

The Campus as a Living Lab: CSUEB's Sustainable Construction Course Pilot

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California State University East Bay

Association for the Advancement of Sustainability in Higher Education

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CALIFORNIA STATE
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Campus as a Living Lab: Sustainable Construction Course Pilot Presentation Contents

- Cal State East Bay Institutional Background
- The Living Lab Grant
- ENGR 3999/6999 Pilot Course
- Student Projects Spring 2014
 - Parking lot lighting study
 - Pervious pavement assessment and demonstration
 - Solar parking canopy study
- Experience gained, reflections and next steps



CSUEB Sustainability Commitment

Shared Strategic Commitment

- *“Contribute to a sustainable planet through our academic programs, university operations, and individual behavior.”*

Facilities + Faculty + Students = Living Lab

- *Achieving our commitment through the curriculum*

Institutional Learning Outcome

- *“Graduates will be able to act responsibly and sustainably at local, national and global levels.”*



Trending In Sustainability For Higher Ed....

Campus landscapes can serve as living laboratories for reducing carbon footprints, conserving water and aquatic resources, supporting biodiversity, and building active, equitable social communities. Moreover, as learning landscapes, such **campuses** actively promote sustainable design by engaging faculty, staff, and students in the design and implementation process as a part of the pedagogy of place. This progressive focus positions universities as leaders educationally and environmentally (Way et al. 2012)

- Way, T. , Matthews, C. , Rottle, N. , & Toland, T. (2012). Greening the american campus: Lessons from campus projects. *Planning for Higher Education*, 40(2), 25-47.



CSUEB Has Rich Landscapes For Change



■ Hayward Campus



■ Concord Campus



Living Lab Grant 2013-14

■ Project Funding

- Partnership: Divisions of Business and Finance, Academic Affairs, and Systemwide Academic Senate
- 23 projects funded (7 new courses, 12 redesigned courses, 3 learning communities)
- \$250,000 in grant money (up to \$12,000 per project)
- \$123,000 infrastructure & equipment (as requested)
- 14/23 campuses got projects

■ CSUEB Projects

- Course redesign – PHYS Renewable Energies Lab Class
- New course – CMGT Sustainable Construction and



New Course on Sustainable Construction

- **Course Title**

- CMGT 4XXX/6XXX Sustainable Construction and Retrofitting of Buildings and Infrastructure

- **Objectives**

- Extend and deepen CMGT students' learning concerning sustainability
- Expand on green building theory and other skill sets (CMGT 4300/6300 Environmental Issues and Green Building)
- Focus on applied and practical aspects of sustainable construction management, life cycle analysis, and the retrofitting of existing buildings and infrastructure



Key Elements of Pilot Offering

- **Buy-in from Facilities Development & Operations**
 - Solicited ideas
 - Jointly developed targeted scopes of work & deliverables
- **Support of Engineering program**
 - Appropriation of existing “Special Issues” elective as pilot
 - Small class size for pilot offering (25 cap but 10-15 OK!)
- **Project Management**
 - Two faculty plus TA



Template

- CSUEB intranet
- Google Drive
- **Standard
template**
 - Project description incl. risks/mitigations
 - Time frame, equipment, etc.
 - Learning outcomes

PROJECT PROFILE – SUSTAINABLE CONSTRUCTION & RETROFITTING OF BUILDINGS AND INFRASTRUCTURE	
Person Suggesting Project:	Add your name here
Project Title:	Add title here
Organization:	California State University East Bay
Project Goal:	Describe project objective here
Location(s):	Hayward Campus, Hayward, CA, or other
FD&O Advisor(s):	List advisor(s) name(s) here
Title/Position(s):	List advisor(s) title(s)/position(s) here
Assistant(s):	List student assistant(s) name(s) here
Department(s):	List student(s) department(s) here
Project Description: (to be completed prior to the project being started)	Provide short description here – describe the nature and the purpose of the activities to be performed, including any risks that must be prevented or mitigated through appropriate protocols and procedures in the implementation phase, etc.
	Detail the expected time frame, stakeholders/partners, equipment needs, target outcomes, etc. here
	State the expected/intended learning outcomes envisaged for the student(s) here (what knowledge, skill, or experience the student will gain or enhance through the project) *.
Project Organization and Management: (to be completed after the project is completed)	Document the actual project organization, management and execution here – who did what, when, how, where?
	Describe the actual results/achievements of the project here.
Project Start Date:	Start date here Mo/Da/Yc
Project End Date:	End date here Mo/Da/Yc
Expected Budget:	
No of student hours:	X
Project expenses:	\$XXX.XX



Projects for 2014 Pilot – Proof of Concept

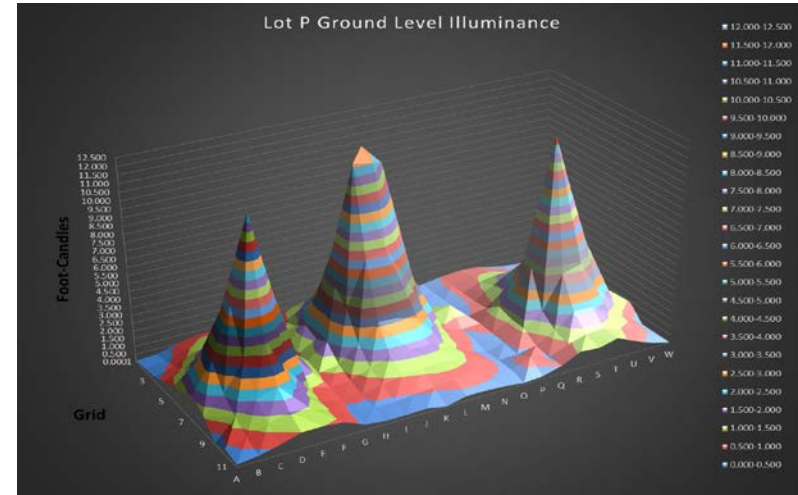


- **Nine potential projects proposed by collaborators**
 - Solar canopy/net zero potential for EV charging
 - Parking lot LED lighting retrofit feasibility
 - Pervious pavement assessment and demonstration



Project Outcomes

- Does not/cannot meet IES recommendations
 - Would need configuration change
- LED performs better overall but not at margins
- LED would be cost-effective



Parking Lot P Retrofit Economic Feasibility Analysis (LED)			
Project	Replace 4-HPS w/ 3-LED Fixtures		
Discount Rate	3.0%	NPV	\$ 4,307.10
Inflation Rate	2.1%	B/C Ratio	2.0
Initial Savings	\$ 396.30	Payback (yrs)	11.9
Initial Cost	\$ 4,231.62	IRR	6.7%



Pervious Pavement (PP)

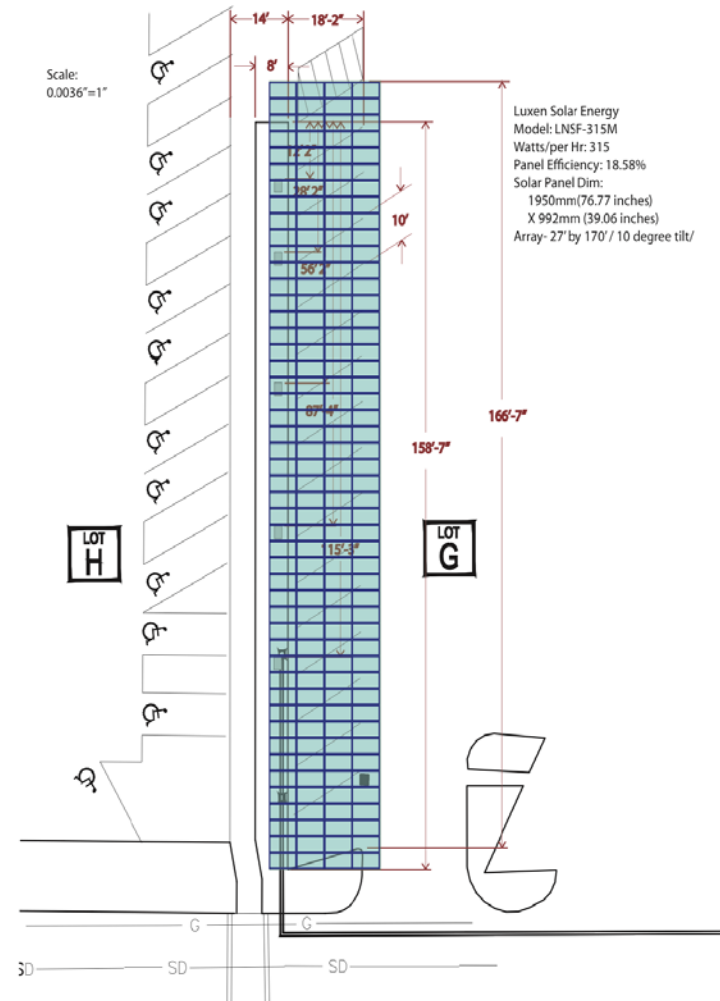
- **Project Profile**
 - Literature review
 - Criteria development
 - Campus screening (ADA mobility barriers) of PP retrofit opportunities
 - Demonstration site selection
 - Installation of first PP section on campus
 - Assistance to MS thesis research on PP
- **PP cost effective if a) larger scale, b) avoids drainage capacity**



Solar Canopy/Net Zero EV Charging

■ Project Profile

- Site analysis
- Design concept
- Design costing
- PVWatts modeling
- EV charge demand model
- Economic analysis
 - NPV LCA
 - B/C Ratio
 - Payback
 - IRR



Project Outcomes

- **Cost Effective**
 - <\$2 per kWh capital cost
 - Paybacks of <10 years
 - Discount and inflation rates critical
- **Canopy above the 12 EV bays can't be net-zero**
 - Equivalent sized panel at different site would be more productive/cost-effective
- **Policy of providing free charging not sustainable**
 - Will be > \$20,000 per year at full capacity






Final Report and Dissemination Plans

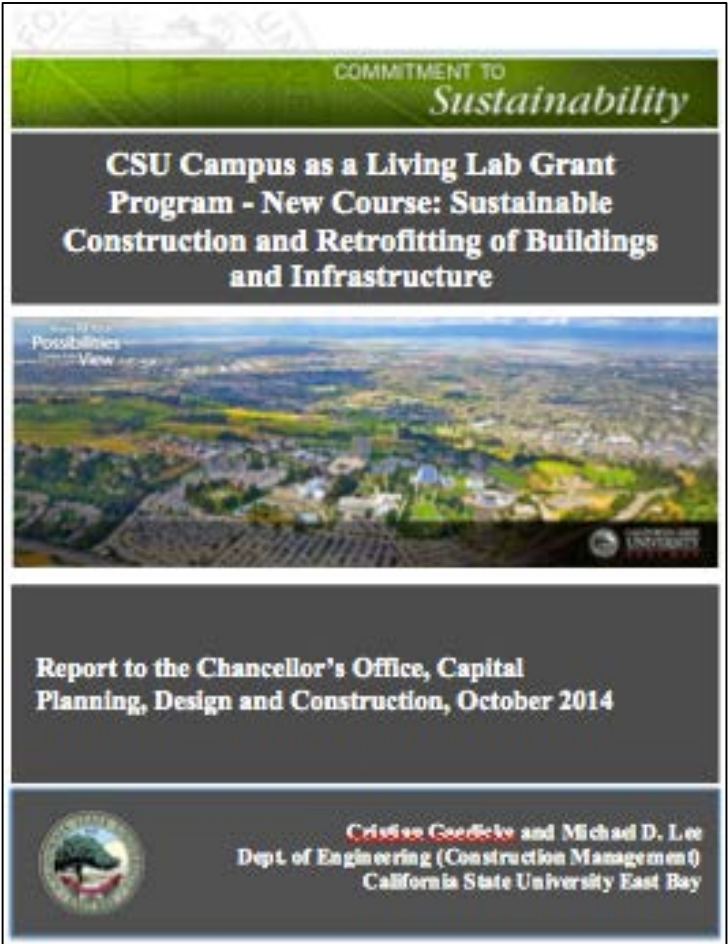
Plans

- Three Project Reports

- Will post in full on Dept. of Engineering website
- Will display flip-book version to recruit for 2015 class on Valley Business & Technology foyer screens

- Report to Long Beach

 <p>CSUEB Solar Array Feasibility Study</p> <p>ENGR 3999/6999 Campus Solar Canopy Group</p> <p>The purpose of this study is to evaluate the feasibility of installing solar canopies above a portion of parking lot G on the Hayward campus of the California State University East Bay, and whether it would be possible to increase the maximum charging capacity for electric vehicles connected to 15 charger stations located below. This study covers the site from 2012 until an assumed October 1, 2014, and determines the payback in net-present value for the December 31, 2014.</p> <p>Sabrina Alvarez (1), Cristine Goble and Hanan Swaid Department of Engineering, California State University East Bay</p>	 <p>Pervious Concrete Group</p> <p>Pervious concrete is an easy way to reduce storm water runoff and filter out the water pollutants. This is achieved by the voids in the concrete which allow water to infiltrate the surface rather than runoff to storm water basins, the ocean and ultimately, the San Francisco Bay. This report was prepared as a result of using pervious concrete (PCI 2009). In this report, a group of Construction Management students received support for pervious concrete on the Hayward Campus. This study was conducted in the summer of 2014. The project is part of a grant offering of a one-credit on sustainable construction and monitoring of change and the construction that uses the campus of the California State University East Bay as a living laboratory for student learning.</p> <p>Key terms: pervious concrete, CSI East Bay, construction management, storm water management.</p> <p>Task Allocation: Ahmed Alattar, and Scott Wang Department of Engineering, California State University East Bay</p>	 <p>Parking Lot Lighting Evaluation at CSUEB</p> <p>ENGR 3999/6999 Campus Lighting Group</p> <p>Investigation of the effect of the new lighting is parting out of the California State University East Bay (CSUEB). Assessment of lighting possibilities for existing transportation parking lot (TP) buildings with light emitting diode (LED) technology. Recommendations will be made for lighting systems (LED) between the buildings and the parking lot. The study will include the following: 1. The location of the lot (LED) and the LED system. (Estimated June 12, 2014).</p> <p>Activity: Ahmed Alattar, Ahmed Khan & Ariana Department of Engineering, California State University East Bay</p>
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COMMITMENT TO Sustainability

CSU Campus as a Living Lab Grant Program - New Course: Sustainable Construction and Retrofitting of Buildings and Infrastructure

Report to the Chancellor's Office, Capital Planning, Design and Construction, October 2014

[Cristine Goble](#) and [Michael D. Lee](#)
Dept. of Engineering (Construction Management)
California State University East Bay



Observations from our Living Lab experience

■ Observations

- 10 weeks goes by *really fast*
- Quality TA was an invaluable asset
- Keep projects simple, self-contained
- Good Scopes of Work are critical
- Can do it on small budget but funding source is nice
- 100% teamwork format is a challenge
- Team teaching hard to arrange
- Must optimize student time by providing boilerplate, analytical tools (NPV, LCA, etc.) + focused instruction

■ Next steps

- Refine expectations
- Submit new course proposal to curriculum committee
- Develop project planning manual, boilerplate, standard financial tools to save time
- Develop clear rubrics for learning outcomes + grades
- Promote better to students
- Plan projects 6-12 mo. ahead
- Consolidate PG&E relationship
- Refine learning outcome assessment process



Thank you for your attention

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