

Land-Use Debate

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Student enthusiasm is enhanced by course activities that apply basic science to societal issues such as land use and its attendant environmental impacts. A land-use-planning exercise requires synthesis of relevant geologic processes, economics, and stewardship issues for students in introductory courses such as Earth system science, environmental geology, or physical geology.

This exercise uses role-playing and discussion to simulate the deliberations of a hypothetical planning commission on a proposal for a large residential development that requires the rezoning of farmland. The example cited here was designed by the Lehigh Environmental Education Consortium specifically for the Lehigh Valley of Pennsylvania (Contact: LEEC, Director of Environmental Education, Wildlands Conservancy, Emmaus PA, 610-965-4397), but the hypothetical development can be modified to suit any community, and the roles can be modified to accommodate a range of student levels (for example, high school, college, or continuing education), class size (10-40) and class duration (1-4 hrs).

A facilitator assigns roles to students that include the farm owner, other farmers and local business owners, developers, advocacy groups (for example,

conservation organizations, chambers of commerce), local media, citizens with various interests and backgrounds (for example, homemaker, retired steel worker), and the township supervisors who ultimately must decide whether to approve the zoning change.

Each student receives a packet containing his or her character's background and opinion and a worksheet of directed questions pertaining to the land-use proposal. The class is provided with reference materials on the site proposed for development, including county planning commission documents; published geologic, topographic, soil, and land-use maps; surface and ground-water data; aerial photographs; and articles on land-use issues. Individually or in groups, students consult the reference materials to complete their worksheets and construct arguments to support their assigned roles. At a mock township meeting, the students (the "community") present and defend their stands on the development proposal before the township supervisors. In the ensuing debate, the students consider the geologic, economic, environmental, and social consequences of land use and development, irrespective of the rezoning decision reached.

Earthquakes and Other Disasters of the Day

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One of the most fascinating aspects of seismology is that there is a new earthquake to study every day. Each earthquake can be used to deliver a scientific message, sometimes about the human element of destruction but more often something about plate tectonics or how rocks fail. Sharing the excitement of the daily seismic records captures students' attention and illuminates abstract scientific concepts.

"Earthquake of the Day" is a short vignette that uses recent or historic earthquakes to set the stage for a lecture in an introductory seismology course for upper-division undergraduates and first-year graduate students and in several courses for earth-science teachers. Every class starts with examination of a seismogram. Some aspect of the seismogram or a related phenomenon is expanded to illustrate the topic of the day's lecture. For example, a small earthquake that occurred in California the previous night might

be used to illustrate the development of various seismic phases and how the timing and polarity of the phases can be used to locate the earthquake. The earthquake or seismogram is also linked directly to a major topic of the course. For the California earthquake, this might be regional earthquake hazards or the dynamics of the San Andreas Fault.

Although we typically utilize earthquakes that have occurred within 48 hours of class, we also use a number of historic events significant for their devastation or the geological information they revealed. An example of a historic event that we use is the 1960 Chilean $M_w=9.6$ earthquake. Recordings of this event showed numerous successive passings of the surface wave packet as it traversed all the way around the globe. We use the seismogram to demonstrate the effects of fault rupture on the waveforms. We supplement it with several other figures that reveal