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Minnesota AGRICULTURAL ECONOMIST



Environmental Quality: Some Economic Implications

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In recent months, there has been increasing concern over the many forms of pollution that detract from the quality of our environment. While most people agree that it is a legitimate cause for concern, there is considerable controversy over specifics such as the causes of pollution, measures that should be taken, and especially over who should bear the costs of pollution control.

The purposes of this article are to identify some causes of environmental deterioration and to discuss some economic implications of constructive change.

WHAT IS ENVIRONMENTAL QUALITY?

A straight forward definition of environmental quality is **the condition of our air, water, soil, and general surroundings**. Some of the conditions that might be included are:

Water — Temperature; pH or acidity; dissolved oxygen; nutrients; metallic ions; chemicals; radioactivity.

Air — Oxides of carbon, nitrogen, and sulphur; hydrocarbons; particulate matter; odors and fumes; radioactivity.

Soil — Nutrients; contaminants such as lead, pesticide residues, and radioactive matter.

General — Access to open space; general aesthetic features; nuisances such as garbage and trash, noise, and flashing lights.

CAUSES OF ENVIRONMENTAL DETERIORATION

More Production and Consumption

A larger population and a rising level of living, as measured by gross national product (GNP), are in part responsible for pollution problems. The consumption as well as the manufacture of many of

the products associated with a higher GNP cause, or have the potential of causing, some forms of environmental deterioration.

The manufacture of the steel, rubber, fiber, and other raw materials that go into the production of automobiles, appliances, clothing, furniture, and many other items we use results in more pollution from industrial processes.

The provision of electric power for a growing population causes unique and difficult problems. Fossil fuel plants create air pollution, and nuclear power plants produce radioactive wastes. Hydro-power requires dams that alter the natural flow and may detract from the scenic and aesthetic qualities of rivers and streams.

The use of modern appliances such as automatic washers and dishwashers requires greater quantities of water than more traditional methods, placing a greater load on waste treatment systems.

Automobiles are a major source of air pollution in our urban areas. Even the lines and poles that transport power sometimes are considered to be eyesores that detract from the quality of our environment.

Pollution problems are accentuated when masses of people are concentrated in urban areas. However, even in rural areas there sometimes are problems such as pollution of lakes by septic tank effluent and pollution of well water by nitrates.

"Sophisticated" Production Techniques

The mass production necessary for increasing GNP requires ever more sophisticated production techniques. For example, complex chemical processes in production generate wastes that are difficult to dispose of. Pesticides used in forestry, for urban purposes such as mosquito abatement, and in certain agricultural production practices create new and largely unknown potentials for environ-

mental damage. The production of nuclear power gives rise to still another class of pollutants about which there are many unanswered questions.

The Resulting Dilemma

It is paradoxical that the increasing level of living which we all enjoy, and which is a measure of our affluence, is partially responsible for the deterioration of our environmental quality in terms of the measures identified above. The recent gain in material goods has coincided with a deterioration in environmental quality and has caused the uneasy feeling on the part of many that the quality of life is deteriorating too.

The dilemma is that as we produce more and become wealthier, it takes a greater proportion of our human and capital resources to maintain a given level of environmental quality. But the situation is not hopeless. As we become more affluent, we can afford to set aside a greater proportion of our resources for maintaining environmental quality. The solution is not without some cost, however, for it will require a reallocation of resources away from other uses.

SOME ECONOMIC IMPLICATIONS

The release of pollutants into the environment can be viewed as a byproduct of production. Their disposal or elimination represents a cost of production. Since the resources of society are limited, the inevitable conclusion is that increased use of resources for pollution control means fewer resources available for other purposes. In other words, if conditions are to be improved, somebody must pay.

Costs to Industry

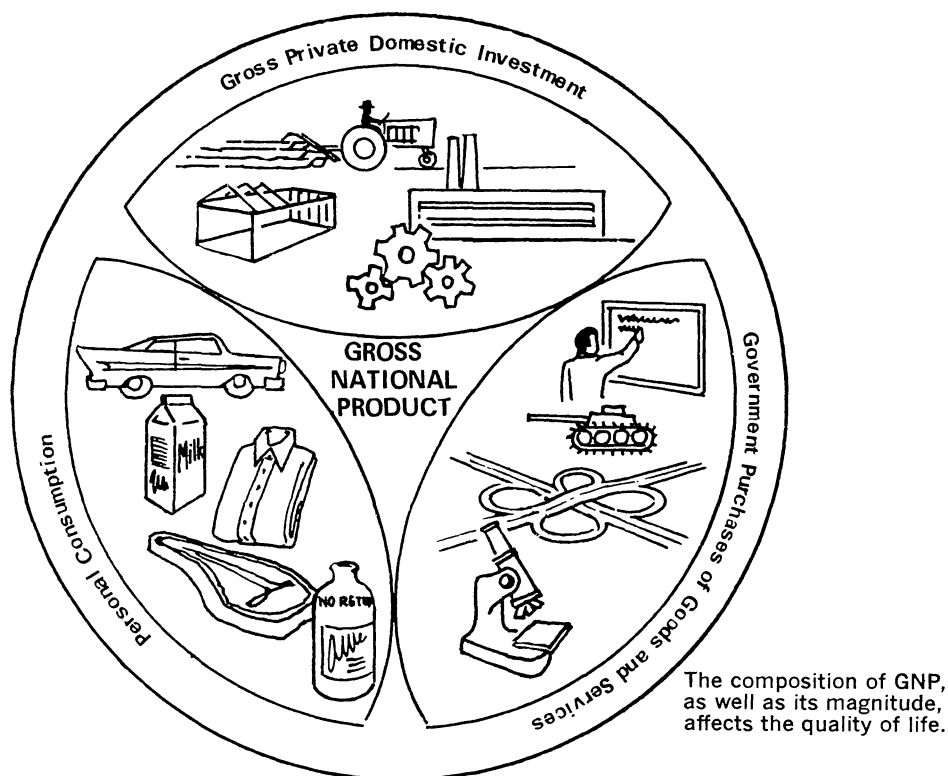
Environmental deterioration can by no means be attributed solely to industry. Yet it is reasonably accurate to state that industry generally has not done all that is physically and economically possible to abate pollution.

In the absence of rules and regulations, industry has little shortrun financial incentive to introduce pollution control practices. This situation exists because the costs of pollution in the form of deterioration of the environment are borne by the general public, not by the firm.¹

For industry to install equipment and adopt processes that are less damaging to the environment will necessarily increase production costs. These increased costs must either be passed on to consumers as higher prices, absorbed as lower profits, or some combination of the two.

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¹ Longrun incentives for introducing pollution control processes might include public relations values, preservation of a physical and social environment conducive to the operation of democratic capitalism, and showing youth that constructive and orderly change can occur within the present political-economic system.



The particular course of action that would be followed by industries adopting pollution control practices would very likely depend on the structure of the industry. Monopolistic and oligopolistic² industries are in a stronger position to pass on increased costs in the form of higher prices than are the more competitive industries.

In the short run, competitive industries will have greater difficulty passing on increased costs in the form of higher prices. However, in the long run, when increased costs affect all firms within the industry, the net result will very likely be higher product prices.

Conflict and controversy may arise when a firm that is required to adopt pollution control measures claims unfair discrimination on the grounds that they are subject to more exacting standards than their competitors. This complaint sometimes is accompanied by an announcement of the possibility of relocation to a situation "more favorable to industry" and the unhappy possibility of regional unemployment.

The fact that all states are in the process of strengthening their air and water quality standards should help to reduce the competitive and relocation arguments. Nevertheless, one can expect that

these points will be brought up often in the future, particularly when a plant is on the verge of obsolescence, since its per unit operating costs already are relatively high at that point.

This type of problem will continue to be among the most difficult to resolve to the satisfaction of all parties.³

Costs to Consumers

The costs of instituting practices to preserve environmental quality will ultimately be borne by consumers in the form of higher prices and, in some cases, limited or restricted use of given resources (such as zoning of lakeshores).

It can be generalized that with a more complex and sophisticated system of production and distribution, greater amounts of resources will be required simply to maintain the system and to protect the environment from pollution resulting from production. The net result will be a lower rate of increase in **shortrun** production and consumption than would occur if protection of the environment were neglected.⁴

³ It is partially for this reason that few politicians have lengthy and impressive records on environmental matters. One might speculate that some of the politicians who have recently taken up environmental issues may not fully realize the potential political pitfalls involved in these controversial issues.

⁴ The reader is reminded that demand for a better natural environment is at least partially a function of affluence. While an affluent society may willingly exchange a higher for a lower rate of economic growth with higher environmental standards, it is sobering to contemplate that less affluent societies may not.

Costs to Taxpayers

Because of the extensive and pervasive nature of certain pollution problems, responsibility for their solution is borne by local, state, and federal government. Local government generally is responsible for collection and treatment of sewage. State government is responsible for setting standards, monitoring, and enforcement activities. Federal government is responsible for national policy, research, and provision of technical and financial assistance to state and local government.

With increased governmental activity in these areas, increased funding must come from either of two sources: higher taxes or reallocation of public expenditures toward pollution control activities and away from other expenditures. In either case, the results are not without some cost.

At the national level, about 2 percent of the budget is allocated to natural resources. The same holds true for Minnesota. In both cases, only a fraction of that 2 percent is for expenditures on environmental quality.

It is these facts, along with resistance to tax increases, that are partially responsible for public attention to reordering priorities, especially at the national level. It can be expected that congress will come under increasing pressure to reallocate public funds toward items such as environmental quality control and away from items currently receiving the major share of funds, such as military hardware and weaponry.

The Role of Technology

It is sometimes charged that technology is the cause of our pollution problems. Others contend that only by the application of technology can we solve the problems of the future. While there is some truth in both statements, realism requires an intermediate position.

It is true that the mass production enabled by technology has caused serious pollution problems. Furthermore, technology has been developed and applied at a rate for which our institutions could not adjust, thereby aggravating many of our social problems. However, as bleak as the prospect may seem, just to feed the world's population, which shows no sign of leveling off, let alone provide a higher level of living, will require the continued application of technology.

If this prospect seems dismal and depressing, hope lies in the opportunity for developing a more balanced technology. In the past, technology has been oriented toward mass production with little thought to consequences in the environ-

² Monopolistic industries are those consisting of one firm in a market area, such as a gas or electric company. Oligopolistic industries are those dominated by a few large firms, each of which has considerable influence on price. Automobile, steel, and rubber manufacturers are examples.

ment. The price and market system quickly and accurately reflects changes in consumer preferences. And the demand for many products is satisfied by mass production techniques. However, **there is no equivalent market mechanism to reflect consumer demand for improved environmental quality.** The net result is a technology that is out of balance and oriented mainly toward production rather than toward maintenance of environmental quality.

Public insistence on governmental action in formulating and enforcing tighter environmental standards is a necessary step in creating the incentive for more research and development on pollution control technology. With the innovation of cost lowering pollution control technology, it will be politically more likely that higher environmental standards will be established.

LONG RANGE CONSIDERATIONS

The contention that the role of economics and technology will continue to be important is not meant to diminish other considerations regarding environmental quality. Foremost among these is population.

It is frequently stated that food and natural resources are limiting factors in population growth. However, with respect to environmental quality and the quality of life, especially in the United States and in Minnesota, this statement misses the point. It is **technically** possible to support a much larger population in Minnesota and in the United States than presently exists. But this possibility doesn't mean that a larger population is a goal most people desire.

The relevant question regarding population is what level of population can we support at the level of living and quality of life we would like to have? In the coming years, the concept of an optimum level of population and a zero or reduced rate of population growth will get more and more discussion.

The total relationship of man to his environment and the social and psychological phenomena of goals, values, and attitudes toward production and consumption are matters that have been overlooked too long and deserve immediate and serious attention.

In the meantime, however, the unglamorous, troublesome, complex, and politically sensitive environmental problems must be dealt with today. However incomplete the solutions, the decisions made today will affect the options available tomorrow. ■

GNP and the Quality of Life

John J. Waelti

Although there are differing opinions about what constitutes quality of life, the criteria must include a minimum level of food, clothing, shelter, and other goods and services, the production of which depends on a properly functioning economy.

Of the concepts useful in analyzing the performance of the economy, one of the most familiar to the general public is **gross national product**, or GNP. It is defined as the **gross market value of all final goods and services produced in the economy in 1 year.** The so called expenditures approach examines GNP as the sum of personal consumption expenditures, gross private domestic investment, government purchases of goods and services (local, state, federal), and net exports.

Today, many people are questioning whether an increasing GNP is a legitimate goal in itself, and whether too much attention is given to GNP (a measure of quantity) and not enough to the quality of life.

GNP was never meant to be a measure of the quality of life. But it has its limitations for the far more modest objective of relating the performance of the economy as a factor contributing to the quality of life. These limitations are especially relevant to an affluent society that has a relatively wide range of economic choices.

SOME LIMITATIONS

1. GNP excludes most nonmarket goods and services. These items, many of which are extremely important to the quality of life, are omitted because of the difficulty of estimating their value. Among the most prominent nonmarket items affecting the quality of life are the important services of the housewife.

The housewife who takes a full- or part-time job not only contributes to final output, but she is likely to purchase more precooked, elaborately packaged foods, restaurant meals, and other higher cost items, all of which contribute to a higher GNP. Some may question the contribution of these latter items to the quality of life and might opt for greater productivity in the home or other nonmarket activities such as civic functions.

The work of the home craftsman who makes his own furniture and paints his own house and the work of the amateur mechanic on his own car are other examples of useful production that are not counted in GNP because of their nonmarket nature. If these services are pur-



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chased, they become a part of GNP.¹

2. GNP neglects social costs and benefits. There are many costs and benefits associated with certain types of production that cannot be readily valued. The damages and inconveniences associated with air and water pollution are examples. The value of a final product of a specific industry can be valued at market price, adding to GNP, but no account is taken of the damage to the environment that may have occurred during the production process.

Other examples include unemployment caused by automation and displacement of persons caused by a housing project.

In other cases, the value of government services may be much greater than their initial cost. Examples might include investment in a Head Start Program, designed to increase the capacity of underprivileged children to develop their abilities, and investment in cancer research or pollution control programs. While the cost of the human and capital resources used in these programs is part of GNP, potential benefits from them are not.

3. GNP does not take account of leisure time. Leisure time is valued by individuals as an opportunity to spend time with the family, for recreation, or for pursuit of interests not directly related to earning a living. An increased work week may add to production and GNP but, because of reduced leisure time, an individual may not feel that his quality of life has improved.

4. GNP does not always take into account changes in product quality. Some changes in product quality are not reflected as changes in price. In general, beef, pork, and many other food products are of higher quality than 15-20 years ago. Price changes in these products reflect changes in the general price level and changes in supply and demand, rather than product quality, which in the case of meat is due to better breeding and feeding of livestock. Contribution

¹ In more traditional and less affluent societies, a greater proportion of productive activity is nonmarket and not included in GNP. This is a major reason why GNP is of limited usefulness in comparing the quality of life in nations at different stages of development.



GNP, as it affects level of living, is only one factor in the quality of life.

to quality of life is therefore understated by this aspect of GNP.

Most new automobiles and appliances have more accessories, options, and other features than older models. In some cases, such additions may be considered an addition to product quality. However, lighter construction, built-in obsolescence, and undependable operation may reflect a decrease in product quality that may not be reflected in lower price and GNP.

5. GNP takes no account of the composition of output. This is one of the most significant limitations of GNP as a measure of the quality of life. Everyone has his own notion about the right combination of output that makes up GNP. And most individuals would prefer a lower GNP with the "right" mix of output to a higher GNP with the "wrong" mix.

For example, while few question national defense and security as a reasonable and legitimate goal, many people question the contribution of certain portions of the defense budget to the achievement of that goal. Expenditures on the development of the supersonic transport and space shots are other items whose contribution to the quality of life many question. Debate on these issues is involved with the current controversy over reordering national priorities.

In the private sector, the manufacture and sale of no return bottles and cans

contributes to GNP. However, these items augment trash and disposal problems. Many contend that these items detract from the quality of life and that resources used in their manufacture would be better used elsewhere or conserved.

In an affluent society, a substantial proportion of GNP is needed just to maintain operation of the economy. Resources spent on commuting, freeways, garbage and trash removal, and other items associated with an increasingly urbanized society are necessary for our present mode of living, but may not add conspicuously to the quality of life. Thus, skepticism regarding the extent to which certain additions to GNP are reflected in the quality of life is in some measure justified.

The concept of GNP is neutral with respect to values. Value judgments can be made only by people as they examine its components.

6. GNP takes no account of the distribution of output. Americans generally agree that a large middle class is preferable to an elite vs. poverty stricken, either or type of society. This agreement implies the preference that GNP be distributed with some degree of equity, however that might be defined.

Because there are some Americans living in a state of poverty, most would agree on the general principle that the quality of life would be improved for everyone if malnutrition, inadequate hous-

ing, and other aspects of poverty and its causes and effects could be reduced or eliminated.

7. GNP is a gross measure. In the process of production, capital goods may be exhausted or used up. GNP minus the value of capital consumed in production (technically referred to as capital consumption allowance) leaves net national product or NNP. NNP is somewhat more meaningful, but is still subject to the above limitations.

8. GNP takes no account of population. If GNP would grow at a slower rate than population, per capita measures would decrease. Thus far, per capita GNP in the United States has grown even though population has increased.

However, it is important to note the consequences of a rapidly growing population in the composition of GNP. An increasing number of young people necessitates larger outlays for education and general investment in human capital, the return for which is not realized for at least a generation. This investment is borne largely at the state and local levels of government. The educational needs arising from the post World War II baby boom partially account for the difficulty of state and local governments in financing public goods and services since World War II.²

Although GNP figured on a per capita basis is in some respects a better measure of the contribution of output to quality of life, it is still subject to the previously mentioned limitations.

When viewed in perspective, GNP can be a useful concept considered as **only one** of many factors that affect the quality of life. It can best be used by examining the components of GNP as they relate to our national, regional, and individual goals and objectives. ■

² Another portion of the explanation is that the major sources of local and state revenue, the property tax and sales tax, are relatively unresponsive to increases in income compared to the income tax, which is the major source of federal revenue.

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