

Workshop on

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**CREEPING ENVIRONMENTAL PHENOMENA**

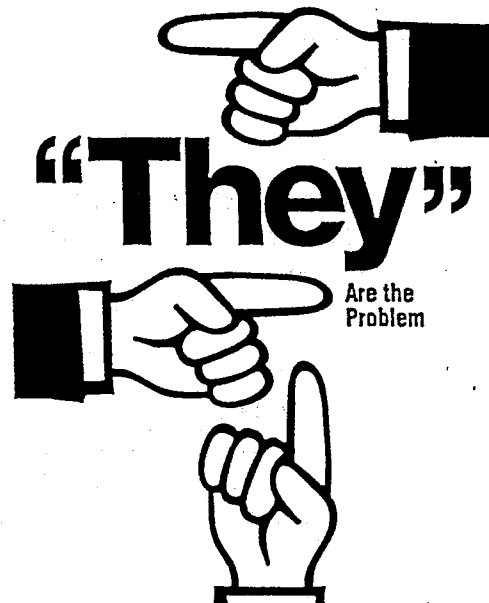
*And Societal Responses to Them*

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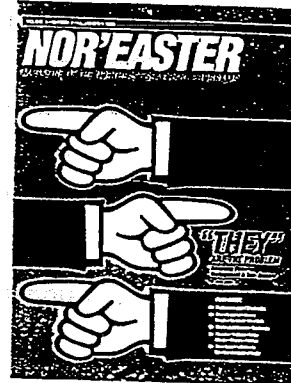
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# CREEPING ENVIRONMENTAL PHENOMENA: ARE SOCIETIES EQUIPPED TO DEAL WITH THEM?<sup>1</sup>

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## Introduction

In our daily lives we are constantly bombarded with bad news about the environment. Some of that news is about environmental problems of a global nature and some of it is about problems at the local level, usually related to urbanization. These have been referred to as green and brown environmental problems, respectively (see Posnick and Vogel, 1992; also Vogel, this volume). For the most part these problems are of a low-grade, long-term and cumulative variety: air pollution, acid rain, global warming, ozone depletion, tropical deforestation, desertification, droughts, famines, the accumulation of nuclear and solid waste, and so forth. Such problems, which can be called creeping environmental phenomena (CEP), cut across disciplines and continents. Countries represented ranged from the United States and Canada to Ethiopia, Morocco, South Africa, Russia, Uzbekistan, Australia, and Brazil.

Although the range of problems represented at the conference was quite broad, participants identified common characteristics among them. One major feature that they share is that a change in a creeping environmental problem is not much worse today than yesterday; nor is the rate or degree of change tomorrow likely to be much different than that of today. So, societies (individuals as well as government bureaucracies) are for the most part not able to see any changes that would prompt them to interact with their environments any differently than they had on previous days. Yet, these incremental changes in environmental conditions accumulate over time with the result that, after some threshold has been crossed, those imperceptible increments of change have added up to a major degradation. If no action is

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taken, as is the usual case, those incremental changes will continue to mount until a full-blown crisis emerges.

Many changes to the environment do not appear detrimental in their early stages --- and if those changes were stopped early enough in the process, they would likely never develop into or be perceived as an environmental problem, let alone a crisis. Such a change might be regarded not as degradation but as transformation. For example, the destruction of a small part of a mangrove forest in Southeast Asia to create a shrimp pond (e.g., transformation) would not necessarily signal a stage in the destruction of the forest ecosystem. If, however, shrimp ponds were to be constructed continually and in great numbers in the same locale, then the mangrove forest as a thriving ecosystem would eventually be destroyed.

For each of the various CEP there is an identifiable threshold (maybe identifiable only after the fact) whereby continued "business as usual," once that threshold has been crossed, will most likely lead to the destruction of an ecosystem. However, thresholds are easier to talk about than to detect, especially in advance. In addition there are several different kinds of thresholds with regard to creeping environmental phenomena: the first, problem awareness, relates to awareness that an ongoing environmental transformation has become an environmental detriment and, hence, a problem; a second threshold, crisis awareness, relates to the realization that the problem has reached a crisis stage; a third threshold, action, relates to a concerted action to cope with the problem. Because these problems derive from low-grade, slow, and cumulative environmental changes, it is not easy to identify objective indicators of thresholds. Hence, thresholds are often identified based on subjective factors.

My concern focuses on the need to recognize how pervasive creeping environmental problems are, and to identify thresholds which would likely vary from one region to another even for the same type of environmental degradation. Societies should not necessarily be blamed for inaction on environmental change before the critical threshold of awareness has been crossed and that change becomes degradation. But once degradation has been recognized, consideration of the environmental change by the government should be undertaken. This presents a dilemma: when to take action to slow down, stop, reverse, or

eradicate a CEP. Close scrutiny of a variety of known CEP could be instructive in identifying purely objective ways to recognize thresholds before they appear.

### **Creeping Environmental Problems: Some Examples**

*Decline in Aral Sea level:* The Aral Sea in Central Asia has declined more than 14 meters since the early 1960s. This has resulted from increasing amounts of water being diverted from the region's two major rivers, the Amudarya and the Syrdarya, to irrigate expanding cotton production. Environmental problems associated with sea level decline were openly acknowledged by the Soviet government in the mid-1980s as a result of Gorbachev's policy of glasnost (openness). His government appealed for assistance from the international community. Many point to the threshold of awareness when glasnost exposed the problem. Yet, potential problems associated with major expansion of irrigated cotton agriculture in Central Asia were identified in the early 1960s by some outspoken Russian scientists, as witnessed by their various articles in *The Journal of Soviet Geography*. The truth of the matter is that there were several signs of degradation which could have been viewed as thresholds of awareness and of crisis: as examples, the Syrdarya failed to reach the Aral Sea in the late 1970s; there was an increase in the frequency and intensity of dust storms originating on the newly exposed, dried seabed along the southeastern shore of the Sea; and the increasingly large diversions of water from the rivers.

*Stratospheric ozone layer depletion:* The threshold of awareness of chlorofluorocarbons (CFCs) as a potential stratospheric "ozone-eater" was reached in the mid-1970s. Problem identification was followed by a ban on the use of CFCs in aerosol (spray) cans by some countries in the late 1970s (e.g., the US and Scandinavian countries). Some countries (e.g., the UK) actively sought to discredit the ban on CFCs as premature. There was little interest at that time, even in the US, in banning CFC use in refrigerants and foam-blowing agents as no substitutes were available or even on the drawing boards of manufacturers. In the mid-1980s, as scientific information began to mount, the problem was acknowledged openly and even by some previously adamant key opponents to CFC reduction. As the threshold of world-level action was reached, the Vienna Convention was accepted in 1985, and in 1987 the Montreal Protocol.

*Desertification:* While societies have coped with erosion of the soil by wind and water, salinization of soils, waterlogging, and so forth, from the beginning of civilization, the concept of desertification, which encompasses all of these processes, appeared in 1949 in Henri Aubreville's publication about the dry tropical forests of Africa. The problem of desertification (as opposed to the problems of the many processes it encompasses) was formally acknowledged on an international scale by the UN system with the convening of the UN Conference on Desertification in 1977 in Nairobi. Since then, however, little out of the ordinary has been accomplished in attempts to combat desertification by the donor community and the affected governments. Interest in desertification heightens during periods of extended drought in arid and semiarid areas, only to wane when drought passes. At the Earth Summit in Rio de Janeiro in June 1992, African governments demanded a desertification convention. International negotiations to develop such a framework are currently in progress.

*Global warming:* The scientific community is concerned that the burning of fossil fuels, along with other human activities, is producing greenhouse gases (CO<sub>2</sub>, CH<sub>4</sub>, CFCs, and nitrous oxides) in amounts that could alter the global climate. This environmental change was first posed as a possibility in the mid-1890s, again in the mid-1930s, and yet again in the mid-1950s by various scientists. However, each time, it had not been taken seriously by the scientific community. Even if it had been considered a possibility, it was not seen as an environmental "bad" but was seen as either a potential "good" that would thwart the onset of the next Ice Age or as an interesting (e.g., neutral) human experiment with the Earth's atmosphere. It was not until the mid-1970s that scientists began to take global warming more seriously as having possible negative consequences for societies around the globe. The 1980s saw a rise in media and political interest in the issue. At the Earth Summit in mid-1992 a framework climate convention, developed during the previous few years, was initiated by many governments. The convention came into force on 21 March 1994 with the necessary 50 countries agreeing to abide by its provisions.

*Tropical deforestation:* Concern was raised about the fate of the Amazon rainforest and the Indians that inhabited the forest in the 1960s with the construction of highways across the region. Assessments of tropical deforestation were undertaken by the FAO in the 1970s

and these appeared along with articles referring to deforestation as an environmental problem. It was the rapid deforestation rates in the Brazilian state of Rondonia, as pictured by remotely sensed satellite imagery showing herring-bone patterns in the midst of virgin forest, that generated a feeling of crisis. In addition, the misstatement that the Amazon rainforest was "the lungs of the earth," coupled with pop-star involvement in saving Indians as well as the rainforest, and the implication of deforestation in an enhancement of the naturally occurring greenhouse effect, combined to draw global attention to tropical deforestation as a negative environmental change that was occurring around the globe. This concern culminated a global action threshold leading to consideration of a possible forest convention.

*Famine:* Famine is a process related to the loss of availability of or access to food. It is a process that occurs over months to a few years. It, too, is a creeping environmental phenomenon of relatively short duration when compared to global warming, ozone depletion, and even tropical deforestation. Famines have plagued societies around the globe since their beginnings. They often capture attention only when they are full blown with thousands of people dying of hunger. With the Green Revolution in the 1960s and 1970s, it was felt that agricultural production would become buffered from weather and climate fluctuations. Yet, with all our advanced technologies and food production methods, famines still occur. It seems that today most famines result from problems stemming from the interplay between drought and conflict. Governments may, in fact, prefer to deal with famines rather than their underlying cause, chronic hunger. To deal with hunger requires readjustments in political, economic and cultural power within a society. Such readjustments, however, are less tractable than is the prospect of mobilizing resources to eradicate a specific famine.

### **What Are CEP?**

So far we have suggested that not all environmental changes are degradations; some can be viewed as transformations. We have also suggested that there is a threshold, most likely only identifiable in retrospect, beyond which the environmental change-as-degradation becomes apparent. One could argue that before that threshold is reached, a government should not be chastised for not having taken action. Once the environmental problem has been exposed, however, the government has an obligation to address it.

Clearly, there are differences in time scales during which these creeping environmental problems take place: Global warming and ozone depletion occur on a time frame of decades to centuries; deforestation and desertification take place from years to decades; famines and droughts occur over a period of months to a few years. So, the argument that a policymaker might make about not acting on global warming or ozone depletion because their consequences are likely to appear in the middle of the next century (e.g., its impacts are so far into the future that there's no need to worry about it now), can not realistically be used by those national and international bureaucrats whose job it is to prevent famine in various parts of the globe. With regard to famine, impacts are but months away when they recognize the possibility of famine.

Each of these CEP has some degree of scientific uncertainty surrounding it. Generally speaking, there will always be uncertainty surrounding many of these environmental issues. For example, the latest challenge has been to desertification estimates, with scientists suggesting that areas subjected to desertification have decreased in the 1980s (e.g., Thomas and Middleton, 1994). Even with regard to ozone depletion, an issue on which most scientists agree, a small but vocal backlash group has emerged. Thus, for most CEP (e.g., global warming, ozone depletion, desertification, tropical deforestation) there has been a backlash, a minority voice, often loud, that plays up what scientists do not know as opposed to emphasizing what they do know. To the public, to policymakers and to the media such interactions within the scientific community (verging upon open combat in the electronic media, in professional journals, or in the newspapers) tend to weaken the resolve of those from whom action is expected. In other words, one can find in the scientific literature viewpoints as well as numbers which can be used to support or attack any particular policy action.

Associated with these CEP is a spatial-scale dimension. These problems may either be global in cause (e.g., greenhouse gases emissions), global in effect (e.g., ozone layer depletion) or global in concern (e.g., desertification). With regard to global warming every society produces greenhouse gases whether to fuel industrial metabolism or to rely on firewood and charcoal to cook an evening meal. With regard to the production of



stratospheric ozone-depleting CFCs, only a score or so of corporations are responsible for their production, although stratospheric ozone is depleted globally. Desertification does not occur in every country. It can be shown to be a national problem, with desertified areas going right up to but not across straight-lined or jagged international borders. Nevertheless, photos of desertified areas and their impacts on human populations in sub-Saharan Africa have captured the attention of people worldwide.

### **Why Do They Continue?**

An improved understanding of the CEP process and societal responses to it would enable us to deal with them in an optimal way, that is, before a costly crisis responses becomes the only option. However, we must be careful not to reduce the reasons why a CEP continues to only one factor, as there are many interactions that foster environmental degradation. It would be fairly easy (even if incorrect) for one to reduce the primary reasons for inaction on CEP by governments to any one of a variety of disciplinary views: for example, economics (e.g., high discount rates for the future; short-term profit over long-term environmental degradation, etc); politics (e.g., avoidance of coping with environmental problems that most voters do not yet consider important; that is, there is a difference in time scales between elections and environmental problems; bureaucratic inertia); psychology (e.g., also discounting the future; lack of a dread factor; perception of risk; selective inattention, etc), and so forth. Each of these perspectives will provide insights into how societies deal with CEP. However, taken alone each would provide an incomplete picture and would most likely lead to insufficient coping responses with regard to a particular CEP.

Excuses or reasons for not taking action are many. As noted earlier, a reason often heard with regard to inaction on the global warming issue is its time scale and the degree of scientific uncertainty surrounding the issue. Yet, policymakers are constantly making policy decisions based on issues tainted with varying degrees of uncertainty regarding outcomes and impacts. Scientific uncertainty should not be an excuse for issue avoidance.

Another factor affecting governmental responses to CEP is that most environmental problems do not affect an entire country in a visible way. As a result, only people who are

directly confronted by the local environmental degradation become most concerned about it, at least in the early stages, and a government is likely to accord a low priority to addressing the problem.

Yet another constraint on timely societal responses to CEP involves "dread factors." Unless a populace fears the consequences of a CEP and those consequences have some perceived high probability of occurring, little action will likely be taken. The recent history of the global warming issue is instructive. There have been several attempts to identify dread factors in order to prompt political action to arrest the emissions of greenhouse gases. For decades, beginning in the 1890s, scientists had viewed global warming resulting from coal burning as a positive thing, staving off the imminent return of an Ice Age. Therefore, while there was recognition of an environmental change, it was not seen as an environmental problem.

In the mid-1970s modeling experiments were proposed using four times the pre-industrial levels of carbon dioxide. It turned out that the scenario was highly unlikely and the experiments were dropped. The next fear raised was that of a *doubling* of preindustrial levels of carbon dioxide. Although there was really nothing significant about a doubling, it took on the aura of a dread factor. In the late 1970s scientists raised the possibility of a breakup of the West Antarctic ice sheet, which would raise the sea level about 8 meters. Further scientific research sharply reduced the likelihood of such an event.

Another apparent dread factor was suggested by Wallace Broecker (1987), who wrote about abrupt changes in ocean currents worldwide over a period of a few decades in response to a warmer atmosphere, disrupting regional and global climates.

In the global warming issue, the search for thresholds of awareness, if not crisis, continues. As these previous dread factors have not panned out, a small community of disbelievers or naysayers represent a backlash against the issue. This controversy notwithstanding, governments are cooperating through the Intergovernmental Panel on Climate

Change (IPCC). As noted earlier, the Climate Convention, designed to cope with the reduction of emissions of greenhouse gases, entered into force on 21 March 1994.

We must also realize the possibility that for such "invisible" issues as global warming, where changes in climate at a regional or local level might not provide enough proof (e.g., the fingerprint) of a global climate change or for ozone depletion (in the absence of an ozone hole), some CEP may not yield a readily identifiable threshold of change in advance. As US Vice President Gore has suggested, "We are not unlike the laboratory frog that, when dropped into a pot of boiling water, quickly jumps out. But when placed in lukewarm water that is slowly heated, the frog will remain there until it is rescued" (Gore, 1992).

There are various ways one might try to determine why most creeping environmental phenomena continue to progress toward crisis. An improved understanding of the CEP process and societal responses to it would enable us to deal with them in a more effective way, that is, before a costly crisis response becomes the only option.

### **Can We Do Anything?**

Societies must identify ways to cope with CEP, not only those affecting their own countries but those in other countries as well. In the process of assessing CEP we should focus on capacity building in developing countries, so that researchers and politicians can join their Northern colleagues in addressing these insidious environmental changes. There will be no hope for governments to achieve sustainable development in the face of such changes. The overriding purpose of improved understanding of CEP is to identify ways to prompt earlier responses from governments to avoid having to deal with costly crisis management, a type of management with which many governments have little experience.

### **References**

- Aubreville, H., 1949: *Climate, Forests and Desertification in Tropical Africa*. Paris, France: Société d'Éditions Géographiques, Maritimes et Coloniales.
- Broecker, W.S., 1987: The biggest chill. *Natural History Magazine*, October, 74-82.

- Gore, A., 1992: *Earth in the Balance: Ecology and the Human Spirit*. New York: Houghton Mifflin Co.
- Posnick, S., and C. Vogel, 1992: Low-income housing -- the "brown" environmental issues. *Proceedings of the EPPIC '92 Conference on Poverty and the Environment*, 28-29 December 1992 in Midrand, Johannesburg, 117-128.
- Thomas, D.S.G., and N.J. Middleton, 1994: *Desertification: Exploding the Myth*. Chicester, UK: John Wiley and Sons.