MESM 2007 Group Project Proposal:

Prototyping a Campus Sustainability Management System

PROPOSERS

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PROBLEM STATEMENT

Creating sustainability initiatives within an organization can seem overwhelming. One of the keys to success is creating a sustainability team and giving them tools and techniques to help them develop a sustainability plan for their organization. UCSB, with the assistance of Brightworks Northwest (www.bwnw.com), is developing a Campus Sustainability Plan (CSP). The plan's approach is based on The Natural Step (wwww.naturalstep.org) framework. Among the challenges are learning how sustainability principles can benefit the campus community and how to incorporate sustainability into the campus culture and business operations. A critical step in that process is to provide campus members with information that identifies the use of resources and emissions of wastes at the level where responsibility lies. Most sustainability audit systems now report only the campus aggregate flows, where the impact of individuals, departments, buildings, etc. is diluted in the totals. We submit that it is necessary to disaggregate the information to the appropriate level of accountability (and reward). This suggests the need for a spatial information system design that links the flow of energy and materials through the campus with the spatial features for which accounting is required. Thus this is more than merely a geographic information system database of the campus but a “smart” database that couples process and objects. By using an object-oriented data model, we expect this smart tool to facilitate the audit reporting process that truly permeates the campus culture and thereby leads to improved performance. It will also be an analytic platform for evaluating management options that would allow UCSB to further its mission towards becoming a sustainable campus.

The issue is certainly not unique to this campus. The Talloires Declaration (TD) is a ten-point action plan for incorporating sustainability and environmental literacy in teaching, research, operations and outreach at colleges and universities. Composed in 1990 at an international conference in Talloires, France, TD has been signed by over 300 university presidents and chancellors in over 40 countries, including UCSB. Consequently, the prototype developed for

this project could be a template for thousands of academic and corporate campuses around the world.

PROJECT OBJECTIVES

The goals of this study are to design and implement a prototype environmental information management system for sustainability indicators on the UCSB campus and to use the system to make management recommendations about cost-effective methods for more sustainable resource use (e.g. more sustainable water uses). Specific objectives will be to:

- Identify a subset of the campus sustainability indicators that should be monitored and reported for specific campus elements rather than reported solely as campus-wide totals. This choice will be based on both the feasibility of collecting data at the required spatial resolution and on the potential for improved performance if data were published. Water usage would meet these criteria.

- Design a geodatabase data model to facilitate storage, querying, analysis, forecasting, simulation, and reporting of the selected indicators.

- Implement the data model for selected indicators as a GIS-based prototype sustainability management system and generate reports at appropriate time and space scales.

- Compare the new and existing methods regarding efficiency in generating reports, in change in performance on the indicators, and the effort to implement the systems.

- Make management recommendations about water usage options that would cost-effectively improve performance on sustainability indicators.

SIGNIFICANCE OF PROJECT

The design and implementation of a GIS-based prototype sustainability management system could:

- Improve the efficiency of the operations of the campus Sustainability Program by organizing data and automating some of the reporting requirements.

- Improve campus sustainability performance by identifying specific campus elements where performance is less than desired.

- Provide real-time monitoring of energy use during electrical emergency reduction periods to identify where additional reductions are needed.

- Provide a platform for testing policy options or alternative technological solutions.

- Provide a tool to support student research and training on sustainability.

- Support education and outreach programs by alerting the campus community where performance can be (or has been) improved, as well as to develop and target incentives.

- Serve as a template for thousands of academic and corporate campuses.

Thus the project will assist the campus Sustainability Program, the campus community as a whole, and potentially other campuses.

BACKGROUND

The UCSB campus established a Central Campus Sustainability Committee (CCSC) and a Sustainability Working Team (SWaT). During the academic year 2003/04, SWT/CCSC reached a consensus on sustainability indicators and populated them for benchmarking. These include indicators for: Energy, Water, Land/Built Environment, Recycling/Waste disposal, Transportation, Purchasing. The Sustainability Program plans to develop a Sustainability Management System based on these indicators. Additionally, as part of UCSB's Long Range Development Plan, an analysis on reducing water demand and studies on feasibility of alternative water resources (e.g. water catchment systems) are recommended (Policy 1305: Administering Long Range Development Plan and Environmental Impact Report: Mitigation Measures, Sept 1, 1992). The Grounds Sustainability committee of the UCSB Sustainability Plan work group has examined water use on campus as part of the overall campus sustainability plan. The committee has identified goals and areas that campus staff is interested in improving. Improved sustainability of water use on campus is one of the identified goals.

The campus is also compiling a GIS database of the campus facilities. This will greatly assist the group project, which can concentrate of adding the relationships between facilities, departments and programs, and the sustainability indicators to the geodatabase.

STAKEHOLDERS

- Facilities Management and the campus GIS program
- Campus Planning Office
- Education and Outreach Office
- Education for Sustainable Living Program (ESLP)
- Jeff Kirby, Bren Engineering Facility Manager
- Goleta Water District
- City of Santa Barbara

APPROACH AND AVAILABLE DATA

Approach

The approach will be similar to previous Bren projects for sustainability monitoring of organic farms (Berry et al. 2003, Beard et al. 2004). It will require a multidisciplinary effort, integrating a multidisciplinary assessment of sustainability, development of a state-of-the-art environmental information management system, policy analysis and organizational behavior. The Bren group will meet with stakeholders across campus to gain a full understanding of the current campus information system and the indicators that stakeholders believe are top priorities for tracking at a disaggregated level (and the time intervals for reporting). They will follow standard data modeling procedures to design a geodatabase data model for the campus that would serve this particular need and then implement the data model by building a smart GIS database for the campus on top of the campus GIS. The database will also be designed to generate some or all of the required reporting at appropriate time intervals. The group will then use this database to explore management options such as alternative technologies, behaviors, or land uses and assess them in terms of their impact on the performance indicators. For instance, one option may be to charge labs or other units for their actual power consumption rather than a campus

average rate. The group would need to evaluate not only the potential reduction in power usage but also the acceptability of such a policy to campus consumers and the relationship to the university's teaching and research mission.

Studies on water conservation technologies will be analyzed for cost-effectiveness and applicability. Based on the water use data, available and appropriate water conservation technologies, and information on campus land use, the project will evaluate management alternatives and make formal recommendations.

Data

The campus is currently developing a GIS database that will include facilities and infrastructure. Many of the flows of inputs and outputs are currently tracked periodically, at least at the campus level. The project will need to design a customized system that better integrates the spatial data on facilities with the flows and with the units for performance evaluation (e.g., people, departments, labs, buildings).

Since water has been a concern for the campus for several years, several separate UCSB campus entities have examined water use, such as Housing, which has five years of data. Additionally, a water resource management study has been produced looking at ways to conserve water. This data will be compiled with water use data for the rest of campus from research with UCSB Facilities Management, and observations of water practices to determine how much water the campus is using.

DELIVERABLES

The project will deliver a working prototype of a GIS-based sustainability management system to the campus Sustainability Program. This system will generate at least parts of the campus report on sustainability. Further, the project will produce a final report that evaluates the benefits of the system relative to the current methods on the basis of improved efficiency in generating the report and of improved sustainability performance of the campus through improved monitoring of elements within the campus. The project will make recommendations on at least one policy option or incentive program. Last, the project will produce a data model template that could be adopted by campuses elsewhere.

REFERENCES

Beard, D., Bedoya, Augusto, Darling, E., Kahn, D. 2004. Wiring the Farm: Operational Practices for Sustainable Agriculture. Unpublished Bren masters group project report. University of California Santa Barbara.

Berry, L., Callender, T., Chang, A., Grabiel, D., Henson, B., Turner, A. 2003. Tracking the Way Towards Sustainable Agriculture: Linking Economics and Ecology at Sunnyside Farms (Washington, VA). Unpublished Bren masters group project report. University of California Santa Barbara.

CLIENTS

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ANTICIPATED FINANCIAL NEEDS AND SOURCES OF SUPPORT

(See included letter of support from George Lewis)

- Registration fee to attend UC/CSU Sustainability Conference at UCSB, June 25-28, 2006.
- Internship for 1 graduate student for summer 2006 in the Sustainability office.
- Supplies (e.g., printing posters)
- An estimated $6,000 may be available from UCSB Housing and Facilities and $1,500 from the Shoreline Preservation Fund for summer internships.