**Environmental Management Certificate**

***Offered by the Program on the Environment***

Graduate students in the Environmental Management Certificate program from across the University collaborate to tackle real-world problems with profound policy, scientific and business ramifications. Students engage in environmental challenges—including energy, climate change, food systems, depletion of natural resources and pollution—and learn to organize collaborative teams to complete a client-based project. Addressing these challenges requires an understanding of diverse disciplines.

The program spans traditional academic boundaries, allowing students to integrate broad perspectives, knowledge, skills and interconnections. Our goal is for students to achieve a coherent view of environmental issues through an interdisciplinary focus on the complex relationships among science, management and policy. Applications are accepted twice each year, usually the first Monday in February and first Monday in May.

The Environmental Management Graduate Certificate program offers students access to the University of Washington’s world-class faculty and resources across multiple colleges and schools, including the Evans School of Public Affairs, Foster School of Business, the College of Engineering, and the College of the Environment.

The EM Certificate program offers students:

* A real-world consulting experience
* A solution-based approach to environmental issues
* Interdisciplinary problem-solving practice
* Skills development in project management, problem solving, communications, and team-building
* Opportunities to develop relationships across an network of graduate students, UW faculty, and potential employers

**Eligibility**

Students must be matriculated graduate or professional students to be eligible to apply to the Environmental Management Certificate program.

**Admission Requirements**

Prior to admission, students must have completed a one quarter upper-level or graduate-level course in each of the following:

1. Applied quantitative methods (e.g., microeconomics, numerical modeling, applied statistical methods) or pure quantitative methods (e.g., mathematics or statistics);
2. Social or natural science.

In addition, strong interpersonal and written and verbal communication skills are required.

Admission is competitive and students are selected on the basis of their academic preparation, ability, and program fit.

**Admission Application Procedures**

Applications are due the first Monday in February and the first Monday in May. To apply for admission, submit the [**application form**](http://depts.washington.edu/poeweb/files/Graduate%20Programs%20Files/EM%20Application%20Form.doc) (Word doc) and the following documents to enviradv@uw.edu:

* ***Completed Application Form***
* ***Letter of Application***
* ***Resume or CV***
* ***Transcripts***

The admissions committee carefully considers all completed applications. Decisions are based on the student’s letter of application, academic record and experience, and potential fit with the Keystone Projects.

**Application and further information:** <http://depts.washington.edu/poeweb/files/Graduate%20Programs%20Files/EM%20Application%20Form.doc>

Contact: Ana Wieman at enviradv@uw.ed \* 012 Wallace Hall \*

**Course Requirements for Environmental Management Certificate**

Requirements for the Graduate Certificate in Environmental Management include:

* 3 core courses (9 or more total credits)
* Completion of a 2 quarter team-based [Keystone Project](http://depts.washington.edu/poeweb/graduate_programs/environmental-management-certificate/keystone-project.php) by registering for the course sequence ENVIR 511 and 512

*Please note that students must have completed at least one, and preferably two, core courses prior to Keystone.*

* Award of the Certificate is contingent on completion of the student's graduate degree.

**Core Courses**

Students must complete three core courses, one in each of three core elements of the Environmental Management curriculum: Environmental Policy, Business and the Environment, and Science Application. A set of courses is available to provide students a fundamental background in the environmental decision-making process from these three perspectives. The courses satisfying the requirements in the three core areas are listed below.

**Environmental Policy**

* **Environmental Policy Processes (PB AF 590)**  
  Environmental policies are crafted and implemented through a wide variety of governance processes. This great diversity of processes is a relatively new phenomenon. Prior to the 1990s, two types of processes predominated in the U.S., both of which were top-down: centralized planning within public agencies and command-and-control regulation. In the 1990s, new types of governance processes emerged, sometimes replacing top-down processes, other times layering over them. Some emerged from the bottom up, such as collaborative partnerships and corporate social responsibility. Others emerged in conjunction with top-down processes (such as ecosystem management and permit trading). In this course, we will survey a wide variety of environmental policy processes.
* **Resource Policy and Administration (SEFS 571 / PB AF 592)**  
  Study based on understanding of the actors, arenas, issues, and policy communities that form the context for policy development and implementation. Exploration of approaches to policy inquiry. Consideration of implications for both policy and management. Students develop a study design for course project.
* **Natural Resource Policy and Planning (ESRM 470)**  
  Introduction to and analysis of environmental policy-making processes, with a focus on forest and land policy and law. Use of policy models to examine the interaction of agencies, interest groups, Congress, and the courts in the legislative process. Policy implementation, evaluation, and change are also addressed.
* **Environmental Planning and Permitting in Practice (ENVIR 485)**  
  Advanced survey of environmental planning and permitting as encountered by environmental and natural resource professionals in Washington State and beyond. Focuses on Washington State acts (SEPA, SMA, GMA) and Federal systems (NEPA, CWA ESA) that shape environmental land use planning and federal planning and permitting systems
* **Marine Policy Analysis (SMEA 519)**  
  Goal is appreciation for and basic working knowledge of techniques used in policy analysis. Techniques are explored in both quasi-realistic settings and in application to real world problems of marine policy.

**Business and the Environment Course Options**

* **Business Strategy and the Natural Environment (ENVIR 502)**  
  Applies economic and business principles (marketing, accounting, operations) to understand interactions between business and the natural environment and how environmental issues influence business strategy. Theory and case studies explore strategies that both respond to and seek competitive advantage from firms' interactions with the environment.
* **Cases in Sustainability (IBUS 545)**  
  This course examines the three chief components of corporate sustainability - financial, social, and environmental/natural- in a case based format.  The orientation of our case work is Business (not Policy or Politics, although given the global perspective these clearly are incorporated).  We tackle rigorous cases with a systems approach to the triple bottom line.   Each of the three sustainability components includes coverage by outside expert speakers & practitioners.  We explore both strategic and executional aspects of major Fortune 500 organizations and the work they are doing in this important 21st century context.  The objective of this course is not only to inform, but to help incorporate into the executive’s decision making process the issues, opportunities and approaches needed to address the issues of Sustainability within any firm.

**Science Application Course Options**

* **Role of Scientific Information in Environmental Decisions (PB AF 597)**  
  This course examines how science contributes to decisions that involve the natural environment: how science and scientists help frame debates and decisions; how scientific findings are incorporated into decision-making processes; how scientists and nonscientists deal with uncertainty about scientific questions. Illustrates the need for accurate representation and critical evaluation of scientific information.
* **Risk Assessment for Environmental Health Hazards (PB AF 589 / ENVH 577)**Environmental Risk Assessment introduces students to the fundamentals of environmental risk assessment. Students learn to identify, characterize and predict environmental health risk. Prediction methods are taught and students will have an opportunity to use these approaches. Methods for evaluating uncertainty in such predictions are presented. Approaches for preventing and controlling such potential risks are also included in the course content and this will involve discussion of legislative and regulatory options as well as risk communication techniques. Students will prepare a risk assessment within a group project.
* **Life Cycle Assessment (M E 515)**Presents and discusses the computation structure and data sources for environmental Life Cycle Assessment. Uses Life Cycle Assessment to analyze materials, products, and services. The analysis either identifies opportunities for improvements or selects a superior alternative on the basis of pollution prevention and resource conservation. Offered: W.
* **Toxic Chemicals and Human Health (ENV H 405)***Professor: Evan Gallagher*  
  Examines the basic principles of toxicology and the effects of chemicals on human health. Includes mechanisms; dose/response relationships; toxicity testing, disposition in the body; modifiers of response; chemicals and cancer; birth defects; exposures in the home, workplace, and environment; and risk assessment and government regulation. Prerequisite: minimum grade of 2.0 in BIOL 220; either 2.0 in CHEM 224, 2.0 in CHEM 239, or 2.0 in CHEM 337. Offered: Sp.
* **Hazardous Waste Management (ENV H 446)***Professor: John Kissel*  
  Characterization of hazardous wastes and introduction to pertinent federal and state regulations. Discussion of exposure pathways and description of management options at pre-generation, pre-release, and post-release stages. Emphasis on public health significance. Supplemented with case studies. Prerequisite: CHEM 162; MATH 124.

**Keystone Project and Courses**

Students must complete a two-quarter long interdisciplinary team-based Keystone Project, which is conducted through the Keystone Project course sequence ENVIR 511, 512 offered Fall and Winter Quarters.

* **Keystone Project I (ENVIR 511) (4 credits)**  
  Environmental Management Certificate Capstone Course.  First course in a two quarter sequence.  Interdisciplinary project teams work with a faculty mentor and community partner to address regional environmental issues.
* **Keystone Project II** **(ENVIR 512) (4 credits)**  
  Environmental Management Certificate Capstone Course.  Second course in a two quarter sequence.  Interdisciplinary project teams work with a faculty mentor and community partner to address regional environmental issues.

**Grading/Assessment/Minimum Standards**

The program complies with [Graduate School standards](http://www.grad.washington.edu/policies/) for performance and completion. Student performance will be assessed in accord with standards in primary academic units. To successfully complete the certificate, the student must earn a cumulative GPA of 3.0 in all courses taken to fulfill the requirements, and no grade in any of these courses can be lower than 2.7.

**Graduate Certificate Information Sources**

Additional information and Graduate School requirements for Graduate Certificate programs are available online at: [Guidelines for Graduate Certificate Programs](http://www.grad.washington.edu/Acad/GradCertificate.htm).

**Keystone Projects – *a sampling, both* *past and present***

### **Pollution Prevention for Specialty Paints**

**Keystone Partner:** [**Pacific Northwest Pollution Prevention Resource Center**](http://www.pprc.org/)  
**Project Summary:** The goal of this project is to analyze and recommend pollution prevention solutions for supply chain inefficiencies surrounding the production, use and disposal of specialty paints.

Specialty paints are a sub-set of commercial paints made for performance properties like impact resistance, heat cold resistance and corrosion resistance. Industry feedback suggests that painting businesses find they have to purchase these paints in minimum quantity batches that exceed the amount of paint needed. Businesses report that the ratio of used to unused paint can be as much at 1 to 12, and that the excess product is stored and disposed of as a hazardous waste. The negative impacts of the current supply chain model include disposal costs, expense of the products to consumers, GHG emissions associated with extraction, production and transport, liabilities associated with manufacture and storage of hazardous substances, and human health/environmental risks associated with disposal.

The deliverable for the project is a report that describes current practices and the magnitude of the problem in the Puget Sound Region, in terms of volumes of waste, associated risks, costs to industry and the public. The Final Report will:

1. characterize the problem in terms of volumes, toxicities and how much economic and environmental waste is involved;
2. identify barriers to small batch production faced by paint manufacturers and trade associations;
3. identify several potential solutions, such as improved supply management (use of a middle expeditor broker), opportunities for multi-functional formulations, take back policies, incentives programs, etc.;
4. identify and recommend alternative supply chain options that reward efficient practices and protect the environment.

### **Carbon Footprint: University of Washington Air Travel**

**Keystone Partner:** [**UW Office of Sustainability**](http://green.uw.edu/)  
Project Summary: The goal of this project is to analyze existing data related to air travel at UW and identify, develop, and recommend actions for UW that will result in measurable GHG reductions.

The UW has committed to reducing carbon to 15% below 2005 levels by 2020, and reducing to 36% below 2005 levels by 2035. Air transportation comprises a significant amount of the UW’s carbon footprint, and the impact of professional and athletic travel on the total footprint is not well understood. Possible professional air travel reduction initiatives will need to take into account the UW’s mission as a collaborative research institution, as well as behavioral resistance to reducing travel.

The deliverable for the project is a report that evaluates available data regarding the University of Washington’s greenhouse (GHG) emissions related to professional travel; explores what peer institutions have implemented; identifies behavior change techniques most likely to succeed within higher education and possible actions that UW can take; and outlines a change management/communication plan.​

The Emerging Risks Workgroup (ERW) analyzed the emerging risks associated with increased production and transport of petroleum products, including changes in transportation patterns in U.S. ports and waterways and their environmental implications. ERW aims to provide topical, useful and thorough research, analysis and recommendations (as appropriate) to the National Oceanic and Atmospheric Administration (NOAA) Office of Response and Restoration so they can effectively mitigate and respond to them in order to protect the nation's coastal environments and communities. The following questions framed our investigation into transportation of crude oil and petroleum products in US waters:

* How might oil transportation patterns in U.S. ports and waterways change?
* What are the environmental risks of new transportation patterns?
* What does this mean for existing spill prevention and response plans?
* Will the federal and state funding be adequate for spill response?
* Are the lessons learned from previous spills still valid?

### **Regional Open Space Strategy**

**Keystone Partner:**[**The Regional Open Space Strategy of Central Puget Sound**](http://uwemross.wordpress.com/)

As the Puget Sound region continues to experience rapid growth and development, policy makers, developers, advocacy groups and others need a regional strategy to address and balance their disparate set of interests. Central to this strategy is how the region will value, use, and interact with open space, including parks, trails, farmlands, forests, recreation areas, waterways, and green storm water infrastructure, all of which provide essential and valuable benefits and services to all inhabitants of the region.

This project provided the Regional Open Space Strategy with a method for evaluating and communicating ecosystem services in order to prioritize conservation activities in the Puget Sound region. The role of the project team is to use existing methodologies of ecosystem services valuation with data from the Puyallup-White watershed. We then developed a framework for valuating ecosystem services in the Puget Sound region and recommended metrics to address ecosystem service benefits, health and equity outcomes, jobs and economic development, and special considerations, such as linking isolated natural lands and parks or providing a key wildlife corridor need.

### **Offshore Wind Energy**

**Keystone Partner:**[**Washington State Department of Commerce**](http://www.commerce.wa.gov/Pages/default.aspx)

Washington law calls for the Washington State Department of Commerce to provide guidance in achieving a unified state position on the siting and operation of renewable energy facilities in Washington's coastal and marine waters. The team focused on developing efficient coordination between state agencies on the development of future Offshore Wind Energy (OWE) projects. The goal of agency coordination is to make the permitting and siting process more efficient for applicants while protecting Washington's natural resources.

* Conducted background research on OWE and state agencies that have responsibilities associate with OWE
* Interviewed representatives from relevant agencies to determine roles and responsibilities related to OWE
* Identified additional groups involved in the process including federal, local, and tribal governments.

The final report provides a Preliminary Guidance Notebook including:

* An overview of each state agency role and responsibility associated with OWE and the relationships between agencies and federal government, tribes and other stakeholder groups.
* A regulatory matrix listing statutes and ordinances relevant to OWE permitting and the corresponding state agency.

Recommendations for further research on policies and procedures for Washington State and identification of gaps based on experiences in other locations.

**University of Washington Residence Hall Energy Conservation Study**

**Keystone Partner:**[**University of Washington Facilities Services**](http://www.washington.edu/facilities/)

The University of Washington Residence Hall Energy Conservation Study is a subsidiary of the Pacific Northwest Smart Grid Demonstration Project. The project's overarching goals are to integrate renewable energy, increase reliability, and promote energy savings in the Pacific Northwest. The team's study focused on addressing these goals specifically at the University of Washington (UW), where smart grid integration has already taken effect.

The project is designed to study the effects of small-scale technological and educational energy interventions on students living in UW residence halls. The research focuses on the degree of change in energy consumption and behavior as result of ten-week interventions. The interventions are implemented in two selected residence halls on UW's Seattle campus.

### **Emerging Environmental Risks from Tar Sands**

Petroleum laden tar sands from Alberta, Canada are being extracted and exported to the US and other counties.  Canada's tar sands and associated pipelines are politically and environmentally controversial for several reasons, including climate change, first nation cultural concerns, foreign policy implications, economic and employment issues, extraction methods, aquifer protection, and transportation risks.  Much of the controversy over transportation involves the proposed Keystone XL Pipeline which would run from Alberta, Canada, to refineries and ports on the U.S. Gulf coast.   Other routes for exporting tar sands include an existing (proposed for expansion) TransMountain pipeline to Vancouver, BC, and a proposed Enbridge Northern Gateway Project route to Kitimat, BC. These other “all Canada” routes have received less visibility in the U.S., but both the Northern Gateway and TransMountain routes have implications for the U.S. as these pipelines would terminate at marine terminals and the oil would be transported via tanker through or adjacent to U.S. waters.

Graduate students from the Environmental Management Certificate Program at the University of Washington will work with the Seattle-based Office of Restoration and Response at NOAA to investigate the implications of the transport and possible spills of this material.  This information will be applicable to Washington and other coastal states.

Key questions include understanding the risks behind the Keystone XL pipeline and other routes for shipping the oil. What are the environmental and economic trade-offs between the routes? How much is currently shipped out of BC ports and what is the expected future traffic? What is the market and use for the material?  What is the behavior of the material when spilled?  What response and assessment issues may arise? What R&D gaps exist for spill responders?

### **Washington’s Working Coast: An Analysis of Resource-based Industries**

The counties of Washington’s outer coast have much in common. They are distant from urban centers of wealth and commerce, more heavily dependent on natural resource extraction and tourism, and have more limited infrastructure to support economic development.  The counties of the north and south coast also differ in important ways. Public and tribal lands dominate the rugged rocky north coast, while the south coast shoreline is characterized by estuaries and beaches held in private ownership.

The DNR seeks an up‐to‐date empirically‐grounded assessment and portrayal of the marine‐based economy of the outer coastal region and challenges to its sustainability. DNR also seeks an assessment of strategies for improving the sustainability of the marine-dependent sector of the coastal economy. This portrait will be useful in conveying to political leaders, managers, and the general public, the importance of these businesses. It will also lay the foundation for developing strategies to address the major challenges to the continued viability of the marine-based economy.

The PoE Keystone team will organize and conduct a thorough assessment of the current status of the coastal marine based economy including identification of all categories of the marine-resource dependent sector, listing of all businesses and mapping of their locations, quantification of jobs and associated aggregated gross revenues, and analyses of the multiplier effects of these activities. Students will conduct an evaluation of the full spectrum of factors important to the sustainability of the coastal marine-based economy such as social, economic, legal and ecological conditions that support or undermine their vitality. The analysis will also identify strategies to promote sustainability, maintain existing uses, and promote job creation.

**(See next page)**

### **UW Smart Residence Halls**

The UW is investing $10 million dollars over five years to improve the Seattle campus electrical system, thanks to a US Department of Energy match grant made possible by the American Recovery and Reinvestment Act.  The UW Smart Campus Demonstration is one of eleven sub-projects within the $178 million regional Northwest Smart Grid Demonstration Project led by Battelle Memorial Institute with support from five technology partners, and the Bonneville Power Administration.  The goal of the project is to demonstrate the feasibility, cost and benefit of a regional smart grid; better integrate distributed and renewable generation assets; develop and validate the two communication pathways required to enable a smarter grid; and develop interoperability and cyber security standards necessary to reliably implement smart grid technologies.

The UW Smart Campus Demonstration Project began in early 2010 and (as of August 2012) has installed some 240 smart meters that report real time electrical use in roughly 11 million gross square feet of space within 200 building served by the central electrical utility on the UW Seattle campus. This fall, a team of EM students will launch a two-year experimental demonstration phase of the project where data will be gathered and analyzed to determine the cost and benefits of deploying smart grid technology.

The UW project will conduct a series of energy efficiency, conservation and demand response experiments.

The UW Smart Residence Halls, Energy Challenge is one of two student engagement experiments included in the project.   The Challenge is an energy consumer engagement experiment that will enlist student residents of Poplar and Elm Halls.  The challenge will involve high tech personal energy management dashboards, floor by floor energy use displays, smart plugs, web based education tools, social media, and conservation competitions with the goal to reduce energy waste on campus residence halls and determine the cost benefit of energy use behavior modification programs.  The objective of this experiment is to determine the cost and magnitude of energy use behavior change accomplished through various conservation techniques; to measure the persistence of behavior change over time and evaluate the effectiveness of various technologies and educational strategies.