Resourceful People and People's Resource

Teaching the Cultural Ecology of South Asia

By Paul Robbins and Jason Moritz

It has been our experience that when most students in the United States think of India or Pakistan, they picture baked and cracked soil, drought, and starving people. When they picture Bangladesh, they most likely think of inundated fields, deadly storms, and drowning farmers. Indeed, these persistent images of nature running wild over helpless people are perhaps the strongest and most pernicious tropes in the North American view of South Asia. Teachers, students, and parents absorb most of these images of the region through television programming beamed from a growing number of cable networks dedicated to nature, animals, and global issues. But the increasing load of pictures of the region has not necessarily assured a diversity of images, and important misconceptions persist. In particular, the myth of the Asian peasant at the mercy of the whims of nature is evident from even a cursory surfing of cable channels. Teaching past this image is imperative and requires a *geographical* approach to demonstrate the resilience and adaptability of humans to the environment.

Using the lens of *cultural ecology* in geography, an alternate picture of South Asian agriculture emerges. Human adaptation to risk and uncertainty in the environment is achieved by modifying the landscape and by spreading ecological pressure over space and time. By teaching a geography of producer behaviors in the region, teachers can (1) dispel pernicious myths about the helplessness and vulnerability of people in places unlike their own, and (2) introduce the key concepts of human adaptation and landscape change, fundamental for an understanding of human/environment relations at the core of geographical education. This essay examines some of the techniques for adapting to environmental risk utilized by people in South Asia, and then introduces a brief teaching plan for demonstrating these geographical concepts in an elementary classroom setting.

Sheep penned in an enclosure on a fallow field. The animals belong to a migrant herder and are being held on the land of a local farmer who exchanges the right to graze for sheep dung, a key fertilizer on sandy soils. This exchange of resources is a form of risk-spreading, as is the migratory strategy of the herder.

Photo courtesy of Paul Robbins.

CULTURAL ECOLOGICAL CONCEPTS

Adaptation, Risk, and Landscape Change

Geography provides a number of useful concepts for better understanding human/environmental relations. One of the most prominent, cultural ecology, examines people within the context of ecological conditions, constraints, and flows, and explores the interrelationships between people, resources, and space. Growing out of both Geography and Anthropology, it examines how people make a living, how cultural and natural systems are integrated, and what effects human ways of life have on ambient environmental systems.[1] For example, in Southeast Asian human ecological research, researchers have compared swidden (slash and burn) agriculture to paddy rice cultivation, considering each as an *ecosystem*. By measuring flows, withdrawals, and biotic change over time, researchers relate each system to the soil and to human demands and labor. Elsewhere, cultural ecologists have traced the relationships between growing and shrinking populations to changing agricultural and social systems.

In South Asia, a cultural ecology approach begins by asking questions like: how are human systems geared around the energy dynamics of climatic variation? How does soil and water availability limit or focus agricultural practices? How are systems of exchange and storage set to manage annual scarcity? In asking these questions, cultural ecology provides a useful heuristic: adaptation. Human communities adapt to changing conditions, and the behaviors and practices built around these conditions can be understood as adaptations. Extensive movement systems

of nomadic herders in deserts, exhaustively dug and maintained terrace systems for mountain agriculture, and social systems for managing irri-gation channels in fertile river valleys, might all be seen as adaptive strategies adopted in particular contexts.[2] This concept can be coupled with the idea of risk, defined as "the likelihood of a range of possible outcomes resulting from a decision or course of action" and the idea of uncertainty, defined as "the possibility of more than one outcome resulting from a particular course of action . . . the probability of one outcome being *unknown*."[3]

People in South Asia face both risk and uncertainty. Knowing that rain fails one year out of four in arid Pakistan, for example, farmers face risk. Add to this the uncertainty of a catastrophic event, and the farmer must either creatively adapt or else periodically waste precious seeds, water, land, and labor. For example, seeds may be sown in the time prior to when rain is expected to come, but if the timing of yearly rainfall varies greatly, that may be a risky strategy. The notion of adapting to risk is, therefore, an important part of human production strategies. Human beings do not only adapt to current conditions; they plan for contingencies and hedge their chances against risky and uncertain situations. Rather than sowing seeds before an expected rain, for example, farmers in some cultures wait until the first rain arrives before planting, therefore reducing risk.

A further geographical and cultural ecological lens for viewing producer behaviors is that of landscape change. Most often, this area of study is associated with the examination of the degradation that accompanies human action in the environment. Equally important, however, are those cases of *creative destruction*, where humans create new landscape conditions that are stable, productive, and sustainable over time. These modifications might range from small mounds for agriculture to reclamation of land from the sea. In Bangladesh, the complex ecosystems created in rice-field agriculture, carved out of saturated wetlands, represent such an alteration. In Pakistan during the 1980s, producers quickly adapted mountainous terrain for intensive farming of exotic crops when resource pressure changed as a result of Afghani refugee inundation. In both of these cases, intimate knowledge of the local ecology is used to transform the landscape, to adapt to changing conditions, and to lower risks in production.

Taken together, these geographical tools turn our attention to particular questions in the human ecology of South Asia and move beyond popular misconceptions, asking how human beings create stability amidst tempestuous variability and productivity where risk and uncertainty are high. For pedagogy, adaptation in arid zones, mountains, and saturated lands make particularly clear examples. In these more extreme regimes, harvesting and storage of crops, and altering of the land all demonstrate the adaptive character of producers under stress.

A grain storage bin for a rural household in western Rajasthan. The bin holds enough for subsistence needs should a single monsoon fail. The construction materials are traditional: mud, dung, and straw.

Photo courtesy of Paul Robbins.

CULTURAL ECOLOGY IN SOUTH ASIA

Risk Spreading, Water Harvesting, and Mountain Terracing

The monsoon rain that drives seasonal South Asian agriculture is always an unsure bet. Producers face a known risk of failed harvests every few years. In the areas where capital development is most extensive, the risk of monsoon failure is ameliorated with tubewell pumping from deep aquifers. In many areas, however, groundwater supplies have been depleted, or even where they remain, they may only be tapped by wealthy producers. A majority of South Asian producers in arid lands still rely on the rain. Given the inter-annual variation in monsoon moisture, such reliance has to be tempered with a mechanism for averting disaster. The tendency in subsistence production towards risk-averse behavior is nearly universal; farmers and herders around the world are usually willing to reduce maximum returns in exchange for a lower annual chance of disaster or failure. In practical terms, this means the investment of time, labor, and resources in production techniques, infrastructure, and social networks that can be called upon during times of scarcity. In arid India, for example, joint family household networks spread risk of crop failure over large groups and areas, assuring that somewhere a household surplus may be called upon in case of disaster or shortage. These networks provide a social circuitry through which livestock and labor can be moved from village to village, where

needed. At the same time, however, producers in extended kin networks like these can be sure that someone in the family will call upon their aid on a regular basis, thus reducing returns overall.

Similarly, producers store value in domesticated livestock, including sheep, buffalo, camels, and goats. In good years, herds increase rapidly, with up to 200 percent annual returns in fast-reproducing species like goats and sheep (see photo on page 12). In times of distress, producers cut their losses through animal sales, thus averting disaster. Simpler techniques for risk spreading also exist. In arid regions, wild grasses are often planted alongside crop species. These wild species make excellent fodder, but more importantly, can store for up to a decade if carefully piled and stacked. With reserves in storage for ten years, producers are not forced to migrate with their animals with every bad monsoon. Desert households usually keep one and sometimes two years of grain in storage against the possibility of total crop failure and use a variety of carefully adapted techniques to protect fodder and grain in the interim (see photo on page 13).

Similarly, water itself is traditionally harvested throughout the subcontinent with a staggering range of technologies: canals for routing water from catchments, deep wells situated in key sites relative to groundwater flow, tanks to feed irrigation, and recharge basins to fill aquifers. In the drier plateau country of South India, temple tanks and catchment basins, religiously proscribed and controlled, are linked to traditional irrigation schemes that depend on seasonal access, even in good rainfall years. In Gujarat, *baolis*, or step wells, are carved into the earth and reinforced with stone. These draw upon deep aquifers and provide a sure source of dry-season water. In central Rajasthan, complex systems of silt ponds are scattered through the landscape to feed groundwater. The recharged aquifer is tapped in shaft and step wells for irrigation. These waters may be drawn using a number of traditional technologies including the Persian wheel driven by ox or camel (see photo, this page). These all represent deliberate alterations of the landscape for the control of resources and of risk. By diverting natural flow of surface water, feeding and tapping groundwater, and impounding catchments, producers reduce the chances of crop failure, disaster, or forced migration.

Many of the region's more notable adaptations occur at scales beyond the household and take the form of collective action. Irrigation systems, managed through carefully coordinated systems of labor, are the hallmark of South Asian "village republics" in India. Likewise, hill forests in Nepal are conserved through collective controls that underlie village solidarity. In another example, village tree stocks throughout the subcontinent are protected in sacred groves (*orans*) where cutting of valuable trees is forbidden, enforced through mutual agreement, and marked in the landscape as cultural artifacts: sacred islands of biodiversity. In all of these examples, the adaptive behaviors go beyond the individual to the group, representing instead larger ecological adaptations held together by cultural norms.

Perhaps most dramatically, the terracing of the mountain landscape in the Himalayan regions of Pakistan, Nepal, and India represents one of the most ancient marks of risk management through the investment of time and labor. Terraces carved out of the mountain slope enable the planting of corn, millet, and, most remarkably, rice in steep terrain and at relatively high altitudes. Like irrigation systems, step wells, and community forests, these carefully maintained fields exemplify the ways in which producers invest labor and resources to spread risk and raise productivity through the modification of the landscape.

The "Persian Wheel" draws water from a shallow well using a belt carrying small vessels. The wheel is driven by animal power yoked in the circle behind the wheel. A mixture of modern and traditional materials is visible here; an aluminum metal beam steadies the mechanism; the cups are ceramic; the belt is made from plant fibers.

Photo courtesy of Paul Robbins.

CRISES IN ADAPTATION

MARKET LOGIC AND KNOWLEDGE

These traditional systems have not gone unchanged by pressures in the region. The two most significant contributions to change are declines in traditional knowledge systems and the pressures of the market. In the first case, new technologies have come to displace older ones and to push the necessary supporting knowledge from the minds and memories of producers. The post-independence development orientation towards large dams and green revolution technologies, for example, pushes aside the traditional adaptations like groundwater harvesting, intercropping, and ethnobotany. Not only are techniques displaced, but the knowledge systems that support them also quickly disappear. The maintenance of recharge tanks for groundwater, for example, requires

specialized experience and information, unknown to university-trained engineers and unappreciated by contemporary planners. These risk-controlling knowledges may vanish in a single generation, and where newer technologies fail to adequately provide for producer needs, it may be too late to recover this information, now lost to history.

In the second case, the pressures of commodity marketing have begun to change the structure of risk itself; while the traditional risk-averse system reduces maximum output, the market provides greater output but with higher risk and inter-annual returns. With the advent of green revolution technologies in agriculture that demand capital-intensive inputs like pesticides and fertilizers, the cash returns for marketed commodities must be increased. This system of incentives is inherently riskier, especially for capital-poor producers who may lose their stake in the first major crop failure. In the process, wealthier producers emerge at an advantage, traditional knowledges are de-emphasized, and the regional cultural ecology changes to higher-risk crops, fewer systems of storage, and less socially organized methods of risk spreading.

While many geographers celebrate the advances of green revolution technologies, more detailed study of household adaptations and farming strategies reveal problems. Negative repercussions of the green revolution include soil degradation from high input rice cultivation in Bangladesh, the disintegration of tribal community through integration with markets in India's far northeast, the unexpected pressures on pastoral systems caused by cropping intensification, and the crisis of landlessness growing from the accumulation of land. Similarly, large-scale irrigation projects for agricultural production appear progressive on paper, but study of regional cultural ecology often shows them to be unsustainable over time. Moreover, cultural ecological analysis reveals that these transformations of regional production have differing and disproportionate impacts on women and the very poor. In sum, cultural and social ecology presents a fundamental challenge to many development orthodoxies.

For these reasons, it is essential that students learn to employ a cultural ecological perspective to understand producer ways of life in South Asia. By using this kind of geographic approach, it becomes evident (1) that village production systems are not at the mercy of nature but are carefully integrated into natural patterns through cultural systems that reduce risk and uncertainty; (2) that these systems reduce risk of disaster and failure through adaptation of production and landscape; and (3) that many technological and market changes endanger carefully adapted systems for survival. Teaching human adaptation, risk control, and landscape change is therefore essential to any curriculum on the geography of South Asia.

TEACHING HUMAN ADAPTATION AND LANDSCAPE CHANGE

These concepts from cultural ecology make good teaching material in geography, social studies, and earth sciences at any level. In classrooms, these concepts are especially helpful ways of bridging students with apparently distant landscapes and cultures. The following exercises are directed towards teaching the concepts of risk, adaptation, and landscape change to elementary school students. They are prepared for world geography classrooms, to be completed in less than an hour, and to lay the foundations for a variety of follow-up exercises.

A first exercise introduces the concepts of adaptation and risk, asks students to imagine and create risky situations and responses to risk, and prepares students for future discussions of human adaptation to risk in South Asia. First, the instructor introduces "adaptation" and "risk" using the simple definitions provided above and a few of the examples. The students are then paired up and instructed to construct collages of risky situations using simple materials, including magazine clippings, construction paper, glue, and pens. On the reverse side, they then write a short plan about how they would deal with the situation and prepare for future problems like it. These can be discussed with the larger group, using questions that emphasize the kinds of sacrifices, investments, and decisions required in preparing for known but unpredictable events. Would such a plan be carried out alone or as a form of group organization? Is the investment worth the reduction of risk? These can be brought back to examples from South Asia: pastoral nomadism in arid regions, agricultural terraces in mountains, irrigation channels in river valleys. Follow-up lessons draw upon the basic examples of risk aversion envisioned by students to underline the logics and resourcefulness of producers in India, Bangladesh, and Pakistan.

A second exercise introduces the concept of adaptive landscape change. Here, students modify their own environment as an imaginary disaster looms. Students are first introduced to the idea of "landscape change" as both the unintentional forces of degradation and as the novel sustainable conditions that accompany human action in the environment. They are then paired up and given an "Impending Disaster Card" describing a foreseeable natural hazard ranging from the small to the catastrophic; drought and flood, for example, are a good place to start, but the range of risks and hazards leaves plenty of room for local specificity and creativity. They can then prepare a map, diagram, or picture presenting their preparations for the disaster/risk, considering the ways in which they might build, plant, dig, or otherwise engineer a solution.

Class discussion can draw out the "unintended" effects of landscape alterations, changes in plant cover, erosion, or other unwanted or unplanned changes resulting from their solution. The lesson can then be returned to the examples of landscape change mentioned above, including rice field cultivation, terracing, well construction, or any other examples with which the instructor is more comfortable and familiar. Follow-up exercises might involve sketching students' landscape-altering solutions to problems, binding these, and comparing them to photographs or slides of land-altering adaptations in South Asia and elsewhere, including dams, silos, reserve forests, etc.

These exercises provide an accessible entry into basic geographical concepts for students at the elementary level and can be used in any sort of geography class. They also lay a foundation for longer units on the geography of South Asia. With a richer vocabulary to describe human actions and impacts, a slide show of South Asia (or any other region) can

become highly interactive, with students suggesting possible explanations for cultural landscape features and pointing out human influences. At more advanced levels, these concepts can be used to build a discussion of technological and economic change. The growth of the high-tech, factory farm in rural India, the shift in the pattern of risk, and the new environmental externalities created under these conditions of change make good foci for discussion and debate about technological history and the notion of "progress" in development. These very simple concepts open onto a broader view of people and resources in Asia and can be used to defy simplistic images of the region and its residents. They also introduce a geographic view of human actions and adaptations that, once learned, can fundamentally change the way students view human beings and the natural world. ■

NOTES

1. The field borrows heavily from traditional ecological categories of analysis. For cultural ecologists, energy transfer, adaptability of organisms, and resource constraints are all important explanatory tools for understanding agriculture, migration, diet, and many other cultural features.
2. There is a debate as to the scientific application of the concept of adaptation, and it is by no means the only tool available to someone examining human systems. Critics argue that adaptation is tautological and insufficiently analytical. Even so, the concept of adaptation is a powerful heuristic and pedagogical counter-image to that of people at the mercy of nature.
3. Definitions from Smith, D. M. "Risk." *The Dictionary of Human Geography*. Eds. D. Gregory, R. J. Johnston, and D. M. Smith. Cambridge: Blackwell Publishers, 1994, p. 536. Risk and uncertainty share an exhaustive literature of their own in geography, outside of cultural ecology.

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