

## Suggested Sustainable Infrastructure Project Topics

### 2011 Sustainability and Design for Environment Class (ME415/CEE495/ENVIR415)

Class website: <http://faculty.washington.edu/cooperjs/Education/ME415/index.htm>

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Infrastructure	What is being demanded?	What processes are generating the demand?	What organizations/ technologies/ activities are meeting the current demand?	Are there quantitative data representing demand and/ or supply?
1. CO2 infrastructure	CO2	Start with the list of uses at <a href="http://en.wikipedia.org/wiki/Carbon_dioxide">http://en.wikipedia.org/wiki/Carbon_dioxide</a> Also, information on the state of demand is at <a href="http://enr.construction.com/news/powerIndustry/archives/080514.asp">http://enr.construction.com/news/powerIndustry/archives/080514.asp</a> also <a href="http://www.kindermorgan.com/business/co2/supply.cfm">http://www.kindermorgan.com/business/co2/supply.cfm</a> (seems natural well extraction is increasing to meet an increasing demand?)	Such as extraction from natural sources and recovery from industrial waste streams <ul style="list-style-type: none"> <li>Start with the information at <a href="http://www.imcatalysts.com/ptd/site.asp?siteid=671&amp;pageid=672">http://www.imcatalysts.com/ptd/site.asp?siteid=671&amp;pageid=672</a></li> <li><a href="http://en.wikipedia.org/wiki/Carbon_capture_and_storage#Cement_production">http://en.wikipedia.org/wiki/Carbon_capture_and_storage#Cement_production</a></li> <li>Additional sources for capture identified in the US GHG inventory at <a href="http://www.epa.gov/climatechange/emissions/usinventoryreport.html">http://www.epa.gov/climatechange/emissions/usinventoryreport.html</a></li> </ul>	See <a href="http://www.netl.doe.gov/energy-analyses/pubs/storing%20co2%20w%20eor_final.pdf">http://www.netl.doe.gov/energy-analyses/pubs/storing%20co2%20w%20eor_final.pdf</a>
2. Fisheries infrastructure	Fish	Start with the information at <a href="http://www.fao.org/docrep/005/x3216e/x3216e00.htm">http://www.fao.org/docrep/005/x3216e/x3216e00.htm</a> and also see <a href="http://www.fao.org/fishery/topic/3456/en">http://www.fao.org/fishery/topic/3456/en</a>	Aquaculture (see <a href="http://www.fao.org/docrep/003/ab412e/ab412e07.htm">http://www.fao.org/docrep/003/ab412e/ab412e07.htm</a> ) Capture fisheries (see <a href="http://www.fao.org/fishery/topic/12306/en">http://www.fao.org/fishery/topic/12306/en</a> )	Again see <a href="http://www.fao.org/docrep/005/x3216e/x3216e00.htm">http://www.fao.org/docrep/005/x3216e/x3216e00.htm</a>
3. New UW stadium infrastructure	A sports/ events venue	Football games, graduation, etc.  <b>Consider maximizing the use of local and recovered resources.</b> For background, start with <a href="http://www.gohuskies.com/genrel/090210aaf.html">http://www.gohuskies.com/genrel/090210aaf.html</a> (and note there is an email address to request more information... <a href="mailto:StadiumRenovation@ica.washington.edu">StadiumRenovation@ica.washington.edu</a> ) and <a href="http://www.washington.edu/mediarelations/pdfs/stadium_factsheet2008.pdf">http://www.washington.edu/mediarelations/pdfs/stadium_factsheet2008.pdf</a>  <b>Scoping this down to only energy and/or construction materials is not an option.</b>	Contact <a href="mailto:StadiumRenovation@ica.washington.edu">StadiumRenovation@ica.washington.edu</a> and set up an interview. Ensure you have your questions ready related to quantifying current plans and costs for: <ul style="list-style-type: none"> <li>Construction and maintenance materials (concrete, steel, aluminum, glass, plastics, paint, etc.) <ul style="list-style-type: none"> <li>Operations: Food services; Energy (consider surface water heat pump system, wind, and solar to start); Water (potable and for grounds); and Recycling (see <a href="http://www.gohuskies.com/genrel/083110aaf.html">http://www.gohuskies.com/genrel/083110aaf.html</a>)</li> </ul> </li> </ul> At best you might be familiar with example options, such as those described in: <a href="http://bleacherreport.com/articles/275434-green-leed-stadiums">http://bleacherreport.com/articles/275434-green-leed-stadiums</a> <a href="http://inhabitat.com/first-leed-certified-nfl-stadium-ever-set-to-be-in-la/">http://inhabitat.com/first-leed-certified-nfl-stadium-ever-set-to-be-in-la/</a> <a href="http://dvice.com/archives/2010/06/qatar-promises.php">http://dvice.com/archives/2010/06/qatar-promises.php</a> <a href="http://inhabitat.com/world-cup-2010-south-africas-top-5-stunning-green-stadiums/">http://inhabitat.com/world-cup-2010-south-africas-top-5-stunning-green-stadiums/</a> and <a href="http://buildica.rmit.edu.au/CaseStud/Stadium/Stadium.html">http://buildica.rmit.edu.au/CaseStud/Stadium/Stadium.html</a> <a href="http://www.stadiummanagers.org/index.php?option=com_content&amp;view=article&amp;id=197:be-an-energy-all-star-july-2010&amp;catid=38:quickhits&amp;Itemid=68">http://www.stadiummanagers.org/index.php?option=com_content&amp;view=article&amp;id=197:be-an-energy-all-star-july-2010&amp;catid=38:quickhits&amp;Itemid=68</a> <a href="http://etihadstadium.com.au/water-saving">http://etihadstadium.com.au/water-saving</a> <a href="http://kansascity.royals.mlb.com/news/press_releases/press_release.jsp?ymd=20100331&amp;content_id=9024904&amp;vkey=pr_kc&amp;fext=.jsp&amp;c_id=kc">http://kansascity.royals.mlb.com/news/press_releases/press_release.jsp?ymd=20100331&amp;content_id=9024904&amp;vkey=pr_kc&amp;fext=.jsp&amp;c_id=kc</a>	

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4. Phosphorous infrastructure	Phosphorous	Start with the information at <a href="http://en.wikipedia.org/wiki/Phosphorus#Applications">http://en.wikipedia.org/wiki/Phosphorus#Applications</a> and for background, also see <a href="http://phosphorusfutures.net/peak-phosphorus">http://phosphorusfutures.net/peak-phosphorus</a>	Start with the information at <a href="http://en.wikipedia.org/wiki/Phosphorus#Occurrence">http://en.wikipedia.org/wiki/Phosphorus#Occurrence</a> and for fertilizer... <a href="http://lancaster.unl.edu/ag/factsheets/288.htm">http://lancaster.unl.edu/ag/factsheets/288.htm</a>	Start with <a href="http://minerals.usgs.gov/minerals/pubs/commodity/phosphate_rock/">http://minerals.usgs.gov/minerals/pubs/commodity/phosphate_rock/</a>
5. Vehicle plastics and composites infrastructure in Washington State	Lightweight, formable material	Boeing component fabricators PACCAR component fabricators And for some background, see <a href="http://engineers.ihs.com/NR/rdonlyres/AEF9A38E-56C3-4264-980C-D8D6980A4C84/0/444.pdf">http://engineers.ihs.com/NR/rdonlyres/AEF9A38E-56C3-4264-980C-D8D6980A4C84/0/444.pdf</a>  The hope is that you will for example uncover opportunities for the use of recycled materials that are generated in the state...	See for example <i>Composite materials for aircraft structures</i> By Alan A. Baker, Stuart Dutton, Donald Kelly, Donald W. Kelly (on Google books) And consider contacting folks at Boeing and PACCAR.	???
6. Provision of interior light	Interior light	Start with <a href="http://www.eia.doe.gov/ask/electricity_faqs.asp#electricity_lighting">http://www.eia.doe.gov/ask/electricity_faqs.asp#electricity_lighting</a> and there is some additional background at <a href="http://www.energyefficiencynews.com/lighting/i/3529/">http://www.energyefficiencynews.com/lighting/i/3529/</a>	See <a href="http://www.eia.doe.gov/emeu/consumptionbriefs/cbecs/pbawebite/office/office_reflightequip.htm">http://www.eia.doe.gov/emeu/consumptionbriefs/cbecs/pbawebite/office/office_reflightequip.htm</a> and <a href="http://www.wbdg.org/resources/efficientlighting.php">http://www.wbdg.org/resources/efficientlighting.php</a> and note that you may be able to use bulbs as a baseline and consider alternatives (e.g., control technologies, window and other technologies for natural lighting) as the project moves forward.	Data for commercial buildings <a href="http://www.eia.gov/emeu/cbecs/cbecs2003/lighting/lighting1.html">http://www.eia.gov/emeu/cbecs/cbecs2003/lighting/lighting1.html</a> Data for residential buildings <a href="http://www.eia.doe.gov/emeu/recs/recs2005/c&amp;e/detailed_tables2005c&amp;e.html">http://www.eia.doe.gov/emeu/recs/recs2005/c&amp;e/detailed_tables2005c&amp;e.html</a> (includes lighting with other appliances) Also see <a href="http://www.eia.doe.gov/emeu/cbecs/lit-type.html">http://www.eia.doe.gov/emeu/cbecs/lit-type.html</a> and note that you may be able to use bulbs as a baseline and consider alternatives as the project moves forward.
7. Radioactive waste infrastructure (US)	Waste treatment and storage	See <a href="http://en.wikipedia.org/wiki/Radioactive_waste#Sources_of_waste">http://en.wikipedia.org/wiki/Radioactive_waste#Sources_of_waste</a> and see "Radioactive waste arisings," at <a href="http://www.iaea.org/Publications/Magazines/Bulletin/Bull364/36402684650.pdf">http://www.iaea.org/Publications/Magazines/Bulletin/Bull364/36402684650.pdf</a>	See <a href="http://en.wikipedia.org/wiki/List_of_nuclear_waste_treatment_technologies">http://en.wikipedia.org/wiki/List_of_nuclear_waste_treatment_technologies</a>	Start with <a href="http://www.eia.doe.gov/fuelnuclear.html">http://www.eia.doe.gov/fuelnuclear.html</a> and <a href="http://www.nationmaster.com/graph/ene_nuc_was_gen-energy-nuclear-waste-generated">http://www.nationmaster.com/graph/ene_nuc_was_gen-energy-nuclear-waste-generated</a>
8. Starch plant infrastructure	Starch	The production of food, feed, and food additives; chemical pre-cursors; cosmetics; packaging; paper; textiles; detergents; biofuels; etc. For example, see <a href="http://www.crops2industry.eu/images/pdf/winschoten/7.%20MELVYN.pdf">http://www.crops2industry.eu/images/pdf/winschoten/7.%20MELVYN.pdf</a> <a href="http://www.shilpaagro.com/rice_uses.php">http://www.shilpaagro.com/rice_uses.php</a> <a href="http://maizeresearch.org/2010/06/uses-of-corn/">http://maizeresearch.org/2010/06/uses-of-corn/</a>	Corn, rice, potatoes, tapioca (cassava), and wheat and the associated value-added/ conversion technologies (as in what processes are used to convert corn to ethanol or to food?). See for example <a href="http://www1.eere.energy.gov/biomass/pdfs/technology_roadmap.pdf">http://www1.eere.energy.gov/biomass/pdfs/technology_roadmap.pdf</a> <a href="http://www.usda.gov/documents/USDA_Biofuels_Report_6232010.pdf">http://www.usda.gov/documents/USDA_Biofuels_Report_6232010.pdf</a>  Note that I had trouble finding a food security roadmap... which I found strange. Does this mean that food and fuel uses have not been considered together (which I would also find strange)?	

Infrastructure	What is being demanded?	What processes are generating the demand?	What organizations/ technologies/ activities are meeting the current demand?	Are there quantitative data representing demand and/ or supply?
		<p>As background, is there a way to characterize the quality of each plant component (e.g., corn = corn + stover) by starch plant so that you might have a basis to optimize a regional or global system? See for example <a href="http://www.foodproductdesign.com/articles/1996/01/understanding-starch-functionality.aspx">http://www.foodproductdesign.com/articles/1996/01/understanding-starch-functionality.aspx</a> and <a href="http://www.fao.org/docrep/012/i1544e/i1544e02.pdf">www.fao.org/docrep/012/i1544e/i1544e02.pdf</a></p> <p>Also, for some additional background see <a href="http://www.card.iastate.edu/iowa_ag_review/summer_08/article1.aspx">http://www.card.iastate.edu/iowa_ag_review/summer_08/article1.aspx</a></p>		
9. Stationary renewable energy storage infrastructure	Energy storage	<p>Some background is at <a href="http://www.agci.org/dB/PDFs/0352_ACavallo_Storage.pdf">http://www.agci.org/dB/PDFs/0352_ACavallo_Storage.pdf</a></p>	<p>Start with the list at <a href="http://wapedia.mobi/en/Energy_storage">http://wapedia.mobi/en/Energy_storage</a></p>	<p>Start with data on renewable energy generation at <a href="http://eia.gov/cneaf/solar.renewables/page/rea_data/rea_sum.html">http://eia.gov/cneaf/solar.renewables/page/rea_data/rea_sum.html</a></p>
10. Water infrastructure (you might also just look at Washington State or the UW)	Water	<p>Categories include public supply, domestic, irrigation, livestock, aquaculture, industrial, mining, and thermoelectric power, see <a href="http://pubs.usgs.gov/fs/2009/3098/">http://pubs.usgs.gov/fs/2009/3098/</a> and specifically the "Report PDF (4.75 MB)" or <a href="http://pubs.usgs.gov/circ/1344/pdf/c1344.pdf">http://pubs.usgs.gov/circ/1344/pdf/c1344.pdf</a></p> <p>Also for background, see <a href="http://en.wikipedia.org/wiki/Peak_water">http://en.wikipedia.org/wiki/Peak_water</a> and <a href="http://www.waterfootprint.org/?page=files/home">http://www.waterfootprint.org/?page=files/home</a></p> <p>and for Seattle see <a href="http://faculty.washington.edu/craigzb/Geog370/8-water.ppt">http://faculty.washington.edu/craigzb/Geog370/8-water.ppt</a></p> <p>and for the UW see <a href="http://continuingeducation.construction.com/article.php?L=107&amp;C=523">http://continuingeducation.construction.com/article.php?L=107&amp;C=523</a> and contact JR Fulton (University of Washington Capital Planning &amp; Sustainability) for the network of UW experts</p>	<p>As ground or surface water and saline or fresh, see Table 14 at <a href="http://pubs.usgs.gov/circ/1344/pdf/c1344.pdf">http://pubs.usgs.gov/circ/1344/pdf/c1344.pdf</a></p> <p>As well as <a href="http://css.snre.umich.edu/css_doc/CSS04-14.pdf">http://css.snre.umich.edu/css_doc/CSS04-14.pdf</a> and <a href="http://ga.water.usgs.gov/edu/drinkseawater.html">http://ga.water.usgs.gov/edu/drinkseawater.html</a> and</p>	<p>Again see <a href="http://pubs.usgs.gov/fs/2009/3098/">http://pubs.usgs.gov/fs/2009/3098/</a> and specifically the "Report PDF (4.75 MB)" or <a href="http://pubs.usgs.gov/circ/1344/pdf/c1344.pdf">http://pubs.usgs.gov/circ/1344/pdf/c1344.pdf</a></p>