely related to climate, and strategic action by the institution to reduce the institution's emissions fits with OSU's scientific reputation.

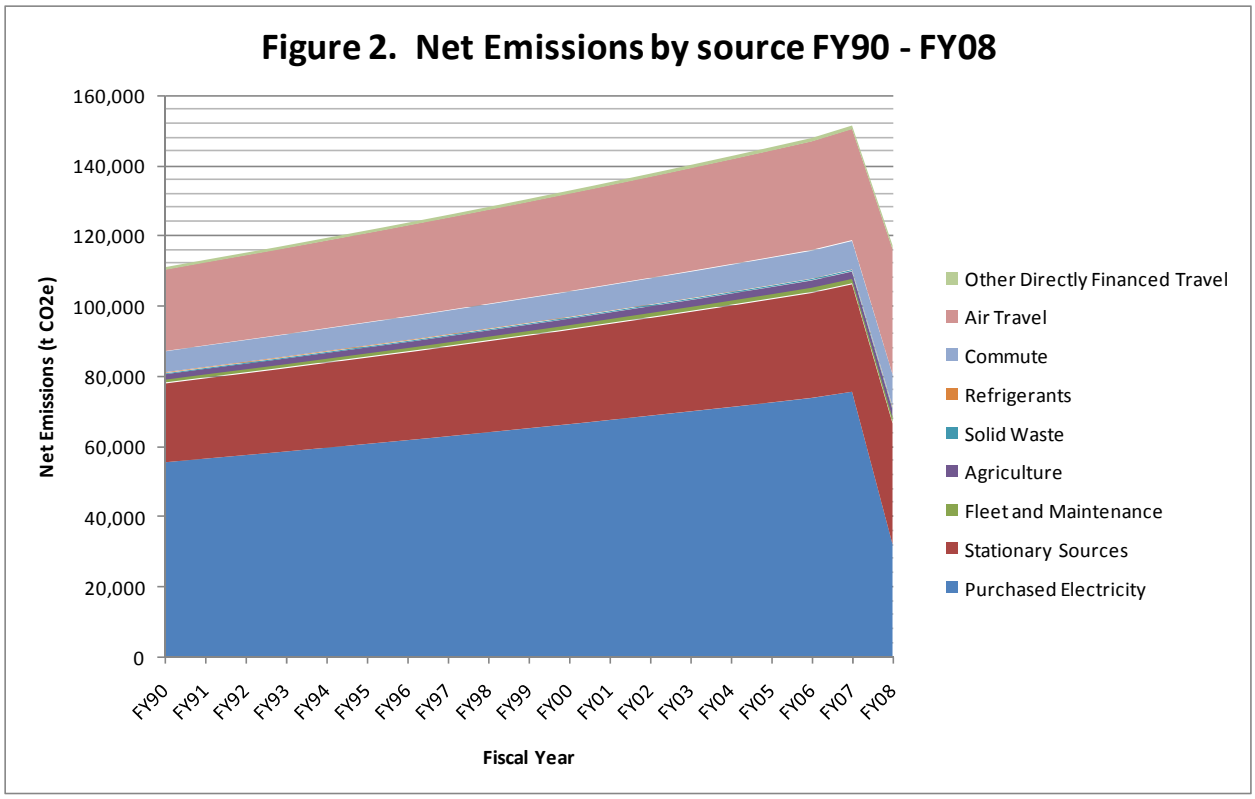
5.3 Emissions, Trajectories and Goals

5.3.1 Current Emissions

In Fiscal Year 2008, OSU had total gross emissions of 170,197 metric tonnes (t) of carbon dioxide-equivalent (CO2e). This represents a 2.3% increase from FY07. Net emissions were 117,210 t CO2e, a 29.6% decrease from FY07. The majority of this decrease was due to the student-funded purchase of renewable energy certificates (RECs). Emissions by source are displayed in Table 2. In Figure 2, emissions from FY90 to FY08 are shown graphically by source.

Table 2. Emissions by Source

Source	FY07	FY08
Purchased Electricity	93,167	85,093
Stationary Sources	31,326	34,472
Fleet and Maintenance	3,119	1,699
Agriculture	2,222	2,371
Solid Waste	346	357
Refrigerants	1,845	273
Commute	4,504	9,132
Air Travel	14,759	35,653
Other Directly Financed Travel	0	1,148
Total Gross Emissions	151,288	170,198
Renewable Energy Credits (RECs)	(1,234)	(52,981)
Compost 'credits'	(1)	(6)
Net Emissions	150,053	117,211



It should be noted that the emissions reported above are not comprehensive; potentially large emissions sources like embodied energy of purchased goods, emissions from construction, and long-distance student travel (for study abroad, travel to/from home and university, etc.) are not included. However, the emissions reported above meet and exceed the reporting requirements of the ACUPCC. OSU will continue to use the existing scope included above for reasons detailed in the FY08 Greenhouse Gas Inventory Report.

5.3.2 Emissions Trajectory and Goals

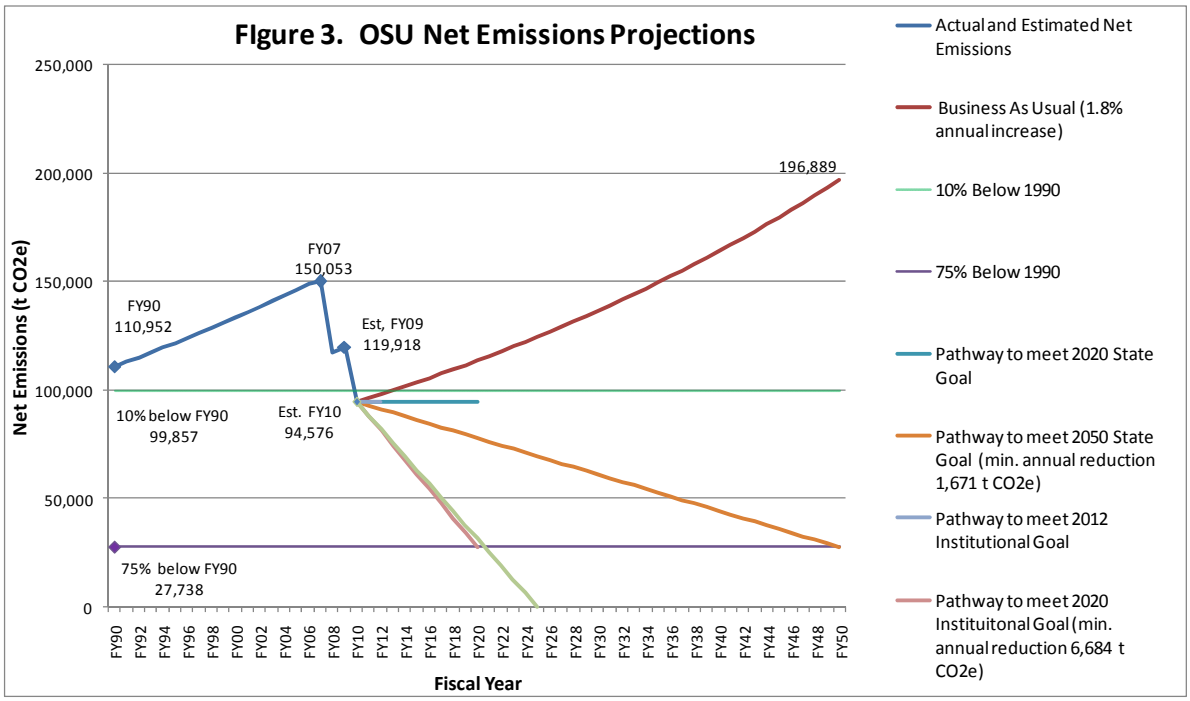
Due to the low availability of data needed to create an historically accurate greenhouse gas profile, it is difficult to measure historical emissions prior to 2003. Using a compilation of recent and sporadic historical data, a rough estimate of FY90 emissions and annual growth of emissions were possible. The analysis estimated

- FY90 emissions of approximately 111,000 t CO2e
- Annual gross emissions increases of approximately 1.9%

Annual growth of emissions would continue at this rate in a business-as-usual scenario. A major capital project, the Energy Center, will make an immediate and long-lasting impact on emissions. This co-gen facility will burn fuel (mainly natural gas, but also diesel, and potentially,

biofuels) and create not only steam, but electricity as well. It has been estimated that emissions resulting from electricity will decrease by nearly 50%; natural gas consumption will rise by 16%. Due to these factors, emissions should decrease significantly for FY10 (the first full year the Energy Center will be fully operational).

Past, current and projected emissions are represented in Figure 3.



Governor Kulongoski enacted with Executive Order 06-02, and the Legislature ratified with HB3543, the following state greenhouse gas emissions goals:

- By 2010, arrest the growth of greenhouse gas emissions and begin to reduce greenhouse gas emissions.
- By 2020, achieve greenhouse gas levels that are 10 percent below 1990 levels.
- By 2050, achieve greenhouse gas levels that are at least 75 percent below 1990 levels.

With respect to the timing of greenhouse gas emissions reductions, the IPCC 2007 Summary for Policymakers states, "Many impacts can be reduced, delayed or avoided by mitigation. Mitigation efforts and investments over the next two to three decades will have a large impact on opportunities to achieve lower stabilisation levels." It is the desire of this institution 1) to set aggressive and attainable goals to significantly reduce greenhouse gas emissions and 2) to achieve climate neutrality. The state goals outlined above do not fully accomplish these desires. Therefore, the following greenhouse gas emissions goals have been set internally by OSU:

- By 2010, arrest the growth of greenhouse gas emissions and begin to reduce emissions.
- By 2012, achieve net greenhouse gas emissions at least 10 percent below 1990 levels.
- By 2020, achieve net greenhouse gas emissions at least 75 percent below 1990 levels.
- **By 2025, achieve net climate neutrality**.

Using the estimated FY90 as a baseline, goals set by the State of Oregon require FY20 emissions to be no more than 99,857 t CO2e. If the aggressive, internally-set goals are adopted, this level of emissions must be reached by 2012. Even though FY10 emissions are estimated to be less than this level, emissions should not increase, or OSU would be noncompliant with State and internal goals because the first interim goal requires arresting the growth of emissions. To achieve the state mandate of 75% below 1990 levels by 2050, emissions for FY50 must be no more than 27,738 t CO2e. This would be the required level for FY20 if internal goals are adopted. Climate neutrality, defined by the ACUPCC as having no net greenhouse gas emissions, would be reached by FY25 under internal goals; state goals do not require this target.

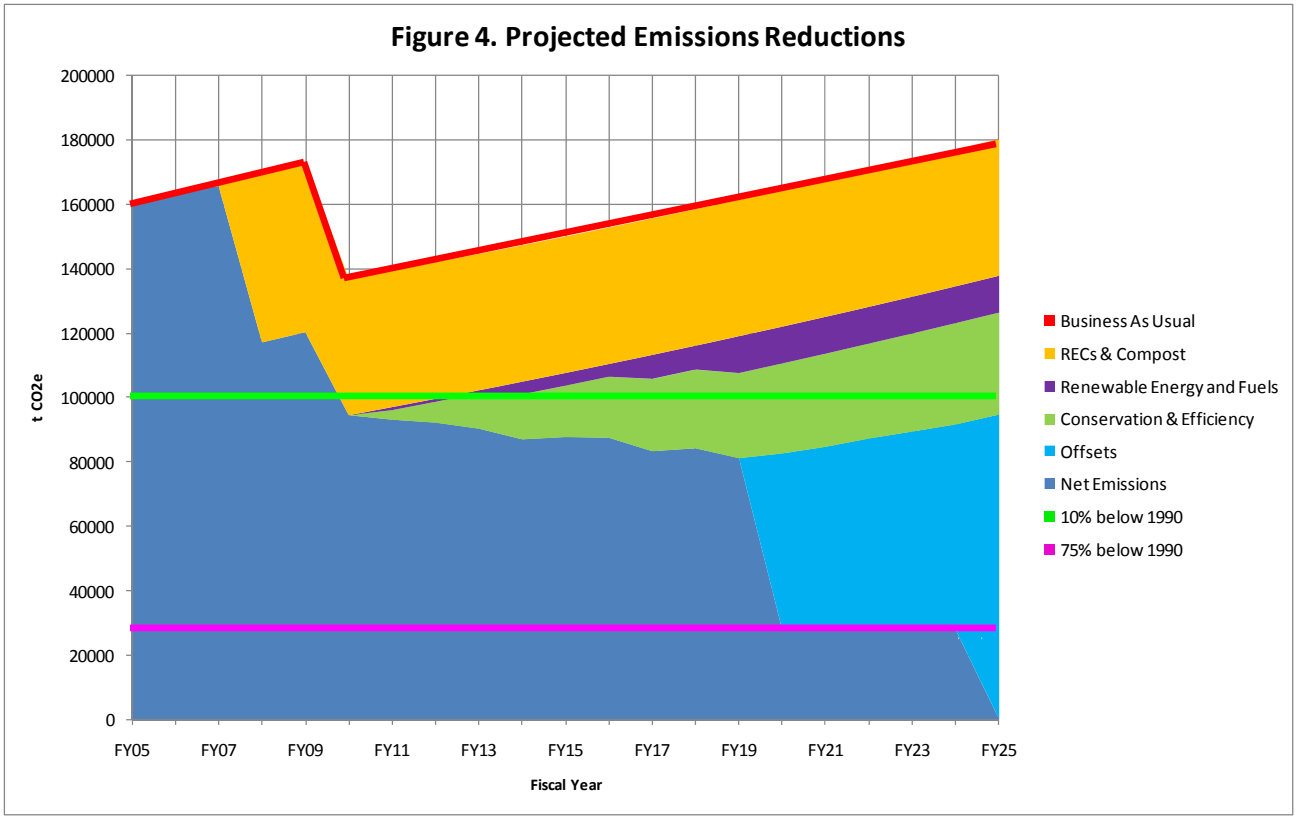
5.4 Reduction Timeline, Financial Analysis, and Emissions Category Reductions

In this section, the estimated impacts of three major mitigation strategies (efficiency/conservation, renewables and offsets/RECs) are analyzed, and the estimated implementation schedule is displayed graphically. Each emissions category (air travel, electricity, solid waste, etc.) has a complete list of strategies needed to attain emissions reductions goals. Example actions for each category are shown for reference. Following submission of this climate action plan, an implementation document will be developed, which will outline a comprehensive set of actions.

5.4.1 Emissions Reduction Timeline

Figure 4 presents a timeline of emissions reductions – and the general types of reductions – needed to meet both interim and final goals. These reductions are based in part on information provided by McKinstry Inc., an engineering firm contracted by the Oregon University System Chancellor's Office to perform high-level energy assessments for OUS campuses. McKinstry analyzed and estimated possible reductions for each of the three main mitigation strategies:

1) direct reduction in emissions (conservation & efficiency)
2) renewable energy and fuels
3) offsets and RECs (REC wedge represents current and future purchases funded by the student renewable energy fee)



5.4.2 Financial Analysis

Costs, both capital and lifetime, will fluctuate significantly from project to project within the different mitigation strategies. Until all potential actions are analyzed, exact costs to the university will not be known. One thing is almost certain: the longer organizations wait to act, the more expensive emissions reductions and climate neutrality will become.

The McKinstry assessment made estimates of costs and associated savings of energy conservation projects on OSU buildings. Also included was a cost analysis of installation of a large solar PV project. This information is presented below.

Energy Conservation: If all conservation projects listed in the assessment were implemented today, the total estimated cost to the university would be $55 million. Annual savings resulting from these changes would be around $2.7 million. Due to estimated increases in utility costs, financial savings would total $52.5 million over the course of 15 years.

Not all of the conservation projects listed would result in increased need for capital repair money, as a number of these projects are on deferred maintenance and other capital improvement lists. In addition, outside funding sources such as state and federal energy grants could be leveraged to reduce the cost to the university.

Renewable installation: The total estimated cost of a solar array supplying 20% of OSU's electricity would be $135 million. The total financial burden to OSU could be significantly reduced by incentives, private partnerships and state and federal grants. The university would see an estimated $1.2 million annual reduction on its electricity bill.

Offsets and Renewable Energy Certificates (RECs): The estimated market price of carbon offsets ($/ t CO2) and RECs ($/MWh) over the coming years varies wildly, with some sources estimating carbon offset prices of $15/t while others estimate prices of over $100/t. In a 2007 MIT study, the price of one metric tonne CO2e in 2025 varied between $18-79, depending on the legislation enacted. The uncertainty over future legislation means future carbon prices are equally uncertain.

Currently, OSU pays approximately $5 to offset, through RECs, one metric tonne of CO2e. The current price for a verified carbon offset varies between $2.75 and $33 per t CO2e offset. In the regulated European Union market, carbon offsets are currently valued at €15 or approximately $21/ t CO2e.

Assuming a carbon offset price of $15/t CO2e, it would cost OSU approximately $2.5 million to fully offset current emissions. If emissions, carbon offset prices, or both, increase, this cost will increase. The uncertainty of future legislation and the volatility of the carbon offset market will increase OSU's exposure to financial risk.

While actual reductions of GHG emissions are desirable, it is likely that carbon offsets will play a role in achieving carbon neutrality for the foreseeable future. There has been considerable controversy regarding carbon offsets, their effect on the environment and disadvantaged populations, as well as their actual impact on reducing GHG emissions. While some of these issues are well-founded, there are independent organizations that have created standards for carbon offsets that ensure offsets are indeed reducing net carbon emissions. OSU shall, in any of its purchases of offsets or renewable energy certificates (RECs), ensure that all purchased offsets are

- Real and measureable – emissions will be reduced and these reductions will be measureable
- Additional – emissions reductions would not have occurred otherwise
- Permanent – emissions reductions are permanent
- Independently verified – actual emission reductions will be verified by a 3rd party organization such as Green-e or the Voluntary Carbon Standard

5.4.3 Emission Category Mitigation Strategies

Air Travel

REDUCTION GOAL: By 2012, reduce net emissions from air travel to no more than 40,000 t CO2e

Goal Overview:
In FY08, air travel was the largest source of net emissions for OSU, contributing more than 35,000 t CO2e. Emissions from air travel have increased rapidly in the past years; the European Environmental Agency estimated that emissions from air travel increased 73% between 1990 and 2005. The growth in university-related air travel and the lack of alternatives to air travel make this a difficult source to mitigate. Because many university-related activities occur at great distances from the main campus and because Oregon occupies a coastal – rather than central – location in the United States, air travel is expected remain a necessary transportation mode for a considerable number of faculty.

Even with these complicating factors, emissions from air travel can be reduced without drastically impacting the way OSU does business.

Summary of Air Travel Emissions Reduction Strategies

Strategy 1: **Encourage alternative transportation modes**
While traveling by plane is certainly the fastest way to go, there are other methods of travel that compare well in terms of speed and convenience but with a much lower carbon impact. In one case, carbon emissions from train travel have been estimated to be 90% lower than a flight of the same distance.
Example Actions: Incentivizing train or carpooling; increasing visibility and use of OSU ride-share site; reimburse carpooling

Strategy 2: **Restrict air travel (or reimbursements) in certain cases**
In some cases a restriction on travel (or on personal reimbursements) may be necessary to reduce emissions from air travel to our reduction goal levels. While this could be contentious, information about productivity, actual time commitments of flying, and carbon intensity could alleviate some potential roadblocks.
Example Actions: Eliminate or reduce reimbursements for flights less than 150 miles from point of origin; no athletic or student group air travel for trips less than 250 miles from point of origin.

Strategy 3: **Encourage use of alternatives to travel (technologies such as teleconferencing, etc.)**
While there are many cases requiring in-person attendance, there are many technologies available that allow us to shrink our world. These technologies could reduce travel time while still providing desired levels of interaction.
Example Actions: Provide teleconferencing technology to entire campus community

Strategy 4: **Minimize climate impact of air travel**

In the cases for which there is no alternative to air travel, we should strive to reduce the impacts of those flights wherever possible.
Example Actions: Encourage purchases from airlines with lowest emissions per mile.

Strategy 5: **Offset remaining emissions from air travel**
There will still be emissions resulting from air travel for the foreseeable future even if unnecessary air travel is eliminated and climate impact of air travel is reduced. In this case, carbon offsets will be necessary to reduce emissions from this source to our reduction goal level.
Example Actions: Include cost of carbon offset in price of all tickets.

Stationary Sources

REDUCTION GOAL: By 2012, reduce net emissions from stationary sources to no more than 45,000 t CO2e

Goal Overview:
In FY08, emissions from stationary sources was the 2nd largest source of net emissions for OSU, contributing nearly 35,000 t CO2e. Fossil fuel use for stationary sources has grown by 12% since 1998, the oldest year with intact data. The vast majority (over 95%) of emissions in this category result from the combustion of natural gas to make steam for the central heat plant. Furthermore, a cogeneration facility that will become operational in early 2010, natural gas consumption is expected to increase by more than 15%.

Summary of Stationary Sources Emissions Reduction Strategies

Strategy 1: **Increase efficiency of the generation systems that derives energy from fossil fuels**
Increasing the efficiency of the current steam generation system is a cost-effective way of mitigating carbon emissions. Associated cost-savings could be significant.
Example Actions: Boiler retro-commissioning project; strengthen preventative maintenance program for boilers and turbines

***Strategy 2*:** **Increase efficiency of distribution system that delivers energy from fossil fuels**
Once steam has been generated, it must also be distributed across campus. This complicated system consists of numerous pumps, heat exchangers, radiators, valves, tanks, and more. Increasing the efficiency of the distribution system will cost effectively reduce emissions.
Example Actions: Insulate steam and hot water piping; repair and maintain condensate system

Strategy 3: **Decrease user-end consumption (conservation)**

Decreasing user-end consumption is a low-cost method of reducing carbon emissions resulting from the combustion of fossil fuels.

Example Actions: Adjust building heating and cooling setpoints; adjust equipment timing; educate building occupants on best practices and efficient products.

***Strategy 4*:** **Minimize climate impact of stationary sources through use of technologies and alternative fuels**

Once efficiency measures are in place and overall consumption has been reduced, emissions from stationary sources will still be considerable, assuming fossil fuels are still the primary source of energy. By utilizing alternative fuels and technologies, emissions from stationary sources could be reduced significantly further.

Example Actions: Increase use of less carbon intense biofuels; implement geothermal heat pumps or solar hot water systems.

***Strategy 5*:** **Offset remaining emissions from stationary sources**

While it is possible to completely eliminate emissions resulting from the combustion of fossil fuels at stationary sources, this may not be the most cost-effective option. Offsets will likely be a part of any carbon reduction plan, and may be the best option once other mitigation strategies have reached the point of zero net marginal returns. However, offsets have little to no educational, cost-saving or behavioral change benefit.

Example Actions: Purchase RECs to offset electricity generated from natural gas at Energy Center.

Electricity

REDUCTION GOAL: By 2012, reduce net emissions from electricity to no more than 500 t CO2e

Goal Overview:

In FY08, gross emissions from electricity generation and distribution was the largest source of emissions for OSU, contributing over 85,000 t CO2e. However, due to the large purchase of renewable energy certificates (RECs) funded by student-endorsed renewable energy fee, net emissions for electricity amounted to just over 32,000 t CO2e. Electricity use has grown by 19% since 1998, the oldest year with intact data. Emissions from electricity are expected to decrease by 50% over the coming years as a result of the Energy Center.

Summary of Electricity Emissions Reduction Strategies

Strategy 1: **Increase efficiency of electrical system**

Efficiency and conservation projects are arguably the most cost-effective ways to reduce emissions. Not only are total emissions reduced, but each kilowatt saved is one we do not need to purchase or generate. Efficiency projects provide more light, heating, cooling or ventilation per unit of energy.

Example Actions: Lighting retrofits; install variable-frequency drives (VFDs); retro-commission building systems.

***Strategy 2*:** **Decrease user electricity consumption (conservation)**

Working hand-in-hand with efficiency upgrades would be projects or policies that decrease electricity use. Conservation projects are relatively low-cost and impart long-lasting educational and behavioral benefits.

Example Actions: Install occupancy sensors; require stringent computer and printer power management; conduct energy campaign/competition.

Strategy 3: **Minimize climate impact of electricity generation and distribution**

Even with all electrical systems functioning at top efficiency and no unnecessary electricity being used, emissions from electricity would still exist in our current system.

Example Actions: Install photovoltaic (PV) panels; require that our utility use more low-carbon sources in its power mix.

Strategy 4: **Offset remaining emissions from purchased electricity**

Until all electricity is generated from zero-carbon sources, there will be emissions resulting from electricity generation. RECs or other forms of offsets will likely be a major part of any carbon neutrality strategy.

Example Actions: Increase student purchase of RECs to offset emissions from purchased electricity.

Ground Transportation

REDUCTION GOAL: By 2012, reduce emissions from ground transportation to no more than 11,500 t CO2e

Goal Overview:

In FY08, emissions from ground transportation contributed almost 12,000 t CO2e. Emissions from student and employee commute, fleet, athletic bus travel, rental car mileage, and personal vehicle mileage used for business purposes are included in this category. Emissions from this category have increased by 13% since 2004, the oldest year with intact data. Some of this increase represents actual growth, while some is a result of improved data collection. Additionally, there are known sources that have not been captured in past inventories, athletics travel reimbursement for example, so actual emissions from this category may increase further.

Summary of Ground Transportation Emissions Reduction Strategies

Strategy 1: **Encourage alternative modes of transportation/commute (reduce the number of vehicle miles driven)**

For ground transportation, like the other categories, the most cost-effective method of reducing emissions is to stop them from being emitted in the first place.

Example Actions: Increase bicycle parking; strategically site operations staff to reduce van miles; actively promote ridesharing.

Strategy 2: **Minimize climate impact of ground transportation when driving**

There is only so much that can be conserved; at some point, people must drive to fulfill job requirements. Emissions resulting from driving can be reduced for these cases.

Example Actions: Incentivize use of electric vehicles for commute; encourage use of biofuels.

Strategy 3: **Offset remaining emissions from ground transportation**

Our current transportation system is heavily reliant upon fossil fuels. While there is some movement towards alternative technologies like fuel cell or electric vehicles, these vehicles currently make up a minute fraction of the fleet. If overall mileage driven is reduced and the climate impact of that driving is minimzed, there will still be a significant emissions portfolio for driving. In this case, it may be necessary to purchase offsets to bring emissions from ground transportation into line with goals described here.

Example Actions: Require purchase of carbon offset to receive travel reimbursement.

Agriculture

REDUCTION GOAL: By 2012, reduce emissions from agricultural activities to no more than 2,150 t CO2e

Goal Overview:

In FY08, emissions from agriculture contributed almost 2,400 t CO2e. These emissions mainly resulted from the digestive processes of livestock and the fertilization of crops with synthetic fertilizers. Emissions from this category have increased by 26% since 2004, the oldest year with intact data. Some of this increase represents actual growth, while some is a result of improved data collection.

Summary of Agriculture Emissions Reduction Strategies

Strategy 1: **Minimize climate impact of animal husbandry**

Animal husbandry is a multibillion-dollar industry, and there is continual need for research, education and training related to it. For this reason, there is little chance that the herds and flocks of OSU will disappear anytime soon. These animals will also maintain their biological processes, regardless of the climate impacts of those processes.

Example Actions: Tune animal diets to reduce methane emitted from livestock; improve manure management practices.

Strategy 2: **Minimize climate impact of crop cultivation**

While the physical growth of crops is assumed to be carbon neutral (or even a carbon sink), the synthetic inputs, mainly fertilizer, do have significant climate impacts. Some argue that the emissions from fertilizer are offset by the increased CO2 uptake by plants, but there is not enough conclusive evidence for all types of crops to make that assumption here.

Example Actions: Encourage use of compost or other low emissions fertilizer; use GPS to increase efficiency of fertilizer spreading on fields.

***Strategy 3*:** **Offset remaining emissions from agriculture**

Even with proper diet, manure management and low climate impact fertilizer, it is likely that some emissions related to agriculture will exist for some time. Offsets may be necessary in this category to achieve goals or attain climate neutrality.

Example Actions: Require any department that owns livestock to purchase offsets.

Solid Waste

REDUCTION GOAL: By 2012, reduce emissions from solid waste to no more than 300 t CO2e by 2020

Goal Overview:

In FY08, emissions from solid waste contributed more than 350 t CO2e. These emissions resulted from methane released from OSU's landfilled waste. Though the quality of our historical solid waste data is unknown, the amount of landfilled solid waste appears to have stayed consistent over the years. This can be attributed to the rise in enrollment, coupled with higher recycling rates. Historically, all of OSU's solid waste has been landfilled at Coffin Butte landfill, where since 1995 methane has been captured and used to generate electricity. This technology drastically reduces OSU's emissions from solid waste, but reduction of the overall waste stream is necessary as well to meet goals.

Summary of Solid Waste Emissions Reduction Strategies

Strategy 1: **Decrease size of waste stream (or Encourage alternatives to landfill)**
While the management of OSU waste produces relatively low levels of emissions, possibilities for improvement exist.
Example Actions: Promote recycling through competitions; eliminate trays in dining centers; compost all compostable materials on-site.

Strategy 2: **Minimize climate impact of solid waste**
With our landfill already generating electricity from methane at the site, options to lessen climate impact of solid waste are few and potentially costly.
Example Actions: Work with waste hauler to improve efficiency of system.

Strategy 3: **Offset remaining emissions from solid waste**
As is the case with many of the other categories, it is likely that there will continue to be emissions from solid waste for the foreseeable future. Offsets may be the most cost-effective option by which to reduce emissions from solid waste to the necessary levels.
Example Actions: Require departments that produce large amounts of waste to purchase carbon offsets.

Refrigerants

REDUCTION GOAL: By 2012, reduce emissions from refrigerants to no more than 300 t CO2e by 2020

Goal Overview:

In FY08, emissions from refrigerants contributed more than 250 t CO2e. These emissions resulted from the escape of refrigerants into the atmosphere, mainly from refrigeration equipment. In 2004, emissions from refrigerants were nearly 10x as high as they are today. This reduction may be due in part to governmental regulation of refrigerants, as well as thoughtful action on the part of Facilities Operations. Some of the decrease may be pure coincidence, however, as emissions from refrigerants vary wildly between years.

Summary of Refrigerants Emissions Reduction Strategies

Strategy 1: **Encourage alternatives to refrigerants**
By reducing the amount of climate-impacting refrigerants in use, the chances of leaking and maintenance-related issues are likewise reduced.
Example Actions: Promote use of air, water or geothermally-cooled equipment.

***Strategy 2*:** **Lessen climate impact of refrigerants**
There will be cases where there is no suitable alternative to climate-altering refrigerants; in these cases, the impact of refrigerants must be reduced.

Example Actions: Encourage use of low global warming potential (GWP) refrigerants; ensure preventative maintenance regime is followed on refrigerant-containing equipment.

***Strategy 3*: Offset remaining emissions from refrigerants**

Eventually, a point will be reached where alternatives to climate-altering refrigerants and reduction of their impacts no longer is cost-effective.
Example Actions: Purchase carbon offsets that are generated as a result of reducing emissions related to refrigerants.

Emissions Sources Not Included in the ACUPCC

REDUCTION GOAL: By 2012, begin to measure and reduce where possible emissions from sources not included in the scope of the ACUPCC.

Goal Overview:

The ACUPCC does not require signatories to report on or mitigate emissions from a number of emissions sources. These include emissions from:

- Water treatment and distribution
- Lifecycle of purchased goods
- Construction
- Long-distance student travel

While not required by the ACUPCC to measure or mitigate these emissions, they are potentially significant and OSU may be required to measure – and in some cases mitigate – them in the future. While these requirements are not expected in the near future, OSU will attempt to measure these emissions where practical and mitigate them as appropriate.

Summary of 'Other' Emissions Reduction Strategies

General Strategies for 'Other' emissions sources

***Strategy 1:* Make current process more efficient**

***Strategy 2*: Reduce demand**

***Strategy 3*: Lessen climate impact of emissions source**

***Strategy 4*: Offset remaining emissions**

5.5 OSU Policies and Standards

While focused actions and projects are integral to reducing our climate impact, a number of high-level documents, policies and procedures also have significant and long-lasting impact.

Focused actions and projects are the best ways to reduce emissions. A brief list of sample current actions is included below in each of the respective emissions categories. A complete list of current and proposed actions will be provided during climate plan implementation.

5.5.1 Current Policies

Facilities Services' Construction Standards
For any type of construction performed at OSU, there is a detailed set of instructions found in the Construction Standards, which governs the type of equipment to be installed, how it is installed, and how it is maintained. By continually revising the Construction Standards and keeping energy and resource efficiency as primary tenets of the Standards, construction projects should effectively work toward reducing climate impacts.

State of Oregon Policy 125-6-010: LEED-equivalent standards for state buildings
All new construction or renovation of state buildings must meet the State of Oregon version of US Green Building Council's LEED Silver standard. This policy reduces costs of getting true LEED certification, but forces building designers to seriously consider the impacts that buildings have in relation to energy and resources.

5.5.2 Future Policies

OSU Energy Efficiency and Resource Conservation Policy
Currently undergoing extensive revisions, this policy will act as a guide and reference for students, staff, and faculty. It details priorities and responsibilities of the institution and the occupant in regards to lighting, building temperature set-points, computer power management settings, transportation and other areas. Once approved, the effects should be widespread and lasting. This policy is expected to be in place by the end of the 2009-2010 fiscal year.

6. Education and Engagement

6.1 Strategic Connections

OSU has achieved far-reaching recognition for providing outstanding experiential learning opportunities for students, including the innovative Student Sustainability Initiative, an entirely student-led, student-organized, and student-funded organization; installing unique technologies such as exercise equipment that generates electricity which is then fed into OSU buildings; and a myriad of other groups organized around sustainability/environmental issues, such as the Global Environmental Change Organization, a graduate student-led group devoted to climate change issues.

The OSU Extension Service addresses the cultural dimensions of Oregon communities and leadership through statewide Extension programs and introduced the first Sustainable Living program in the United States. The existing widespread network of Extension connections facilitates the rapid dissemination of novel programs and new approaches that will help establish and maintain healthy urban and rural populations.

The ACUPCC requires plans to advance sustainability and climate-related education and outreach. As stated in the *Education for Climate Neutrality and Sustainability: Academic Guidance for ACUPCC Institutions,* signatory institutions must

- make climate neutrality and sustainability a part of the curriculum and other educational experience for all students
- develop a means of reviewing progress and expanding reach over time.

Because it reflects principles shared between OSU's institutional principles and the tenets of the American College and University Presidents' Climate Commitment, the newly created Phase II of the OSU Strategic Plan forms a strong platform for this section of OSU's Climate Plan.

Strategic Plan Phase II goals One and Two specifically impact Education and Engagement at OSU:

1. Provide outstanding academic programs that further strengthen performance and pre-eminence in the three Signature Areas of Distinction.
2. Provide an excellent teaching and learning environment and achieve student access, persistence and success through graduation and beyond that matches the best land grant universities in the country.

As noted above, the *Ecosystems* Signature Area is OSU's opportunity to create superior learning opportunities for students by

> Improving the understanding of the earth ecosystems upon which all life depends, and promoting their sustainability through high-impact public policy involvement with issues such as climate change, food security and safety, renewable energy production, and economically viable natural resource management

6.2 Supporting Activities For Education and Engagement

This section contains Goals, Strategies and sample Actions that support the OSU Strategic Plan but were not part of the same planning process. The elements presented here are based on campus community input relevant to Education and Engagement climate planning.

6.2.1 Experiential and Applied Learning

Goal 1: OSU students at all levels have in-depth experiential and applied learning opportunities and are aware of these of opportunities.

Strategy 1: Engage existing student groups in campus operations activities that enhance their understanding of energy conservation, renewable energy, and climate issues.

> **Action 1:** By fall 2009, complete implementation of the student-administered Sustainable Energy Revolving Loan Fund approved by students in spring 2009. This fund, infused with $100,000 per year for 5 years starting in fall 2009, will fund conservation/efficiency and renewable energy projects on the OSU campus. Savings from projects will replenish the fund.

Strategy 2: Increase number of paid internships and student worker positions with campus departments and community organizations.

> **Action 1:** By winter 2010, develop collaborative list of campus and community sustainability organizations with internship opportunities. Post list online and with OSU Career Services. *Linked with Engagement Goal 2.*
>
> **Action 2:** By spring 2010, strengthen hiring and marketing process for paid positions within the Student Sustainability Initiative.

Strategy 3: Promote student involvement in and exposure to OSU sponsored research related to sustainability, environmental issues, climate change, etc.

Strategy 4: Provide students unpaid opportunities to learn about and participate in activities for extra credit, curricular requirements, and community service contribution.

6.2.2 The Classroom Experience

Goal 1: Make sustainability and climate change issues part of the classroom experience for all students.

Strategy 1: Incorporate elements of climate and/or sustainability into all fields of study.

> **Action 1:** Continue development of a sustainability double degree, or similar degree or minor programs.
>
> **Action 2:** Institute an environmental literacy requirement so that all students who graduate from OSU have some exposure to sustainability concepts.

Strategy 2: Make students aware of existing class offerings related to climate.

Action 1: In fall 2009, the Sustainability Office will build on the Institute for Natural Resources sustainability inventory and publish current course offerings and work with academic departments to keep the results current over time.

Strategy 3: Encourage and provide resources to faculty to incorporate material on climate change in their curriculum. *Linked with Employee Development Goal 2.*

Action 1: Pilot integration of external resources, such as Northwest Earth Institute discussion course material, into specific OSU courses. Explore benefit of holding courses outside regularly structured class time.

Goal 2: Students seeking a deeper understanding of climate and sustainability issues gain in-depth exposure to sustainability and climate issues by combining a deep as well as broad understanding of those issues.

Strategy 1: Students and faculty have access to in-depth sustainability and climate related learning and service opportunities which supplement the classroom experience.

Action 1: By June 2010, the Sustainability Office will create and maintain a menu of existing service learning opportunities that foster a deeper understanding of sustainability and climate change.

Action 2: Starting in fall 2009, the Sustainability Office will begin working with academic departments to increase the number of service learning opportunities that foster a deeper understanding of sustainability and climate change.

Action 3: In fall 2009, involve at least one undergraduate course section in the creation of the FY09 greenhouse gas inventory report.

Strategy 2: Create case studies of early efforts at the unit level that can be used by other OSU units as models of how to integrate sustainability into curriculum. These case studies can include examples of ways to integrate sustainability into strategic plans, syllabi for sustainability courses, etc.

6.2.3 Campus and Community Engagement

Goal 1: Students, particularly freshman and transfers, are aware of and utilize campus and community climate- and sustainability-related resources at OSU and in Corvallis. Life skills are enhanced by direct engagement with these resources.

Strategy 1: Utilize student orientation events as outreach opportunities.

Action 1: Host information tables at events: START, Beaver Fair, etc.

Action 2: By fall 2010, begin regular tours of campus and community green features and destinations.

Goal 2: Connections between Corvallis/surrounding communities and OSU are strengthened in order to deal with pressing global climate issues.

Strategy 1: Community members are aware of and given reasonable access to university experts and specialists.

Action 1: Expand and regularly update a comprehensive list of university faculty expertise organized by topic area.

Strategy 2: OSU departments and community groups are connected with student organizations in order to facilitate internship, volunteer, and work opportunities. *Linked with Experiential and Applied Learning Goal 1.*

Strategy 3: OSU offers a variety of climate-related events and speakers at its facilities throughout the state.

Action 1: OSU institutionalizes or systematically maintains and increases the number of publicly-available climate- and sustainability-related lecturers.

6.2.4 Employee Development

Goal 1: A complete and comprehensive inventory of existing employee development opportunities that move OSU toward climate neutrality is up to date and available online.

Goal 2: As it relates to their field(s) of expertise, faculty and staff have adequate training and professional development opportunities around issues of climate and sustainability. *Linked with Classroom Experience Goal 1, Strategy 4.*

Strategy 1: Create a fund and allocation process for faculty development and training on sustainability principles relevant to faculty's field of expertise or study or that supports employees' volunteer activities.

Action 1: Pilot employee development via Northwest Earth Institute course delivery. Distribute information on courses through offices of Training & Professional Development, Community and Diversity, and departmental trainings and meetings. Get trainings onto central training calendar.

Goal 3: Faculty and staff actions in the workplace support OSU's institutional movement toward climate neutrality.

Strategy 1: increase employee awareness of possible workplace sustainability practices as well as the resources (people, training, tools, etc) available to employees that will help them operate their workplaces in ways that reduce climate emissions.

Action 1: Starting in 2010, reach out to employees at all large employee-oriented events, such as University Day and Training Days.

Action 2: By fall 2009, create a list of employee organizations with which to network on an ongoing basis, such as labor unions, Association of Office Professionals, Professional Faculty Leadership Association and others. Establish relationships starting in 2010.

Action 3: Create a "sustainable solutions" type of award to recognize faculty and staff for great ideas or contributions (similar to program at U of FL).

Action 4: Encourage all departments to have their workspace undergo a sustainability audit.

Strategy 2: Partner with other organizations to offer low cost training options.

Action 1: Use Oregon Dept. of Administrative Services electronic training modules for state agency employees.

7. Research

7.1 Strengths

Across many climate-related disciplines, OSU research strengths run deep. The Carnegie Foundation ranked OSU in its "very high research activity" tier, making it one of only 96 universities in the United States to earn that rating. In 2008-2009, OSU researchers had another record year in externally funded research in which their programs were awarded $252 million. Additionally,

- Oregon State University ranks first in the nation in the frequency with which its research in Agricultural Sciences is cited in peer-reviewed articles, according to Science Watch.
- Oregon State ranks sixth in the United States in the number of times its research in Geosciences is cited in peer-reviewed articles.
- OSU ranked No. 9 worldwide in the frequency with which its faculty members' published research is cited by other researchers.

7.2 Strategic Connections and Signature Research

OSU's proficiency in climate change and emissions mitigation research stems from the university's roots in natural resources expertise and its land, sea, space and sun grant designation. Based on this expertise, OSU has formed new partnerships with other Oregon research universities, the private sector and state and federal agencies, to create three Oregon Signature Research Centers, two of which relate closely to sustainability.

Oregon Nanoscience and Microtechnologies Institute (ONAMI)
ONAMI has been revolutionizing how universities collaborate on research for Oregon's emerging industries. ONAMI has led to new business ventures at the Microproducts Breakthrough Institute; core initiatives developed at OSU include the OSU Materials Institute and the environmental health and safety initiative on safer nanomaterials. A noteworthy example of ONAMI work is the human-portable self-contained cooling system – a technology that, when fully developed, has potential in the automotive and aircraft industries, and maybe even in home heating and cooling to greatly reduce energy consumption from cooling systems.

Oregon Built Environment and Sustainable Technology (Oregon BEST)
Boosted by funds from the Oregon University System, BEST's mission is to catalyze and develop Oregon's leadership in sustainability research. The focus is on "clean technology" for everything from renewable building materials and energy to wastewater systems and bioproducts. OSU is collaborating with Portland State University, the University of Oregon, and the Oregon Institute of Technology.

The OSU Strategic Plan refocuses OSU on its core strengths and three Signature Areas of Distinction. The first such area, *Advancing the Science of Sustainable Earth Ecosystems,* in particular, speaks to the vision of maintaining and enhancing OSU's natural resources focus.

As stated in the OSU Strategic Plan Phase II, institutional focus since 2004 has

> …resulted in greater interdisciplinary collaboration, scholarly achievement, and external impact, including the development of new institutes and centers targeted at such critical issues as water resources and climate change.

Since the development of the 2004 Strategic Plan, investments in and attention to OSU's thematic areas have resulted in the development of new institutes and centers targeted to such critical research issues as water resources and climate change.

A prime example of the increased institutional focus on climate change is the new Oregon Climate Change Research Institute (OCCRI), an Oregon University System institute housed at OSU that is charged with networking researchers, serving as a clearinghouse for climate information and providing climate change information to the public. OCCRI will also support the Oregon Global Warming Commission in developing strategies to prepare for and to mitigate the effects of climate change and to provide technical assistance to local governments to assist them in developing climate change policies, practices, and programs.

Strategic Plan Phase II continues to encourage large scale inter-institutional research and development efforts such as OCCRI, and focuses interdisciplinary scholarly activity on the most pressing regional, national and global issues.

Other existing research activities and strengths include

- Developing Alternative Energy and Energy Systems, including wave energy, biomass, and small scale "portable", proliferation resistant nuclear technologies
- Developing co-products, such as enzymes, pharmaceuticals and natural crop control chemicals, and structural materials that can be obtained from locally available crops and plants
- Advancing solar energy technologies, including new photovoltaic compounds that can absorb more light, as well as oxides that can replace the current mainstays of silicon and cadmium
- Using satellite data to examine the effect of haze and clouds on climate change.

7.3 Research Funding

In June 2009, the Institute for Natural Resources (INR) completed an inventory of sustainability-related activities at OSU: *Sustainability at Oregon State University*. Based on a review of college and department based research focus areas, INR identified six categories of OSU research

where sustainability is emphasized. For a full explanation of the six categories, and a list of examples of research activities, please see the full report, linked above.

During Fiscal Year 2007, projects within OSU's six sustainability strengths, were overwhelmingly funded by federal agencies, with the exception of rural communities, in which funds primarily came from state agency sources of funding.

Sustainability Research Strengths	Funding Amount
Alternative Energy and Energy Sources	$ 5,242,954
Blue Sustainability	$ 54,646,393
Climate	$ 20,239,141
Green Sustainability	$ 46,275,998
Materials, Practices, and Technologies	$ 21,424,186
Rural Communities	$ 5,634,617
Total	**$153,463,289**

Table 3. Fiscal Year 2007 Funding for grants and contracts based on Sustainability Strength (Institute for Natural Resources)

For research funded during FY07, almost three-quarters of OSU's research related to sustainability. For more details, please see Tables 6 and 7 in the INR report, which list department- and college-level research focus areas. Thirty-four departmental research focus areas cross two or more of the six research strength areas.

In support of the Strategic Plan Phase II goals, several strategic initiatives have been identified. One such initiative is to increase total grants and contracts to expand the impact of research on scholarship and the creative work of faculty, and enhance partnerships with the business and corporate sector, other universities and associations, and non-profit and non-governmental organizations.

Of the $189 million of sponsored research (from competitive awards) in 2008-2009, over $162 million came from federal agencies such as the National Science Foundation, the National Institutes of Health, the Department of Agriculture and the Department of Energy. OSU continues to strengthen collaborative relationships with these and other agencies in an effort to increase research funding. Because of this extensive reliance on federal funding, OSU research activities will continue to increase and decrease in intensity in response to the ebb and flow of interest in climate issues expressed by these federal agencies.

In addition to allocations from federal agencies, OSU occasionally pursues federal appropriations for scholarly research, training and instruction or technology, and equipment. By seeking a variety of federal funding for these types of projects, OSU affirms its commitment to maintaining a significant level of future research into climate-related issues.

As seen by the research activities categorized above, sustainability and climate-related research represents a large portion of overall research at Oregon State. OSU's natural resources expertise supports its competitiveness with respect to external funding and open solicitations for climate-related research. For internally funded research activities, the OSU Research Council advises the university to allocate funding for scholarly research. The recent growth in climate-related research is largely due to increased requests from faculty for such funding. Because OSU's research priorities are based on – and are expected to advance – the university's Strategic Plan, it is expected that the trend toward more climate and sustainability related research will continue.

Nonetheless, existing funding sources and mechanisms may not fully address the range and depth of funding necessary to promote excellence in climate-related research. In response to this concern, the campus community identified several strategies to enhance funding for climate and sustainability research. Goal 3 in Supporting Activities below lists those strategies.

7.4 Future OSU Research Activities

OSU will continue to capitalize on its broad strengths in technology, engineering, science and business to pursue breakthrough advances in renewable and alternative energy, green building technology, and resource and enterprise sustainability. Several alternative energy companies have recently emerged from OSU, and energetic linkages between business, engineering, and science-dependent colleges are giving rise to new degree programs and strategic partnerships with corporations, as well as accelerating the process of bringing discoveries to market. All of these activities create advanced learning opportunities for students.

As detailed above in the Climate Plan introduction, several OSU colleges have identified research priorities related to climate and sustainability in addition to the goals outlined in the university Strategic Plan. In particular, OSU's College of Oceanic and Atmospheric Sciences has a stated goal to

> …ensure the long-term ecological and economic sustainability of our region through fundamental research, technology development, and the creation of meaningful partnerships within the University, with government agencies at all levels, and with the private sector.

Although no recognized protocols exist today for measuring and attributing the benefits of research activities that reduce global greenhouse gas emissions, OSU intends to explore ways to claim valid quantitative recognition for the real reductions in emissions resulting from OSU research activities. OSU will move toward adopting, as appropriate, protocols and standards as they are developed. And of course, all travelers will be encouraged to consider alternatives to air travel.

7.5 Supporting Activities for Research

Goal 1: Stakeholders (including existing and prospective students, federal and state agencies, Oregon citizens, etc.) are aware of and, when appropriate, connected to existing climate change and sustainability-related research and the personnel behind this research.
Strategy 1: Incorporate marketing of sustainability and climate research as part of OSU's integrated marketing campaign.
Strategy 2: Institutionalize tracking of sustainability and climate-related research activities.

Action 1: Improve electronic documentation and communications about existing research activities.

Action 2: Enhance communication among internal OSU stakeholders by convening one or more cross-disciplinary groups comprised of college representatives who are knowledgeable of efforts in their units. These groups can acts as liaisons to other interested parties in the private and public sectors as well as to community members.

Action 3: Involve where possible undergraduate students in research related to sustainability and climate issues.

Goal 2: Oregon citizens are aware of potential impacts of climate change and also aware of ways to mitigate their contributions to climate change.
Strategy 1: Broaden information availability to external audiences about regional climate change impacts.
Strategy 2: Study socio-economic issues in a global way, linking disciplines such as engineering, social sciences and natural sciences. Identify who understands these linkages and promote discussion and study among experts.

Goal 3: Enhance incentive funding to better enable faculty to undertake 'top tier' climate change research.
Strategy 1: Make available startup funds to build research and teaching programs. When appropriate, target these funds toward new faculty.
Strategy 2: Increase available internal funding to match external funding sources.
Strategy 3: Reward and evaluate faculty for promotion and tenure based on interdisciplinary (non-"silo") activities.
Strategy 4: Create physical space that does not isolate people and programs.

8. Next Steps and Tracking Progress

The ACUPCC requires signatories to include "mechanisms for tracking progress on goals and actions" within their climate plans, and to expand the reach of their initiatives over time. Each year beginning in October or November 2010, OSU will begin including Climate Plan implementation details in the university's annual greenhouse gas inventory report. This report will become the overarching report of OSU's climate-related activities from the previous fiscal year, combining findings from the greenhouse gas inventory with progress on actions toward climate neutrality. This practice aligns with past inventory reports, which have included information on progress to date of all aspects of the ACUPCC, beyond measuring and reporting greenhouse gas emissions. To track implementation and results of actions, a matrix will be created to capture estimated costs, savings and emissions reductions. This document will be regularly updated and available online.

Each strategy-level item in the three Climate Plan chapters is structured so that success is measureable. Certain metrics, such as the number of courses relating to sustainability or climate change and the number of sustainability-related events and student groups, are tracked but not yet reported. The annual Climate Plan update and greenhouse gas inventory report will include more robust reporting of both existing and new metrics.

The ACUPCC encourages signatories to reevaluate their plans at least every other year. Modifications to the plans are allowed; however, revised plans must be submitted and the reasons behind changes must be described. Any updates to OSU goals, strategies and actions will be detailed in the annual inventory report, which will be available online.

8.1 Action Analysis

Following the submittal of this strategic document, analysis of actions will continue. Actions will be evaluated on the following tentative criteria, though not necessarily in this order. Some criteria will not apply to every action.

- Financial payback
- Cost per t CO2e mitigated
- Visibility
- Education or research value/potential
- Scalability
- Maintenance and other associated benefits
- Community interest
- Impact to stakeholders

Upon completion of the analysis, actions will be represented on a graph similar to Figure 5.

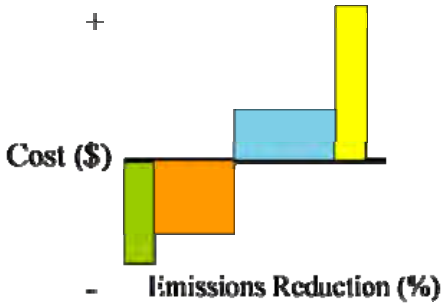


Figure 5. Emissions reduction concept graph
(Image: Clean Air-Cool Planet)

In this graph, each vertical bar represents an action: the height of the bar represents cost, and the width of the bar represents emissions reduction potential. An action with financial savings within the project lifecycle will have a bar that falls below the x-axis. Actions without savings during the project lifecycle will appear above the x-axis. A wide bar represents an action with more mitigation potential than a thin bar. Moving toward climate neutrality at any institution will require a blend of actions. In general it is expected that OSU will move from implementing highly cost effective measures to lower cost effective measures over time.

Table 4 is an example of how the complete list of actions might be displayed.

Emissions Source: Air Travel, Strategy 1, Action 1	
Increase reimbursements for travel by train	
Estimated Reduction:	115 t CO2e
Estimated Cost:	$10,000
Cost per t CO2e mitigated	$87/t CO2e
Auxillary Benefits: Increased awareness to effects of air travel, increased productivity, reduced travel stress	
Case Studies from other Institutions:	to-be added
Financing Mechanisms:	to-be added

Table 4. Example of action format to be included in implementation plan