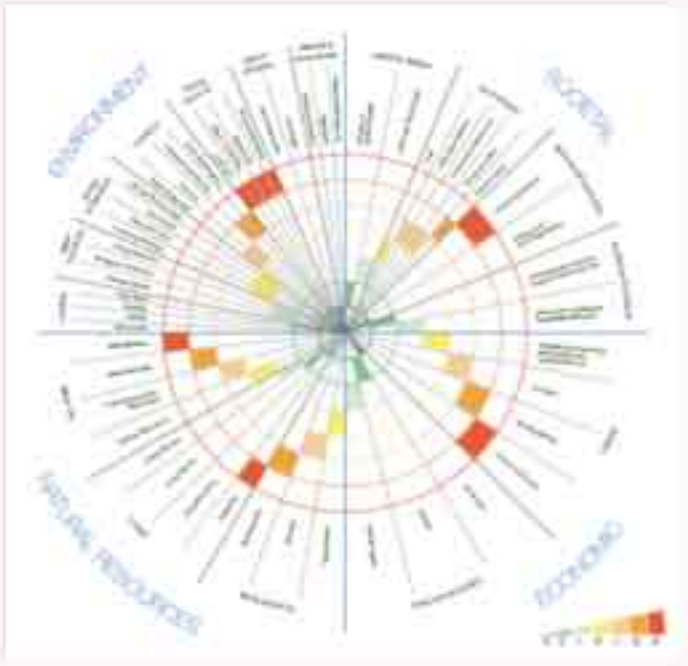
360: Urban Sustainability
Complexities and Changes

Spring 2012
Cities, Mathematics, and Education



SPeAR™ (Sustainability Project Appraisal Routine) sustainability framework tool designed by ARUP

Today we are facing numerous and interrelated challenges to the urban and natural environment, including rapid climate change, rising population numbers, and the extreme socio-economic differences that go hand in hand with them. Initiatives from green building to education for sustainability are aimed at reconsidering what is needed to adapt cities to current challenges and requirements. To assess how planning and design interventions, changes in governance or education in the broadest sense can be most successful, and to provide students with concrete tools to assess the impact of the choices human beings make, our 360 offers a multi-disciplinary investigation of urban and educational policies and implementation issues that are crucial to issues of urban sustainability, while mathematical modeling provides frame-

Building Green: Sustainable Design Past and Present
Carola Hein, Cities

At a time when more than half of the human population lives in cities, the design of the built environment is of key importance. This course is designed for students to investigate issues of sustainability in architecture and urban design. A close reading of texts and careful analysis of buildings and cities will help us understand the terms and practices of architectural and urban design and the importance of ecological, economic, political, cultural, social sustainability in cities over time and through space. We will carefully assess the theoretical and practical foundations of projects for sustainability in existing cities, including Philadelphia, and investigate large-scale proposals for zero-energy, zero-waste urban settlements around the world. The course will further consider green technologies, new sustainability legislation, and teaching of green design. The course has a Praxis component and through fieldtrips and class visits by practitioners, students will be able to put their research on historic and contemporary topics into the context of their daily life. The 360 connection will offer students opportunities to work interdisciplinary with their peers, to apply mathematical reasoning to

The Ecology of Education: How schools can both hinder and help us solve real-world challenges
Jody Cohen, Education

Education has the capacity to prepare students to perceive, think, and problem-solve in new and creative ways, to nurture thinkers/actors who can help our society meet change. But education as a system also reproduces the status quo, acting as a sorting mechanism that perpetuates socioeconomic class, for example. In this course we work with the dialectic of education as both a preserver of the status quo and a laboratory for new directions. We take up Baldwin's challenge that true education would produce citizens that 'no society wants' because of their capacity to think for themselves. What can we learn about how to create educational institutions, modes of teaching and learning that maximize students' capacity to discover fresh ways of understanding and acting upon deep societal challenges such as how we manage our shared resources? More specifically, the course will address key issues in ecological change, focusing on the question of what it means to develop "sustainability-literate" educators and students and how we

Mathematical Modeling of Real World Situations: Dynamical Systems, Chaos Theory, Tipping Points and Sustainability.
Victor Donnay, Mathematics

In our increasingly technological world, mathematics is being used to study real world situations through the use of mathematical and computational models. In this course, we will examine the mathematics of modeling with a particular focus on studying problems that relate to sustainability such as population growth, species extinction, resources use and climate change. In so doing, we will examine the transition from 19th century approaches, when the prevailing paradigm was linear systems which can be predicted exactly to the present focus on non-linear systems. Non-linear systems can be unpredictable, exhibit chaotic behavior and contain tipping points at which the behavior of the system changes dramatically. The course will include the use of computer modeling (no previous experience necessary). Students will apply the mathematics they are learning to local issues of sustainability. Mathematics pre-requisite is