

**ENERGY AND PLANNING:
CERTAINTIES IN AN UNCERTAIN WORLD**

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Perhaps the most appropriate beginning for a panel on Uncertain Energy Futures is to briefly list some certainties about our future. There are many candidates for such a list, but we believe that six can be generally agreed upon:

FIRST: World commercial energy requirements will increase, if for no other reason than to meet the development needs (and rights) of Asia, Africa and Latin America. The mid-range projection by the Institute for Applied Systems Analysis estimated that energy needs of developing countries would triple by 2020, from the 1980 level of 3.3 terawatts, to over 9.2 terawatts. World Resources Institute recently projected only a doubling by 2020, but even so this would mean an increase of 4.1 terawatts, or roughly 40 percent of existing world energy use (see Wang, et al., 1988). (In U.S. equivalents, it's about 1.6 annual U.S. energy consumptions.)

SECOND: World pollution levels will continue to increase while societies depend upon fossil fuel combustion for most of their energy needs. Several global environmental consequences derive from dependence upon fossil energy: from the visible disasters of the sliming of Prince William Sound to less immediate but far more dangerous perils such as global warming. With regard to the latter, James MacKenzie of World Resources notes that measurements at Mauna Loa, Hawaii Observatory over a 30-year period show a continuous climb in atmospheric CO₂ levels. This increase is part of a longer-term trend which has resulted in a 25% rise in the level of atmospheric CO₂ since the mid-19th century. He estimates

that a doubling of CO₂--which will accompany the doubling of world energy use unless we change our fuel mix substantially--will result in a per decade rise in the average global temperature of the earth of between 1.5 and 4.5 degrees Centigrade (1987).

THIRD: The principal source of increased energy demand and world environmental pollution is, and will be, industrialization. Industrialized countries are the largest contributors of CO₂ buildup. They also supply the greatest amounts of air-borne sulphur oxides, nitrous oxides and volatile organic compounds necessary for the formation of ozone (O₃). While developing countries will increase their pollution contributions, and perhaps their share of world environmental degradation, this will be a derived result of two things: (1) the continued exploitation of their resources and peoples by the already-industrialized; and (2) the dictated development path they will follow to achieve parity. Choice in this matter is greatly restricted by the entrenched political, economic and technological power of the already-industrialized.

FOURTH: The combined trends of industrial growth, increased energy requirements, and rising pollution are unsustainable at the global level and have and will engender pressure for change. It is very difficult to achieve consensus on the definition of sustainability and significant controversy surrounds the characterization of the development-energy-environment interrelationships. But while we

may argue over these particulars, there does seem to be a growing awareness that whatever we mean by our terms, and however we model the relationships, the existing order of things is problematic and its viability is in doubt.

The present distribution of financial and industrial power is at the center of world problems of unsustainability. The productive and reproductive capacities of the world economy presently assume pervasive inequality. Such inequality, as the World Commission on Environment and Development has observed, forces the poor to become partners in environmental degradation (1987:67-68):

International economic relationships pose a particular problem for poor countries trying to manage their environments, since the export of natural resources remains a large factor in their economies, especially those of the least developed nations. The instability and adverse price trends faced by most of these countries make it impossible for them to manage their natural resource bases for sustained production. The rising burden of debt servicing and the decline in new capital flows intensify those forces that lead to environmental deterioration and resource depletion occurring at the expense of long-term development.

FIFTH: Addressing inequality must have our highest priority. But as we make changes in the world political economy, we will also have to act on two sectoral logjams--those in electricity and transportation. Both sectors will be the focus of world pressures for change. This is not to suggest that other sectors won't also be required to be changed; indeed, change is likely to be widespread,

particularly if certain planning regimes are adopted (which are discussed below). But the utility and transportation sectors are central hubs in the industrial network: they play a fundamental role in determining the type of economic development we enjoy, the nature and amount of energy we produce and utilize, and, most important, the environmental waste stream we generate in sustaining a certain way of life. If industrial societies account for most of the world's pollution, these two sectors are the principal suppliers. Electric utilities in the U.S., for example, are the major sources of atmospheric CO₂ and SO₂ generating, respectively, 33% and 65% of these pollutants. This waste comes mostly from the burning of coal. Transportation runs a close second on CO₂ at 31% (from oil combustion). And this sector is the leading supplier of carbon monoxide at 70%, of nitrous oxides at 41% and of volatile organic compounds also at 41% (MacKenzie, 1987).

SIXTH: Change will be required at all organizational levels from city to nation, but most importantly, at the international level. A recently completed study by Finland's NEMO project estimates that almost two-thirds of the country's sulphur deposition originates abroad. While Finland has adopted a policy goal of reducing its SO₂ emissions to half their 1980 level by 1993, realization of this or more ambitious goals will require international cooperation and action. Finland's dilemma is shared by countries in all parts of the globe and underscores the need for international energy, environment and development policies. The UN Conference on

Electricity and Environment now being planned for 1991 in Helsinki is a step in the right direction; a similar endeavor on Transportation and the Environment is equally needed.

Each of these certainties embodies a host of uncertainties, including:

1. the rate at which energy requirements will increase;
2. the acceleration curves and catastrophe points for global environmental threats such as the greenhouse effect and acid rain;
3. the point at which we will run out of affordable oil, at which we will have to stop burning coal, as well as the interval before the next nuclear accident, the next tanker spill, the next gas pipeline rupture; and
4. the timing and location of the next famine which will visit the developing world and where and which country will next experience economic collapse.

Uncertainties of this type have been the target of research and analysis for years. Often the motive for investigating them has been to defend the present as a basis for organizing the future. That is, the concerns raised by uncertain events is that our current way of doing things may be disrupted. Such concerns call forward planning approaches which emphasize prediction as the antidote. There are many uncertainties which can be addressed in this manner. But there are also many, as we have learned, which cannot. Treating uncertainty as a problem of prediction necessarily underestimates the possibility that the impossible will happen. When the impossible entails minor costs for being wrong, we can live with our mistakes. But in the energy-environment-

development interrelation, there are fewer and fewer permissible mistakes of this kind.

A more sophisticated planning regime is to recognize the unpredictability of the future, and to shift attention to changing the organization, rather than defending it, in order to cope with the future. You will be hearing for Dr. Sioshani about a particularly interesting version of this planning style and how it is being used within the volatile but critically important world of utility decisionmaking. It is revolutionary in its implications because such planning assumes change not as an exogenous threat, but as an endogenous condition of organizational growth and viability.

The shift from the mechanical to the biological required by change-dominated planning implies learning as the proper response to uncertainty. This leads us to a third planning philosophy in which uncertainty evokes a sense of opportunity rather than threat. In this direction, energy and development structures which are fixed in the present become the objects and even the agents of transformation in the future. It is clear that thinking of this kind is essential if we are to address the unsustainable trends immanent in the contemporary world economy. The recently concluded Economic Summit in Paris and President Gorbachev's extraordinary proposal to begin a process of economically linking East and West are welcome steps toward international cooperation. A healthy

skepticism will and should accompany these pronouncements until substantive actions are undertaken. In this vein, the Brundtland report provides one of the clearest and best reasoned frameworks for international action.

The problems of the developing world, which Dr. Schramm will shortly address, and the need to create new supranational forms of political decisionmaking, which Dr. Koomanoff will discuss in his remarks, are prime examples of where planning as a learning response to uncertainty can be most effective.

Each of these planning approaches--planning as prediction, planning as change, planning as learning--speak to the goals and methods of the enterprise as a generic social activity. They are not specific about substantive purposes of a plan. But the six certainties outlined above make amply clear the need to focus on specific goals. Two undeniable aims of planning will have to be:

- (1.) to safeguard the environment for the future; and
- (2.) to avoid, as far as possible, social and environmental trends which jeopardize our capacity to choose among a rich range of alternative, sustainable futures.

These goals propel us into a world of problems which typically have gestated for very long periods of time and which will require long-term attention to solve or abate. In a spring 1986 article in the American Planning Association Journal, Bruce Tonn of Oak Ridge

labeled these phenomena "500 year problems" and called for 500 year planning to cope with them. Many would argue that a 500-year plan is an extravagance which we cannot afford, given our present dangers. On the other hand, unless we consider both the genesis of our problems and their solution in a time frame which recognizes present economic, political and technology systems as not only transformable but transitory, we are unlikely to penetrate the reproduction cycle of our certain dilemmas.

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(Maps are from M. Kidron and Ronald Segal, 1987, The New State of the World Atlas, NY: Simon & Schuster).