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6.1 INTRODUCTION

The set of important environmental problems created by man is large and diverse. Figure 6-1, taken from a conceptual scheme presented by Brubaker (1972), lists twenty-three environmental problems in order of ascending gravity.

Amenity Considerations	Human Health Effects	Human Genetic and Reproductive Effects	Effects on Ecological System and the Earth's Life Supportive Capacity
Litter	Air pollution-combustion products	Radioactivity	Human occupancy of biospace
Noise		Pesticides	Ocean threats:
Odor		Industrial chemicals	Pesticides
Air, visibility aspects	Water pollution:		Oil
Water quality, recreational aspects	Pathogens		Other chemicals
City, aesthetic aspects	Nitrates		Erosion
	Industrial chemicals		Fertilizers and damage to mineral cycling
City, convenience and efficiency aspects	Pesticides (through food chain)		CO ₂ , albedo, and climate
Country, aesthetic aspects	Radioactivity		Heat rejection, local aspect and global aspect
Access to country and nature	Heavy metals		

Figure 6-1 A spectrum of environmental problems associated with demographic and material growth
Source: Brubaker 1972, pp. 186-188.

Many of the problems listed in Figure 6-1 either are unrelated to variables in World3 or are dealt with in other sectors of the global model. For example, none of the problems listed as amenity considerations have any direct influence on the variables included in World3; the effects of pathogens or of air and water pollutants on human health are highly dependent on population density and thus are dealt with in the population sector through the lifetime multiplier from crowding; the effects of erosion and air pollution on agricultural productivity are represented in the agriculture sector; and the effects of thermal emissions or of increases in atmospheric carbon dioxide (CO₂) or albedo on long-term global weather patterns will most likely manifest themselves over a time period greater than that of interest in our study and thus were excluded from our analysis.

When these problems are subtracted from those listed in Figure 6-1, there still remains a substantial group of material pollutants of potential importance to the world system over the next hundred years. The long-term behavior of these pollutants has been modeled explicitly in the World3 pollution sector. These persistent material pollutants include industrial and agricultural chemicals, radioactive isotopes, and heavy metals. Although few time-series data on the effects of these materials are