EXPERT JUDGMENT AND CLIMATE FORECASTING:
A METHODOLOGICAL CRITIQUE OF "CLIMATE CHANGE TO THE YEAR 2000"

THOMAS R. STEWART and MICHAEL H. GLANTZ
Environmental and Societal Impacts Group, National Center for Atmospheric Research*, P.O. Box 3000, Boulder, CO 80307, U.S.A.

Abstract. The National Defense University's study of climate change to the year 2000 was based largely on the judgments of the members of two expert panels. Although the study has been widely distributed and apparently read by policy makers in the U.S. and abroad, the method of eliciting and analyzing expert judgment has not been critically reviewed. This paper uses the literature on judgment and subjective probability to evaluate the expert judgment methods used in the study.

1. Introduction

This paper analyzes the methodological underpinnings of a study of future climate change. The study, undertaken by the United States' National Defense University (NDU), was designed to elicit expert opinion about the probability of different climate futures. Its conclusions suggested that climate in the next twenty years would be similar to that of the recent past.

There is evidence to suggest that the NDU study received widespread attention in the disciplines related to atmospheric sciences and to agriculture, among the highest level of policymakers in the United States, and perhaps in other countries as well. Yet to date its methodological underpinnings, not to mention the implications of its substantive findings, have not been critically assessed. It has been reviewed benignly in several places (Kraemer, 1978; U.N. FAO, 1979; Science News, 1978; Sellers, 1979; McKay and Williams, 1982), with the reviews merely describing in brief the study's findings.

Because of the widespread dissemination and apparent use of the NDU study's findings by government policy planners, it is important to examine closely the basis for its conclusions. In this paper we examine the validity and, therefore, reliability of the study's findings from a methodological perspective. Specifically, we examine the method used to elicit judgments from the expert group in the first part of the NDU study and we identify and describe some method-induced biases likely to have affected the study's results. First we briefly review the historical setting of the study and summarize its results.

2. Historical Setting

The 'Green Revolution', based on the development of the high-yield varieties of grain in

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the 1960's, fostered new hope that technology could buffer developing as well as developed societies from the vagaries of weather. Sharply increasing productivity on land was being reinforced by expectations that parallel increases could also be derived from the sea. Not only were abundant, but yet untapped, living marine resources viewed as a reservoir of protein that could supplement protein derived from terrestrial resources, but new technologies such as factory ships were being touted as the wave of the future. It was also in the 1960s that hypotheses were being presented about ways to slow high population growth rates that were widespread throughout the Third World. Thus, by 1970 an optimistic feeling was emerging that world food problems were on the verge of being brought under control (Brown, 1970).

This feeling changed by the mid-1970s, following a period of climate-related shocks to agronomists, agricultural planners, and farmers. After decades of what in retrospect has been referred to as benign worldwide weather conditions, climate anomalies and subsequent societal reactions to them led to a revised view of food production. In the early 1970s there were droughts in the U.S.S.R., China, Central America, the West African Sahel, East Africa, and Australia. The resulting crop failures sharply increased demand for available grain stocks. The rapid depletion of grain stocks, in turn, caused a sharp increase in grain prices in the international marketplace (e.g., Hopkins and Puchala, 1978). There was a concurrent sharp decline in fish landings (this was also climate related) that generated a new skepticism about the ability of the seas to supply with new technology the hundreds of millions of metric tons of fish per year as had been suggested in earlier fish stock assessments. Some scientists insisted that living marine resources were already overexploited.

A new political perspective on American food exports was formed. Secretary of Agriculture Earl Butz, among others, began to boast that food had become an important foreign policy tool in the American diplomatic negotiating kit, the strength of which might offset the inconveniences, for example, of the threat of additional sharp increase in oil prices. Reinforcing Butz’s contention were the scores of headlines referring to the politics of droughts and of starvation, the economics of grains, and so forth. The U.S. Central Intelligence Agency, too, showed a new interest in climate and produced a number of public documents related to climate and food, and the need for climatological research within the intelligence community (U.S. CIA, 1974).

Fueling the new-found political interest in climate was the debate that was then raging in journals, meetings, conferences, and ultimately in the popular press about whether the global climate was changing. Was it becoming warmer (with the appearance of book titles like Hothouse Earth) or were we moving toward an Ice Age (with book titles like The Cooling)? Still others, seeing the issue surrounded by a high degree of scientific uncertainty, suggested strategies to cope with climate variability and change regardless of direction (e.g., The Genesis Strategy: Climate and Global Survival). Selective evidence to support each of these contending views could be found in the scientific literature (e.g., it was ‘time’ for a new ice age, or thermal pollution or increased CO₂ loading of the atmosphere would ultimately lead to a global warming). This debate commanded the attention of Congress (e.g., Congressional Research Service, 1976).