

EXTREME EVENTS AND THE POLICY SCIENCES

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We have been asked to discuss the implications of our own experience for the broad issue of extreme events, and more specifically for a possible research program. My experience lies in the policy sciences, which (as the name suggests) attempts to integrate science and policy.¹ A few words of introduction are in order because the policy sciences differs from other approaches to policy in certain important respects.

First, in the policy sciences, the basic purpose of science in human affairs is not prediction from generalizations, but freedom through insight. Scientific insight can free policy makers (including members of the general public) from ignorance of the internal and external factors that stand in the way of realizing their interests in particular situations. The recommendation is that scientists serve common interests compatible with human dignity for all, not special interests. Second, the underlying postulate is not that behavior can be reduced to fundamental laws, but that each of us acts on his or her own perspective to realize preferred outcomes in any situation. That perspective is far from omniscient, and may differ significantly from other perspectives and from the actual situation. Thus the outcomes expected and preferred in the situation may differ significantly across actors and from actual outcomes. But in any case, actors may learn from the experience.² Third, because perspectives are limited, diverse, and

¹ The policy sciences began be crystallized and institutionalized by Lasswell and McDougal at the Yale Law School in 1943. For an overview see Lasswell and McDougal (1992). On the policy sciences in the broader policy movement see Brunner (1991).

² This postulate is not unique to the policy sciences. It is equivalent to Simon's (1957:199) principle of bounded rationality, for example. But it is significantly different from reductionism, the postulate that the behavior of human beings and other living forms can be reduced to small number of fundamental laws. For more on the latter, see Anderson (1972).

subject to change, generalizations about human behavior tend to be weak (in the sense that there are many exceptions) and subject to decay with new experience and insight. Thus general concepts and propositions are properly used as heuristics to guide inquiry into specific contexts, and not to predict what will found be there. Inquiry into specific contexts is unavoidable.

Propositions based on the postulate suggest that many extreme events – the ones most relevant to public policy – create problems to be prevented if possible, but also opportunities to adapt policies and social outcomes to changing circumstances. The opportunities may provide the most distinctive rationale for a research program on extreme events. Let me introduce three propositions (from Lasswell 1977) and some cases, and then draw some implications for a possible research program on extreme events.

First, some extreme events disrupt the routine practices of many people at the same time, creating unavoidable problems of adjustment. For example, the oil embargo initiated by OPEC in October 1973 restricted the supply of crude oil worldwide. Among other things, this forced people to divert limited time to waiting in lines at gasoline stations, and to curtail driving for all kinds of purposes. Escalating fuel prices forced households and organizations, private and public, to divert limited budgets from other activities to cover necessary fuel costs. In January 1986, the loss of the space shuttle Challenger forced delays and additional costs on people involved in virtually all NASA programs – because NASA constructed the post-Apollo civil space program to depend almost exclusively on shuttles for launching manned and unmanned missions into space. In 1997, the flood of the Red River of the North crested at a record level, causing about \$1.2 billion in damage to property around Grand Forks, ND. Downstream in Fargo, ND, better preparation limited damage to about 50 properties. In all these cases, private persons and public officials alike found it necessary to act to alleviate the problems caused by an extreme event. Directly experienced emotional and material damages are not easily dismissed and ignored as mere propaganda.³

³ Compare the following proposition (Lasswell and Kaplan, 1950:113): “Propaganda in accord with predispositions strengthens them; propaganda counter to predispositions weakens them only if supported by factors other than propaganda.” The factors other than propaganda include direct experience.

Second, one of the first effects of such widespread disruptions is to weaken emotional attachments to established ways of thinking and doing, and to create a susceptibility to proposals. Disruptions also stimulate the supply of proposals. Without going back to review the record, I recall that in the immediate aftermath of the oil embargo, Congress authorized the Alaskan pipeline (which had been blocked for environmental reasons), imposed year-round daylight savings time, and passed many other bills to secure energy supplies. Before long virtually every political interest group revised its strategy and tactics in light of the opportunities presented by the energy crisis. Eventually, for example, various interest groups got federal support for the development of shale oil reserves in the West, a breeder reactor at Clinch River in Tennessee, and a strategic petroleum reserve in Louisiana. Environmentalists got the National Solar Energy Research Laboratory. Utility companies got the Low Income Energy Assistance Program to cover the unpaid bills of poor people, and gained the support of welfare organizations that sought additional means to alleviate the burden of higher energy costs on their constituents. As Shakespeare put it, “Necessity is the mother of invention.”

Third, in the aftermath of widespread disruptions, the decision process tends to select “inventions” that are emotionally satisfying, although some may also be rationally effective in ameliorating the problems caused by an extreme event. In the aftermath of the energy embargo, the alternatives adopted but eventually terminated included shale oil development, the Clinch River breeder reactor, and year-round daylight savings time, which saved little energy but exposed kids to more risks as they traveled to school in the dark. In the aftermath of the Challenger disaster, NASA conceded some launches to unmanned rockets in order to defend the shuttle program, a centerpiece of its commitment to the human exploration of space. NASA’s critics had no effective alternative to decouple the civil space program from dependence on the shuttle, and gradually lost interest in fundamental reforms –leaving most of the civil space program vulnerable to loss of another shuttle. In contrast, Fargo and to a lesser extent Grand Forks reduced their vulnerability to another record flood by buying up properties damaged in the flood in 1997. This enabled former owners to rebuild out of harm’s way.

From these propositions and examples, I think it is clear that extreme events create opportunities for adaptation to changes in circumstances, but the opportunities may be foregone

if good intelligence is lacking. By “intelligence” I mean the knowledge and information available for purposes of policy decision -- and more specifically, policy alternatives that are both politically viable and rationally effective. Better intelligence might have deterred some of the failed public policy responses to the oil embargo, and emphasized the decentralized or distributed conservation policies that contributed more than anything else to reduced vulnerability to shortages later in the 1970s. Better intelligence might have empowered NASA’s critics to significantly reduce our vulnerability to the loss of another shuttle, but NASA largely controlled the intelligence function for the civil space program. Good intelligence did in fact help Grand Forks and Fargo reduce their vulnerability to future floods.

Prevention also depends upon better intelligence, but predicting and preventing problems caused by extreme events may be more difficult than exploiting opportunities. None of the published forecasts of energy supply and demand predicted an oil embargo in 1973, despite its obvious importance to all kinds of organized interest groups in the private and public sectors worldwide. Nearly everyone acknowledged the possible loss of a space shuttle, but NASA was unprepared; it lacked even a public relations plan when the Challenger exploded. Information on problems in the O-rings of the solid rocket boosters during cold-weather launches had been discounted and ignored as it moved up the NASA hierarchy, and was contained within that hierarchy. Grand Forks and Fargo both had access to the same official forecasts of the Red River flood in 1977. Fargo experienced less damage because its people had greater capacity to use those forecasts for policy purposes – to minimize whatever damage they could not avoid.

What are the implications for a research program to serve the common interest in preventing the problems caused by extreme events, or exploiting the opportunities for needed adaptation? *The major implication is that good science is not sufficient* – if “good science” is restricted to the development of predictions and generalizations, supported by quantitative data and formal-deductive methods, and judged through scientific peer review alone. Good policy intelligence depends upon a broader conception of “science” – one

- guided by explicit normative judgments of the common interest in the particular context,

- focused on empirical inquiry into the particular context, using concepts and generalizations distilled from broad experience as heuristics; and
- judged by policy makers and scientists, to improve chances that research proposals and results are relevant to policy decisions, and readily usable in them.⁴

Based on this broader conception, a program might be designed to minimize the problems of policy *irrelevance* encountered by a long series of research programs intended to inform policy decisions. These include such high profile programs as the NAS/NRC Committee on Nuclear and Alternative Energy Systems, the National Acid Precipitation Assessment Program, and the U.S. Global Change Research Program. It might also be refined to minimize the problems of policy *relevance* – and therefore political controversy – encountered by the NSF program on Research Applied to National Needs. If NSF officials are not willing to accept these problems as challenges, in a new research program on extreme events is probably not in the common interest.

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⁴ For a proposal along these lines, see Brunner (1996).