Effects of New Technologies

Section 6.4 suggested four possible technological policies for pollution control: increasing the pollution transmission delay, increasing the rate of pollution assimilation, decreasing the damage caused by each unit pollution, and reducing the amount of pollution associated with each unit of resource or agricultural input. The following runs test the effectiveness of these four types of technological policies in avoiding the pollution crisis behavior shown in Run 6-4 (Figure 6-31). The exogenous inputs are again those portrayed in Figure 6-30, where continued material growth was assumed. In the real world, policies typically affect more than one relationship; the side effects and trade-offs of real-world policies are often complex and must therefore be modeled carefully when alternative policies are being considered. However, in the following runs we seek only to illustrate the behavior of the persistent pollution sector in response to several generic influences. Thus we assume that the changes we introduce influence only one sector relationship at a time.

Run 6-10 (Figure 6-37) shows the behavior of the persistent pollution sector if the persistent pollution transmission delay PPTD is doubled to 40 years in 1975 to represent the effects of technological advances that slow the transmission of persistent pollutants through the ecosystem. Such a change might be implemented in the real

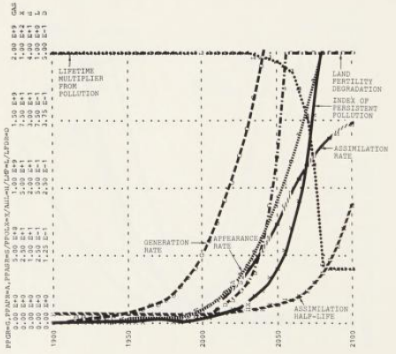

Figure 6-37 Run 6-10: behavior of the pollution sector in response to a doubling of the persistent pollution transmission delay in 1975

world by improved pollution storage techniques or by a shift in the geochemical characteristics of the persistent material emissions. Comparing Runs 6-10 and 6-4, indicates that this policy is effective only in the short term, postponing the rise of persistent pollutants for about 20 years. In the long run, continued growth in the generation of persistent pollutants PPGR counteracts the technological policy and causes PPOLX to grow exponentially. The net effect of this particular technological advance is to delay the damage portrayed in Run 6-4 by 20 years.

Run 6-11 (Figure 6-38) shows the effects of an advance in pollution assimilation technology implemented in 1975. In this run the assimilative limit of the ecosystem is doubled by reducing the effects of high levels of accumulated pollution on the pollution assimilation half-life AHL. As expected, the persistent pollution assimilation rate PPASR continues to grow for a longer period in Run 6-11 than in Run 6-4 because AHL remains lower in Run 6-11 than in Run 6-4. Even with increased assimilation technology, however, the growth in AHL is sufficient to raise the index of pollution PPOLX to 25 times its 1970 level by the year 2045. This value for PPOLX is two-thirds that observed in Run 6-4 in the same year. Doubling the assumed limit to the rate of pollution assimilation PPASR postpones the eventual impact on life expectancies LE and land fertility degradation LFDR by only 15 years.

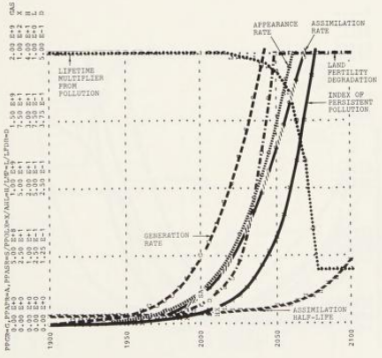

Figure 6-38 Run 6-11: behavior of the pollution sector in response to an advance in persistent pollution assimilation technology in 1975