The Center for Nanotechnology in Society
ARIZONA STATE UNIVERSITY

Anticipating Environmental Impacts of Solar Technologies

Traditionally, Life Cycle Assessment (LCA) has been applied to products and technologies after they've been developed and deployed and hard data can be gathered on environmental impacts. By then, however, significant irreversible harm may have already occurred.

To address this problem, CNS-ASU, teamed up with the ASU QESST Engineering Research Center to develop an anticipatory LCA approach and apply it to research on photovoltaic cells, the technology used in solar panels.

The approach embraces conflicting data and uses probability and modeling to analyze multiple uncertain parameters and generate best- and worst-case scenarios to identify an environmentally promising research agenda.

The collaboration and new approach landed CNS Fellow Ben Wender and co-authors top billing in the September 16, 2014, issue of Environmental Science and Technology (ES&T), a peer-reviewed journal published by the American Chemical Society.

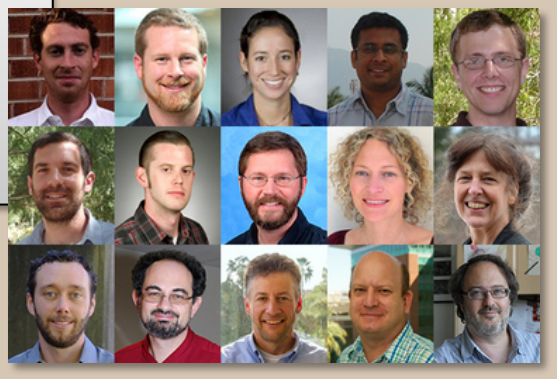
Photo by ASU Quantum Energy and Sustainable Solar Technologies Engineering Research Center

The *ES&T* cover uses an image from the PHX 2050 video, the product of a unique collaboration led by **Dr. Arnim Wiek** (TRC 2) and **Darren Petrucci,** ASU's Design School. The video shares two scenarios of how Phoenix's future might play out. That work was featured in *Issues in Science and Technology.*

Photo by ASU Design School

Fifteen authors representing industry, government, engineering, risk assessment, and social science collaborated to develop and test the new anticipatory LCA approach.

Wender, B., Foley, R., Prado-Lopez, V., Ravikumar, D., Eisenburg, D., Hottle, T., Sadowski, J., Flanagan, W., Fisher, A., Laurin, L., Bates, M., Linkov, I., Seager, T., Fraser, P., & Guston, D. (2014). **Illustrating Anticipatory Life Cycle Assessment for Emerging Photovoltaic Technologies.** *Environmental Science & Technology*, *48*(18), 10531-10538.



Dr. Arnim Wiek and his team conduct research in the Thematic Research Cluster (TRC 2) on Urban Design, Materials and the Built Environment. The group addresses the question: *How can nanotechnology be innovated and governed in responsible ways and with sustainable outcomes?* They employ system analysis, scenario construction, assessment and intervention research methods to explore theories of anticipatory governance, sustainability and responsible innovation.

Research, education and outreach activities at CNS-ASU are supported by the National Science Foundation under cooperative agreement #0937591