

Sustainable Built Environments

The Colleges of Natural Sciences (CNS), Social and Behavioral Sciences (CSBS) and Humanities and Fine Arts (CHFA) in collaboration with Engineering (COE)

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The built environment is a complex system that shapes enormous resource flows (*i.e.*, material, energy, labor and economic investments) and impacts the natural environment for decades, if not centuries. If one considers typical design, construction and maintenance practices used today, the relationship between the built environment and the natural environment is not sustainable. Here, we propose that new, multidisciplinary approaches must be applied to the design, construction, maintenance and re-use of the built environment to make it more sustainable and dramatically reduce its carbon footprint. The sooner we make an investment in sustainable building practices, the faster we will make progress toward a truly sustainable future. Four programs and departments from four Colleges, the Architecture + Design Program from the College of Humanities and Fine Art; Building Materials and Wood Technology Program, from the College of Science; the Department of Landscape Architecture and Regional Planning in the College of Social and Behavioral Sciences; and the Department of Civil and Environmental Engineering from the College of Engineering have teamed together to build an initiative focused on to propose an interdisciplinary cluster in Sustainable Built Environments.

This effort will be accelerated and catalyzed by hiring interdisciplinary junior faculty across the participating units: The Architecture+Design Program, the Department of Landscape Architecture and Regional Planning, the Building Materials and Wood Technology Program, and the Department of Civil and Environmental Engineering [separately submitted proposal].

These four programs have a well-developed collaborative and interdisciplinary relationship in research, graduate committees and student coursework. Hiring in this cluster will extend the expertise and capabilities of these relationships and truly integrate many of the common research themes currently underway at UMass Amherst, establishing UMass as a leader in the area of Sustainable Design.

The hires will combine design concepts, innovative materials and impact to industry through technical expertise, outreach activities and integration with initiatives currently under development.

The Programs in Building Material and Wood Technology (BMATW), Architecture + Design (A+D) and Department Landscape Architecture and Regional Planning (LARP) and are involved in the creation of this cluster, with existing mission statements and graduate and undergraduate programs that will benefit from strengthening by new hires within the cluster. This proposal would be linked to Sustainable Structural Infrastructure request put forward by the Department of Civil and Environmental Engineering (Contact: Civjan).

Description of the Positions

The cluster will be anchored by four new hires (plus the linked proposal position in Sustainable Structural Infrastructure). Hires will include one each in BMATW, LARP and A+D, and one shared by two of the programs. The focus of these positions will be in Sustainable Construction Choices, Sustainable Transportation Planning and Sustainable Architecture, and Sustainable and Healthy Communities respectively. These distinct aspects of infrastructure development and planning are addressed to provide a truly effective impact on society. The focus on research and education in these areas will directly affect global sustainability.

College of Humanities and Fine Art: Department of Art, Architecture, and Art History *Program in Architecture + Design: 1 position*

Sustainable Building Systems

This position is in architectural design with a focus on environmental issues, clean energy technology, quantitative analysis of embodied energy, and LEED. The successful candidate will teach sustainability focused studios and technology courses, which will help the program address its NAAB identified deficiency in “sustainability.” The NAAB report indicates, “A consistent presentation of the principles of sustainability is not present.” Research related to the candidate’s teaching should focus on building performance analysis, life cycle modeling and emerging materials.

College of Natural Sciences: Department of Natural Resources *Building Materials and Wood Technology- 1 position*

Sustainable Construction Choices:

The focus of the energy use in buildings, both residential and commercial, is a key driver for greenhouse gas emissions, global climate change, and a host of other influences on our natural environment. In the United States; 36% of total energy use, 65% of electricity, 30% of greenhouse gas emissions and 30% of raw materials usage can be attributed to building construction and use. With 80% of US electricity demand tied directly to residential and commercial buildings, advancing the material and equipment choices, siting, and other design factors directly impact energy efficiency and our ability to achieve global climate change goals. Private residential construction alone represents 7% of our National GDP. There is an overwhelming and urgent need to improve energy and material use in both our existing built infrastructure as well as in new design and construction. The position will leverage UMass Amherst existing capacity in this area and meet a critical need in transferring building energy technologies and academic research to practical use in the field.

The position would focus on tracking, monitoring and improving energy efficiency in the construction phase of buildings. This would complement existing research in building energy performance that focuses on the as-built condition of structures. Research programs initiated by this position would be disseminated through a program of outreach serving related contractors, builders, developers, and homeowners in the area of energy efficient: design, construction, auditing, analysis, and retrofitting of both residential and commercial buildings. The network required for this outreach is already well established through existing NRC programs. The Building and Construction

Technology program can assist in developing and delivering classes, workshops and trainings for the target audience to support education efforts in building energy and remediation areas. This will include on-campus, off-campus, and online training delivery mechanisms.

College of Social and Behavioral Sciences: Department of LARP: 1 position

Sustainable Transportation Planning:

Transportation planning and the relationship of transportation to the design of cities account for a large portion of the debate in fuel consumption, national rates of obesity and their impact on health, and global climate change due to excess carbon. The position will include expertise in the area of transportation systems design and multi-modal design and planning. The faculty member will be able to teach at the undergraduate level in our growing Environmental Design program, and at the graduate level in our developing interdisciplinary studio involving landscape architecture, planning and architecture students. Most importantly, transportation planning expertise is critical to the cross-disciplinary success of a sustainable development cluster. Without this expertise, the departments/programs involved and the University cannot claim national leadership in this area. Transportation planning also provides access to many lucrative grant and contract opportunities at federal, state and local levels.

Colleges of HFA, SBS, and/or NS: 1 shared Position

Sustainable and Healthy Communities—Springfield community design center

This faculty member will conduct research in healthy and sustainable communities, teach community based studios and technical courses [with a focus on Western Massachusetts] , and help develop a new the Springfield Center for Community Design and Planning The Springfield Center for Community Design and Planning is a proposed UMass Amherst research center affiliated with UMass Extension and the Architecture+Design, Building Materials+Wood Technology Program, Landscape Architecture, and Regional Planning programs. The Center will provide services and resources that help Springfield communities envision, advocate, and implement high quality design solutions that ensure equal access to healthy, sustainable built environments.

The faculty member will play a key role in the Chancellor's vision for increased visibility in the area's gateway cities. The program has spearheaded highly visible community based design projects in local communities such as Springfield and Holyoke. As the program grows, it needs to bolster its efforts in this area. The successful candidate will teach community based focused studios and professional practice. Chancellor Holub's "Framework for Excellence" notes:

[UMass Amherst] seek[s] to establish a permanent office in Springfield, which will house numerous and varied initiatives, from arts and educational programs to **architectural assistance** to consultative aid in public health and nutrition.

This position also explicitly addresses one of the university's greatest strengths—community based design. The NAAB report indicates under "collaborative skills": "Students and faculty alike were committed to collaboration in coursework and in research efforts. This is a strength of the program."

The faculty member will have a joint appointment in two of the three colleges, depending on expertise.

Proven Excellence of Amherst Campus in Research/Teaching Area

The mission and research focus of the Department of Landscape Architecture and Regional Planning has historically been strong in several of the building blocks of sustainable development: greenways and open space networks, and smart growth and sustainable landscape planning. With the rise in importance of issues of climate change, wide ranging pollution and overdevelopment, the department's historic focus has positioned it well to develop a strong leadership role in the regional and national debate over issues of sustainable development. With three new hires in 2007, the department has doubled its research publication output over the past two years, and has substantially increased its proposals for external research funding. In addition, with a renewed focus on graduate enrollment, we have the largest graduate entering classes in the past few years, a 75 to 100% increase in both the Master of Regional Planning program and the Master of Landscape Architecture program. Enrollment in Environmental Design continues to rise, and is hampered only by the lack of faculty and course offerings. With the recent award of a FIPSE grant for the development of a joint undergraduate and graduate planning program with the University in Goyas, Brazil, and efforts to establish a dual degree Masters program with Xiamen University in China, the addition of a faculty member in transportation planning is critical to these efforts. We anticipate the outcome would be both a substantial increase in international graduate and undergraduate student enrollment, as well as access to new funding streams from the federal and state Departments of Transportation in sustainable development practice.

The Architecture+Design Program is on a trajectory of remarkable success. Following the 2007 accreditation of the Master of Architecture program, by the National Architecture Accrediting Board, interest in the BFA Design and Master of Architecture programs has been robust. The program expects well over 100 on-campus and off-campus applications to the undergraduate program this year (deadline is April 15). Graduate Studies reports about 80 applications to the masters programs. This substantial number of applications happened in a year that the marketing budget in the department severely reduced. According to OIR data, the number of Design majors has increased from 23 in 2005-06 to 119 in 2009-10. That number will increase to 130 in 2009-10. The Master of Architecture has increased from zero in 2005 to 47 in 2009-10. The Master of Science in Design program will grow slightly from 5 (2005) to 8 (2009). Undergraduate and graduate Architecture+Design majors account for 1/3 of the students in the Art Department. The Master of Architecture is already the department's largest graduate program. College wide, in 2008-09 Architecture+Design students will account for 5% of the HFA's bachelors students and 10% of its masters students. External reviews indicate that the interdisciplinary Architecture+Design faculty has been successful in research/creative work. The National Architecture Accrediting Board notes that:

The architecture faculty at UMass is talented, committed and collegial. Given the high teaching loads and demands of a new program, the faculty is productive and engaged in a range of creative work.

Alas, the NAAB also notes that these successes are not sustainable without an increase in the number of architecture faculty members. There are only 7 core Architecture+Design faculty members—about 22% of the Department's 31.3 FTE tenure and non-tenure system faculty. Many key courses are taught by affiliate faculty at UMass (for free) and part time faculty. In 2008-09, the ratio of majors (undergrad and grad) to faculty is

about 24 to 1, very high for an architecture program. The program relies heavily on affiliate faculty to absorb architecture students into existing courses. Many required undergraduate and graduate courses in studio, architecture history, and technology are offered this way. This model is not sustainable, as it is difficult for these faculty to absorb increasing numbers of Architecture+Design students into their courses. In addition, sometimes the coursework in these affiliate courses, such as “Business of Building,” taught by Building Materials faculty, do not explicitly address A+D’s curricular needs.

The Building Materials and Wood Technology Program has similarly grown. The number of majors increased from 25 in 1999 to 125 in 2009. Graduate enrollment has grown from 0 to 8 over the same time period. The program has experienced 105% increase in teaching capacity with no additional full-time faculty.

Interdisciplinary/Transdisciplinary Nature of the Cluster

Interdisciplinary research and teaching is vibrant between BMATWT (NRC), LARP, A+D and the College of Engineering. For example, NRC and LARP are currently collaborating on a multi-year, multi-million dollar proposal to the US Forest Service on an ULTRA grant, and LARP and A+D are collaborating on interdisciplinary outreach design studios this fall in Springfield and Belchertown. The college of Engineering has joint grants to NSF and MassPort with NRC, LARP and A+D. The studios in LARP and A+D focus on sustainable redevelopment options. Courses in these programs are often co-listed or have enrollments from collaborating Departments, indicating the existing interdisciplinary activities. In addition, several of these department’s full time faculty are also listed as Adjunct Faculty in the other departments.

The key to this proposal is in establishing transdisciplinary programs of research, where interaction is at a level where concepts from one field can be adapted and accessed effortlessly into the other fields. Through this cluster in Sustainable Development this environment will be nurtured. Construction issues and methodology of evaluations can be applied to buildings and transportation planning. Transportation planning issues directly affect the delivery of construction materials and site development is intrinsically tied to architectural design. Sustainable design of buildings cannot be separated from the construction process. This inherent web of interactions is much larger than individuals can address. A cluster in this area will blur traditional discipline boundaries and allow UMass to become a leader in the field.

Department/College Support and Leadership

All colleges have already made several lead investments in this cluster, including a new NRC hire in Green Building (2008), two new hires in Landscape Architecture and Regional Planning in landscape planning (2007) and new Architecture+Design hire in architectural design (2007). There is a solid base of excellence on which to build. A recent Chronicle of Higher Education has published excerpts of the latest Academic Analytics Faculty-Productivity Index ranks UMass Amherst is 8th nationally in the category of Architecture, Design, and Planning.

Ability to Attract Funding

The cluster of positions is expected to attract funding through three means. First, the group is ideally suited to collaborate on research initiatives and grant funds from the following sources: NSF, USEPA, US Forest

Service, HUD, USDA, DOE Massachusetts Technology Collaborative, EPA, US and state Departments of Transportation, Public Utilities, private industry and others. Second, outreach activities to industry will establish an income from courses, seminars, and trainings. Third, integration with the Springfield community design center would likely generate income, as it is expected to be a self-sufficient entity within 4 years through grant and foundation activity. Direct collaborations with this initiative will likely result in some sub-contracts on sustainability issues.

Prospects for Establishing UMass as a Leader in the Field

Very few universities can claim to have interdisciplinary programs in sustainability of the built environment. UMass currently has a well-respected program of interaction between BMATWT, LARP, A+D and Engineering. In addition, this cluster interfaces directly with the cluster proposal for The Human Dimensions of Global Environmental Change. The addition of these positions will bridge the departments and programs in a comprehensive program of research. This has a high prospect for establishing UMass at the top tier of sustainable development research and teaching programs.