$447 million. New limitations on the number of surgical procedures per animal will require an increase in the use of primates and dogs by 17.3% and 11.2%, respectively.

The analysis reports that 1021 research facilities now have Institutional Animal Care and Use Committees and 272 still have to establish them. Costs of additional staff for full compliance are put at $40 million a year. New staffing needs for both animal handlers and clerical personnel add up to 1390.

The latest submissions contain no analysis of the potential impact on biomedical research. This, says the impact analysis, "remains an interesting empirical question."

The proposed regulations have been held up at the OMB by squabbles between OMB and the Agriculture Department. The OMB has asked for more information on alternative approaches to achieving regulatory objectives, and suggested that there is too much reliance on design rather than performance standards. It also wants more analysis of the societal costs and benefits of the regulations and better scientific rationales for the APHIS recommendations. APHIS head James Glosser has contended that additional analysis is "unnecessary." In correspondence with the OMB's Office of Information and Regulatory Affairs he said the law rules out consideration of alternatives, that it is up to others to compute indirect costs and benefits, and that scientific analysis is impeded by a "dearth of scientific literature."

How and by whom the costs of all the changes will ultimately be borne remains an unanswered question. The only federal money specifically targeted for animal facilities improvement is a program in NIH's Division of Research Resources. The fiscal 1989 budget for this is $11.6 million which requires matching funds from the recipient.

■ CONSTANCE HOLDEN

# The Ecosystem and Human Behavior

A group of social scientists is drawing up an international research strategy on "human dimensions of global change." The plan, to explore how humans cause and are affected by large-scale environmental changes, envisages the most massive collaborative effort—in terms of geographical and temporal scales as well as breadth of content—ever undertaken in the social sciences.

The National Science Foundation (NSF) has funded some preliminary workshops to develop the research agenda, and the National Academy of Sciences (NAS) plans to appoint a committee to further the project. There are no estimates yet of the total costs of the program, which would be borne by a variety of national, international, and private sources.

The program is intended to supplement the International Geosphere-Biosphere Program (IGBP), which was initiated in 1986 by the International Council on Scientific Unions. This effort, drawing on experience from the International Geophysical Year of 1957 and the 10-year International Biological Program, involves research projects throughout the world that will attempt to integrate physical and biological knowledge about the earth's environment and predict future changes.

Physical and biological scientists are now well versed in global modeling. But the social sciences have lagged far behind in assessing the interactions between physical changes and human activities. Far more is known about the processes of global warming, deforestation, resource depletion, and pollution than about the processes of the human institutions that create these effects. Yet, states the report of a Brown University workshop held last spring, "For the first time in history, the unintended consequences of human actions and social processes now approximate the scale of the interactive processes of nature in their effects on the earth as a life-support system."

After initially trying to get IGBP organizers to incorporate more attention to human activities into their program, a separate but parallel effort was decided upon. As a participant at an Ann Arbor workshop put it, "If the natural scientists study ocean currents, we will study all of the human phenomena connected with ocean currents. We will study what they study."

Exploration of the human factor has been starkly lacking in most large-scale analyses of environmental change. While reports are always full of explanations and recommendations, there is little or no systematic exploration of why individuals, groups, and institutions do what they do in behavior affecting the environment. Roberta Balstad Miller, head of the NSF's Directorate of Social and Economic Science, observes that crucial questions are often ignored—such as the effects of values on behavior, the willingness of individuals to trade present pleasure for future gain, and industrial attitudes toward environmental risk.

At various meetings, some of the types of questions raised have been:

■ What affects a government's ability to change policies that accelerate environmental degradation or adopt measures to reduce it. What are the roles of direct government controls as opposed to market mechanisms.

■ How do population growth and demographic characteristics, including rural to urban migration, interact with economic growth and technology to affect resource use.

■ What are the environmental effects of financial policies and trade patterns.

■ What influences individual perceptions of the environment, how do perceptions affect attitudes, and how are attitudes translated into behavior. Why are rational courses of action not being followed.

The task ahead is daunting. To begin with, appropriate data sources that integrate information from a variety of disciplines do not exist. Demographic data exist separately from data on land use or data on industrial policy. Knowledge from areas of study such as "risk perception," which bears on how people make decisions, would be introduced for the first time into many types of projections. The new program would have a technology-forcing effect, so to speak, on social science methodologies, which would have to be adapted to long-term, large-scale multidiscplinary projects far beyond the customary scope of most disciplines.

Among the initiators of the human dimensions program are Harold Jacobsen of the University of Michigan's Center for Political Studies (Ann Arbor) and Robert Cates of Brown University's World Hunger Program. A number of organizations, including the Social Science Research Council and the International Federation of Institutes of Advanced Study in Toronto, have been exploring the subject. Objectives were sharpened up at a symposium held in Tokyo in September. The subject has increasingly become featured at international meetings, including the September meeting of the European Science Foundation in Oslo.

The Commission on Behavioral and Social Sciences and Education of the NAS has applied to the NSF and several foundations for funds to set up a committee on human dimensions of global change. According to commission director Robert Caplan, the committee will assess the types of data resources now available and their linkage with human activities, explore theories and models for long-term predictions, and come up with specific research questions. One example, says Caplan, might be an analysis of global warming on land use and agriculture in North America, and the demographic and political repercussions of a northward shift of the grain belt. Another would be what will happen when large areas such as Bangladesh go under water.

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