Pushing the Construction+Demolition Waste Recycling Envelope: ENVISION and Measuring Impacts of Re-Using Recycled CD+W on Infrastructure Projects (CDW.4)
NYC ACS@110 William Street, Room 1406
October 23, 2019, 2:00 p.m. to 5:00 p.m.

AGENDA

2:00—2:15 p.m.	Registration, Introduction and Welcome
2:15—3:00 p.m.	ENVISION Professor Spiro Pollalis, Harvard/GSD and Zoffnas Program
3:00—3:15 p.m.	Break
3:15—3:45 p.m.	Calculating Impacts of Recycling CDW Professor Christoph Meinrenken, Columbia
3:45—4:00 p.m.	Break
4:00—5:00 p.m.	Discussion

Introduction. This is the fourth Town+Gown: NYC symposium event focusing on advancing the recycling envelope for construction and demolition waste (CDW). The first event was a general exploration of the state of academic research and practical considerations and Impediments, and, at the second event, working groups formed to explore ways to close concrete, gypsum, carpet and soil material loops. The working groups continued to meet generating several potential research projects, some of which are active projects in 2019-2020.

The third event focused specifically on life cycle cost benefit analysis (LCCBA) modeling applied to recycled concrete aggregate as a basis for providing a LCCBA model template for all material loops in the working group. Since LCCBA modeling quantifies environmental impacts from reuse of recycled materials, the presentation raised questions among participants about how an owner wishing to qualify its infrastructure project within the Envision framework should assess the environmental impact of reusing recycled materials on its infrastructure projects. That question is the subject of this fourth event.

Calculating Use of Recycled CDW under Envision. Envision developed as "the product of a joint collaboration between the Zofnass Program for Sustainable Infrastructure at the Harvard University Graduate School of Design and the Institute for Sustainable Infrastructure."[1] When talking about the Envision rating system, which is a framework applied to infrastructure projects,[2] it is tempting to refer to it "LEED"[3] for infrastructure.[4] City law mandates that all public buildings comply with LEED, while city construction agencies use Envision on a voluntary basis.

While both LEED and Envision focus on the impact of built environment artifacts on the environment, Envision is a framework and is less prescriptive in the use of methodologies to measure the impact of using recycled CDW on new construction projects than LEED because Envision "is a set of guidelines that aid in optimizing the sustainability of an infrastructure project during the planning and preliminary design phases, as well as a means to quantify the relative sustainability of the project."[5]

With respect to measuring the environmental impacts of using CDW on construction projects on the environment, LEED is prescriptive. It requires building owners to calculate the environmental impact of activities by using one of three methodologies. For U.S. owners, TRACI, developed by the U.S. Environmental Protection Agency, is the mandated methodology.[6] An earlier version of Envision had referred to with International Organization for Standardization (ISO) Standards 14040 and 14044 for life cycle environmental assessment purposes with respect to reusing recycled CDW, but the current version no

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[1] https://research.gsd.harvard.edu/zofnass/menu/envision/ accessed 10-10-19 @ 3:41 p.m.
[2] See https://research.gsd.harvard.edu/zofnass/menu/envision/.
[3] See https://new.usgbc.org/leed.
[4] "Although several rating systems are widely used to analyze the sustainability of individual buildings, no rating system for assessing the sustainability of infrastructure projects has gained widespread adoption. The lack of a common rating system is especially troubling because of the significant impacts infrastructure projects and networks have on the environment." "What LEED™ has done for building-scale sustainability, Envision aims to do for infrastructure: educate citizens and increase public awareness, provide a means to quantify sustainability in infrastructure, and facilitate the adoption of sustainable design for infrastructure." See footnote 1.
[5] See footnote 1.
[6] See LEED reference guide, pp. 467-472, 479-484, 495-512 and 587-594.

longer refers to those standards or any other methodology. Envision's intent is to permit owners use the best methodology, which may allow owners to use locally-derived parameters and data, to conduct a life cycle environmental assessment that provides the project examiner with sufficient quantitative analysis to evaluate the credits sought. In addition to TRACI, which contains pre-set parameters and data, other methodologies include the ISO standards referred to above and the Greenhouse Gas Protocol developed by the World Resources Institute in collaboration with the World Business Council for Sustainable Development.

Recap of CDW.3. Professor Yazdanbaksh ran through the mechanics of life cycle cost benefit analysis (LCCBA) modeling and the main parameters LCCBA modeling must account for in the context of the unique characteristics of concrete and recycled concrete aggregate (RCA), which served as the case study. Re-use of RCA in concrete shares important land use characteristics of concrete production so that the recycling plant should be close to the production plant as well as certain construction economic conditions of concrete production, which is that demand for concrete and recycled concrete made from RCA depends on local construction demand that fluctuates. While materials research on the use of RCA in concrete suggests that RCA can produce concrete of desired quality regardless of the quality of RCA and the price of RCA typically does not cost more than the price of natural aggregate (NA), there are practical operational challenges to the use of RCA in concrete production that may increase the cost of concrete with RCA as compared to the cost of concrete with RA: there must be a sufficient and continuous source of RCA, *variation* in RCA quality must be low; and, additional space and equipment is needed at the concrete plant to use RCA.

The ultimate question to be answered with LCCBA for RCA in new concrete is whether it is worth the additional costs, which have a financial component and an environmental component. Prof. Yazdanbaksh suggested that government should mandate the use of RCA in new concrete when it is proven to reduce current costs and costs over time and to reduce environmental impacts. The presence of alternative applications and uses of RCA, such as in sub-base materials and even average daily cover at landfills, means it is necessary to analyze the financial and environmental cost profiles of all feasible alternative so that the least financial cost applications associated with the highest CO_2 reductions should form the basis of policy decisions. This analysis may be further complicated by the changing economics of other concrete components, such as fly ash, a by-product of coal-burning electrical power production, that is becoming more expensive as electrical power production shifts toward the use of renewable resources.

Prof. Ardavan suggested a publicly-supported research project to research, from the perspective of industry, and possibly with case-study plants and government subsidies, what is needed to drive down production of costs to use of RCA in new concrete, in order to get a sense of whether such use can become profitable without subsidies over time. That idea led to a discussion of how government nudge industry along without subsidies and the need to bring in industry representatives into this working group process. With respect to legislative models, the conversation pointed to a recent Massachusetts law as an example of how government should not proceed in this area and an Oregon law would serve as a better model.

Kate Mikuliak of NYC DOT and Professor Matthew Adams of NJIT provided the group with an update of research begun after CDW.2 with respect to testing uses of concrete using RCA generated by the NYC DOT crusher for potential NYC DOT uses.