

From the Endless Frontier to the Finite World

Ragnar Fjelland

Centre for the Study of the Sciences and the Humanities

University of Bergen



Alexandre Koyré: *From the Closed World to the Infinite Universe* (1957)



“No wonder that the Aristotelian felt himself astonished and bewildered by this amazing attempt to explain the real by the impossible - or, which is the same thing, to explain real being by mathematical being, because, as I have mentioned already, these bodies moving in straight lines in infinite empty space are not real bodies moving in real space, but mathematical bodies moving in mathematical space.” (Koyré: “Galileo and Plato”, 1943)



“I grant that these conclusions proved in the abstract will be different when applied in the concrete and will be fallacious to this extent, that neither will the horizontal motion be uniform nor the natural acceleration be in the ratio assumed, nor the path of the projectile a parabola, etc.” (Galileo, Dialogue)



“...in order to handle this matter in a scientific way, it is necessary to cut loose from these difficulties; and having discovered and demonstrated the theorems, in the case of no resistance, to use them and apply them with such limitations as experience will teach. And the advantage of this method will not be small; for the material and shape of the projectile may be chosen, as dense and round as possible, so that it will encounter the least resistance in the medium.” (Galileo Galilei: *Dialogue Concerning Two Chief World Systems* 1638)



“And thereby make ourselves, as it were, the lords and masters of nature.”

(René Descartes: *Discourse on Method*)



President Roosevelt's letter to Bush

"Dear Dr. Bush: The Office of Scientific Research and Development, of which you are the Director, represents a unique experiment of team-work and cooperation in coordinating scientific research and in applying existing scientific knowledge to the solution of the technical problems paramount in war."



"There is, however, no reason why the lessons to be found in this experiment cannot be profitably employed in times of peace."

"New frontiers of the mind are before us, and if they are pioneered with the same vision, boldness, and drive with which we have waged this war we can create a fuller and more fruitful life."



Science The Endless Frontier

***A Report to the President by
Vannevar Bush***

***Director of the Office of Scientific
Research and Development***

July 1945



Summary of the Report

Scientific Progress is Essential

"Progress in the war against disease depends upon a flow of new scientific knowledge. New products, new industries, and more jobs require **continuous additions to knowledge of the laws of nature**, and the application of that knowledge to practical purposes. Similarly, our defence against aggression demands new knowledge so that we can develop new and improved weapons. **This essential, new knowledge can be obtained only through basic scientific research.**"



Daniel Sarewitz: *Frontiers of Illusion. Science, Technology and the Politics of Progress* (1996)

Chapt. 6. The Myth of the Endless Frontier

Endless Frontier, Finite Earth



Donelle Meadows, Dennis Meadows and
Jørgen Randers: *Limits to Growth* (1972)



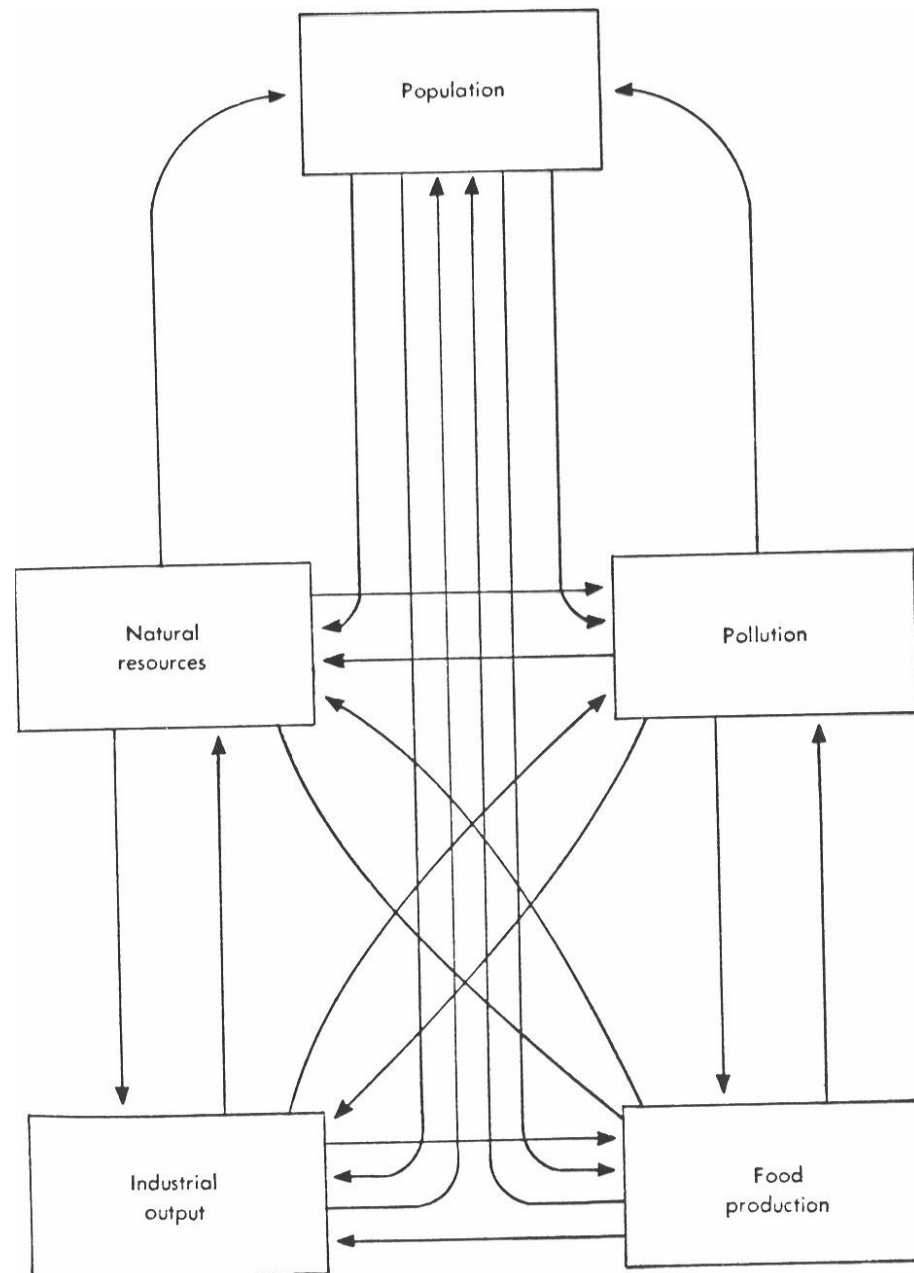
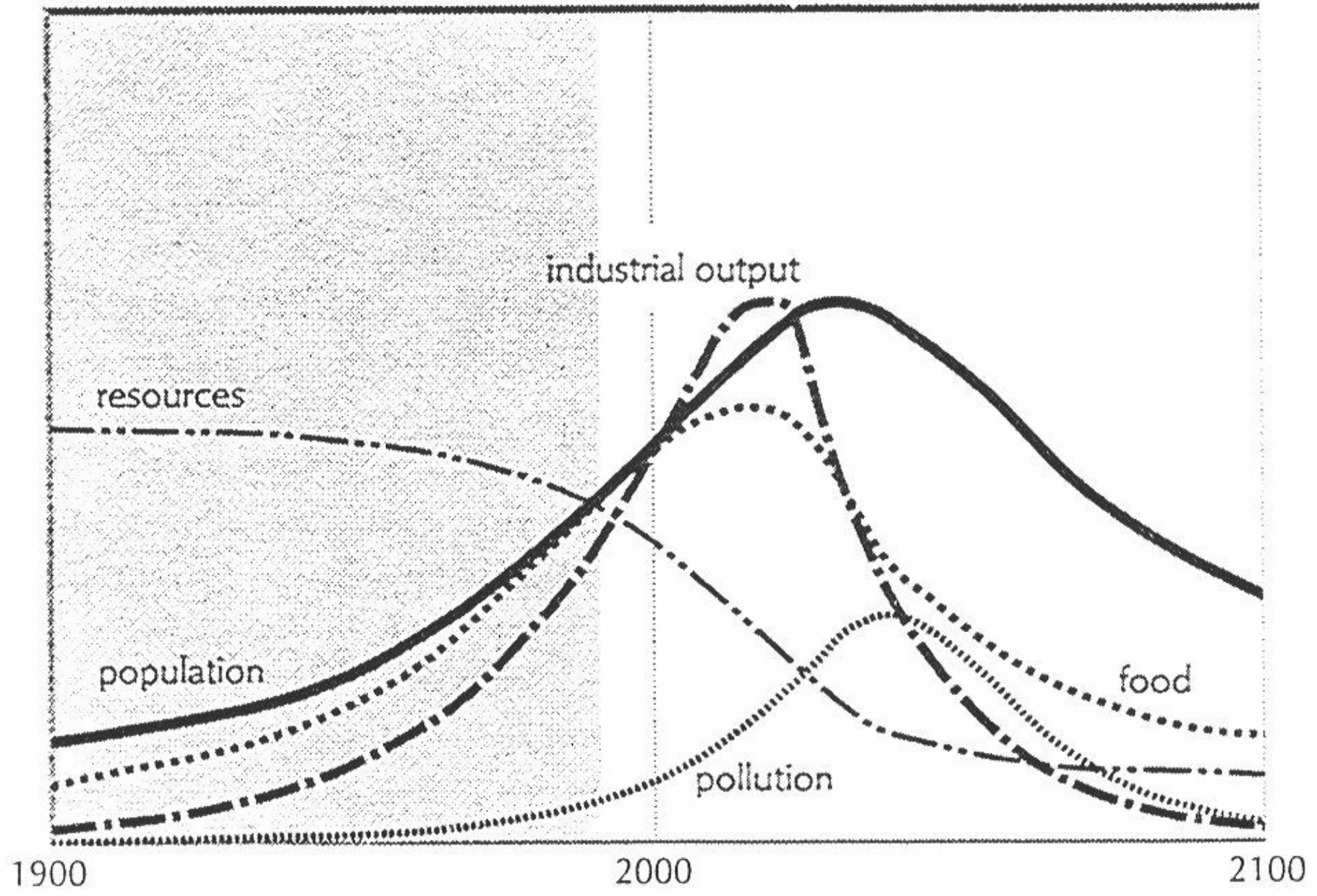
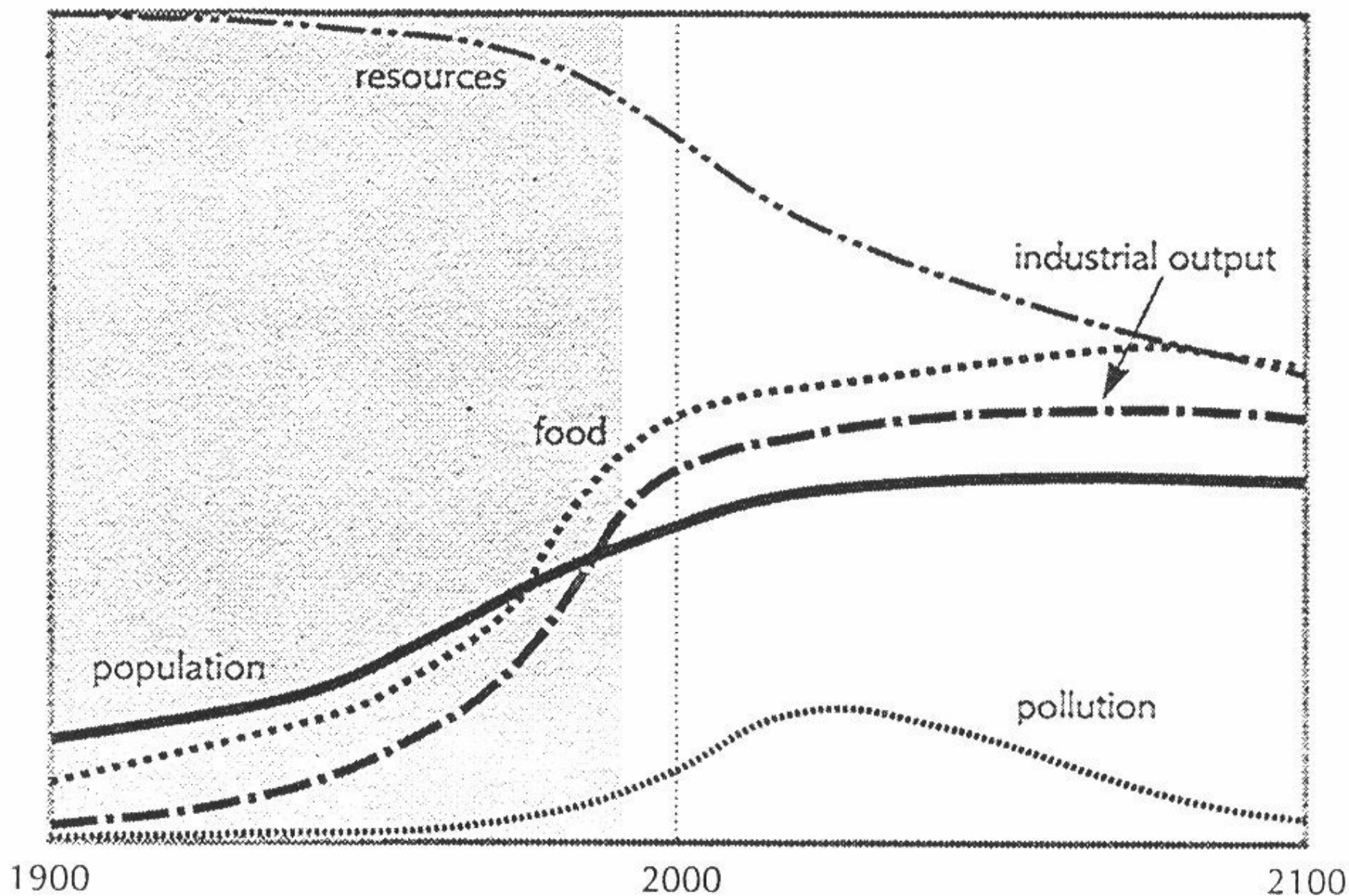
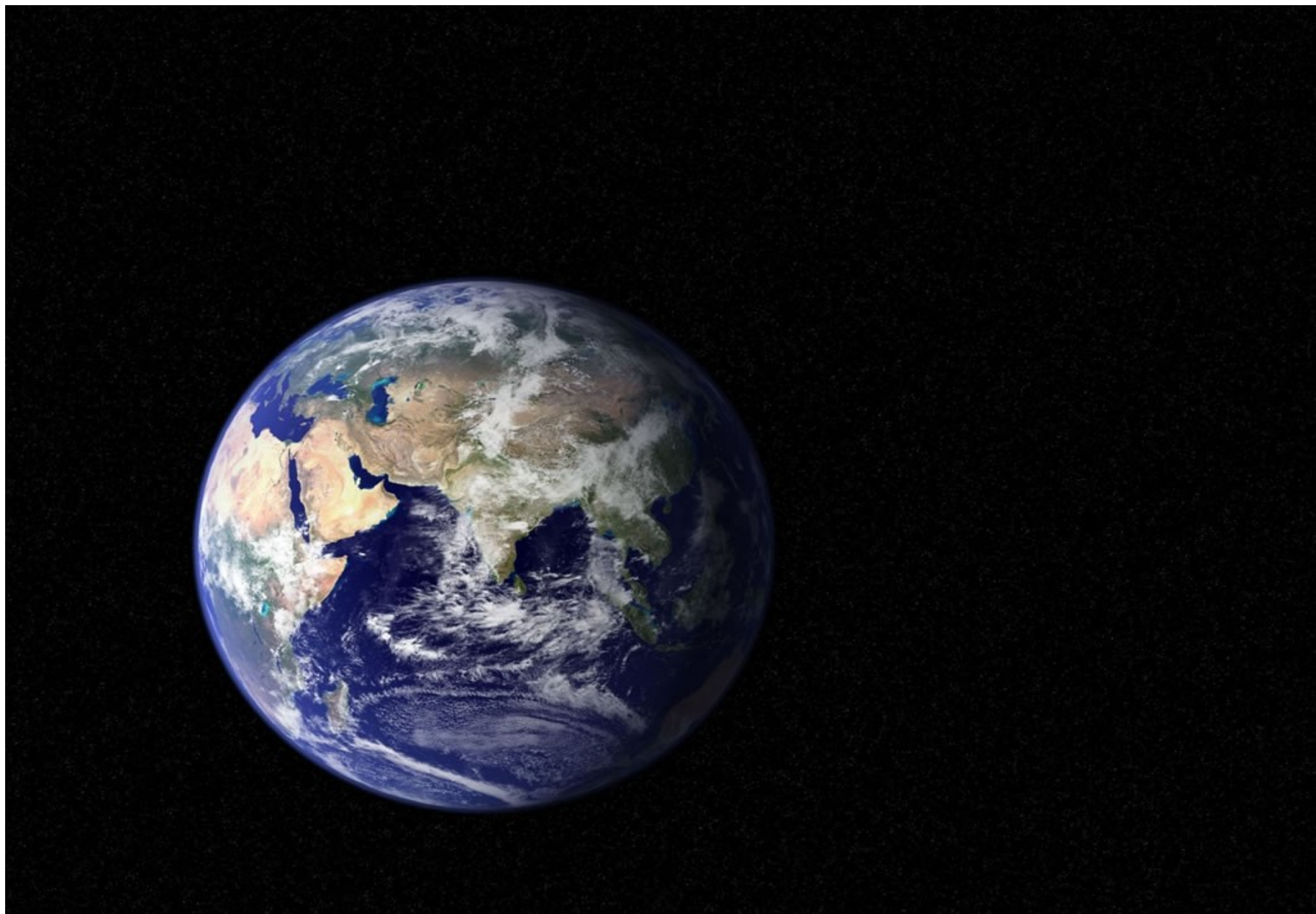


FIGURE 7.4 Interactions in the World II model







Barry Commoner: *Making Peace with the Planet* (first edition 1975)



The basic fact

Man inhabits two different spheres:

- the natural ecosphere, the thin global skin of air, water, and soil and the plants and animals that live in it
- the man-made technosphere



The technosphere has become sufficiently large and intense to alter the natural processes that govern the ecosphere.....

... The human attack on the ecosphere has instigated an ecological counterattack. The two worlds are at war.



The three (informal) laws of ecology:

1. “Everything is connected to everything else.”
2. “Everything has to go somewhere.”
1. and 2: The processes of the ecosphere are cyclical (whereas the processes of the technosphere are linear).



3. “Nature knows best.”

Natural evolution is slow, and therefore, there is time to eliminate errors.

Development of the technosphere is fast. For example, nature used millions of years to produce the oil and gas that we burn in a few centuries.



Making peace with the planet

Commoner has no simple solution, but let me indicate two ideas:

1. The basic question, then, is this: To what extent should the choice of production technologies be governed by private, generally short-term economic considerations such as profit maximization, and to what extent by long-term social concerns such as environmental quality?



2. Thus, resolving the environmental crisis would require a let us say 50 percent cut in worldwide military expenditures. In sum, we can end the environmental crisis by sharply reducing the present global commitment to militarism.

