

**ASSESSING THE IMPACTS OF CLIMATE: THE ISSUE OF  
WINNERS AND LOSERS IN A GLOBAL CLIMATE CHANGE CONTEXT**

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## PART I

The burning of fossil fuels (coal, oil and natural gas), deforestation, and land use activities (ie, the production of paddy rice, the use of fertilizers and the maintenance of livestock) produce radiatively active trace gases (popularly referred to as the greenhouse gases). Small amounts of these gases in the atmosphere can act to trap radiation, thereby heating the earth's atmosphere. The processes related to the increases in atmospheric CO<sub>2</sub> concentrations have been well known for more than a century, although most reviews of the greenhouse problem usually begin with the 1890s works of Swedish scientist Arrhenius.

Interest in the possible impacts on climate of CO<sub>2</sub> emissions have waxed and waned since that time with notable milestones of renewed interest appearing in the mid-1930s (Callendar, 1938), the mid-1950s (Revelle and Suess, 1957) and again in the late 1970s (i.e., Kellogg, 1977).

Today, we are engrossed in assessments of the prospects of a global warming and its possible impacts on environment and society. Discussions of such a prospect have steadily increased during the past fifteen years, reaching amazing levels in the past year or so. In fact, during the last Congressional session in the US, about three dozen bills were submitted (for a variety of reasons) related to the global warming issue.

Century-long interest in the issue has been interrupted in part by other more pressing and urgent historical events such as two world wars, a worldwide depression, decolonization, the Cold War, and a global cooling; and partly by the fact that the impacts of a CO<sub>2</sub>-induced global warming were originally believed to be beneficial to society. For example, it was suggested as late as the 1930s that a human-induced global warming would help

to thwart the emergence of an apparently imminent ice age (Callendar, 1938). Scientific evidence suggested that the earth was coming to the end of an interglacial period and that at any decade the ice age process could begin. The warming due to the increased greenhouse gases could delay that process.

From about 1940 to the late 1960s the earth underwent an unexplained cooling. Evidence was cited to support the belief that the earth was on the threshold of an ice age: the growing season in England had been shortened by two weeks, fish caught off the northern coast of Iceland were now appearing only off its southern coast, sea ice in the north Atlantic had increased in extent in the early 1970s and was appearing in normally ice-free shipping lanes, and hay production in Iceland had declined by 25% as a result of less hospitable weather. The fact that the armadillo, which had migrated as far north as Kansas in warmer decades, was starting to retreat toward the south was also used as evidence to support the ice age hypothesis. Geologic records were invoked as well to show that an ice age was near.

In sum, discussions in the scientific community about the possibility of a global cooling were widespread. Scientists provided eclectic evidence (but nonetheless convincing to the lay public as well as to parts of the scientific community) that the earth was possibly moving toward the beginning of an ice age. Talk of a global cooling, however, soon gave way to serious scientific discussion about the strong possibility of a CO<sub>2</sub>-induced global warming. Today, one hears nothing about global cooling.

Despite the brief duration of scientific concern centered on the possibility of a global cooling, one issue widely considered was how it might affect the relative economic or political

“position” of different countries around the globe. Even the CIA undertook studies to show how the climate change (cooling) might affect the USSR’s agriculture (CIA, 1976). *The Ecologist* examined the potential impacts of a few degrees cooling on agriculture in the Canadian Prairies (Goldsmith, 1977).

Some books and articles on the topic went so far as to identify specific countries that would become climate-related world powers in the event of a cooling. For example, Ponte (1976, p. 238) suggested that “adapting to a cooler climate in the north latitudes, and to a drier climate nearer the equator, will require vast resources and almost unlimited energy.... A few countries, such as equatorial Brazil, Zaire, and Indonesia, could emerge as climate-created superpowers.” He also suggested that “We can say with high probability today that the global monsoon rainfall will be below average for the remainder of the century (p. 243)”.

Another book on the possibility of a global cooling (The Impact Team, 1977, p. 216) suggested that with a cooling “... there would be broad belts of excess and deficit rainfall in the middle latitudes; more frequent failure of the monsoons that dominate the Indian sub-continent, south China and western Africa; shorter growing seasons for Canada, northern Russia and north China. Europe could expect to be cooler and wetter. Of the main grain-growing regions, only the US and Argentina would escape adverse effects.”

It is interesting to note that despite the short period of time that the scientific community entertained the fear of a global cooling, an immediate focus of concern and an immediate issue for open discussion was that of winners and losers. During the early 1970s there was no reluctance whatsoever to discuss who might win and who might lose in

the event of a climate change (cooling). Also, there was no reluctance to identify specific countries or specific economic sectors within a country as winners and as losers.

A striking difference between the scientific and political responses in the 1970s to a potential cooling and those of today (to a warming) is that today there is a great reluctance to discuss the notion of winners and losers in the context of a global warming. Clearly, there is strong opposition within scientific as well as policymaking circles to recognize the existence of, let alone identify, specific winners and losers, especially winners. Senator Gore, for example, argues that there will be no winners in the event of a global warming. This view apparently is also held by the EPA. Soviet scientist Mikhail Budyko in contrast asserts that everyone will benefit from a global warming. Each holds his view for different reasons. Perhaps the comments that Senator Tsongas made about diametrically opposed views on the energy crisis of the 1970s and 1980s are apropos to the diametrically opposed views of Gore and Budyko: "Both of these approaches are equally absurd, equally rhetorical, and equally successful. When talking to the convinced, they are very powerful. And that is basically how most people address the issue: we are awash in rhetoric, not to mention hypocrisy, when what we need is a careful sorting and weighing of the facts and values involved in making—or not making—a decision" [on who might win and who might lose in the event of a global warming] p. xii.

There is a belief that discussion and identification of winners and losers will prove to be divisive in terms of putting together a global coalition to combat global warming. Opposition to the open recognition of winners and losers was recently highlighted when the President of the World Bank suggested in a speech that there might be winners with

a warmer atmosphere. Environmental groups, which have been marching lock-step on this particular issue, opposed his public comments. As a result of his speech, some congressmen have even suggested the need for a closer scrutiny of the World Bank's activities and budget. For example, it was reported in the *Washington Post* (12 September 1989) that "In a letter to Conable, [Senator] Kasten [Wisconsin] wrote, 'The bank's failure to be on the front lines of efforts to fight global warming threatens the bank's long-term financial support from Congress'".

It is interesting to note that a similar argument was raised with respect to preventive versus adaptive strategies. There was a feeling that "premature" discussions about adaptive strategies with respect to global warming would break down the development of a united effort to support the enactment of preventive strategies. Proponents of preventive strategies wanted attention to focus on prevention as the best way to cope with global warming.

There is, however, one projected impact of global warming for which one is allowed to identify specific winners and losers; sea level rise. This is probably because it is the one impact of a global warming for which there may be no obvious winners. It appears that no one is reluctant to discuss or even identify specific losers associated with sea level rise. In this regard, one could argue that the sea level rise problem is similar to the stratospheric ozone depletion problem—no readily apparent significant winners can be identified. Such would probably not be the case for changes in rainfall distribution, water resources availability, agricultural production, fisheries productivity and energy production and consumption.

In this paper it is my intention to consider problems associated with the process of labeling wins and losses as such. What factors, for example, must be taken into account in labeling a region, an activity, or a country a winner or a loser? How do perceptions compare with reality? Can wins and losses be objectively identified? What are the costs and benefits of not addressing this issue as opposed to addressing it openly?

The intention is not to label specific countries as winners or losers. To do that, one could simply use any of the GCM-generated scenarios, the scenarios generated by paleo-ecological reconstructions, or assessments of recent environmental changes and label specific countries and regions within countries accordingly.

I realize that there is a risk associated with such an identification. If winners and losers are identified with some degree of reliability, the potential for unified action against the global warming will be reduced. Winners will not necessarily want to relinquish any portion of their benefits to losers in order to mitigate the impacts of their losses. On the other hand there is also a risk in not making such a distinction between winners and losers. While scientists and policymakers formally discuss only losses associated with a global warming, others may perceive that there will be positive benefits as well. The result is that the proponents for action on global warming could be likened to the fable about the emperor's new clothes, professing there are no winners, while everyone agrees with them in public but believes the opposite. This could sharply reduce the credibility of the proponents.

## PART II

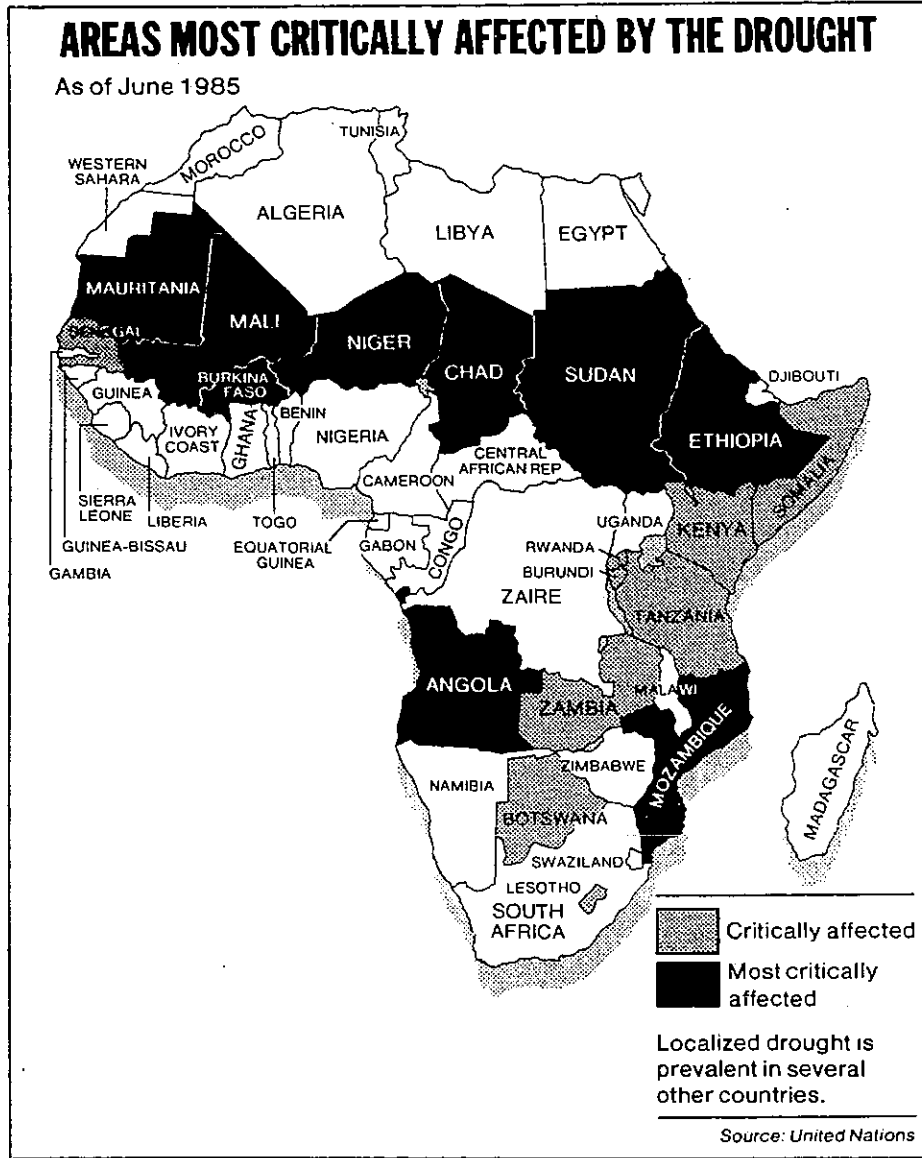
In the following section the notion of winners and losers is discussed in terms of climatic conditions. These conditions include today's global climate regime, an altered climate regime, and varying rates of change.

### A. Winners and losers with today's global climate regime

Why are some scientists and policymakers so concerned today about whether there might be winners in the event of a climate change (ie, global warming)? It seems obvious to this author that, say fifty years hence, there will be some societies that will benefit from whatever climate exists at that time. This is based on the belief that with today's climate, we can identify climate-related winners and losers. The following map, for example, shows drought-prone regions in sub-Saharan Africa, some of which could be considered climate-related losers. Such maps depicting drought- (and flood-) prone areas exist for other regions around the globe.

One could argue, however, that there has been little sustained (or effective) effort to date by climate-related winners to assist those who might be considered climate-related losers. Such a statement, of course, calls into question how foreign aid from the international donor community has been distributed. We have seen, for example, how in the past several decades foreign assistance has been frequently tied to political considerations (e.g., aid to Cambodia and South Vietnam in the 1960s and 1970s or Ethiopia in the 1980s). Examples that justify such low expectations about adequate, apolitical assistance from the industrialized countries are not difficult to find. In the early 1970s when there were widespread droughts throughout the world, except in the US, then-Secretary of Agriculture





New York Times, 8/20/85

Earl Butz spoke about how food exports from the US would be a new tool in the US foreign policy negotiating kit. Despite statements to the contrary, few leaders in countries chronically affected by the adverse impacts of today's climate believe that they can rely on assistance from those favored by today's global climate.

The Colorado River Compact of 1922 provides an example of a recent "climate change" in which winners and losers have been identified. Briefly, the Colorado River Compact was drawn up in 1922 to divide the waters of this river of great importance to the western US. The Colorado River Basin was divided into two parts, the Upper and Lower Basins. The flow in the system was estimated at about 15 million acre-feet (maf) based on the record for the previous 20-year period. It was decided by the representatives of the various states in the basin to divide in absolute terms 15 maf average annual flow equally between the two basins; 7.5 maf for each basin (75 maf over a 10-year period). It was believed by the upper basin states that there was in fact more water in the system than 15 maf and that they would benefit from any surplus that might exist.

Shortly after the agreement was signed, the Colorado River entered a period of low streamflow, setting record lows in the 1930s (the Dust Bowl decade). Today the streamflow is estimated at about 13.5 maf average annual flow. The Upper Basin states, however, had agreed to provide the Lower Basin with 7.5 maf. (For further details, see Brown, 1988). The loss in streamflow has to be absorbed by the Upper Basin. Thus, in this situation, one can identify winners and losers as a result from what might be considered a climate change that has to date lasted about six decades.

Carrying this analysis further one might ask what those who benefited from the Compact have done to compensate those who have not? What lessons for climate change responses by society might be drawn from this situation? Should future water compacts be based on proportional divisions of a variable resource instead of absolute amounts? What does this case study suggest about when to reach agreement on a variable resource—before winners and losers are identified or after?

Finally, an important related question that merits attention, but has yet to be addressed amidst discussions about possible strategic responses to global warming, is the following: Who loses and who wins if no action is taken and the climate remains as it is today? If it could be ascertained that no global warming were to occur, what actions would today's climate-related winners take to alleviate the climate-related problems of today's climate-related losers?

#### **B. Winners and losers with an altered global climate regime**

While we do not know the global let alone regional specifics of the havoc (or windfall) that a climate change will bring, we can assume that there will be winners and losers (however defined) with a global climate warming.

Some researchers and policymakers who are primarily concerned about the regional impacts believe that, compared to the present climate of their region, it is possible that their climate could improve rather than worsen with a global warming. Saudi Arabia is one such example, Ethiopia may be another. In other words they might consider the risk of change worthwhile. Bandyopadhyaya, an Indian social scientist, as well as Budyko of the USSR,

have made this argument at length in favor of a climate warming (Bandyopadhyaya, 1983, Budyko, 1988).

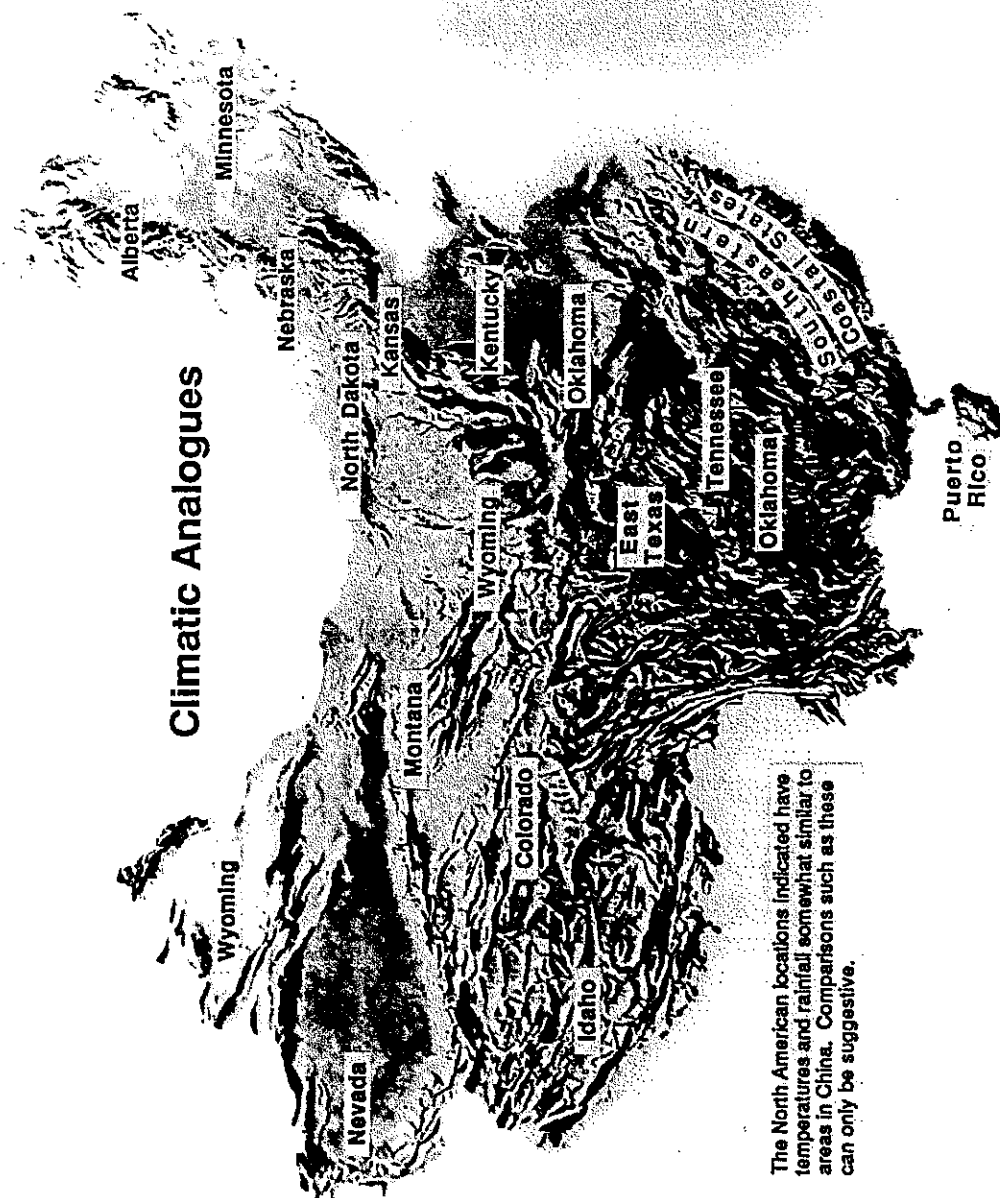
Often, when people talk about the possibility of increased rainfall in a given region, a counter-argument is raised that ambient temperatures (and, therefore, evaporation rates) will also increase. This would negate any benefits that might come from additional rainfall. Yet, history shows that societies have devised ways to capture rainfall and reduce evaporation, thereby improving the percentage of rainfall that they can effectively use.

Can we find examples of environmental conditions that different societies might have to cope with in the advent of a global warming? Are there existing climate change analogues for most places in the world? For example, with a warming, it has been suggested that Iowa will become hotter and drier than it is at present. Might Nebraska or Kansas provide a glimpse at Iowa's possible future environmental setting and, therefore, a glimpse of Iowa's future? Attempts to identify climate analogues are not new. The following maps of the USSR (CIA, 1974) and China (after Nuttonson, 1947) depict agro-climate analogues from North America. Similar analogue maps could be created that pertain to climate warming once we have an improved regional picture of the impacts of a global warming.

### **C. Winners and losers and rates of change**

As we have seen with other environmental changes, it is often not the change itself but the rapid rates of change that are so disruptive of human activities (including the ability to adjust). If changes are slow enough (whatever that means), their impacts may be relatively less disruptive in the short and medium terms than if the rates of change are much faster.





The North American locations indicated have temperatures and rainfall somewhat similar to areas in China. Comparisons such as these can only be suggestive.

Today, rates of change are receiving increasing attention. Some researchers, for example, have compared the rates of change in temperature during the thousands of years of the interglacial period (about  $2^{\circ}\text{C}/1000$  years) to rates of change that occurred during the past century ( $0.2\text{--}0.8^{\circ}\text{C}/\text{decade}$ ). Such a comparison is unscientific and misleading and should be challenged. Clearly, faster rates of change as well as slower ones have occurred in the last 10–12,000 years and one can selectively choose a period of years that could yield a “desired” rate of change.

One of society’s problems in confronting the climate change issue is the absence of a realistic “dread” factor. While attempts have been made in the recent past to identify such factors, they have generally been dismissed under closer scrutiny. For example, the possibility of the disintegration of the West Antarctic ice sheet (which would cause sea levels to rise 8 meters) was raised at the end of the 1970s. Upon closer scrutiny of the geophysical mechanisms involved, the probabilities associated with this occurrence were sharply reduced. The use of the notion of a doubling of  $\text{CO}_2$  from pre-industrial levels was another attempt to identify a dread factor. But, as some observers have noted, there was nothing cataclysmic about a doubling itself. Major environmental and societal impacts could occur before as likely as after the doubling. Interestingly, the time associated with the doubling has been moved closer to the present by different researchers; beginning at first with 2050–2075, to 2020, and even to 2010.

Yet another attempt to identify a dread factor was the article and news release about how the global climate regime might shift abruptly in a step-like manner as opposed to gradually (Broecker, 1988). Step-like changes in global climate would give societies little

time to cope with and adjust to the relatively abrupt environmental change that might ensue.

The most recent dread factor appeared in the testimony to Congress of scientist James Hansen during the summer of 1988 in which he stated that the four hottest years on record in North America occurred in the 1980s (US Congress, 1988). He contended that this was proof that the greenhouse effect was in progress and that the especially severe drought of the summer of 1988 was linked to the global warming. Other scientists (e.g., Trenberth et al., 1988) have since shown that the severe drought of 1988 was most likely related to other geophysical aspects and not necessarily to the global warming phenomenon.

Search for a dread factor in order to catalyze action is in itself a risky business. Each time a new dread factor has been suggested, evaluated and challenged, it has not stood up under scientific scrutiny, thereby diminishing the reliability and credibility of the global warming proponents. Finally, Several of the dread factors cited above relate to rates of climate change. Rates of change can have very significant impacts on society (and therefore are especially important to political decisionmakers). They must be examined and projected with objectivity and care.

### **PART III**

Before attempting to identify specific winners and losers that might result from a global warming at some time in the future, there are several "prior" questions that must be addressed. In this section, some of these "prior" questions are posed and only briefly discussed in order to stimulate more critical examination. The following is meant to be suggestive of the kinds of concerns that must be raised when assessing the societal



impacts of a global warming. These, among other "prior" questions will be discussed at an international workshop on assessing winners and losers in a global warming context, tentatively scheduled for late Spring 1990 in Malta.

*1. What do we mean by a win or a loss?*

It is not sufficient, meaningful or realistic to equate more rainfall than normal with a win and less rainfall than normal with a loss. In reality, the actual annual amount of rainfall in a given location does not by itself tell much about agricultural production. There are numerous articles about definitions of drought (e.g., Wilhite and Glantz, 1985). Researchers have identified differences between meteorological, agricultural and hydrologic droughts. If the expected annual amount falls (no meteorological drought) but is distributed throughout the growing season at the wrong time with respect to crop growth and development, a sharp decline in agricultural production (an agricultural drought) could occur.

Defining a win or a loss according to changes in evaporation rates may also not be very useful. If evaporation rates increase, and all else remains the same, then there will be a depletion of water resources. However, as noted earlier, people in many arid and semiarid areas have devised ways to minimize the impacts of high evaporation rates by the way they collect, store and use their available, often scanty, water resources. Thus, the dependence on a single physical parameter to identify the costs or benefits to a society of a climate change has severe limitations.

*2. How does one measure a win or a loss?*

While there has been much talk about winners and losers, there has been little attention paid to how those determinations have been made. One often hears that Canada will be a winner because as temperatures increase and the growing season lengthens, agricultural productivity will improve. However, one must ask what the impacts of a global warming will have on Canadian fisheries? On the timing of seasonal snowmelt? On the Canadian ski industry? And so forth. The point is that it is no simple matter to determine what might be construed as a positive impact of a change in global climate.

Another example of the difficulty associated with measuring wins and losses is provided by attempts to augment precipitation in a semiarid part of central Colorado. Cloud seeders were hired to augment rainfall, suppress hail and reduce rainfall during harvest, in order to improve the productivity of hops for beer production. Another group of farmers growing crops (e.g., lettuce) and ranchers with different moisture requirement in the same valley opposed these cloud seeding activities. The conflict between the two factions became violent and the operation was eventually halted. Thus, even within small areas there can be different responses to more or less rainfall, making an objective determination of a win or a loss exceedingly difficult.

Finally, another dimension of this aspect of winners and losers is whether a win (or loss) is absolute or relative. If one loses but loses less than others in a similar situation then that might be viewed as a relative win.

### *3. Can wins and losses be aggregated?*

While wins and losses can be added together to produce a net figure, one must question the value of that figure. The wins (or losses) are not shared commodities. Those who lose may not benefit in any way from those who win. For example, when the Peruvian anchoveta fishery collapsed those fishermen who had focused their activities (fishing gear, fishmeal processing factories and so on) on exploiting anchoveta were not prepared to take advantage of exploiting the sharp increase in shrimp populations that appeared along the Peruvian and Ecuadorian coasts. A country can expect to have both winners and losers within its borders in the event of a climate change. While the winners may be in a position to take care of themselves, **someone** will have to help the losers. I suggest that wins and losses cannot be aggregated. A win is a **win** and a loss is a **loss**.

### *4. What is the relationship between perceptions of wins and losses and actual wins and losses?*

Given the uncertainties surrounding today's scientific information about the regional impacts of a global warming, actual winners and losers within and between countries cannot be identified with any degree of confidence. Perhaps, we will learn that in reality everyone will lose with a global warming of the atmosphere. However, as long as some regions or countries **perceive** themselves to be winners or losers, they will act according to their perceptions. Their actions based on their perceptions will have real consequences. Thus, the issue of winners and losers must be addressed openly, objectively and scientifically, if we wish to minimize the chance that actions taken in response to a global warming will be based on misperceptions.

*5. How should one deal with the issue of intergenerational equity?*

Identifying winners and losers spatially as well as temporally must become a concern of those dealing with the global warming issue. Arguments about intergenerational equity have been invoked to generate support for taking action now against global warming. We are asked to take actions today to protect future generations from the environmental insults wrought by present generations. However, what is it that makes us believe that intergenerational equity arguments will generate widespread support for an environmental insult expected to occur a few generations in the future when we cannot generate the necessary support for achieving intragenerational equity today?

It appears that we have come to believe that any change in the status quo is by definition a bad change. But the real answer to this question will depend on who is asked to respond. A Saudi might believe that any change in the current climate regime will most likely be better for future generations of Saudis than the existing one. The opposite belief might be held by a farmer in the US Great Plains.

## **Conclusion**

Every discipline has dealt with the concept of winners and losers – biology, political science, sociology, economics, geography, law, ecology, conflict resolution, risk assessment, game theory and so on. Climate-related impacts as a result of a global warming is only the latest topic that requires consideration of winners and losers.

There have been conflicting views on whether to identify specific countries as winners or losers in the event of a global warming of the atmosphere. There has also been a reluctance to discuss the possibility that there may be any winners at all. It is time to get beyond that

conflict and to ask questions that need to be addressed so that the notion of winners and losers can be assessed on a more objective and realistic level.

There is a calculated risk in such a discussion. Once specific winners have been reliably identified, there may be reluctance on their part to lend support for global action to combat a greenhouse-gases-induced global warming. It is a risk that must be taken. Many issues must be resolved before we will be in a position to identify with any degree of confidence who those specific winners will be. In the meantime, other issues, such as equity issues, definition issues, measurement issues, perception vs reality issues, among others, must be addressed if, when the time comes, we wish to identify with some degree of confidence how specific countries, economic sectors, and regions within countries will be affected by climate change in the midst of the 21st century.

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