Transcript: Recognizing Value In U.N. World Environment Day and Other Environmental Research

Interviewee: David Dzombak, the Walter J. Blenko Sr. Professor of Civil and Environmental Engineering at Carnegie Mellon and faculty director of the Steinbrenner Institute for Environmental Education and Research

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Question 2: What is your research, and how does it impact both the environment and public policy?

Dzombak:

My research is focused on water quality and land contamination and stewardship of water resources and the land. And currently, we are working on several projects pertaining to carbon capture and sequestration. This is the technology that is under development for capture or carbon dioxide emitted from power plants and other fossil fuel sources of energy. To capture the CO2 from the gas being emitted from the combustion process, separated from the gas stream, compress it and inject it into the ground for permanent storage, deep into the ground for permanent storage. There are a host of technological issues to be developed in that regard. The research that I, my colleagues and students are working on pertain to the geologic storage component. Thinking about the interaction of the CO2, the compressed CO2 and the minerals around in a storage zone, in the porous rock, where the CO2 will be stored, as well as interaction with the CO2 and the impermeable rock overlying the porous rock to keep it in place. We’re thinking about the interactions with those minerals and the potential for leakage, or we’re trying to assess the integrity of the system as it’s conceived. At the same time at Carnegie Mellon, there are projects going on related to developing appropriate policy and regulations incorporating this new technology of carbon capture and sequestration and we’re part of a multidisciplinary effort here, looking at different components of CCS technologies, as it’s called, that is the most promising approach right now for keeping CO2 from going into the atmosphere as we generate electricity and use fossil fuels for other kinds of production such as steel and aluminum. Another area we’re engaged at look at is water use and energy production. So water and energy are inextricably linked. We need water to produce energy, we need energy to produce water. We treat water for drinking purposes and industrial uses, and that requires energy. We pump it around in distribution systems, that requires energy. At the same time, we need water to make energy, to produce energy. So, for example, in coal-fired power production, which is more than half of the electric power produced in the United States, and for nuclear power production, which is about 20 percent of the electric power production in the United States, there’s a great deal of water use for cooling in those thermoelectric power production processes. And if we look at areas where we’re going to need more power in the years ahead, in the United States for example, a number of those areas are in water-short areas such as in the Western U.S., in the Southwest in particular, but not only in the west in the southeast. The Atlanta region, tremendous population growth there, demand for water for industry for drinking purposes and also for power production. So there are limits to availability of fresh water for use in power production cooling, and some of the research we’re engaged in is looking at alternative sources of water. Looking at water in degraded quality for thermoelectric power production such as treated municipal waste water, abandoned mine draining, industrial process water, sources other than fresh water for which there are many competing demands. Using these degraded waters for power plant cooling has a variety of technological challenges, and we’re examining those. Looking at the ability to control corrosion, biofouling, and other problems that come with using low-quality waters for power plant cooling. So we’re working on the water-energy nexus here, as it’s called, and not only my group, but others here at Carnegie Mellon are working on those issues as well.