



Report of the

Task Force on the Environmental Sciences

The Ohio State University

September 21, 2009

Task Force on the Environmental Sciences Report

Preface

This report presents the main findings and recommendations of the Task Force on the Environmental Sciences. The accompanying document, Summary of the Work of the Task Force on the Environmental Sciences, describes and summarizes the activities of the task force and its working groups. The summary provides the supporting information for the task force findings and recommendations. The summary also provides links to the working group reports and other documents reviewed or prepared by the task force. Taken together, this material constitutes a complete record of the task force's efforts and provides a base for implementation activities.

Introduction

The Task Force on the Environmental Sciences¹ was convened by Provost Joseph Alutto in September 2008 in response to one of the top-level findings of the recent doctoral program assessment process. Specifically, that process revealed that there is

a tremendous opportunity for Ohio State to excel in the environmental and earth sciences. The organization and coordination of these efforts are currently suboptimal. Ohio State already has demonstrated strengths and faculty with international reputations in these important areas, but the individual efforts are widely distributed across eight colleges on campus.²

As a result, Ohio State is neither receiving the full recognition of its work in environmental sciences³ nor achieving its full research and educational potential.

Charge to Task Force

- Identify how Ohio State's academic programs in the environmental sciences should be optimally configured.
- Recommend appropriate organizational processes and arrangements to support high-quality educational and research efforts. The task force will look at overarching research themes, existing strengths, and opportunities for Ohio State.

Committee Members

The task force was co-chaired by **Joan R. Leitzel**, Interim Executive Dean for Arts and Sciences and Vice Provost, and **Patrick S. Osmer**, Vice Provost for Graduate Studies and Dean of the Graduate School. Members include:

Douglas E. Alsdorf, Associate Professor, School of Earth Sciences

Nicholas T. Basta, Professor, School of Environment and Natural Resources

Ralph E.J. Boerner, Professor, Department of Evolution, Ecology, and Organismal Biology

Timothy J. Buckley, Associate Professor, College of Public Health

¹ The task force was initially named the Task Force on the Earth and Environmental Sciences based on the findings of the review of doctoral programs at Ohio State. The name of the task force was shortened to environmental sciences to encompass all activities, including relevant activities in the earth sciences, related to environmental sciences at Ohio State.

² "Doctoral Program Assessment and Plan," Graduate School, The Ohio State University, April 2009, pp. iv-v.

³ The task force recognizes the interdisciplinary nature of environmental research and education. Its use of the term "environmental sciences" is meant to encompass the broad range of disciplines involved in environmental research and education. These disciplines include those that may, in some settings, be organized under such rubrics as environmental engineering or environmental studies.

Jay S. Hobgood, Associate Professor, Department of Geography

William Berry Lyons, Professor and Director, Byrd Polar Research Center

Karen M. Mancl, Professor, Food, Agricultural, and Biological Engineering and director of the Environmental Sciences Graduate Program (on leave 2008-09)

Jay F. Martin, Associate Professor, Department of Food, Agricultural, & Biological Engineering

Bobby D. Moser, Vice President for Agricultural Administration, University Outreach, and executive dean for the College of Food, Agricultural, and Environmental Sciences

Matthew S. Platz, Distinguished University Professor and Interim Dean, College of Mathematical and Physical Sciences and College of Biological Sciences

Gregory N. Washington, Interim Dean, College of Engineering

Linda K. Weavers, John C. Geupel Professor, Department of Civil and Environmental Engineering and Geodetic Science

Caroline C. Whitacre, Senior Vice President of Research

W. Randy Smith, Vice Provost (Office of Academic Affairs' liaison)

Activities of the Task Force

The task force began its work by establishing three working groups to gather and review basic information in three critical areas:

Inventory. This group compiled and summarized information on activities, people, and programs in the environmental sciences at Ohio State. This information was fundamental to the work of the task force and demonstrated the scale and breadth of activity: 200 faculty across 16 departments and programs housed in eight colleges and schools.

The group found that environmental sciences activities at Ohio State are highly decentralized and that academic offerings at the undergraduate level are totally decentralized. Individual units develop their own curricula based on their philosophy and academic resources. At the graduate level and faculty levels, the group found multiple linkages between units and research centers that resemble a hub and spoke network. The Environmental Sciences Graduate Program is a large hub; other units and centers are hubs of various sizes. The linkages among the units have developed through mutual interest. There has not been central planning.

Research Frontiers. This group was charged to review and identify current areas of frontier research in the environmental sciences together with main areas of activity and excellence at Ohio State. This information provided a base and framework for future directions of research and education at Ohio State.

The group found that main research areas at the national level included water (hydrology and availability and access to safe water supplies), energy, environmental change (climate and landscape change), infectious diseases, environmental impacts of emerging contaminants and technologies, and the cyber infrastructure needed to study environmental problems.

Examples of strengths at Ohio State include glaciers and climate change; energy and carbon mitigation; water quantity and hydrology; nutrients and pollutants; environmental agents and health; and sustainable food production and global food security.

Best Practices. This group was charged to review organizational structures for interdisciplinary education and research at other institutions to gain ideas about what approaches would work best for Ohio State. As the National Academy of Sciences report *Facilitating Interdisciplinary Research* made clear, the optimal approach for supporting interdisciplinary research and education in universities is not a solved problem in social science research.⁴ Ohio State thus must develop its own solution, based on what has been learned elsewhere and on Ohio State's unique resources. The group noted that

⁴ National Academy of Sciences, 2004, p. 40.

organizational structures and practices in environmental programs at Arizona State, Minnesota, and Penn State provided valuable ideas for developing a new framework at Ohio State.

The reports of these groups (which are summarized in the accompanying document), together with what was learned from the series of open forums for faculty, students, and researchers, led to the identification of several major findings by the task force. These findings and the resulting recommendations developed by the task force constitute the main part of this report.

FINDINGS AND RECOMMENDATIONS

Top-Level Findings

Topics such as climate change and global warming, control of the emission of greenhouse gases, emergence of new infectious diseases, and maintaining adequate supplies of food and clean water are in the news headlines daily and are some of the most pressing global issues facing humankind today. Their importance to the people of Ohio and to Ohio State can hardly be overstated; it is therefore imperative that Ohio State have world-class research and educational programs to address these problems. In addition, President Gee has announced the university's commitment to responsible use of natural resources and to sustainable practices. As such, the institution seeks to apply the best that is known about environmental sustainability in ways that engage all members of the university community.

A top-level finding of the working groups is that the environmental sciences are vast and wide in terms of the topics and disciplines they encompass and that the boundaries of their activities are not well-defined.. The total federal expenditures on research in environmental sciences of \$3.6B in FY2007 represent a significant national effort but are broadly distributed among and within different federal agencies, including the EPA, NSF and NIH; the NSF has no single directorate or division for environmental sciences. Environmental sciences activities at Ohio State are similarly distributed broadly and range from basic research on global climate change to environmental watershed studies and management and environmental public health issues in the state.

The inherent diversity of disciplines that fall under the rubric of environmental sciences combined with the corresponding diversity of activities on campus pose a great challenge to develop an effective organizational approach that will enable Ohio State to achieve its full potential in the environmental sciences. On the other hand, the scope of academic work at Ohio State relating to the environment is a positive. Programs in the natural and social sciences, in food, agricultural and environmental sciences, in medical areas, in public health, in public policy, in various areas of engineering and geodetic science, in climate change, in statistics and mathematics collectively provide a great opportunity for Ohio State researchers to do work here that cannot be done elsewhere.

Part of the challenge arises from a related finding of the task force: there is a need to address culture, conflict issues, and territorialism among departments, programs, and colleges regarding "environmental" degree programs and research at Ohio State. These issues have impeded the development of important new programs on campus and have led to reduced productivity and wasted resources, including duplicative course offerings.

This assessment of Ohio State's current situation sets the stage for the more specific findings and recommendations of the task force.

Specific Findings

1. There is a need to fix the financial and administrative structure for the interdisciplinary graduate programs (IGPs), specifically the Environmental Science Graduate Program. The IGPs and college/department programs at present compete for both financial and human resources. Furthermore, there is a lack of ownership of the IGPs, which leads to them being regarded as cost centers without adding corresponding value to the individual colleges.
2. There is a need to ensure that department chairs develop written agreements with faculty who participate in cross-disciplinary centers and/or in interdisciplinary graduate programs. This expectation has been set by Provost Joseph A. Alutto in his March 20, 2009, memo to the faculty. The goal is to change the culture of deans, department chairs, and faculty members about the

expectations, annual goals, and reward structures for faculty regarding their work within departments and without, e.g., on interdisciplinary programs.

3. There is a need to design a process to review and update the curricula in the graduate programs (both departmental and interdisciplinary) with the expectation that this will also strengthen and broaden the research programs.
4. There is a need to expand forums, trans-university information and networking tools and knowledge management efforts and to develop and maintain web-based portals in support of interdisciplinary research and educational efforts and to attract prospective students.
5. There is a need to establish that a main expectation of broad university investments and initiatives is that they will, in time, attract major external support. The internal support is not the end point.
6. There is a need to identify space requirements for appropriate co-location of offices, laboratories, and equipment that will facilitate interdisciplinary research and educational programs.
7. The campus itself offers an excellent opportunity to serve as a laboratory for environmental research and education.
8. There is a need to review and design a process to move from multiple undergraduate programs to a coordinated undergraduate curriculum that includes various options.⁵

Recommendations

Organization and Leadership

We begin by addressing the organizational and administrative issues because their solution is a prerequisite for strengthening both the research and graduate programs in the environmental sciences. The goal is to fix existing financial and administrative problems with IGPs and to establish flexible and responsive arrangements for supporting interdisciplinary work and aligning efforts with current research and teaching goals. Existing barriers to new initiatives and work outside faculty members' home departments and colleges must be lowered.

The approach of the task force is to recognize and support the diversity and breadth of work in the environmental sciences, not try to fit it into an existing or new unit or college that would add, not reduce, complexity and cost to the work. The approach builds on a significant, comparative advantage of Ohio State relative to other institutions: the great breadth and comprehensiveness of its programs and faculty.

The task force recommends a support structure that can provide coordination of significant activities common to all graduate programs in the environmental sciences, disciplinary and interdisciplinary. This coordinating structure (or umbrella) would maximize the strengths of all programs, enhance their visibility, and ensure that the totality of programs is the right mix for Ohio State. Coordinated activities under the umbrella should include 1) a central portal for application to all graduate programs in the environmental sciences, 2) support for recruiting of high-quality graduate students, 3) a high-quality web portal to serve as a central focal point for students and faculty for student, faculty and research activities across campus in the environmental sciences, and 4) linkages among graduate faculty and students through formal seminar series, brown-bag lunches, and related activities.

A Program Council for Environmental Sciences should have responsibility and give direction to the efforts. Membership would be drawn from those deans/directors and lead faculty with active involvement and investment in the environmental sciences programs. The Dean of the Graduate School and the Vice

⁵ It became clear during the work of the task force that the undergraduate programs in environmental sciences needed attention and could not be completely separated from discussion of Ohio State graduate curricula, future research directions, and administrative structures to support the environmental sciences. While a full review of the undergraduate component was beyond the scope of the task force, the task force outlines the problems and makes recommendations for a more comprehensive review and possible approach.

President of Research should also be members. An additional responsibility of the Program Council would be to design and carry out, in coordination with the Graduate School and the Office of Academic Affairs, periodic reviews of the environmental sciences graduate programs, both disciplinary and interdisciplinary, to assess the quality of each program and also to evaluate the mix of current programs. The metrics for success should include those that indicate the development and growth of high quality programs including: the creation of a collaborative, networked culture for faculty and graduate students working on environmental issues; successful recruitment of high quality and diverse graduate students together with an increased percentage of domestic students; an increase in external grants, including training grants; moving up in ranking systems that are appropriate to academic programs in the environmental sciences; and greater national visibility via a web portal.

To succeed, this approach must have both 1) excellent leadership from the top down to the group level and 2) well-defined ground rules that will facilitate the work of individuals and small groups of faculty and students across traditional departmental and college boundaries as needed to carry out their educational and research programs. Adequate resources are a third requirement for success; we will return to this point after elaborating more on the first two.

Ground Rules

While excellent leadership as described above is a requirement for success, the great majority of the research and teaching work, the development of creative new ideas, and the writing of proposals to seek external funding are done by the faculty, researchers, and students. Getting the ground rules right to enable and facilitate their work is essential, which means 1) the barriers identified above must be removed and 2) appropriate incentives must be established.

Finding # 2 establishes the need for the first ground rule; that is, that deans, chairs, and faculty must be clear about the importance of both disciplinary and interdisciplinary work. Furthermore, Patterns of Administrations (POAs) for units must describe how interdisciplinary work, in particular, will be valued and rewarded in terms of criteria for promotion, tenure, and salary increases. The provost's memo sets an expectation that chairpersons and faculty members will come to explicit agreement about what the expectations are around interdisciplinary research and involvement in interdisciplinary instruction, how these contributions will be evaluated, and how they will be rewarded. Real or not, the task force encountered perceptions among too many faculty members that work outside their department or in another subject was not valued by their chairs or, in the worst cases, that they were penalized for it.

Another ground rule, that resources follow successful effort, follows from Finding # 1. This ground rule includes the expectation that credit for teaching in environmental sciences graduate programs, and hence the instructional subsidy, will go to the unit of the instructor. A similar rule must be established for an equitable distribution of indirect costs on grants that will support and encourage cross-department and cross-college collaborations. The absence of these ground rules has been a hindrance to work in the environmental sciences, and in other interdisciplinary areas, at Ohio State. The MOU approach used by the Byrd Polar Research Center provides a good basis for developing a ground rule on research funding.

Funding

Finding # 6 says simply that Ohio State must concentrate on increasing the amount of external funding if it is to excel in the environmental sciences. University and state resources cannot be expected to support the scope of work that is possible and envisioned. Available internal funding should be used to seek or leverage external funding, as in the case of the TIE programs. This, however, requires a change in university culture that must be made clear to all researchers. Furthermore, Ohio State must concentrate on seeking larger grants, including those that support interdisciplinary projects. Individual PI grants are very important but cannot by themselves provide the needed resources for major new initiatives in the environmental sciences. For this effort to succeed, the university will need to establish a process to identify and select the most promising directions and initiatives for the larger projects and provide the support needed to develop them. The amount of effort required to develop and write successful proposals for large grants is beyond what can be reasonably expected of faculty researchers on their own if they are to carry a full load of research and teaching activities. Therefore, professional support to help prepare proposals is needed, and it can also help identify and develop potential sources of funding from

corporate, private, and other non-federal sources. This support will be crucial and very cost-effective when successful. It should be provided through a collaboration of the Office of Research, the Colleges, and the Graduate School, and could build on the successful efforts of established research centers and institutes on campus.

Space Planning

A requirement for successful interdisciplinary research and education is co-location of people working together and arrangements of office and laboratory space, cafeterias, and informal meeting areas that bring people together and promote the discussion and development of new ideas. This is a challenge for any organization, let alone the largest single campus in the nation. In the short term, meeting this need will require creative use and reallocation of space in existing buildings to support interdisciplinary activities; in the longer term, plans for new and renovated buildings and facilities must take into account the needs for supporting co-location of different groups. The comprehensive planning exercise involving Sasaki & Associates provides a special opportunity to develop an integrated concept for how best to facilitate interdisciplinary research and educational efforts in the environmental sciences at Ohio State. More information on this topic is provided in the summary document.

Campus as an Environmental Laboratory

Ohio State's campus is large and diverse enough to serve as a learning laboratory for the environment in multiple areas, such as storm water runoff, energy use in campus buildings, water testing of the Olentangy River, and measuring nutrient and herbicide levels in campus wetlands. Initial discussions with Facilities Operations and Development have found areas of potential mutual interest, and there would be good opportunities for undergraduate, cross-disciplinary capstone courses. This should be another responsibility of the Program Council.

Undergraduate Programs

It became clear during the work of the task force that the undergraduate programs in environmental sciences need attention and could not be separated from the discussion of graduate programs, future research directions, and administrative structures at Ohio State. Two examples of the connection between the undergraduate programs and the graduate and research activities are that 1) the undergraduate enrollments have a strong impact on the financial and academic base of support for graduate and research programs and 2) the currently fragmented undergraduate offerings, and the tension/competition about them, are detracting from the overall environmental efforts at Ohio State. Furthermore, undergraduate research activities and graduate teaching efforts provide additional linkages between the two levels of education.

A full review of the undergraduate component was beyond the scope of the task force. However, during its review of the graduate and research enterprises associated with the environmental sciences, it became clear to the task force that coordination and further development of the undergraduate environmental curricula would be desirable. The task force's suggestions are intended to provide a framework and base for a more comprehensive review and changes going forward. The main task force recommendation is to establish a new task group to design, by the end of the academic year 2009-10, a coordinated undergraduate curriculum with multiple options that will embrace the totality of environmental science, environmental engineering, and environmental studies activities on campus. To aid in this effort and to provide a starting point, the attached summary describes the findings and recommendations in more detail. The task force does not want to pre-ordain the outcome of this new effort. Rather, it wants to make its preliminary work available to the new task group.

Conclusions

Preservation of the natural environment and changes in climate are issues of public concern around the globe. The areas of study called environmental sciences now attract researchers from many different fields, and students show strong interest in environmental problems. Significant funding from federal, state, and industrial sources is available to support work in this area. There is every reason to believe that environmental sciences will be a dynamic and very important academic area for many, many years.

Ohio State has named climate, energy, and the environment as one of its central areas of excellence. Indeed, Ohio State has many recognized faculty members across the university working on many

different environmental problems, and many students preparing for careers in these fields. The Task Force on Environmental Sciences believes Ohio State can move to an even stronger level of leadership. The task force recommends that the university view the diversity of activity in environmental sciences as a positive and undertake to lower many of the current organizational barriers separating programs and faculty, to coordinate recruitment and admission of graduate students into these programs, to provide for periodic review and updating of curricula, to develop mechanisms to improve communication, to position programs for greater external funding, and to bring greater visibility to the work at Ohio State in environmental sciences. This approach would not have the rigidity of a center or a college but rather would have the agility and flexibility that an evolving interdisciplinary area requires. Development of an implementation plan for this concept will be an important next step.

This report presents the several findings and recommendations of the task force. In addition, the working groups have produced other reports, which are summarized in the accompanying document, to inform the implementation of the recommendations going forward. The task force is persuaded that environmental sciences is an area of great opportunity for Ohio State and is eager for the university to move now from deliberation to action.