**Chapter 1**

**Four Economic Issues about Global Warming**

 1.1 How Much Pollution is Too Much?

 1.2 Is Government Up to the Job?

 1.3 How Can We Do Better?

 1.4 How Can We Resolve Global Issues?

 1.5 Summary

SUGGESTIONS AND SHORTCUTS

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Dwelling on the benefit-cost or scientific details can eat up the whole term. The students should be looking at the big picture here.

WHAT’S NEW

Economic analysis has begun to shift away from benefit-cost analysis of climate change and towards a view of climate policy as insurance against catastrophic outcomes. The chapter has more emphasis on this perspective, and includes a “Stern versus Nordhaus” discussion that captures the range in perspectives among economists. Also, the policy context of the chapter has been reframed around the Climate Paris Agreement.

 This chapter provides an introduction to the scientific issues surrounding the build-up of greenhouse gases in our atmosphere and the resultant liklihood of significant global warming. However, the focus is not on specific environmental concerns arising from our economic activity. Instead, the point is to *illustrate the framework* that economists use for approaching pollution problems. For any such concern, from landfill siting, to chemical regulation, to loss of species diversity, three general questions must be answered:

 1. How much pollution is too much?

 2. Is government up to the job?

 3. How can we do better?

When, as is increasingly common, the issue is an international one, a fourth question must also be addressed:

 4. How can we resolve global issues?

 The chapter outlines the questions raised and provided a sketch of the answers that arise when one grapples with the economics of environmental protection. As indicated, there is often lively debate among economists regarding the right answers. But what we do agree on is the centrality of these four questions.

**Application 1.0 Setting Goals for Greenhouse Gas Pollution, Take One**

The Kyoto Protocol requires that greenhouse gases be stabilized at a level that prevents “dangerous anthropogenic interference” with the climate system. In an effort to help define what these means, O’Neil and Oppenheimer (2002) relate certain physical effects to rising temperature:

* At 2○ F, we can expect “large-scale eradication of coral reef systems” on a global basis.
* At 4○ F, an irreversible process leading to the collapse of the West Antarctic Ice Sheet and a sea-level rise of 25 feet becomes significantly more likely.
* At 6○ F, the shutdown of the Gulf Stream leading to sudden, dramatic cooling in Northern Europe and accelerated warming in the South Atlantic becomes significantly more likely.

The authors conclude that it is impossible to prevent a 2 degree warming. Based on the relationships above, they call for holding global temperature increases to less than 4 degrees.

a. Is this an efficiency, ecological sustainability, or safety standard? Why?

**Answer**

1. The 4 degree target is an ecological goal. The target is set only with reference to preventing significant ecological damage to our descendants, with no reference to the costs of achieving the goals.

**Application 1.1 Setting Goals for Greenhouse Gas Pollution, Take Two**

Estimating the economic costs of global warming is a quite difficult process. In a recent book looking at the issue, Nordhaus provided this disclaimer: “attempts to estimate the impacts of climate change remain highly speculative. Outside of agriculture and sea-level rise the number of scholarly studies of the economic impacts of climate change remains small”. Nevertheless, he undertakes the process, offering this table:

|  |  |  |
| --- | --- | --- |
| Market impacts |  |  |
| Agriculture |  |  -$4 |
| Energy |  |  0 |
| Sea level |  |  -$6 |
| Timber |  | 0 |
| Water |  | 0 |
| **Total market** |  | -$11 |
| Nonmarket impacts |  |  |
| Health, water quality, and human life |  | -$1 |
| Migration |  | Na |
| Human amenity, recreation and Nonmarket time |  |  $17 |
| Species loss |  | Na |
| Human settlements |  | -$6 |
| Extreme and catastophic events  |   | -$25 |
| **Total nonmarket** |  | -$17 |
|  |  |  |
| **Total (market and nonmarket sectors)** |  |  |
| Billions of 1990 $ |  | -$28 |
| % of 1990 GDP |  | -0.5 |

Table 1.3-- Impacts of Global Warming in the United States: 2.5° C (5° F)

(billions of 1990 dollars/year benefits are positive while damages are negative.)

Source: Nordhaus (2000).

Note: na=not available or not estimated.

Nordhaus finds small negative impacts for agriculture (-$4 billion) and sea level rise (-$6 billion); argues that warming is likely to yield significant benefits for outdoor recreation (in crude terms, more good golf days, +$17 billion); and maintains that the biggest negative impacts of climate change are likely to come from destroying parts of historically or culturally unique human settlements like New Orleans or Olympia, Washington (-$6 billion), or from catastrophic climate change (-$28 billion). Overall he finds a negative impact of only .5% of GDP. (Note this figure leaves out the costs of species extinction—no accounting for coral reefs here). This is the analysis that underlies calls for “small” taxes on carbon dioxide ($10 per ton), leading to an ultimate rise in global temperature of close to 5○ F. {Compare to 4○ F in Application 1.0]

a. Is this an efficiency, ecological sustainability, or safety standard? Why?

b. One might question the value of basing environmental decisions on data that is “highly speculative.” How do you think Nordhaus defends drawing conclusions based on numbers like those in Table 1.3?

**Answers**

1. This 5 degree target is an efficiency goal—it seeks to weigh the benefits of stabilizing greenhouse gas concentrations in the atmosphere against the costs of doing so.
2. Two defenses here.
	1. The first is that best guess estimates are better than no estimates at all. We need to put down on paper some notion of what the likely costs of business as usual global warming will be in order to decide how strongly we need to react to the threat. Otherwise, we could well “over-react”—reduce too much at too high a cost—or “under-react”—do nothing.
	2. The second: once we have our best guess down, we can begin to see how sensitive the estimates are to underlying assumptions. For example: agriculture is the sector most likely to be impacted by climate change. But agriculture makes up less than 3% of GDP in most wealthy countries. Thus the impacts the economy working through the ag sector cannot be too large. An ecological critic would argue in response that if you wiped out half the agricultural sector in an economy, the secondary effects would be much larger. The debate between an efficiency and ecological standard ultimately revolves around just how “speculative” these estimates are, and thus how big the remaining uncertainty.

**Multiple Choice**

1. In 2017, most climate scientists believed that

a. the evidence for global warming remained somewhat flimsy.

b. carbon dioxide was the only human made source of the greenhouse effect.

c. the earth was likely to warm over the next 50 years as a consequence of greenhouse gas pollution.

d. belly button lint caused cancer.

e. atmospheric carbon dioxide levels were likely to stabilize naturally within 20 years.

2. Negative feedback effects on global warming

a. include exposure of dark earth as polar ice caps melt.

b. would accelerate the warming trend.

c. would slow down the warming trend.

d. would result if higher CO2 levels reduced the capacity of the ocean to absorb CO2.

e. are likely if the melting of frozen tundra increases the emission of methane gas into the atmosphere.

3. If global warming does occur, economic costs include

a. enhanced agricultural productivity in cold climates.

b. sea-level rise.

c. enhanced agricultural productivity, especially in poor countries.

d. a likely increase in the diversity of natural ecosystems, as warmer climates emerge.

e. b and d.

4. Benefit-cost analysis of global warming

a. has proven to be relatively uncontroversial.

b. suggests that *on net*, controlling CO2 emissions will generate higher costs than benefits.

c. is a scientific process, free of ethical decisions.

d. calls for at least moderate reductions in greenhouse gas emissions.

e. has created a consensus view among economists as to how fast new technologies can be developed.

5. Given that government regulators operate in a world of poor information, and are subject to political influence,

a. conservatives nevertheless concede that government intervention to protect the environment is generally socially beneficial.

b. conservatives seek an absolute minimum of government intervention.

c. progressives have faith that a *laissez-faire* attitude is best for the environment.

d. progressives view active government as both effective and necessary.

e. b and d.

6. Incentive-based regulatory approaches, such as pollution taxes

a. are viewed positively by most economists-- both progressive and conservative-- as a way to control pollution.

b. provide less flexibility than traditional technology-based regulation.

c. tend to hurt wealthier people more than poor people.

d. would be sufficient, in the eyes of progressive economists, to control global warming.

e. require that the government specify certain types of pollution control technology that firms *must* adopt.

**Answers to Multiple Choice:** c,c,b,d,e,a.