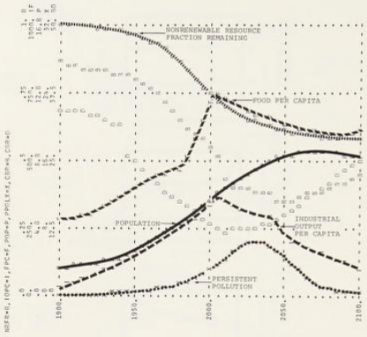

Figure 7-30 Run 7-22: adaptive technological policies—the effects of delays and costs of technological development and implementation

Advances in recycling, pollution control, and land yield technologies are again assumed to be obtainable only at a finite cost. In addition, it is assumed that the benefits of these technologies will not be realized until 10 years after their initiation. As in Run 7-21, the rising costs, modeled as a rise in the industrial capital-output ratio ICOR, cause industrial output per capita IOPC to decline. The added costs incurred by the continued implementation of new technologies even after IOPC has peaked force IOPC to fall more precipitously than in Run 7-21.

put per capita IOPC continue to grow, however, the technological improvements necessary to offset the side effects of this growth must also increase. The increasing technological developments demand more and more protective capital, which raises the capital-output ratio. As the capital-output ratio rises, industrial output per capita IOPC decreases after the year 2010. Food per capita FPC stabilizes near the desired level of 700 vegetable-equivalent kilograms per person-year in the year 2020. Resource usage and the level of pollution both decrease to their desired levels after the year 2000. Population POP stabilizes at 8 billion people in the year 2050, although both birth and death rates CBR and CDR are rising because of the decline in industrial output per capita IOPC.

Run 7-21 shows a behavior quite different from that of Run 7-19 (Figure 7-24), where the development and implementation of new technologies were achieved at no additional costs. In Run 7-21, continued growth in population POP and industrial

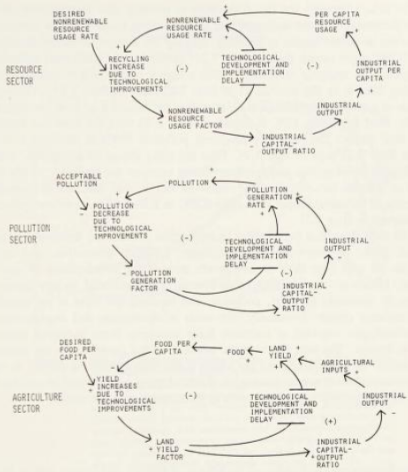

Figure 7-31 Structural additions for adaptive technological policies with delays and costs of technological development and implementation

output per capita IOPC cannot be continuously supported by advances in technology, for these advances become more costly as their magnitude increases. Eventually, this rise in costs causes industrial output per capita IOPC to decrease.

Adaptive Technological Policies—The Effects of Delays and Costs of Technological Development and Implementation Run 7-22 (Figure 7-30) shows the behavior of the model if technological advances are obtained at some cost and only after a 10-year development and implementation delay. Figure 7-31 shows the structural additions assumed in this run. Increases in technology raise the industrial capital-output ratio as in the previous run, but they affect resource usage, pollution generation, and land yields only after a 10-year delay. Run 7-22 shows the effects of these development and implementation delays on the model's behavior.