

Kentucky's Economic Trends and Environmental Futures

Kentucky's economy and its environment are inextricably linked—the economic development policies we adopt and the actions we take to implement those policies can, and do, affect the quality of our environmental assets. Forward-looking legislation and policy are dependent upon information about the effects of different mixes in the pursuit of economic development and the promotion of environmental protection in Kentucky. The problem is not one of tradeoffs between the environment and the economy, but the development of policies and programs and private sector practices that will protect the environment in order to permit more economic development.

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Kentucky's economy and environment are inextricably linked. The economic development policies we adopt and the actions we take to implement those policies can, and do, affect the quality of the air, water, land, and other environmental assets of the Commonwealth. By the same token, the quality of the environment can affect Kentucky's ability to develop its economy. While a despoiled environment can diminish the Commonwealth's attractiveness for development, a clean, healthy, aesthetically pleasing environment can actually serve as a stimulus to economic growth. Thus, it is imperative that public policy pursue a balance of economic development and environmental protection in Kentucky. The resources of the public sector need to be committed to sustainable development so the Commonwealth can enable people to accomplish their current economic goals without encumbering the resources and quality of life for future generations of Kentuckians.

Determining where to begin pursuing sustainable development, however, presents a challenge. In order to plan for the future, we must first understand how economic policies and actions affect environmental preservation. The Forecasting Kentucky's Environmental Futures (FKEF) Project sought to begin this process by identifying those policy alternatives and directions that have the greatest potential for achieving both enhanced socio-economic well-being and a stronger natural environment. Fortunately, but also problematically, policy alternatives and potential changes abound. Economic and environmental policymakers face many difficult choices such as:

- Emphasizing reliance on natural gas for automobiles or promoting expanded use of mass transit where possible
- Investing state resources in educating the public on environmental issues in order to promote more sustainable household behaviors or spending those resources on helping companies to adopt—and market—the most advanced environment-protecting technologies, showing them how to profit by doing so
- Providing subsidies to attract new firms wherever they locate in the Commonwealth or targeting support to direct development in particular regions
- Deciding between alternative means of stimulating forest products use and secondary wood processing in the Commonwealth, which may have indistinguishable economic effects but different environmental consequences

All of these choices involve the pursuit of financial gain for the citizens of Kentucky, but all also reflect the reality of environmental impacts—and decisionmakers are rarely provided

with adequate information on the outcomes of choices they must make. Thus, the importance of this project becomes clear: FKEF attempts to provide some sense of the long-term effects of interactions between shifts in economic activity and environmental policy.

The FKEF project was undertaken by the Center for Environmental Management (CEM), a component of the Kentucky Institute for the Environment and Sustainable Development at the University of Louisville (KIESD) for the Kentucky Long-Term Policy Research Center (LTPRC). It builds on the *Kentucky Outlook 2000* Comparative Risk project now being completed by the Cabinet for Natural Resources and Environmental Protection (CNREP). The project combines detailed consultations and focus group meetings involving knowledgeable parties from government, industry, higher education, and environmental organizations with computer-based projection techniques to identify and test alternative environmental futures. To obtain systematic projections, the FKEF team pursued mathematical forecasts, combining economic and environmental conditions in the Commonwealth around the year 2025. The numerical findings presented and discussed here come from two sources: (1) The REMI economic model employed by the Legislative Research Commission for state economic projections (This type of model automatically extends current trends to the future, so the forecasts are solidly grounded in current economic conditions and policy directions.); and, (2) POLESTAR, a decision-support tool that links environmental conditions to levels of population and gross domestic product.

Projecting Kentucky's Futures

If Kentucky's current economic and demographic trends remain unchanged, the Commonwealth will likely face serious environmental problems. Our baseline projection, which envisions no significant shifts in technology, regulatory practice, production techniques, or patterns of consumption beyond those currently evident in economic and demographic trends, shows significant economic gains, but, as Table 25.1 indicates, at substantial environmental cost. The projected 40 percent increase in per capita income and constant purchasing power will likely exact its price in continued deterioration of the natural environment, as future levels of both air pollutants and energy consumption will become significantly worse. In this baseline projection, the technical relationships between levels of economic activity and environmental consequences (emissions, wastes, resource consumption, energy generation and use, land required for infrastructure and other uses, etc.) were assumed to be effectively unchanged from those that now exist.

Of course, this baseline projection is fundamentally unrealistic because it assumes no change in current economic patterns. Thus we also developed a restructured economic projection to account for deviations from the baseline in particular sectors. Experts who participated in focus groups for this project agree that the Kentucky economy will change in five key sectors:

- Tobacco and production agriculture
- Coal mining
- Secondary wood processing

Economic or Environmental Condition	After 30 Years	
	Total Level	% Change
Gross Domestic Product (total output)	\$111 billion	47%
Population	4 million	5%
Gross Domestic Product per Person	\$27,750	40%
Annual Total Energy Consumed	2,073 Petajoules	44%
Annual Carbon Dioxide Emissions	278 Megatons	17%
Annual Releases of Sulphur Dioxide	914 Kilotons	12%
Annual Volatile Organic Compounds	1,104 Kilotons	7%

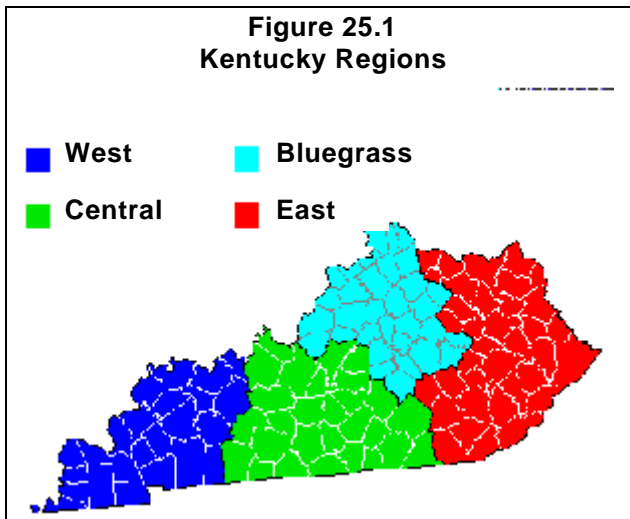
- Manufacturing attraction and succession
- Tourism

While the first two of these changes are driven by external forces, the last three represent successful pursuit of economic development by the Commonwealth. In general, the restructured projection involves decreased reliance on tobacco farming, increased demand for forestry yields as inputs to secondary wood processing industries, decreased mining activity, and increased manufacturing and tourism. Such responses to market pressures would not significantly alter economic growth expectations, but might affect environmental impacts. These changes and our rationales for choosing them are summarized in Table 25.2.

Economic shifts—and their environmental consequences—will not, however, be experienced similarly across the entire Commonwealth. Kentucky enjoys extensive variety in its geographic and economic characteristics, including mountainous areas, wide open rural areas, and cities of diverse size, all with varying concentrations of income from different sources. To accommodate this diversity, the state's REMI econometric model was configured to encompass four regions: Bluegrass, Central, East, and West (See Figure 25.1).

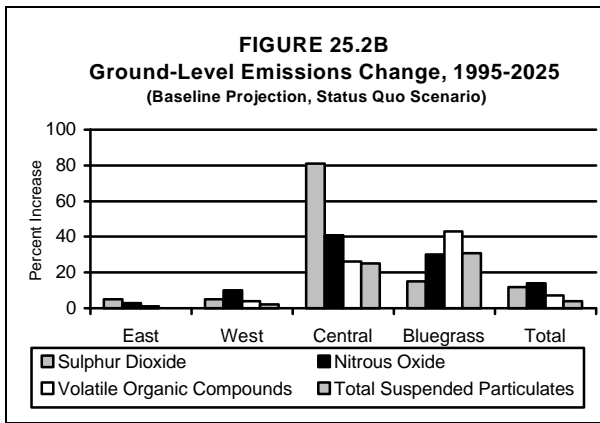
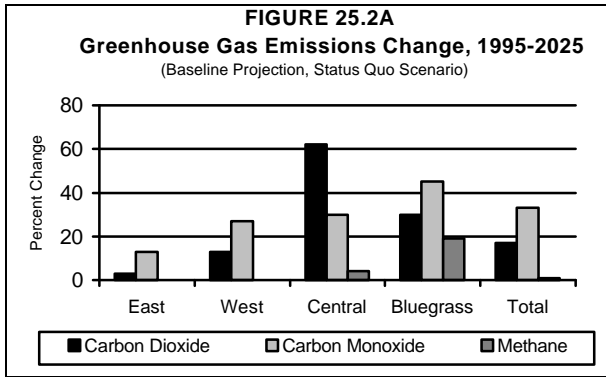
TABLE 25.2
Sectoral Changes Employed in the Restructured Economy Projection

Sector	Change Introduced into Projection
Tobacco & Production Agriculture	50% reduction in the 1995 burley quota by the year 2025
Coal Mining	15% reduction over current REMI projection for 2025 in coal mined in Kentucky, distributed proportionally over Eastern and Western coal fields
Secondary Wood Processing	Increase over REMI projections for 2025 of 20% in relatively low-skill wood processing activities and 10% in relatively high-skill wood processing production
Manufacturing Attraction and Succession	Increases in the REMI projections for 1995 in a number of sectors: 5% in metal machining and related work; 20% in machinery production; 10% in automobile production; 15% in plastic products manufacturing
Tourism	A 3 million person increase in the number of tourism nights projected by REMI for 2025, representing about a 7% increase



the Bluegrass, which includes the Lexington, Louisville, and Northern Kentucky areas, is currently the most environmentally stressed, especially with respect to air quality. The fastest future economic and population growth will likely occur in this region, so not surprisingly, it promises to be the hardest hit environmentally as well. In fact, the projected 43 percent increase in ground-level pollutants in the Bluegrass threatens to exceed current federal limits and could cause the Commonwealth to lose major federal government funds.

The Central region also risks damaged air quality because of power plant expansions. Figure 25.2A and Figure 25.2B illustrate the variety of air pollution emissions that might be experienced across the regions under the baseline economic scenario.



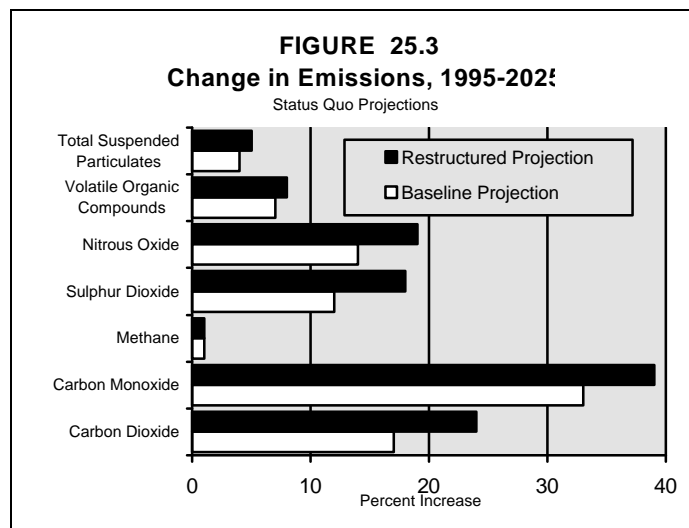
Moreover, the possible restructuring of the Kentucky economy will not solve the environmental problems that are emerging. Figure 25.3 shows graphically that the restructured Kentucky economy that might emerge over the next 30 years could pose even greater environmental challenges in the form of air pollution emissions than would continued expansion of the economy the Commonwealth now experiences. The environmental challenges in fact threaten to choke off economic expansion, especially if there are physical, human health, or legal constraints on possible increases in air emissions in key urban regions.

These gloomy projections pose a real problem. However, they have not taken into consideration a whole range of changes in household tastes and behaviors, business priorities and practices, and possible regulatory shifts. Nor have they

incorporated possible changes in the adoption and acceptance of currently available but underutilized technologies that could reduce negative environmental effects without damaging prospects for economic gain. We turn next to the impacts of these types of changes on environmental deterioration.

The Prospects for More Sustainable Development

The FKEF project considered two broad types of shifts in the context in which economic activity and the environment interact: technological changes and policy and practice changes. In both instances, we took care to include only changes that appear probable at the present time. That is, we projected changes that seem probable prospects in light of current sociological and behavioral data on environmental practices and currently available technologies for reducing negative environmental impacts. The two sets of changes are summarized in Table 25.3.



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TABLE 25.3
Sector Changes Assumed under Different Scenarios

Sector	Technical Change Assumed	Policy, Practice Changes Assumed
Transportation	1. Increased fuel efficiency of vehicles. 2. Reduced emissions per mile driven. 3. Changes in fuels used.	1. Changes in mass transit, assuming major new use in urban areas. 2. Reduced car miles driven per capita.
Households	1. Major increase in lighting, appliance efficiency. 2. Some shift to renewable power to heat and cool homes. 3. Increased energy efficiency of heating and cooling.	1. Some energy conservation obtained through changes in use behaviors.
Service Sector	1. Total electricity consumption falls substantially thanks to engineering efficiency gains.	1. Total electricity consumption decreases due to consumer taste, marketing changes.
Manufacturing	1. Total power use exhibits a significant drop due to technological changes. 2. Shift from reliance on fossil fuels (other than coal) towards renewables. 3. Chemical industry use of coal, rather than oil or gas, as a feedstock for plastics production rises.	1. Power use falls somewhat due to efforts to conserve.
Land Use	1. Built Environment required per capita falls substantially overall as the result of technological gains, falling more in denser population areas. 2. Forest lands grow in response.	1. Built Environment required per capita in the Bluegrass Region falls significantly due to taste changes. 2. Built Environment required per capita in the Eastern Region rises a bit due to new infrastructure. 3. Forest lands change in response.
Solid Waste	1. Volume of packaging on consumer goods falls, reducing solid waste.	1. Total per capita household solid waste generation falls due to new buying habits. 2. Recycling by all sectors rises substantially.

The same forces that may produce restructuring of the Kentucky economy may also generate these types of changes. Growing awareness by firms, businesses, and families of the development problem posed by worsening environmental conditions could over time accelerate interest in, and acceptance of, new practices and available technologies. Moreover, state government efforts could, conceivably, systematically attempt to accelerate adoption of available technologies or shift the practices and behaviors of households, firms, and local governments. Either type of change would significantly reduce the negative impacts of economic expansion on the environment of the Commonwealth, as Table 25.4 illustrates.

By way of example, it is clear that either change could reduce the flow of waste to municipal landfills below the 5 percent increase that would be expected under the current conditions (status quo), with policy and practice changes—largely increased recycling—having the greatest effect. Energy demands could also be reduced substantially—and with them an array of air emissions—but in this instance, the greatest improvement would come from adoption of available energy-saving technologies, not shifts in policy or behavior.

The FKEF project did not attempt to predict which changes would be most likely be adopted in Kentucky, nor did

TABLE 25.4
Environmental Impacts in 2025
Under Technology and Policy Change Scenarios
(measured by percentage change in impact relative to 1995 data)

Impact Measure	Status Quo (no change)	Technology Change	Policy Change
Air Emissions			
Carbon Dioxide	17 24	03 09	12 19
Carbon Monoxide	33 39	11 18	38 44
Methane	01 01	01 01	-05 -06
Sulphur Dioxide	12 18	06 10	09 15
Nitrous Oxide	14 19	02 05	11 16
Volatile Organic Compounds	07 08	-01 00	07 08
Total Suspended Particulates	04 05	-03 -03	03 04
Municipal Solid Waste Generated	05 05	-01 -01	-12 -12

we derive prescriptions for how to generate the shifts. Our focus group consultations with a broad range of experts identified a series of five possible policy context shifts that might shape the prospects for such changes:

- *The extent of Environmental Literacy*, which would affect people's improved understanding of the environmental consequences of their actions and decisions, thus affecting the prospect for changes in policies and practices
- *The degree of public acceptance of the principles of sustainable economic development*, reflecting concern for accelerated adoption of available technologies that could reduce or limit the adverse environmental effects of economic expansion
- *The need for leadership at the level of state government*, in developing, recognizing, and involving the electorate in choosing among policy alternatives that could increase the prospects for pursuit of the dual objectives of economic expansion and environmental preservation or improvement
- *Construction of needed public works*, and upgrading of the infrastructure for transportation, water and waste treatment facilities, and electronic data communications facilities in the Commonwealth, with their dual potential impacts on the economy and the environment
- *The prospect of energy use changes*, especially outside the Commonwealth, and their implications for the coal market and revenues from mining activity in Kentucky.

The prospect for implementation of the types of changes which could reduce the negative impacts of needed economic expansion on the Kentucky environment will clearly depend on the context in which they are pursued. While these five factors may be critical, as our advisory panels noted, the trends in them cannot be predicted with any certainty.

Findings and Policy Implications

The FKEF project conclusions about environmental futures may be stated simply, if not optimistically:

Elements of the Kentucky environment will deteriorate over the next 30 years under either economic projection, and even if all the changes in environmentally sensitive technologies and in policies, practices and behaviors considered here take place.

The levels of deterioration in air quality in particular will be such that *environmental factors will slow the rate of economic growth and make the projected gains by 2025 unattainable* given current standards for required minimum environmental quality. Thus the problem is not one of the tradeoffs between the environment and the economy, but, rather, the development of policies and programs and private sector practices that will *protect the environment in order to permit more economic development*.

Considering the possible changes that might occur in the Kentucky economy and in its environmental practices over the next 30 years, the project provides additional insights:

- *Consideration of the advisability of economic restructuring should include assessment of environmental factors.* As our comparison of the baseline and restructured economic projection illustrates, the anticipated restructuring would involve significantly higher pollution levels, which may or may not be acceptable.
- *To the extent to which environmental factors may affect the capacity of the Commonwealth to increase incomes, Kentucky will face increased environment-income complementarity, rather than rising conflict, as time progresses*
- *This sensitivity of economic prospects to environmental considerations may be geographically concentrated*, as our scenarios suggest. Statewide economic develop-

ment planning must therefore be sensitive to such vulnerabilities, since environmental deterioration could easily stymie plans for economic expansion.

- *For the immediate future, state efforts to promote adoption of available environmentally-sensitive technologies appear to hold substantially more promise for supporting the dual objectives of economic expansion and environmental protection than do regulatory, attitudinal or behavioral shifts.* This relationship may change over time, however, as policy context factors rather than public actions themselves affect behaviors, political priorities and the technologies available.
- *However, it is not appropriate to consider technological change and policy and practice change to be mutually exclusive.* They can be very complementary and may well interact so as to avoid further deterioration of the Kentucky environment as the population and economy of the Commonwealth continue to expand.

The pessimistic findings on the trends in Kentucky's environment, and the indications of possible means to minimize negative developments are a call for new focus in policy planning and assessment. The issues raised go far beyond the mandate of the Cabinet for Natural Resources and Environmental Protection: Kentucky's environmental futures will be shaped by transportation policy, educational policies and practices, land use plans and economic development and technology policies (NOT simply the volume of economic activity, but its types), agricultural policies and practices and so on. A brighter environmental future can be pursued, but only through recognition across the operating agencies of the public sector in the Commonwealth that the environmental implications of policies need to be considered, both in terms of the direct effects of public actions and in terms of the impacts on private sector decisionmaking. Without conscious coordinated public efforts to improve our environmental futures, we can expect deteriorated environmental conditions; with focused efforts and some limited but strategic resource commitments, we can maintain—and even accelerate—the pattern of improvement that we have been fortunate enough to witness over the past 15 years.

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